

Scott Rifenbark, Scotty's Documentation
Services, INC <srifenbark@gmail.com>

by Scott Rifenbark
Copyright © 2010-2020 Linux Foundation

Permission is granted to copy, distribute and/or modify this document under the terms of the Creative Commons Attribution-Share Alike 2.0 UK: England & Wales [<http://creativecommons.org/licenses/by-sa/2.0/uk/>] as published by Creative Commons.

Manual Notes

- This version of the Yocto Project Reference Manual is for the 3.0.3 release of the Yocto Project. To be sure you have the latest version of the manual for this release, go to the Yocto Project documentation page [<http://www.yoctoproject.org/documentation>] and select the manual from that site. Manuals from the site are more up-to-date than manuals derived from the Yocto Project released TAR files.
- If you located this manual through a web search, the version of the manual might not be the one you want (e.g. the search might have returned a manual much older than the Yocto Project version with which you are working). You can see all Yocto Project major releases by visiting the Releases [<https://wiki.yoctoproject.org/wiki/Releases>] page. If you need a version of this manual for a different Yocto Project release, visit the Yocto Project documentation page [<http://www.yoctoproject.org/documentation>] and select the manual set by using the "ACTIVE RELEASES DOCUMENTATION" or "DOCUMENTS ARCHIVE" pull-down menus.
- To report any inaccuracies or problems with this manual, send an email to the Yocto Project discussion group at yocto@yoctoproject.com or log into the freenode #yocto channel.

Table of Contents

1. System Requirements	1
1.1. Supported Linux Distributions	1
1.2. Required Packages for the Build Host	2
1.2.1. Ubuntu and Debian	2
1.2.2. Fedora Packages	2
1.2.3. openSUSE Packages	3
1.2.4. CentOS Packages	3
1.3. Required Git, tar, and Python Versions	4
1.3.1. Downloading a Pre-Built buildtools Tarball	4
1.3.2. Building Your Own buildtools Tarball	4
2. Yocto Project Terms	6
3. Yocto Project Releases and the Stable Release Process	11
3.1. Major and Minor Release Cadence	11
3.2. Major Release Codenames	11
3.3. Stable Release Process	11
3.4. Testing and Quality Assurance	12
4. Migrating to a Newer Yocto Project Release	14
4.1. General Migration Considerations	14
4.2. Moving to the Yocto Project 1.3 Release	14
4.2.1. Local Configuration	14
4.2.2. Recipes	15
4.2.3. Linux Kernel Naming	16
4.3. Moving to the Yocto Project 1.4 Release	16
4.3.1. BitBake	16
4.3.2. Build Behavior	17
4.3.3. Proxies and Fetching Source	17
4.3.4. Custom Interfaces File (netbase change)	17
4.3.5. Remote Debugging	17
4.3.6. Variables	17
4.3.7. Target Package Management with RPM	18
4.3.8. Recipes Moved	18
4.3.9. Removals and Renames	18
4.4. Moving to the Yocto Project 1.5 Release	19
4.4.1. Host Dependency Changes	19
4.4.2. atom-pc Board Support Package (BSP)	19
4.4.3. BitBake	19
4.4.4. QA Warnings	20
4.4.5. Directory Layout Changes	20
4.4.6. Shortened Git SRCREV Values	20
4.4.7. IMAGE_FEATURES	20
4.4.8. /run	21
4.4.9. Removal of Package Manager Database Within Image Recipes	21
4.4.10. Images Now Rebuild Only on Changes Instead of Every Time	21
4.4.11. Task Recipes	21
4.4.12. BusyBox	21
4.4.13. Automated Image Testing	21
4.4.14. Build History	21
4.4.15. udev	22
4.4.16. Removed and Renamed Recipes	22
4.4.17. Other Changes	22
4.5. Moving to the Yocto Project 1.6 Release	23
4.5.1. archiver Class	23
4.5.2. Packaging Changes	23
4.5.3. BitBake	23
4.5.4. Changes to Variables	24
4.5.5. Package Test (ptest)	25
4.5.6. Build Changes	25
4.5.7. qemu-native	25
4.5.8. core-image-basic	25
4.5.9. Licensing	25
4.5.10. CFLAGS Options	26

4.5.11. Custom Image Output Types	26
4.5.12. Tasks	26
4.5.13. update-alternative Provider	26
4.5.14. virtclass Overrides	26
4.5.15. Removed and Renamed Recipes	26
4.5.16. Removed Classes	26
4.5.17. Reference Board Support Packages (BSPs)	27
4.6. Moving to the Yocto Project 1.7 Release	27
4.6.1. Changes to Setting QEMU PACKAGECONFIG Options in local.conf	27
4.6.2. Minimum Git version	27
4.6.3. Autotools Class Changes	27
4.6.4. Binary Configuration Scripts Disabled	28
4.6.5. eglibc 2.19 Replaced with glibc 2.20	28
4.6.6. Kernel Module Autoloading	28
4.6.7. QA Check Changes	28
4.6.8. Removed Recipes	29
4.6.9. Miscellaneous Changes	29
4.7. Moving to the Yocto Project 1.8 Release	29
4.7.1. Removed Recipes	29
4.7.2. BlueZ 4.x / 5.x Selection	30
4.7.3. Kernel Build Changes	30
4.7.4. SSL 3.0 is Now Disabled in OpenSSL	30
4.7.5. Default Sysroot Poisoning	30
4.7.6. Rebuild Improvements	31
4.7.7. QA Check and Validation Changes	31
4.7.8. Miscellaneous Changes	31
4.8. Moving to the Yocto Project 2.0 Release	31
4.8.1. GCC 5	31
4.8.2. Gstreamer 0.10 Removed	32
4.8.3. Removed Recipes	32
4.8.4. BitBake datastore improvements	32
4.8.5. Shell Message Function Changes	32
4.8.6. Extra Development/Debug Package Cleanup	33
4.8.7. Recipe Maintenance Tracking Data Moved to OE-Core	33
4.8.8. Automatic Stale Sysroot File Cleanup	33
4.8.9. linux-yocto Kernel Metadata Repository Now Split from Source	34
4.8.10. Additional QA checks	34
4.8.11. Miscellaneous Changes	34
4.9. Moving to the Yocto Project 2.1 Release	34
4.9.1. Variable Expansion in Python Functions	34
4.9.2. Overrides Must Now be Lower-Case	35
4.9.3. Expand Parameter to getVar() and getVarFlag() is Now Mandatory	35
4.9.4. Makefile Environment Changes	35
4.9.5. libexecdir Reverted to \${prefix}/libexec	35
4.9.6. ac_cv_sizeof_off_t is No Longer Cached in Site Files	35
4.9.7. Image Generation is Now Split Out from Filesystem Generation	36
4.9.8. Removed Recipes	36
4.9.9. Class Changes	36
4.9.10. Build System User Interface Changes	37
4.9.11. ADT Removed	37
4.9.12. Poky Reference Distribution Changes	37
4.9.13. Packaging Changes	38
4.9.14. Tuning File Changes	38
4.9.15. Supporting GObject Introspection	38
4.9.16. Miscellaneous Changes	38
4.10. Moving to the Yocto Project 2.2 Release	39
4.10.1. Minimum Kernel Version	39
4.10.2. Staging Directories in Sysroot Has Been Simplified	39
4.10.3. Removal of Old Images and Other Files in tmp/deploy Now Enabled	40
4.10.4. Python Changes	40
4.10.5. uClibc Replaced by musl	40
4.10.6. \${B} No Longer Default Working Directory for Tasks	40
4.10.7. runqemu Ported to Python	41
4.10.8. Default Linker Hash Style Changed	42

4.10.9. KERNEL_IMAGE_BASE_NAME no Longer Uses KERNEL_IMAGETYPE	42
4.10.10. BitBake Changes	42
4.10.11. Swabber has Been Removed	43
4.10.12. Removed Recipes	43
4.10.13. Removed Classes	44
4.10.14. Minor Packaging Changes	44
4.10.15. Miscellaneous Changes	44
4.11. Moving to the Yocto Project 2.3 Release	44
4.11.1. Recipe-specific Sysroots	44
4.11.2. PATH Variable	45
4.11.3. Changes to Scripts	46
4.11.4. Changes to Functions	46
4.11.5. BitBake Changes	46
4.11.6. Absolute Symbolic Links	47
4.11.7. GPLv2 Versions of GPLv3 Recipes Moved	47
4.11.8. Package Management Changes	47
4.11.9. Removed Recipes	48
4.11.10. Wic Changes	48
4.11.11. QA Changes	49
4.11.12. Miscellaneous Changes	49
4.12. Moving to the Yocto Project 2.4 Release	50
4.12.1. Memory Resident Mode	50
4.12.2. Packaging Changes	50
4.12.3. Removed Recipes	51
4.12.4. Kernel Device Tree Move	52
4.12.5. Package QA Changes	52
4.12.6. README File Changes	53
4.12.7. Miscellaneous Changes	53
4.13. Moving to the Yocto Project 2.5 Release	54
4.13.1. Packaging Changes	54
4.13.2. Removed Recipes	54
4.13.3. Scripts and Tools Changes	55
4.13.4. BitBake Changes	55
4.13.5. Python and Python 3 Changes	55
4.13.6. Miscellaneous Changes	56
4.14. Moving to the Yocto Project 2.6 Release	57
4.14.1. GCC 8.2 is Now Used by Default	57
4.14.2. Removed Recipes	57
4.14.3. Packaging Changes	58
4.14.4. XOrg Protocol dependencies	58
4.14.5. distutils and distutils3 Now Prevent Fetching Dependencies During the do_configure Task	59
4.14.6. linux-yocto Configuration Audit Issues Now Correctly Reported	59
4.14.7. Image/Kernel Artifact Naming Changes	59
4.14.8. SERIAL_CONSOLE Deprecated	60
4.14.9. Configure Script Reports Unknown Options as Errors	60
4.14.10. Override Changes	60
4.14.11. systemd Configuration is Now Split Into systemd-conf	61
4.14.12. Automatic Testing Changes	61
4.14.13. OpenSSL Changes	61
4.14.14. BitBake Changes	61
4.14.15. Security Changes	61
4.14.16. Post Installation Changes	61
4.14.17. Python 3 Profile-Guided Optimization	62
4.14.18. Miscellaneous Changes	62
4.15. Moving to the Yocto Project 2.7 Release	62
4.15.1. BitBake Changes	62
4.15.2. Eclipse™ Support Removed	63
4.15.3. qemu-native Splits the System and User-Mode Parts	63
4.15.4. The upstream-tracking.inc File Has Been Removed	63
4.15.5. The DISTR0_FEATURES_LIBC Variable Has Been Removed	63
4.15.6. License Value Corrections	63
4.15.7. Packaging Changes	63
4.15.8. Removed Recipes	64

4.15.9. Removed Classes	64
4.15.10. Miscellaneous Changes	64
4.16. Moving to the Yocto Project 3.0 Release	65
4.16.1. Init System Selection	65
4.16.2. LSB Support Removed	65
4.16.3. Removed Recipes	65
4.16.4. Packaging Changes	66
4.16.5. CVE Checking	66
4.16.6. Bitbake Changes	66
4.16.7. Sanity Checks	67
4.16.8. Miscellaneous Changes	68
5. Source Directory Structure	69
5.1. Top-Level Core Components	69
5.1.1. bitbake/	69
5.1.2. build/	69
5.1.3. documentation/	69
5.1.4. meta/	69
5.1.5. meta-poky/	69
5.1.6. meta-yocto-bsp/	70
5.1.7. meta-selftest/	70
5.1.8. meta-skeleton/	70
5.1.9. scripts/	70
5.1.10. oe-init-build-env	70
5.1.11. LICENSE, README, and README.hardware	71
5.2. The Build Directory - build/	71
5.2.1. build/buildhistory	71
5.2.2. build/conf/local.conf	71
5.2.3. build/conf/bblayers.conf	72
5.2.4. build/conf/sanity_info	72
5.2.5. build/downloads/	72
5.2.6. build/sstate-cache/	72
5.2.7. build/tmp/	72
5.2.8. build/tmp/buildstats/	73
5.2.9. build/tmp/cache/	73
5.2.10. build/tmp/deploy/	73
5.2.11. build/tmp/deploy/deb/	73
5.2.12. build/tmp/deploy/rpm/	73
5.2.13. build/tmp/deploy/ipk/	73
5.2.14. build/tmp/deploy/licenses/	73
5.2.15. build/tmp/deploy/images/	73
5.2.16. build/tmp/deploy/sdk/	74
5.2.17. build/tmp/sstate-control/	74
5.2.18. build/tmp/sysroots-components/	74
5.2.19. build/tmp/sysroots/	74
5.2.20. build/tmp/stamps/	74
5.2.21. build/tmp/log/	74
5.2.22. build/tmp/work/	75
5.2.23. build/tmp/work/tunearch/recipe/version/	75
5.2.24. build/tmp/work-shared/	76
5.3. The Metadata - meta/	76
5.3.1. meta/classes/	76
5.3.2. meta/conf/	76
5.3.3. meta/conf/machine/	76
5.3.4. meta/conf/distro/	76
5.3.5. meta/conf/machine-sdk/	76
5.3.6. meta/files/	76
5.3.7. meta/lib/	76
5.3.8. meta/recipes-bsp/	77
5.3.9. meta/recipes-connectivity/	77
5.3.10. meta/recipes-core/	77
5.3.11. meta/recipes-devtools/	77
5.3.12. meta/recipes-extended/	77
5.3.13. meta/recipes-gnome/	77
5.3.14. meta/recipes-graphics/	77

5.3.15. meta/recipes-kernel/	77
5.3.16. meta/recipes-lsb4/	77
5.3.17. meta/recipes-multimedia/	77
5.3.18. meta/recipes-rt/	77
5.3.19. meta/recipes-sato/	77
5.3.20. meta/recipes-support/	77
5.3.21. meta/site/	78
5.3.22. meta/recipes.txt	78
6. Classes	79
6.1. allarch.bbclass	79
6.2. archiver.bbclass	79
6.3. autotools*.bbclass	79
6.4. base.bbclass	80
6.5. bash-completion.bbclass	80
6.6. bin_package.bbclass	80
6.7. binconfig.bbclass	80
6.8. binconfig-disabled.bbclass	81
6.9. blacklist.bbclass	81
6.10. buildhistory.bbclass	81
6.11. buildstats.bbclass	81
6.12. buildstats-summary.bbclass	81
6.13. ccache.bbclass	81
6.14. chrpath.bbclass	82
6.15. clutter.bbclass	82
6.16. cmake.bbclass	82
6.17. cml1.bbclass	82
6.18. compress_doc.bbclass	82
6.19. copyleft_compliance.bbclass	82
6.20. copyleft_filter.bbclass	82
6.21. core-image.bbclass	82
6.22. cpan*.bbclass	82
6.23. cross.bbclass	83
6.24. cross-canadian.bbclass	83
6.25. crosssdk.bbclass	83
6.26. debian.bbclass	83
6.27. deploy.bbclass	83
6.28. devshell.bbclass	83
6.29. devupstream.bbclass	83
6.30. distro_features_check.bbclass	84
6.31. distutils*.bbclass	84
6.32. distutils3*.bbclass	84
6.33. externalsrc.bbclass	85
6.34. extrausers.bbclass	85
6.35. fontcache.bbclass	86
6.36. fs-uuid.bbclass	86
6.37. gconf.bbclass	86
6.38. gettext.bbclass	86
6.39. gnomebase.bbclass	86
6.40. gobject-introspection.bbclass	86
6.41. grub-efi.bbclass	86
6.42. gsettings.bbclass	87
6.43. gtk-doc.bbclass	87
6.44. gtk-icon-cache.bbclass	87
6.45. gtk-immodules-cache.bbclass	87
6.46. gzipnative.bbclass	87
6.47. icecc.bbclass	87
6.48. image.bbclass	88
6.49. image-buildinfo.bbclass	88
6.50. image_types.bbclass	89
6.51. image-live.bbclass	89
6.52. image-mklibs.bbclass	89
6.53. image-prelink.bbclass	89
6.54. insane.bbclass	89
6.55. insserv.bbclass	92

6.56. kernel.bbclass	93
6.57. kernel-arch.bbclass	93
6.58. kernel-devicetree.bbclass	93
6.59. kernel-fitimage.bbclass	93
6.60. kernel-grub.bbclass	93
6.61. kernel-module-split.bbclass	93
6.62. kernel-uboot.bbclass	93
6.63. kernel-uimage.bbclass	93
6.64. kernel-yocto.bbclass	93
6.65. kernelsrc.bbclass	93
6.66. lib_package.bbclass	94
6.67. libc*.bbclass	94
6.68. license.bbclass	94
6.69. linux-kernel-base.bbclass	94
6.70. linuxloader.bbclass	94
6.71. logging.bbclass	94
6.72. meta.bbclass	94
6.73. metadata_scm.bbclass	94
6.74. migrate_localcount.bbclass	94
6.75. mime.bbclass	94
6.76. mirrors.bbclass	95
6.77. module.bbclass	95
6.78. module-base.bbclass	95
6.79. multilib*.bbclass	95
6.80. native.bbclass	95
6.81. nativesdk.bbclass	96
6.82. nopackages.bbclass	96
6.83. npm.bbclass	96
6.84. oelint.bbclass	96
6.85. own-mirrors.bbclass	97
6.86. package.bbclass	97
6.87. package_deb.bbclass	98
6.88. package_ipk.bbclass	98
6.89. package_rpm.bbclass	98
6.90. package_tar.bbclass	98
6.91. packagedata.bbclass	98
6.92. packagegroup.bbclass	98
6.93. patch.bbclass	98
6.94. perlnative.bbclass	99
6.95. pixbufcache.bbclass	99
6.96. pkgconfig.bbclass	99
6.97. populate_sdk.bbclass	99
6.98. populate_sdk *.bbclass	99
6.99. preexport.bbclass	100
6.100. primport.bbclass	100
6.101. prserv.bbclass	100
6.102. ptest.bbclass	100
6.103. ptest-gnome.bbclass	100
6.104. python-dir.bbclass	100
6.105. python3native.bbclass	101
6.106. pythonnative.bbclass	101
6.107. qemu.bbclass	101
6.108. recipe_sanity.bbclass	101
6.109. relocatable.bbclass	101
6.110. remove-libtool.bbclass	101
6.111. report-error.bbclass	101
6.112. rm_work.bbclass	101
6.113. rootfs*.bbclass	102
6.114. sanity.bbclass	102
6.115. scons.bbclass	102
6.116. sdl.bbclass	102
6.117. setuptools.bbclass	103
6.118. setuptools3.bbclass	103
6.119. sign_rpm.bbclass	103

6.120. sip.bbclass	103
6.121. siteconfig.bbclass	103
6.122. siteinfo.bbclass	103
6.123. spdx.bbclass	103
6.124. sstate.bbclass	103
6.125. staging.bbclass	103
6.126. syslinux.bbclass	104
6.127. systemd.bbclass	105
6.128. systemd-boot.bbclass	105
6.129. terminal.bbclass	106
6.130. testimage*.bbclass	106
6.131. testsdk.bbclass	106
6.132. texinfo.bbclass	106
6.133. tinderclient.bbclass	106
6.134. toaster.bbclass	107
6.135. toolchain-scripts.bbclass	107
6.136. typecheck.bbclass	107
6.137. uboot-config.bbclass	107
6.138. uninative.bbclass	107
6.139. update-alternatives.bbclass	107
6.140. update-rc.d.bbclass	108
6.141. useradd*.bbclass	108
6.142. utility-tasks.bbclass	109
6.143. utils.bbclass	109
6.144. vala.bbclass	109
6.145. waf.bbclass	109
7. Tasks	110
7.1. Normal Recipe Build Tasks	110
7.1.1. do_build	110
7.1.2. do_compile	110
7.1.3. do_compile_ptest_base	110
7.1.4. do_configure	110
7.1.5. do_configure_ptest_base	110
7.1.6. do_deploy	110
7.1.7. do_fetch	111
7.1.8. do_image	111
7.1.9. do_image_complete	111
7.1.10. do_install	111
7.1.11. do_install_ptest_base	112
7.1.12. do_package	112
7.1.13. do_package_qa	112
7.1.14. do_package_write_deb	112
7.1.15. do_package_write_ipk	112
7.1.16. do_package_write_rpm	112
7.1.17. do_package_write_tar	112
7.1.18. do_packagedata	112
7.1.19. do_patch	112
7.1.20. do_populate_lic	113
7.1.21. do_populate_sdk	114
7.1.22. do_populate_sysroot	114
7.1.23. do_prepare_recipe_sysroot	114
7.1.24. do_rm_work	114
7.1.25. do_unpack	114
7.2. Manually Called Tasks	114
7.2.1. do_checkpkg	114
7.2.2. do_checkuri	115
7.2.3. do_clean	115
7.2.4. do_cleanall	115
7.2.5. do_cleansstate	115
7.2.6. do_devpyshell	116
7.2.7. do_devshell	116
7.2.8. do_listtasks	116
7.2.9. do_package_index	116
7.3. Image-Related Tasks	116

7.3.1. do_bootimg	116
7.3.2. do_bundle_initramfs	116
7.3.3. do_rootfs	116
7.3.4. do_testimage	116
7.3.5. do_testimage_auto	117
7.4. Kernel-Related Tasks	117
7.4.1. do_compile_kernelmodules	117
7.4.2. do_diffconfig	117
7.4.3. do_kernel_checkout	117
7.4.4. do_kernel_configcheck	117
7.4.5. do_kernel_configme	117
7.4.6. do_kernel_menuconfig	118
7.4.7. do_kernel_metadata	118
7.4.8. do_menuconfig	118
7.4.9. do_savedefconfig	118
7.4.10. do_shared_workdir	118
7.4.11. do_sizecheck	118
7.4.12. do_strip	118
7.4.13. do_validate_branches	119
7.5. Miscellaneous Tasks	119
7.5.1. do_spdx	119
8. devtool Quick Reference	120
8.1. Getting Help	120
8.2. The Workspace Layer Structure	122
8.3. Adding a New Recipe to the Workspace Layer	123
8.4. Extracting the Source for an Existing Recipe	124
8.5. Synchronizing a Recipe's Extracted Source Tree	124
8.6. Modifying an Existing Recipe	124
8.7. Edit an Existing Recipe	124
8.8. Updating a Recipe	124
8.9. Checking on the Upgrade Status of a Recipe	125
8.10. Upgrading a Recipe	126
8.11. Resetting a Recipe	127
8.12. Building Your Recipe	127
8.13. Building Your Image	127
8.14. Deploying Your Software on the Target Machine	127
8.15. Removing Your Software from the Target Machine	128
8.16. Creating the Workspace Layer in an Alternative Location	128
8.17. Get the Status of the Recipes in Your Workspace	129
8.18. Search for Available Target Recipes	129
9. OpenEmbedded Kickstart (.wks) Reference	130
9.1. Introduction	130
9.2. Command: part or partition	130
9.3. Command: bootloader	132
10. QA Error and Warning Messages	133
10.1. Introduction	133
10.2. Errors and Warnings	133
10.3. Configuring and Disabling QA Checks	139
11. Images	140
12. Features	142
12.1. Machine Features	142
12.2. Distro Features	143
12.3. Image Features	144
12.4. Feature Backfilling	145
13. Variables Glossary	147
14. Variable Context	269
14.1. Configuration	269
14.1.1. Distribution (Distro)	269
14.1.2. Machine	269
14.1.3. Local	269
14.2. Recipes	270
14.2.1. Required	270
14.2.2. Dependencies	270
14.2.3. Paths	270

14.2.4. Extra Build Information	270
15. FAQ	271
16. Contributions and Additional Information	277
16.1. Introduction	277
16.2. Contributions	277
16.3. Yocto Project Bugzilla	277
16.4. Mailing lists	277
16.5. Internet Relay Chat (IRC)	278
16.6. Links and Related Documentation	278

Chapter 1. System Requirements

Welcome to the Yocto Project Reference Manual! This manual provides reference information for the current release of the Yocto Project. The manual is best used after you have an understanding of the basics of the Yocto Project. The manual is neither meant to be read as a starting point to the Yocto Project nor read from start to finish. Use this manual to find variable definitions, class descriptions, and so forth as needed during the course of using the Yocto Project.

For introductory information on the Yocto Project, see the Yocto Project Website [<http://www.yoctoproject.org>] and the "Yocto Project Development Environment [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#overview-development-environment>]" chapter in the Yocto Project Overview and Concepts Manual.

If you want to use the Yocto Project to quickly build an image without having to understand concepts, work through the Yocto Project Quick Build [<http://www.yoctoproject.org/docs/3.0.3/brief-yoctoprojectqs/brief-yoctoprojectqs.html>] document. You can find "how-to" information in the Yocto Project Development Tasks Manual [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html>]. You can find Yocto Project overview and conceptual information in the Yocto Project Overview and Concepts Manual [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html>].

Tip

For more information about the Yocto Project Documentation set, see the "Links and Related Documentation" section.

1.1. Supported Linux Distributions

Currently, the Yocto Project is supported on the following distributions:

Notes

- Yocto Project releases are tested against the stable Linux distributions in the following list. The Yocto Project should work on other distributions but validation is not performed against them.
 - In particular, the Yocto Project does not support and currently has no plans to support rolling-releases or development distributions due to their constantly changing nature. We welcome patches and bug reports, but keep in mind that our priority is on the supported platforms listed below.
 - The Yocto Project is not compatible with the Windows Subsystem for Linux [https://en.wikipedia.org/wiki/Windows_Subsystem_for_Linux] (WSL). You cannot use a build host that is running WSL.
 - If you encounter problems, please go to Yocto Project Bugzilla [<http://bugzilla.yoctoproject.org>] and submit a bug. We are interested in hearing about your experience. For information on how to submit a bug, see the Yocto Project Bugzilla wiki page [https://wiki.yoctoproject.org/wiki/Bugzilla_Configuration_and_Bug_Tracking] and the "Submitting a Defect Against the Yocto Project [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#submitting-a-defect-against-the-yocto-project>]" section in the Yocto Project Development Tasks Manual.
- Ubuntu 16.04 (LTS)
 - Ubuntu 18.04 (LTS)
 - Ubuntu 19.04
 - Fedora 28
 - Fedora 29
 - Fedora 30

- CentOS 7.x
- Debian GNU/Linux 8.x (Jessie)
- Debian GNU/Linux 9.x (Stretch)
- Debian GNU/Linux 10.x (Buster)
- OpenSUSE Leap 15.1

Note

While the Yocto Project Team attempts to ensure all Yocto Project releases are one hundred percent compatible with each officially supported Linux distribution, instances might exist where you encounter a problem while using the Yocto Project on a specific distribution.

1.2. Required Packages for the Build Host

The list of packages you need on the host development system can be large when covering all build scenarios using the Yocto Project. This section provides required packages according to Linux distribution and function.

1.2.1. Ubuntu and Debian

The following list shows the required packages by function given a supported Ubuntu or Debian Linux distribution:

Note

If your build system has the `oss4-dev` package installed, you might experience QEMU build failures due to the package installing its own custom `/usr/include/linux/soundcard.h` on the Debian system. If you run into this situation, either of the following solutions exist:

```
$ sudo apt-get build-dep qemu
$ sudo apt-get remove oss4-dev
```

- Essentials: Packages needed to build an image on a headless system:

```
$ sudo apt-get install gawk wget git-core diffstat unzip texinfo gcc-multilib \
build-essential chrpath socat cpio python python3 python3-pip python3-pexpect \
xz-utils debianutils iputils-ping python3-git python3-jinja2 libegl1-mesa libsdl1.2-dev \
pylint3 xterm
```

- Documentation: Packages needed if you are going to build out the Yocto Project documentation manuals:

```
$ sudo apt-get install make xsltproc docbook-utils fop dblatex xmlto
```

1.2.2. Fedora Packages

The following list shows the required packages by function given a supported Fedora Linux distribution:

- Essentials: Packages needed to build an image for a headless system:

```
$ sudo dnf install gawk make wget tar bzip2 gzip python3 unzip perl patch \
diffutils diffstat git cpp gcc gcc-c++ glibc-devel texinfo chrpath \
ccache perl-Data-Dumper perl-Text-ParseWords perl-Thread-Queue perl-bignum socat \
```

```
python3-pexpect findutils which file cpio python python3-pip xz python3-GitPython \
python3-jinja2 SDL-devel xterm
```

- Documentation: Packages needed if you are going to build out the Yocto Project documentation manuals:

```
$ sudo dnf install docbook-style-dsssl docbook-style-xsl \
docbook-dtds docbook-utils fop libxslt dblatex xmlto
```

1.2.3. openSUSE Packages

The following list shows the required packages by function given a supported openSUSE Linux distribution:

- Essentials: Packages needed to build an image for a headless system:

```
$ sudo zypper install python gcc gcc-c++ git chrpath make wget python-xml \
diffstat makeinfo python-curses patch socat python3 python3-curses tar python3-pip \
python3-pexpect xz which python3-Jinja2 Mesa-libEGL1
$ sudo pip3 install GitPython libSDL-devel xterm
```

- Documentation: Packages needed if you are going to build out the Yocto Project documentation manuals:

```
$ sudo zypper install dblatex xmlto
```

1.2.4. CentOS Packages

The following list shows the required packages by function given a supported CentOS Linux distribution:

- Essentials: Packages needed to build an image for a headless system:

```
$ sudo yum install -y epel-release
$ sudo yum makecache
$ sudo yum install gawk make wget tar bzip2 gzip python unzip perl patch \
diffutils diffstat git cpp gcc gcc-c++ glibc-devel texinfo chrpath socat \
perl-Data-Dumper perl-Text-ParseWords perl-Thread-Queue python34-pip xz \
which SDL-devel xterm
$ sudo pip3 install GitPython jinja2
```

Notes

- Extra Packages for Enterprise Linux (i.e. `epel-release`) is a collection of packages from Fedora built on RHEL/CentOS for easy installation of packages not included in enterprise Linux by default. You need to install these packages separately.
- The `makecache` command consumes additional Metadata from `epel-release`.
- Documentation: Packages needed if you are going to build out the Yocto Project documentation manuals:

```
$ sudo yum install docbook-style-dsssl docbook-style-xsl \
docbook-dtds docbook-utils fop libxslt dblatex xmlto
```

1.3. Required Git, tar, and Python Versions

In order to use the build system, your host development system must meet the following version requirements for Git, tar, and Python:

- Git 1.8.3.1 or greater
- tar 1.27 or greater
- Python 3.4.0 or greater

If your host development system does not meet all these requirements, you can resolve this by installing a **buildtools** tarball that contains these tools. You can get the tarball one of two ways: download a pre-built tarball or use BitBake to build the tarball.

1.3.1. Downloading a Pre-Built **buildtools** Tarball

Downloading and running a pre-built **buildtools** installer is the easiest of the two methods by which you can get these tools:

1. Locate and download the *.sh at <http://downloads.yoctoproject.org/releases/yocto/yocto-3.0.3/buildtools/>.
2. Execute the installation script. Here is an example:

```
$ sh ~/Downloads/x86_64-buildtools-nativesdk-standalone-3.0.3.sh
```

During execution, a prompt appears that allows you to choose the installation directory. For example, you could choose the following:

```
/home/your-username/buildtools
```

3. Source the tools environment setup script by using a command like the following:

```
$ source /home/your_username/buildtools/environment-setup-i586-poky-linux
```

Of course, you need to supply your installation directory and be sure to use the right file (i.e. i585 or x86-64).

After you have sourced the setup script, the tools are added to PATH and any other environment variables required to run the tools are initialized. The results are working versions of Git, tar, Python and chrpath.

1.3.2. Building Your Own **buildtools** Tarball

Building and running your own **buildtools** installer applies only when you have a build host that can already run BitBake. In this case, you use that machine to build the .sh file and then take steps to transfer and run it on a machine that does not meet the minimal Git, tar, and Python requirements.

Here are the steps to take to build and run your own **buildtools** installer:

1. On the machine that is able to run BitBake, be sure you have set up your build environment with the setup script (oe-init-build-env).
2. Run the BitBake command to build the tarball:

```
$ bitbake buildtools-tarball
```

Note

The `SDKMACHINE` variable in your `local.conf` file determines whether you build tools for a 32-bit or 64-bit system.

Once the build completes, you can find the `.sh` file that installs the tools in the `tmp/deploy/sdk` subdirectory of the Build Directory. The installer file has the string "buildtools" in the name.

3. Transfer the `.sh` file from the build host to the machine that does not meet the Git, tar, or Python requirements.
4. On the machine that does not meet the requirements, run the `.sh` file to install the tools. Here is an example:

```
$ sh ~/Downloads/x86_64-buildtools-nativesdk-standalone-3.0.3.sh
```

During execution, a prompt appears that allows you to choose the installation directory. For example, you could choose the following:

```
/home/your_username/buildtools
```

5. Source the tools environment setup script by using a command like the following:

```
$ source /home/your_username/buildtools/environment-setup-i586-poky-linux
```

Of course, you need to supply your installation directory and be sure to use the right file (i.e. i585 or x86-64).

After you have sourced the setup script, the tools are added to `PATH` and any other environment variables required to run the tools are initialized. The results are working versions of Git, tar, Python and chrpath.

Chapter 2. Yocto Project Terms

Following is a list of terms and definitions users new to the Yocto Project development environment might find helpful. While some of these terms are universal, the list includes them just in case:

- **Append Files:** Files that append build information to a recipe file. Append files are known as BitBake append files and `.bbappend` files. The OpenEmbedded build system expects every append file to have a corresponding recipe (`.bb`) file. Furthermore, the append file and corresponding recipe file must use the same root filename. The filenames can differ only in the file type suffix used (e.g. `formfactor_0.0.bb` and `formfactor_0.0.bbappend`).

Information in append files extends or overrides the information in the similarly-named recipe file. For an example of an append file in use, see the "Using `.bbappend` Files in Your Layer [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#using-bbappend-files>]" section in the Yocto Project Development Tasks Manual.

When you name an append file, you can use the `"%"` wildcard character to allow for matching recipe names. For example, suppose you have an append file named as follows:

```
busybox_1.21.%.bbappend
```

That append file would match any `busybox_1.21.x.bb` version of the recipe. So, the append file would match the following recipe names:

```
busybox_1.21.1.bb
busybox_1.21.2.bb
busybox_1.21.3.bb
```

Important

The use of the `"%"` character is limited in that it only works directly in front of the `.bbappend` portion of the append file's name. You cannot use the wildcard character in any other location of the name.

- **BitBake:** The task executor and scheduler used by the OpenEmbedded build system to build images. For more information on BitBake, see the BitBake User Manual [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html>].
- **Board Support Package (BSP):** A group of drivers, definitions, and other components that provide support for a specific hardware configuration. For more information on BSPs, see the Yocto Project Board Support Package (BSP) Developer's Guide [<http://www.yoctoproject.org/docs/3.0.3/bsp-guide/bsp-guide.html>].
- **Build Directory:** This term refers to the area used by the OpenEmbedded build system for builds. The area is created when you source the setup environment script that is found in the Source Directory (i.e. `oe-init-build-env`). The `TOPDIR` variable points to the Build Directory.

You have a lot of flexibility when creating the Build Directory. Following are some examples that show how to create the directory. The examples assume your Source Directory is named `poky`:

- Create the Build Directory inside your Source Directory and let the name of the Build Directory default to `build`:

```
$ cd $HOME/poky
$ source oe-init-build-env
```

- Create the Build Directory inside your home directory and specifically name it `test-builds`:

```
$ cd $HOME
```

```
$ source poky/oe-init-build-env test-builds
```

- Provide a directory path and specifically name the Build Directory. Any intermediate folders in the pathname must exist. This next example creates a Build Directory named YP-22.0.3 in your home directory within the existing directory mybuilds:

```
$cd $HOME
$ source $HOME/poky/oe-init-build-env $HOME/mybuilds/YP-22.0.3
```

Note

By default, the Build Directory contains TMPDIR, which is a temporary directory the build system uses for its work. TMPDIR cannot be under NFS. Thus, by default, the Build Directory cannot be under NFS. However, if you need the Build Directory to be under NFS, you can set this up by setting TMPDIR in your `local.conf` file to use a local drive. Doing so effectively separates TMPDIR from TOPDIR, which is the Build Directory.

- **Build Host:** The system used to build images in a Yocto Project Development environment. The build system is sometimes referred to as the development host.
- **Classes:** Files that provide for logic encapsulation and inheritance so that commonly used patterns can be defined once and then easily used in multiple recipes. For reference information on the Yocto Project classes, see the "Classes" chapter. Class files end with the `.bbclass` filename extension.
- **Configuration File:** Files that hold global definitions of variables, user-defined variables, and hardware configuration information. These files tell the OpenEmbedded build system what to build and what to put into the image to support a particular platform.

Configuration files end with a `.conf` filename extension. The `conf/local.conf` configuration file in the Build Directory contains user-defined variables that affect every build. The `meta-poky/conf/distro/poky.conf` configuration file defines Yocto "distro" configuration variables used only when building with this policy. Machine configuration files, which are located throughout the Source Directory, define variables for specific hardware and are only used when building for that target (e.g. the `machine/beaglebone.conf` configuration file defines variables for the Texas Instruments ARM Cortex-A8 development board).

- **Container Layer:** Layers that hold other layers. An example of a container layer is OpenEmbedded's `meta-openembedded` [<https://github.com/openembedded/meta-openembedded>] layer. The `meta-openembedded` layer contains many `meta-*` layers.
- **Cross-Development Toolchain:** In general, a cross-development toolchain is a collection of software development tools and utilities that run on one architecture and allow you to develop software for a different, or targeted, architecture. These toolchains contain cross-compilers, linkers, and debuggers that are specific to the target architecture.

The Yocto Project supports two different cross-development toolchains:

- A toolchain only used by and within BitBake when building an image for a target architecture.
- A relocatable toolchain used outside of BitBake by developers when developing applications that will run on a targeted device.

Creation of these toolchains is simple and automated. For information on toolchain concepts as they apply to the Yocto Project, see the "Cross-Development Toolchain Generation [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#cross-development-toolchain-generation>]" section in the Yocto Project Overview and Concepts Manual. You can also find more information on using the relocatable toolchain in the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html>] manual.

- **Extensible Software Development Kit (eSDK):** A custom SDK for application developers. This eSDK allows developers to incorporate their library and programming changes back into the image to make their code available to other application developers.

For information on the eSDK, see the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html>] manual.

- **Image:** An image is an artifact of the BitBake build process given a collection of recipes and related Metadata. Images are the binary output that run on specific hardware or QEMU and are used for specific use-cases. For a list of the supported image types that the Yocto Project provides, see the "Images" chapter.
- **Layer:** A collection of related recipes. Layers allow you to consolidate related metadata to customize your build. Layers also isolate information used when building for multiple architectures. Layers are hierarchical in their ability to override previous specifications. You can include any number of available layers from the Yocto Project and customize the build by adding your layers after them. You can search the Layer Index for layers used within Yocto Project.

For introductory information on layers, see the "The Yocto Project Layer Model [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#the-yocto-project-layer-model>]" section in the Yocto Project Overview and Concepts Manual. For more detailed information on layers, see the "Understanding and Creating Layers [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#understanding-and-creating-layers>]" section in the Yocto Project Development Tasks Manual. For a discussion specifically on BSP Layers, see the "BSP Layers [<http://www.yoctoproject.org/docs/3.0.3/bsp-guide/bsp-guide.html#bsp-layers>]" section in the Yocto Project Board Support Packages (BSP) Developer's Guide.

- **Metadata:** A key element of the Yocto Project is the Metadata that is used to construct a Linux distribution and is contained in the files that the OpenEmbedded build system parses when building an image. In general, Metadata includes recipes, configuration files, and other information that refers to the build instructions themselves, as well as the data used to control what things get built and the effects of the build. Metadata also includes commands and data used to indicate what versions of software are used, from where they are obtained, and changes or additions to the software itself (patches or auxiliary files) that are used to fix bugs or customize the software for use in a particular situation. OpenEmbedded-Core is an important set of validated metadata.

In the context of the kernel ("kernel Metadata"), the term refers to the kernel config fragments and features contained in the `yocto-kernel-cache` [<http://git.yoctoproject.org/cgit/cgit.cgi/yocto-kernel-cache>] Git repository.

- **OpenEmbedded-Core (OE-Core):** OE-Core is metadata comprised of foundational recipes, classes, and associated files that are meant to be common among many different OpenEmbedded-derived systems, including the Yocto Project. OE-Core is a curated subset of an original repository developed by the OpenEmbedded community that has been pared down into a smaller, core set of continuously validated recipes. The result is a tightly controlled and an quality-assured core set of recipes.

You can see the Metadata in the `meta` directory of the Yocto Project Source Repositories [<http://git.yoctoproject.org/cgit/cgit.cgi>].

- **OpenEmbedded Build System:** The build system specific to the Yocto Project. The OpenEmbedded build system is based on another project known as "Poky", which uses BitBake as the task executor. Throughout the Yocto Project documentation set, the OpenEmbedded build system is sometimes referred to simply as "the build system". If other build systems, such as a host or target build system are referenced, the documentation clearly states the difference.

Note

For some historical information about Poky, see the Poky term.

- **Package:** In the context of the Yocto Project, this term refers to a recipe's packaged output produced by BitBake (i.e. a "baked recipe"). A package is generally the compiled binaries produced from the recipe's sources. You "bake" something by running it through BitBake.

It is worth noting that the term "package" can, in general, have subtle meanings. For example, the packages referred to in the "Required Packages for the Build Host" section are compiled binaries that, when installed, add functionality to your Linux distribution.

Another point worth noting is that historically within the Yocto Project, recipes were referred to as packages - thus, the existence of several BitBake variables that are seemingly mis-named, (e.g. PR, PV, and PE).

- **Package Groups:** Arbitrary groups of software Recipes. You use package groups to hold recipes that, when built, usually accomplish a single task. For example, a package group could contain the recipes for a company's proprietary or value-add software. Or, the package group could contain the recipes that enable graphics. A package group is really just another recipe. Because package group files are recipes, they end with the `.bb` filename extension.
- **Poky:** Poky, which is pronounced Pock-ee, is a reference embedded distribution and a reference test configuration. Poky provides the following:
 - A base-level functional distro used to illustrate how to customize a distribution.
 - A means by which to test the Yocto Project components (i.e. Poky is used to validate the Yocto Project).
 - A vehicle through which you can download the Yocto Project.Poky is not a product level distro. Rather, it is a good starting point for customization.

Note

Poky began an open-source project initially developed by OpenedHand. OpenedHand developed Poky from the existing OpenEmbedded build system to create a commercially supportable build system for embedded Linux. After Intel Corporation acquired OpenedHand, the poky project became the basis for the Yocto Project's build system.

- **Recipe:** A set of instructions for building packages. A recipe describes where you get source code, which patches to apply, how to configure the source, how to compile it and so on. Recipes also describe dependencies for libraries or for other recipes. Recipes represent the logical unit of execution, the software to build, the images to build, and use the `.bb` file extension.
- **Reference Kit:** A working example of a system, which includes a BSP as well as a build host and other components, that can work on specific hardware.
- **Source Directory:** This term refers to the directory structure created as a result of creating a local copy of the poky Git repository `git://git.yoctoproject.org/poky` or expanding a released poky tarball.

Note

Creating a local copy of the poky Git repository is the recommended method for setting up your Source Directory.

Sometimes you might hear the term "poky directory" used to refer to this directory structure.

Note

The OpenEmbedded build system does not support file or directory names that contain spaces. Be sure that the Source Directory you use does not contain these types of names.

The Source Directory contains BitBake, Documentation, Metadata and other files that all support the Yocto Project. Consequently, you must have the Source Directory in place on your development system in order to do any development using the Yocto Project.

When you create a local copy of the Git repository, you can name the repository anything you like. Throughout much of the documentation, "poky" is used as the name of the top-level folder of the local copy of the poky Git repository. So, for example, cloning the poky Git repository results in a local Git repository whose top-level folder is also named "poky".

While it is not recommended that you use tarball expansion to set up the Source Directory, if you do, the top-level directory name of the Source Directory is derived from the Yocto Project release tarball. For example, downloading and unpacking `poky-zeus-22.0.3.tar.bz2` results in a Source Directory whose root folder is named `poky-zeus-22.0.3`.

It is important to understand the differences between the Source Directory created by unpacking a released tarball as compared to cloning `git://git.yoctoproject.org/poky`. When you unpack a tarball, you have an exact copy of the files based on the time of release - a fixed release point.

Any changes you make to your local files in the Source Directory are on top of the release and will remain local only. On the other hand, when you clone the poky Git repository, you have an active development repository with access to the upstream repository's branches and tags. In this case, any local changes you make to the local Source Directory can be later applied to active development branches of the upstream poky Git repository.

For more information on concepts related to Git repositories, branches, and tags, see the "Repositories, Tags, and Branches [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#repositories-tags-and-branches>]" section in the Yocto Project Overview and Concepts Manual.

- Task: A unit of execution for BitBake (e.g. `do_compile`, `do_fetch`, `do_patch`, and so forth).
- Toaster: A web interface to the Yocto Project's OpenEmbedded Build System. The interface enables you to configure and run your builds. Information about builds is collected and stored in a database. For information on Toaster, see the Toaster User Manual [<http://www.yoctoproject.org/docs/3.0.3/toaster-manual/toaster-manual.html>].
- Upstream: A reference to source code or repositories that are not local to the development system but located in a master area that is controlled by the maintainer of the source code. For example, in order for a developer to work on a particular piece of code, they need to first get a copy of it from an "upstream" source.

Chapter 3. Yocto Project Releases and the Stable Release Process

The Yocto Project release process is predictable and consists of both major and minor (point) releases. This brief chapter provides information on how releases are named, their life cycle, and their stability.

3.1. Major and Minor Release Cadence

The Yocto Project delivers major releases (e.g. 3.0.3) using a six month cadence roughly timed each April and October of the year. Following are examples of some major YP releases with their codenames also shown. See the "Major Release Codenames" section for information on codenames used with major releases.

2.2 (Morty)
2.1 (Krogoth)
2.0 (Jethro)

While the cadence is never perfect, this timescale facilitates regular releases that have strong QA cycles while not overwhelming users with too many new releases. The cadence is predictable and avoids many major holidays in various geographies.

The Yocto project delivers minor (point) releases on an unscheduled basis and are usually driven by the accumulation of enough significant fixes or enhancements to the associated major release. Following are some example past point releases:

2.1.1
2.1.2
2.2.1

The point release indicates a point in the major release branch where a full QA cycle and release process validates the content of the new branch.

Note

Realize that there can be patches merged onto the stable release branches as and when they become available.

3.2. Major Release Codenames

Each major release receives a codename that identifies the release in the Yocto Project Source Repositories [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#yocto-project-repositories>]. The concept is that branches of Metadata with the same codename are likely to be compatible and thus work together.

Note

Codenames are associated with major releases because a Yocto Project release number (e.g. 3.0.3) could conflict with a given layer or company versioning scheme. Codenames are unique, interesting, and easily identifiable.

Releases are given a nominal release version as well but the codename is used in repositories for this reason. You can find information on Yocto Project releases and codenames at <https://wiki.yoctoproject.org/wiki/Releases>.

3.3. Stable Release Process

Once released, the release enters the stable release process at which time a person is assigned as the maintainer for that stable release. This maintainer monitors activity for the release by investigating

and handling nominated patches and backport activity. Only fixes and enhancements that have first been applied on the "master" branch (i.e. the current, in-development branch) are considered for backporting to a stable release.

Note

The current Yocto Project policy regarding backporting is to consider bug fixes and security fixes only. Policy dictates that features are not backported to a stable release. This policy means generic recipe version upgrades are unlikely to be accepted for backporting. The exception to this policy occurs when a strong reason exists such as the fix happens to also be the preferred upstream approach.

Stable release branches have strong maintenance for about a year after their initial release. Should significant issues be found for any release regardless of its age, fixes could be backported to older releases. For issues that are not backported given an older release, Community LTS trees and branches exist where community members share patches for older releases. However, these types of patches do not go through the same release process as do point releases. You can find more information about stable branch maintenance at https://wiki.yoctoproject.org/wiki/Stable_branch_maintenance.

3.4. Testing and Quality Assurance

Part of the Yocto Project development and release process is quality assurance through the execution of test strategies. Test strategies provide the Yocto Project team a way to ensure a release is validated. Additionally, because the test strategies are visible to you as a developer, you can validate your projects. This section overviews the available test infrastructure used in the Yocto Project. For information on how to run available tests on your projects, see the "Performing Automated Runtime Testing [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#performing-automated-runtime-testing>]" section in the Yocto Project Development Tasks Manual.

The QA/testing infrastructure is woven into the project to the point where core developers take some of it for granted. The infrastructure consists of the following pieces:

- `bitbake-selftest`: A standalone command that runs unit tests on key pieces of BitBake and its fetchers.
- `sanity.bbclass`: This automatically included class checks the build environment for missing tools (e.g. `gcc`) or common misconfigurations such as `MACHINE` set incorrectly.
- `insane.bbclass`: This class checks the generated output from builds for sanity. For example, if building for an ARM target, did the build produce ARM binaries. If, for example, the build produced PPC binaries then there is a problem.
- `testimage.bbclass`: This class performs runtime testing of images after they are built. The tests are usually used with QEMU [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#dev-manual-qemu>] to boot the images and check the combined runtime result boot operation and functions. However, the test can also use the IP address of a machine to test.
- `ptest` [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#testing-packages-with-ptest>]: Runs tests against packages produced during the build for a given piece of software. The test allows the packages to be run within a target image.
- `oe-selftest`: Tests combination BitBake invocations. These tests operate outside the OpenEmbedded build system itself. The `oe-selftest` can run all tests by default or can run selected tests or test suites.

Note

Running `oe-selftest` requires host packages beyond the "Essential" grouping. See the "Required Packages for the Build Host" section for more information.

Originally, much of this testing was done manually. However, significant effort has been made to automate the tests so that more people can use them and the Yocto Project development team can run them faster and more efficiently.

The Yocto Project's main Autobuilder (autobuilder.yoctoproject.org) publicly tests each Yocto Project release's code in the OE-Core, Poky, and BitBake repositories. The testing occurs for both the

current state of the "master" branch and also for submitted patches. Testing for submitted patches usually occurs in the "ross/mt" branch in the poky-contrib repository (i.e. the master-under-test branch) or in the "master-next" branch in the poky repository.

Note

You can find all these branches in the Yocto Project Source Repositories [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#source-repositories>].

Testing within these public branches ensures in a publicly visible way that all of the main supposed architectures and recipes in OE-Core successfully build and behave properly.

Various features such as multilib, sub architectures (e.g. x32, poky-tiny, musl, no-x11 and so forth), bitbake-selftest, and oe-selftest are tested as part of the QA process of a release. Complete testing and validation for a release takes the Autobuilder workers several hours.

Note

The Autobuilder workers are non-homogeneous, which means regular testing across a variety of Linux distributions occurs. The Autobuilder is limited to only testing QEMU-based setups and not real hardware.

Finally, in addition to the Autobuilder's tests, the Yocto Project QA team also performs testing on a variety of platforms, which includes actual hardware, to ensure expected results.

Chapter 4. Migrating to a Newer Yocto Project Release

This chapter provides information you can use to migrate work to a newer Yocto Project release. You can find the same information in the release notes for a given release.

4.1. General Migration Considerations

Some considerations are not tied to a specific Yocto Project release. This section presents information you should consider when migrating to any new Yocto Project release.

- **Dealing with Customized Recipes:** Issues could arise if you take older recipes that contain customizations and simply copy them forward expecting them to work after you migrate to new Yocto Project metadata. For example, suppose you have a recipe in your layer that is a customized version of a core recipe copied from the earlier release, rather than through the use of an append file. When you migrate to a newer version of Yocto Project, the metadata (e.g. perhaps an include file used by the recipe) could have changed in a way that would break the build. Say, for example, a function is removed from an include file and the customized recipe tries to call that function.

You could "forward-port" all your customizations in your recipe so that everything works for the new release. However, this is not the optimal solution as you would have to repeat this process with each new release if changes occur that give rise to problems.

The better solution (where practical) is to use append files (*.bbappend) to capture any customizations you want to make to a recipe. Doing so, isolates your changes from the main recipe making them much more manageable. However, sometimes it is not practical to use an append file. A good example of this is when introducing a newer or older version of a recipe in another layer.

- **Updating Append Files:** Since append files generally only contain your customizations, they often do not need to be adjusted for new releases. However, if the .bbappend file is specific to a particular version of the recipe (i.e. its name does not use the % wildcard) and the version of the recipe to which it is appending has changed, then you will at a minimum need to rename the append file to match the name of the recipe file. A mismatch between an append file and its corresponding recipe file (.bb) will trigger an error during parsing.

Depending on the type of customization the append file applies, other incompatibilities might occur when you upgrade. For example, if your append file applies a patch and the recipe to which it is appending is updated to a newer version, the patch might no longer apply. If this is the case and assuming the patch is still needed, you must modify the patch file so that it does apply.

4.2. Moving to the Yocto Project 1.3 Release

This section provides migration information for moving to the Yocto Project 1.3 Release from the prior release.

4.2.1. Local Configuration

Differences include changes for `SSTATE_MIRRORS` and `bblayers.conf`.

4.2.1.1. SSTATE_MIRRORS

The shared state cache (sstate-cache), as pointed to by `SSTATE_DIR`, by default now has two-character subdirectories to prevent issues arising from too many files in the same directory. Also, native sstate-cache packages, which are built to run on the host system, will go into a subdirectory named using the distro ID string. If you copy the newly structured sstate-cache to a mirror location (either local or remote) and then point to it in `SSTATE_MIRRORS`, you need to append "PATH" to the end of the mirror URL so that the path used by BitBake before the mirror substitution is appended to the path used to access the mirror. Here is an example:

```
SSTATE_MIRRORS = "file:///.* http://someserver.tld/share/sstate/PATH"
```

4.2.1.2. bblayers.conf

The meta-yocto layer consists of two parts that correspond to the Poky reference distribution and the reference hardware Board Support Packages (BSPs), respectively: meta-yocto and meta-yocto-bsp. When running BitBake for the first time after upgrading, your `conf/bblayers.conf` file will be updated to handle this change and you will be asked to re-run or restart for the changes to take effect.

4.2.2. Recipes

Differences include changes for the following:

- Python function whitespace
- `proto=` in `SRC_URI`
- `nativesdk`
- Task recipes
- `IMAGE_FEATURES`
- Removed recipes

4.2.2.1. Python Function Whitespace

All Python functions must now use four spaces for indentation. Previously, an inconsistent mix of spaces and tabs existed, which made extending these functions using `_append` or `_prepend` complicated given that Python treats whitespace as syntactically significant. If you are defining or extending any Python functions (e.g. `populate_packages`, `do_unpack`, `do_patch` and so forth) in custom recipes or classes, you need to ensure you are using consistent four-space indentation.

4.2.2.2. `proto=` in `SRC_URI`

Any use of `proto=` in `SRC_URI` needs to be changed to `protocol=`. In particular, this applies to the following URIs:

- `svn://`
- `bzr://`
- `hg://`
- `osc://`

Other URIs were already using `protocol=`. This change improves consistency.

4.2.2.3. `nativesdk`

The suffix `nativesdk` is now implemented as a prefix, which simplifies a lot of the packaging code for `nativesdk` recipes. All custom `nativesdk` recipes, which are relocatable packages that are native to `SDK_ARCH`, and any references need to be updated to use `nativesdk-*` instead of `*-nativesdk`.

4.2.2.4. Task Recipes

"Task" recipes are now known as "Package groups" and have been renamed from `task-*.bb` to `packagegroup-*.bb`. Existing references to the previous `task-*` names should work in most cases as there is an automatic upgrade path for most packages. However, you should update references in your own recipes and configurations as they could be removed in future releases. You should also rename any custom `task-*` recipes to `packagegroup-*`, and change them to inherit `packagegroup.bbclass` instead of `task`, as well as taking the opportunity to remove anything now handled by `packagegroup.bbclass`, such as providing `-dev` and `-dbg` packages, setting `LIC_FILES_CHKSUM`, and so forth. See the "packagegroup.bbclass" section for further details.

4.2.2.5. IMAGE_FEATURES

Image recipes that previously included "apps-console-core" in IMAGE_FEATURES should now include "splash" instead to enable the boot-up splash screen. Retaining "apps-console-core" will still include the splash screen but generates a warning. The "apps-x11-core" and "apps-x11-games" IMAGE_FEATURES features have been removed.

4.2.2.6. Removed Recipes

The following recipes have been removed. For most of them, it is unlikely that you would have any references to them in your own Metadata. However, you should check your metadata against this list to be sure:

- libx11-trim: Replaced by libx11, which has a negligible size difference with modern Xorg.
- xserver-xorg-lite: Use xserver-xorg, which has a negligible size difference when DRI and GLX modules are not installed.
- xserver-kdrive: Effectively unmaintained for many years.
- mesa-xlib: No longer serves any purpose.
- galago: Replaced by telepathy.
- gail: Functionality was integrated into GTK+ 2.13.
- eggdbus: No longer needed.
- gcc-*-intermediate: The build has been restructured to avoid the need for this step.
- libgsmd: Unmaintained for many years. Functionality now provided by ofono instead.
- contacts, dates, tasks, eds-tools: Largely unmaintained PIM application suite. It has been moved to meta-gnome in meta-openembedded.

In addition to the previously listed changes, the meta-demoapps directory has also been removed because the recipes in it were not being maintained and many had become obsolete or broken. Additionally, these recipes were not parsed in the default configuration. Many of these recipes are already provided in an updated and maintained form within the OpenEmbedded community layers such as meta-oe and meta-gnome. For the remainder, you can now find them in the meta-extras repository, which is in the Yocto Project Source Repositories [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#source-repositories>].

4.2.3. Linux Kernel Naming

The naming scheme for kernel output binaries has been changed to now include PE as part of the filename:

```
KERNEL_IMAGE_BASE_NAME ?= "${KERNEL_IMAGETYPE}-${PE}-${PV}-${PR}-${MACHINE}-${DATETIME}"
```

Because the PE variable is not set by default, these binary files could result with names that include two dash characters. Here is an example:

```
bzImage--3.10.9+git0+cd502a8814_7144bcc4b8-r0-qemux86-64-20130830085431.bin
```

4.3. Moving to the Yocto Project 1.4 Release

This section provides migration information for moving to the Yocto Project 1.4 Release from the prior release.

4.3.1. BitBake

Differences include the following:

- **Comment Continuation:** If a comment ends with a line continuation (\) character, then the next line must also be a comment. Any instance where this is not the case, now triggers a warning. You must either remove the continuation character, or be sure the next line is a comment.
- **Package Name Overrides:** The runtime package specific variables `RDEPENDS`, `RRECOMMENDS`, `RSUGGESTS`, `RPROVIDES`, `RCONFLICTS`, `RREPLACES`, `FILES`, `ALLOW_EMPTY`, and the `pre`, `post`, `install`, and `uninstall` script functions `pkg_preinst`, `pkg_postinst`, `pkg_prerm`, and `pkg_postrm` should always have a package name override. For example, use `RDEPENDS_${PN}` for the main package instead of `RDEPENDS`. BitBake uses more strict checks when it parses recipes.

4.3.2. Build Behavior

Differences include the following:

- **Shared State Code:** The shared state code has been optimized to avoid running unnecessary tasks. For example, the following no longer populates the target `sysroot` since that is not necessary:

```
$ bitbake -c rootfs some-image
```

Instead, the system just needs to extract the output package contents, re-create the packages, and construct the root filesystem. This change is unlikely to cause any problems unless you have missing declared dependencies.

- **Scanning Directory Names:** When scanning for files in `SRC_URI`, the build system now uses `FILESOVERRIDES` instead of `OVERRIDES` for the directory names. In general, the values previously in `OVERRIDES` are now in `FILESOVERRIDES` as well. However, if you relied upon an additional value you previously added to `OVERRIDES`, you might now need to add it to `FILESOVERRIDES` unless you are already adding it through the `MACHINEOVERRIDES` or `DISTROOVERRIDES` variables, as appropriate. For more related changes, see the "Variables" section.

4.3.3. Proxies and Fetching Source

A new `oe-git-proxy` script has been added to replace previous methods of handling proxies and fetching source from Git. See the `meta-yocto/conf/site.conf.sample` file for information on how to use this script.

4.3.4. Custom Interfaces File (netbase change)

If you have created your own custom `etc/network/interfaces` file by creating an append file for the `netbase` recipe, you now need to create an append file for the `init-ifupdown` recipe instead, which you can find in the Source Directory at `meta-recipes-core/init-ifupdown`. For information on how to use append files, see the "Using .bbappend Files [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#using-bbappend-files>]" section in the Yocto Project Development Tasks Manual.

4.3.5. Remote Debugging

Support for remote debugging with the Eclipse IDE is now separated into an image feature (`eclipse-debug`) that corresponds to the `packagegroup-core-eclipse-debug` package group. Previously, the debugging feature was included through the `tools-debug` image feature, which corresponds to the `packagegroup-core-tools-debug` package group.

4.3.6. Variables

The following variables have changed:

- `SANITY_TESTED_DISTROS`: This variable now uses a distribution ID, which is composed of the host distributor ID followed by the release. Previously, `SANITY_TESTED_DISTROS` was composed of the description field. For example, "Ubuntu 12.10" becomes "Ubuntu-12.10". You do not need to worry about this change if you are not specifically setting this variable, or if you are specifically setting it to "".

- `SRC_URI`: The `${PN}`, `${PF}`, `${P}`, and `FILE_DIRNAME` directories have been dropped from the default value of the `FILESPATH` variable, which is used as the search path for finding files referred to in `SRC_URI`. If you have a recipe that relied upon these directories, which would be unusual, then you will need to add the appropriate paths within the recipe or, alternatively, rearrange the files. The most common locations are still covered by `${BP}`, `${BPN}`, and `"files"`, which all remain in the default value of `FILESPATH`.

4.3.7. Target Package Management with RPM

If runtime package management is enabled and the RPM backend is selected, Smart is now installed for package download, dependency resolution, and upgrades instead of Zypper. For more information on how to use Smart, run the following command on the target:

```
smart --help
```

4.3.8. Recipes Moved

The following recipes were moved from their previous locations because they are no longer used by anything in the OpenEmbedded-Core:

- `clutter-box2d`: Now resides in the meta-oe layer.
- `evolution-data-server`: Now resides in the meta-gnome layer.
- `gthumb`: Now resides in the meta-gnome layer.
- `gtkhtml2`: Now resides in the meta-oe layer.
- `gupnp`: Now resides in the meta-multimedia layer.
- `gypsy`: Now resides in the meta-oe layer.
- `libcanberra`: Now resides in the meta-gnome layer.
- `libgdata`: Now resides in the meta-gnome layer.
- `libmusicbrainz`: Now resides in the meta-multimedia layer.
- `metacity`: Now resides in the meta-gnome layer.
- `polkit`: Now resides in the meta-oe layer.
- `zeroconf`: Now resides in the meta-networking layer.

4.3.9. Removals and Renames

The following list shows what has been removed or renamed:

- `evieext`: Removed because it has been removed from xserver since 2008.
- `Gtk+ DirectFB`: Removed support because upstream Gtk+ no longer supports it as of version 2.18.
- `libxfontcache` / `xfontcacheprot`: Removed because they were removed from the Xorg server in 2008.
- `libxp` / `libxprintapputil` / `libxprintutil` / `printproto`: Removed because the XPrint server was removed from Xorg in 2008.
- `libxtrap` / `xtrapproto`: Removed because their functionality was broken upstream.
- `linux-yocto 3.0` kernel: Removed with `linux-yocto 3.8` kernel being added. The `linux-yocto 3.2` and `linux-yocto 3.4` kernels remain as part of the release.
- `lsbsetup`: Removed with functionality now provided by `lsbtest`.
- `matchbox-stroke`: Removed because it was never more than a proof-of-concept.

- `matchbox-wm-2` / `matchbox-theme-sato-2`: Removed because they are not maintained. However, `matchbox-wm` and `matchbox-theme-sato` are still provided.
- `mesa-dri`: Renamed to `mesa`.
- `mesa-xlib`: Removed because it was no longer useful.
- `mutter`: Removed because nothing ever uses it and the recipe is very old.
- `orinoco-conf`: Removed because it has become obsolete.
- `update-modules`: Removed because it is no longer used. The kernel module `postinstall` and `postrm` scripts can now do the same task without the use of this script.
- `web`: Removed because it is not maintained. Superseded by `web-webkit`.
- `xf86bigfontproto`: Removed because upstream it has been disabled by default since 2007. Nothing uses `xf86bigfontproto`.
- `xf86rushproto`: Removed because its dependency in `xserver` was spurious and it was removed in 2005.
- `zypper` / `libzypp` / `sat-solver`: Removed and been functionally replaced with `Smart` (`python-smartpm`) when RPM packaging is used and package management is enabled on the target.

4.4. Moving to the Yocto Project 1.5 Release

This section provides migration information for moving to the Yocto Project 1.5 Release from the prior release.

4.4.1. Host Dependency Changes

The OpenEmbedded build system now has some additional requirements on the host system:

- Python 2.7.3+
- Tar 1.24+
- Git 1.7.8+
- Patched version of Make if you are using 3.82. Most distributions that provide Make 3.82 use the patched version.

If the Linux distribution you are using on your build host does not provide packages for these, you can install and use the Buildtools tarball, which provides an SDK-like environment containing them.

For more information on this requirement, see the "Required Git, tar, and Python Versions" section.

4.4.2. **atom-pc** Board Support Package (BSP)

The `atom-pc` hardware reference BSP has been replaced by a `genericx86` BSP. This BSP is not necessarily guaranteed to work on all x86 hardware, but it will run on a wider range of systems than the `atom-pc` did.

Note

Additionally, a `genericx86-64` BSP has been added for 64-bit Atom systems.

4.4.3. BitBake

The following changes have been made that relate to BitBake:

- BitBake now supports a `_remove` operator. The addition of this operator means you will have to rename any items in recipe space (functions, variables) whose names currently contain `_remove_` or end with `_remove` to avoid unexpected behavior.
- BitBake's global method pool has been removed. This method is not particularly useful and led to clashes between recipes containing functions that had the same name.

- The "none" server backend has been removed. The "process" server backend has been serving well as the default for a long time now.
- The bitbake-runtask script has been removed.
- `_${P}` and `_${PF}` are no longer added to `PROVIDES` by default in `bitbake.conf`. These version-specific `PROVIDES` items were seldom used. Attempting to use them could result in two versions being built simultaneously rather than just one version due to the way BitBake resolves dependencies.

4.4.4. QA Warnings

The following changes have been made to the package QA checks:

- If you have customized `ERROR_QA` or `WARN_QA` values in your configuration, check that they contain all of the issues that you wish to be reported. Previous Yocto Project versions contained a bug that meant that any item not mentioned in `ERROR_QA` or `WARN_QA` would be treated as a warning. Consequently, several important items were not already in the default value of `WARN_QA`. All of the possible QA checks are now documented in the "insane.bbclass" section.
- An additional QA check has been added to check if `/usr/share/info/dir` is being installed. Your recipe should delete this file within `do_install` if "make install" is installing it.
- If you are using the `buildhistory` class, the check for the package version going backwards is now controlled using a standard QA check. Thus, if you have customized your `ERROR_QA` or `WARN_QA` values and still wish to have this check performed, you should add "version-going-backwards" to your value for one or the other variables depending on how you wish it to be handled. See the documented QA checks in the "insane.bbclass" section.

4.4.5. Directory Layout Changes

The following directory changes exist:

- Output SDK installer files are now named to include the image name and tuning architecture through the `SDK_NAME` variable.
- Images and related files are now installed into a directory that is specific to the machine, instead of a parent directory containing output files for multiple machines. The `DEPLOY_DIR_IMAGE` variable continues to point to the directory containing images for the current `MACHINE` and should be used anywhere there is a need to refer to this directory. The `runqemu` script now uses this variable to find images and kernel binaries and will use BitBake to determine the directory. Alternatively, you can set the `DEPLOY_DIR_IMAGE` variable in the external environment.
- When `buildhistory` is enabled, its output is now written under the Build Directory rather than `TMPDIR`. Doing so makes it easier to delete `TMPDIR` and preserve the build history. Additionally, data for produced SDKs is now split by `IMAGE_NAME`.
- The `pkgdata` directory produced as part of the packaging process has been collapsed into a single machine-specific directory. This directory is located under `sysroots` and uses a machine-specific name (i.e. `tmp/sysroots/machine/pkgdata`).

4.4.6. Shortened GitSRCREV Values

BitBake will now shorten revisions from Git repositories from the normal 40 characters down to 10 characters within `SRCPV` for improved usability in path and file names. This change should be safe within contexts where these revisions are used because the chances of spatially close collisions is very low. Distant collisions are not a major issue in the way the values are used.

4.4.7. IMAGE_FEATURES

The following changes have been made that relate to `IMAGE_FEATURES`:

- The value of `IMAGE_FEATURES` is now validated to ensure invalid feature items are not added. Some users mistakenly add package names to this variable instead of using `IMAGE_INSTALL` in order to have the package added to the image, which does not work. This change is intended to catch those kinds of situations. Valid `IMAGE_FEATURES` are drawn from `PACKAGE_GROUP` definitions,

COMPLEMENTARY_GLOB and a new "validitems" varflag on IMAGE_FEATURES. The "validitems" varflag change allows additional features to be added if they are not provided using the previous two mechanisms.

- The previously deprecated "apps-console-core" IMAGE_FEATURES item is no longer supported. Add "splash" to IMAGE_FEATURES if you wish to have the splash screen enabled, since this is all that apps-console-core was doing.

4.4.8. /run

The /run directory from the Filesystem Hierarchy Standard 3.0 has been introduced. You can find some of the implications for this change here [<http://cgkit.openembedded.org/openembedded-core/commit/?id=0e326280a15b0f2c4ef2ef4ec441f63f55b75873>]. The change also means that recipes that install files to /var/run must be changed. You can find a guide on how to make these changes here [<http://permalink.gmane.org/gmane.comp.handhelds.openembedded/58530>].

4.4.9. Removal of Package Manager Database Within Image Recipes

The image core-image-minimal no longer adds remove_packaging_data_files to ROOTFS_POSTPROCESS_COMMAND. This addition is now handled automatically when "package-management" is not in IMAGE_FEATURES. If you have custom image recipes that make this addition, you should remove the lines, as they are not needed and might interfere with correct operation of postinstall scripts.

4.4.10. Images Now Rebuild Only on Changes Instead of Every Time

The do_rootfs and other related image construction tasks are no longer marked as "nostamp". Consequently, they will only be re-executed when their inputs have changed. Previous versions of the OpenEmbedded build system always rebuilt the image when requested rather than when necessary.

4.4.11. Task Recipes

The previously deprecated task.bbclass has now been dropped. For recipes that previously inherited from this class, you should rename them from task-* to packagegroup-* and inherit packagegroup instead.

For more information, see the "packagegroup.bbclass" section.

4.4.12. BusyBox

By default, we now split BusyBox into two binaries: one that is suid root for those components that need it, and another for the rest of the components. Splitting BusyBox allows for optimization that eliminates the tinylogin recipe as recommended by upstream. You can disable this split by setting BUSYBOX_SPLIT_SUID to "0".

4.4.13. Automated Image Testing

A new automated image testing framework has been added through the testimage.bbclass class. This framework replaces the older imagetest-qemu framework.

You can learn more about performing automated image tests in the "Performing Automated Runtime Testing [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#performing-automated-runtime-testing>]" section in the Yocto Project Development Tasks Manual.

4.4.14. Build History

Following are changes to Build History:

- Installed package sizes: installed-package-sizes.txt for an image now records the size of the files installed by each package instead of the size of each compressed package archive file.

- The dependency graphs (`depends*.dot`) now use the actual package names instead of replacing dashes, dots and plus signs with underscores.
- The `buildhistory-diff` and `buildhistory-collect-srcrrevs` utilities have improved command-line handling. Use the `--help` option for each utility for more information on the new syntax.

For more information on Build History, see the "Maintaining Build Output Quality" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#maintaining-build-output-quality>] section in the Yocto Project Development Tasks Manual.

4.4.15. udev

Following are changes to `udev`:

- `udev` no longer brings in `udev-extraconf` automatically through `RRECOMMENDS`, since this was originally intended to be optional. If you need the extra rules, then add `udev-extraconf` to your image.
- `udev` no longer brings in `pciutils-ids` or `usbutils-ids` through `RRECOMMENDS`. These are not needed by `udev` itself and removing them saves around 350KB.

4.4.16. Removed and Renamed Recipes

- The `linux-yocto 3.2` kernel has been removed.
- `libtool-nativesdk` has been renamed to `nativesdk-libtool`.
- `tinylogin` has been removed. It has been replaced by a `suid` portion of `Busybox`. See the "BusyBox" section for more information.
- `external-python-tarball` has been renamed to `buildtools-tarball`.
- `web-webkit` has been removed. It has been functionally replaced by `midori`.
- `imake` has been removed. It is no longer needed by any other recipe.
- `transfig-native` has been removed. It is no longer needed by any other recipe.
- `anjuta-remote-run` has been removed. Anjuta IDE integration has not been officially supported for several releases.

4.4.17. Other Changes

Following is a list of short entries describing other changes:

- `run-postinsts`: Make this generic.
- `base-files`: Remove the unnecessary `media/xxx` directories.
- `alsa-state`: Provide an empty `asound.conf` by default.
- `classes/image`: Ensure `BAD_RECOMMENDATIONS` supports pre-renamed package names.
- `classes/rootfs_rpm`: Implement `BAD_RECOMMENDATIONS` for RPM.
- `systemd`: Remove `systemd_unitdir` if `systemd` is not in `DISTRO_FEATURES`.
- `systemd`: Remove `init.d` dir if `systemd` unit file is present and `sysvinit` is not a distro feature.
- `libpam`: Deny all services for the `OTHER` entries.
- `image.bbclass`: Move `runtime_mapping_rename` to avoid conflict with `multilib`. See YOECTO #4993 [https://bugzilla.yoctoproject.org/show_bug.cgi?id=4993] in Bugzilla for more information.
- `linux-dtb`: Use kernel build system to generate the dtb files.
- `kern-tools`: Switch from `guilt` to new `kgit-s2q` tool.

4.5. Moving to the Yocto Project 1.6 Release

This section provides migration information for moving to the Yocto Project 1.6 Release from the prior release.

4.5.1. archiver Class

The archiver class has been rewritten and its configuration has been simplified. For more details on the source archiver, see the "Maintaining Open Source License Compliance During Your Product's Lifecycle" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#maintaining-open-source-license-compliance-during-your-products-lifecycle>] section in the Yocto Project Development Tasks Manual.

4.5.2. Packaging Changes

The following packaging changes have been made:

- The binutils recipe no longer produces a binutils-symlinks package. update-alternatives is now used to handle the preferred binutils variant on the target instead.
- The tc (traffic control) utilities have been split out of the main iproute2 package and put into the iproute2-tc package.
- The gtk-engines schemas have been moved to a dedicated gtk-engines-schemas package.
- The armv7a with thumb package architecture suffix has changed. The suffix for these packages with the thumb optimization enabled is "t2" as it should be. Use of this suffix was not the case in the 1.5 release. Architecture names will change within package feeds as a result.

4.5.3. BitBake

The following changes have been made to BitBake.

4.5.3.1. Matching Branch Requirement for Git Fetching

When fetching source from a Git repository using SRC_URI, BitBake will now validate the SRCREV value against the branch. You can specify the branch using the following form:

```
SRC_URI = "git://server.name/repository;branch=branchname"
```

If you do not specify a branch, BitBake looks in the default "master" branch.

Alternatively, if you need to bypass this check (e.g. if you are fetching a revision corresponding to a tag that is not on any branch), you can add ";nobranch=1" to the end of the URL within SRC_URI.

4.5.3.2. Python Definition substitutions

BitBake had some previously deprecated Python definitions within its bb module removed. You should use their sub-module counterparts instead:

- bb.MalformedUrl: Use bb.fetch.MalformedUrl.
- bb.encodeurl: Use bb.fetch.encodeurl.
- bb.decodeurl: Use bb.fetch.decodeurl.
- bb.mkdirhier: Use bb.utils.mkdirhier.
- bb.movefile: Use bb.utils.movefile.
- bb.copyfile: Use bb.utils.copyfile.
- bb.which: Use bb.utils.which.
- bb.vercmp_string: Use bb.utils.vercmp_string.

- `bb.vercmp`: Use `bb.utils.vercmp`.

4.5.3.3. SVK Fetcher

The SVK fetcher has been removed from BitBake.

4.5.3.4. Console Output Error Redirection

The BitBake console UI will now output errors to `stderr` instead of `stdout`. Consequently, if you are piping or redirecting the output of `bitbake` to somewhere else, and you wish to retain the errors, you will need to add `2>&1` (or something similar) to the end of your `bitbake` command line.

4.5.3.5. **task-taskname** Overrides

`task-taskname` overrides have been adjusted so that tasks whose names contain underscores have the underscores replaced by hyphens for the override so that they now function properly. For example, the task override for `do_populate_sdk` is `task-populate-sdk`.

4.5.4. Changes to Variables

The following variables have changed. For information on the OpenEmbedded build system variables, see the "Variables Glossary" Chapter.

4.5.4.1. **TMPDIR**

`TMPDIR` can no longer be on an NFS mount. NFS does not offer full POSIX locking and inode consistency and can cause unexpected issues if used to store `TMPDIR`.

The check for this occurs on startup. If `TMPDIR` is detected on an NFS mount, an error occurs.

4.5.4.2. **PRINC**

The `PRINC` variable has been deprecated and triggers a warning if detected during a build. For PR increments on changes, use the PR service instead. You can find out more about this service in the "Working With a PR Service [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#working-with-a-pr-service>]" section in the Yocto Project Development Tasks Manual.

4.5.4.3. **IMAGE_TYPES**

The "`sum.jffs2`" option for `IMAGE_TYPES` has been replaced by the "`jffs2.sum`" option, which fits the processing order.

4.5.4.4. **COPY_LIC_MANIFEST**

The `COPY_LIC_MANIFEST` variable must now be set to "1" rather than any value in order to enable it.

4.5.4.5. **COPY_LIC_DIRS**

The `COPY_LIC_DIRS` variable must now be set to "1" rather than any value in order to enable it.

4.5.4.6. **PACKAGE_GROUP**

The `PACKAGE_GROUP` variable has been renamed to `FEATURE_PACKAGES` to more accurately reflect its purpose. You can still use `PACKAGE_GROUP` but the OpenEmbedded build system produces a warning message when it encounters the variable.

4.5.4.7. Preprocess and Post Process Command Variable Behavior

The following variables now expect a semicolon separated list of functions to call and not arbitrary shell commands:

```
ROOTFS_PREPROCESS_COMMAND
ROOTFS_POSTPROCESS_COMMAND
SDK_POSTPROCESS_COMMAND
POPULATE_SDK_POST_TARGET_COMMAND
```

```
POPULATE_SDK_POST_HOST_COMMAND
IMAGE_POSTPROCESS_COMMAND
IMAGE_PREPROCESS_COMMAND
ROOTFS_POSTUNINSTALL_COMMAND
ROOTFS_POSTINSTALL_COMMAND
```

For migration purposes, you can simply wrap shell commands in a shell function and then call the function. Here is an example:

```
my_postprocess_function() {
    echo "hello" > ${IMAGE_ROOTFS}/hello.txt
}
ROOTFS_POSTPROCESS_COMMAND += "my_postprocess_function; "
```

4.5.5. Package Test (ptest)

Package Tests (ptest) are built but not installed by default. For information on using Package Tests, see the "Testing Packages with ptest [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#testing-packages-with-ptest>]" section in the Yocto Project Development Tasks Manual. For information on the ptest class, see the "ptest.bbclass" section.

4.5.6. Build Changes

Separate build and source directories have been enabled by default for selected recipes where it is known to work (a whitelist) and for all recipes that inherit the cmake class. In future releases the autotools class will enable a separate build directory by default as well. Recipes building Autotools-based software that fails to build with a separate build directory should be changed to inherit from the autotools-brokensep class instead of the autotools or autotools_stageclasses.

4.5.7. qemu-native

qemu-native now builds without SDL-based graphical output support by default. The following additional lines are needed in your local.conf to enable it:

```
PACKAGECONFIG_pn-qemu-native = "sdl"
ASSUME_PROVIDED += "libsdl-native"
```

Note

The default local.conf contains these statements. Consequently, if you are building a headless system and using a default local.conf file, you will need comment these two lines out.

4.5.8. core-image-basic

core-image-basic has been renamed to core-image-full-cmdline.

In addition to core-image-basic being renamed, packagegroup-core-basic has been renamed to packagegroup-core-full-cmdline to match.

4.5.9. Licensing

The top-level LICENSE file has been changed to better describe the license of the various components of OE-Core. However, the licensing itself remains unchanged.

Normally, this change would not cause any side-effects. However, some recipes point to this file within LIC_FILES_CHKSUM (as \${COREBASE}/LICENSE) and thus the accompanying checksum must be changed from 3f40d7994397109285ec7b81fdeb3b58 to 4d92cd373abda3937c2bc47fbc49d690. A better alternative is to have LIC_FILES_CHKSUM point to a file describing the license that is distributed with the source that the recipe is building, if possible, rather than pointing to \${COREBASE}/LICENSE.

4.5.10. CFLAGS Options

The "-fpermissive" option has been removed from the default CFLAGS value. You need to take action on individual recipes that fail when building with this option. You need to either patch the recipes to fix the issues reported by the compiler, or you need to add "-fpermissive" to CFLAGS in the recipes.

4.5.11. Custom Image Output Types

Custom image output types, as selected using IMAGE_FSTYPES, must declare their dependencies on other image types (if any) using a new IMAGE_TYPEDEP variable.

4.5.12. Tasks

The do_package_write task has been removed. The task is no longer needed.

4.5.13. update-alternative Provider

The default update-alternatives provider has been changed from opkg to opkg-utils. This change resolves some troublesome circular dependencies. The runtime package has also been renamed from update-alternatives-cworth to update-alternatives-opkg.

4.5.14. virtclass Overrides

The virtclass overrides are now deprecated. Use the equivalent class overrides instead (e.g. virtclass-native becomes class-native.)

4.5.15. Removed and Renamed Recipes

The following recipes have been removed:

- packagegroup-toolset-native - This recipe is largely unused.
- linux-yocto-3.8 - Support for the Linux yocto 3.8 kernel has been dropped. Support for the 3.10 and 3.14 kernels have been added with the linux-yocto-3.10 and linux-yocto-3.14 recipes.
- ocf-linux - This recipe has been functionally replaced using cryptodev-linux.
- genext2fs - genext2fs is no longer used by the build system and is unmaintained upstream.
- js - This provided an ancient version of Mozilla's javascript engine that is no longer needed.
- zaurusd - The recipe has been moved to the meta-handheld layer.
- eglibc 2.17 - Replaced by the eglibc 2.19 recipe.
- gcc 4.7.2 - Replaced by the now stable gcc 4.8.2.
- external-sourcery-toolchain - this recipe is now maintained in the meta-sourcery layer.
- linux-libc-headers-yocto 3.4+git - Now using version 3.10 of the linux-libc-headers by default.
- meta-toolchain-gmae - This recipe is obsolete.
- packagegroup-core-sdk-gmae - This recipe is obsolete.
- packagegroup-core-standalone-gmae-sdk-target - This recipe is obsolete.

4.5.16. Removed Classes

The following classes have become obsolete and have been removed:

- module_strip
- pkg_metainfo

- `pkg_distribute`
- `image-empty`

4.5.17. Reference Board Support Packages (BSPs)

The following reference BSPs changes occurred:

- The BeagleBoard (`beagleboard`) ARM reference hardware has been replaced by the BeagleBone (`beaglebone`) hardware.
- The RouterStation Pro (`routerstationpro`) MIPS reference hardware has been replaced by the EdgeRouter Lite (`edgerouter`) hardware.

The previous reference BSPs for the `beagleboard` and `routerstationpro` machines are still available in a new `meta-yocto-bsp-old` layer in the Source Repositories [<http://git.yoctoproject.org>] at <http://git.yoctoproject.org/cgi/cgit.cgi/meta-yocto-bsp-old/>.

4.6. Moving to the Yocto Project 1.7 Release

This section provides migration information for moving to the Yocto Project 1.7 Release from the prior release.

4.6.1. Changes to Setting QEMUPACKAGECONFIG Options in `local.conf`

The QEMU recipe now uses a number of `PACKAGECONFIG` options to enable various optional features. The method used to set defaults for these options means that existing `local.conf` files will need to be modified to append to `PACKAGECONFIG` for `qemu-native` and `nativesdk-qemu` instead of setting it. In other words, to enable graphical output for QEMU, you should now have these lines in `local.conf`:

```
PACKAGECONFIG_append_pn-qemu-native = " sdl"
PACKAGECONFIG_append_pn-nativesdk-qemu = " sdl"
```

4.6.2. Minimum Git version

The minimum Git [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#git>] version required on the build host is now 1.7.8 because the `--list` option is now required by BitBake's Git fetcher. As always, if your host distribution does not provide a version of Git that meets this requirement, you can use the `buildtools-tarball` that does. See the "Required Git, tar, and Python Versions" section for more information.

4.6.3. Autotools Class Changes

The following autotools class changes occurred:

- A separate build directory is now used by default: The `autotools` class has been changed to use a directory for building (B), which is separate from the source directory (S). This is commonly referred to as `B != S`, or an out-of-tree build.

If the software being built is already capable of building in a directory separate from the source, you do not need to do anything. However, if the software is not capable of being built in this manner, you will need to either patch the software so that it can build separately, or you will need to change the recipe to inherit the `autotools-brokensep` class instead of the `autotools` or `autotools_stage` classes.

- The `--foreign` option is no longer passed to `automake` when running `autoconf`: This option tells `automake` that a particular software package does not follow the GNU standards and therefore should not be expected to distribute certain files such as `ChangeLog`, `AUTHORS`, and so forth. Because the majority of upstream software packages already tell `automake` to enable foreign mode themselves, the option is mostly superfluous. However, some recipes will need patches for this change. You can easily make the change by patching `configure.ac` so that it passes "foreign"

to `AM_INIT_AUTOMAKE()`. See this commit [<http://cgит.openembedded.org/openembedded-core/commit/?id=01943188f85ce6411717fb5bf702d609f55813f2>] for an example showing how to make the patch.

4.6.4. Binary Configuration Scripts Disabled

Some of the core recipes that package binary configuration scripts now disable the scripts due to the scripts previously requiring error-prone path substitution. Software that links against these libraries using these scripts should use the much more robust `pkg-config` instead. The list of recipes changed in this version (and their configuration scripts) is as follows:

```
directfb (directfb-config)
freetype (freetype-config)
gpgme (gpgme-config)
libassuan (libassuan-config)
libcroco (croco-6.0-config)
libgcrypt (libgcrypt-config)
libgpg-error (gpg-error-config)
libksba (ksba-config)
libpcap (pcap-config)
libpcre (pcre-config)
libpng (libpng-config, libpng16-config)
libsdl (sdl-config)
libusb-compat (libusb-config)
libxml2 (xml2-config)
libxslt (xslt-config)
ncurses (ncurses-config)
neon (neon-config)
npth (npth-config)
pth (pth-config)
taglib (taglib-config)
```

Additionally, support for `pkg-config` has been added to some recipes in the previous list in the rare cases where the upstream software package does not already provide it.

4.6.5. **eglibc 2.19** Replaced with **glibc 2.20**

Because `eglibc` and `glibc` were already fairly close, this replacement should not require any significant changes to other software that links to `eglibc`. However, there were a number of minor changes in `glibc 2.20` upstream that could require patching some software (e.g. the removal of the `_BSD_SOURCE` feature test macro).

`glibc 2.20` requires version 2.6.32 or greater of the Linux kernel. Thus, older kernels will no longer be usable in conjunction with it.

For full details on the changes in `glibc 2.20`, see the upstream release notes here [<https://sourceware.org/ml/libc-alpha/2014-09/msg00088.html>].

4.6.6. Kernel Module Autoloading

The `module_autoload_*` variable is now deprecated and a new `KERNEL_MODULE_AUTOLOAD` variable should be used instead. Also, `module_conf_*` must now be used in conjunction with a new `KERNEL_MODULE_PROBECONF` variable. The new variables no longer require you to specify the module name as part of the variable name. This change not only simplifies usage but also allows the values of these variables to be appropriately incorporated into task signatures and thus trigger the appropriate tasks to re-execute when changed. You should replace any references to `module_autoload_*` with `KERNEL_MODULE_AUTOLOAD`, and add any modules for which `module_conf_*` is specified to `KERNEL_MODULE_PROBECONF`.

4.6.7. QA Check Changes

The following changes have occurred to the QA check process:

- Additional QA checks `file-rdeps` and `build-deps` have been added in order to verify that file dependencies are satisfied (e.g. package contains a script requiring `/bin/bash`) and build-time dependencies are declared, respectively. For more information, please see the "QA Error and Warning Messages" chapter.
- Package QA checks are now performed during a new `do_package_qa` task rather than being part of the `do_package` task. This allows more parallel execution. This change is unlikely to be an issue except for highly customized recipes that disable packaging tasks themselves by marking them as `noexec`. For those packages, you will need to disable the `do_package_qa` task as well.
- Files being overwritten during the `do_populate_sysroot` task now trigger an error instead of a warning. Recipes should not be overwriting files written to the sysroot by other recipes. If you have these types of recipes, you need to alter them so that they do not overwrite these files.

You might now receive this error after changes in configuration or metadata resulting in orphaned files being left in the sysroot. If you do receive this error, the way to resolve the issue is to delete your `TMPDIR` or to move it out of the way and then re-start the build. Anything that has been fully built up to that point and does not need rebuilding will be restored from the shared state cache and the rest of the build will be able to proceed as normal.

4.6.8. Removed Recipes

The following recipes have been removed:

- `x-load`: This recipe has been superseded by U-boot SPL for all Cortex-based TI SoCs. For legacy boards, the `meta-ti` layer, which contains a maintained recipe, should be used instead.
- `ubootchart`: This recipe is obsolete. A `bootchart2` recipe has been added to functionally replace it.
- `linux-yocto 3.4`: Support for the linux-yocto 3.4 kernel has been dropped. Support for the 3.10 and 3.14 kernels remains, while support for version 3.17 has been added.
- `eglibc` has been removed in favor of `glibc`. See the "`eglibc 2.19 Replaced with glibc 2.20`" section for more information.

4.6.9. Miscellaneous Changes

The following miscellaneous change occurred:

- The build history feature now writes `build-id.txt` instead of `build-id`. Additionally, `build-id.txt` now contains the full build header as printed by BitBake upon starting the build. You should manually remove old "build-id" files from your existing build history repositories to avoid confusion. For information on the build history feature, see the "Maintaining Build Output Quality [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#maintaining-build-output-quality>]" section in the Yocto Project Development Tasks Manual.

4.7. Moving to the Yocto Project 1.8 Release

This section provides migration information for moving to the Yocto Project 1.8 Release from the prior release.

4.7.1. Removed Recipes

The following recipes have been removed:

- `owl-video`: Functionality replaced by `gst-player`.
- `gaku`: Functionality replaced by `gst-player`.
- `gnome-desktop`: This recipe is now available in `meta-gnome` and is no longer needed.
- `gsettings-desktop-schemas`: This recipe is now available in `meta-gnome` and is no longer needed.
- `python-argparse`: The `argparse` module is already provided in the default Python distribution in a package named `python-argparse`. Consequently, the separate `python-argparse` recipe is no longer needed.

- telepathy-python, libtelepathy, telepathy-glib, telepathy-idle, telepathy-mission-control: All these recipes have moved to meta-oe and are consequently no longer needed by any recipes in OpenEmbedded-Core.
- linux-yocto_3.10 and linux-yocto_3.17: Support for the linux-yocto 3.10 and 3.17 kernels has been dropped. Support for the 3.14 kernel remains, while support for 3.19 kernel has been added.
- poky-feed-config-opkg: This recipe has become obsolete and is no longer needed. Use distro-feed-config from meta-oe instead.
- libav 0.8.x: libav 9.x is now used.
- sed-native: No longer needed. A working version of sed is expected to be provided by the host distribution.

4.7.2. BlueZ 4.x / 5.x Selection

Proper built-in support for selecting BlueZ 5.x in preference to the default of 4.x now exists. To use BlueZ 5.x, simply add "bluez5" to your DISTRO_FEATURES value. If you had previously added append files (*.bbappend) to make this selection, you can now remove them.

Additionally, a bluetooth class has been added to make selection of the appropriate bluetooth support within a recipe a little easier. If you wish to make use of this class in a recipe, add something such as the following:

```
inherit bluetooth
PACKAGECONFIG ??= "${@bb.utils.contains('DISTRO_FEATURES', 'bluetooth', '${BLUEZ}', '', d)}
PACKAGECONFIG[bluez4] = "--enable-bluetooth,--disable-bluetooth,bluez4"
PACKAGECONFIG[bluez5] = "--enable-bluez5,--disable-bluez5,bluez5"
```

4.7.3. Kernel Build Changes

The kernel build process was changed to place the source in a common shared work area and to place build artifacts separately in the source code tree. In theory, migration paths have been provided for most common usages in kernel recipes but this might not work in all cases. In particular, users need to ensure that `${S}` (source files) and `${B}` (build artifacts) are used correctly in functions such as `do_configure` and `do_install`. For kernel recipes that do not inherit from `kernel-yocto` or include `linux-yocto.inc`, you might wish to refer to the `linux.inc` file in the meta-oe layer for the kinds of changes you need to make. For reference, here is the commit [<http://cgit.openembedded.org/meta-openembedded/commit/meta-oe/recipes-kernel/linux/linux.inc?id=fc7132ede27ac67669448d3d2845ce7d46c6a1ee>] where the `linux.inc` file in meta-oe was updated.

Recipes that rely on the kernel source code and do not inherit the module classes might need to add explicit dependencies on the `do_shared_workdir` kernel task, for example:

```
do_configure[depends] += "virtual/kernel:do_shared_workdir"
```

4.7.4. SSL 3.0 is Now Disabled in OpenSSL

SSL 3.0 is now disabled when building OpenSSL. Disabling SSL 3.0 avoids any lingering instances of the POODLE vulnerability. If you feel you must re-enable SSL 3.0, then you can add an append file (*.bbappend) for the openssl recipe to remove "-no-ssl3" from EXTRA_OECONF.

4.7.5. Default Sysroot Poisoning

gcc's default sysroot and include directories are now "poisoned". In other words, the sysroot and include directories are being redirected to a non-existent location in order to catch when host directories are being used due to the correct options not being passed. This poisoning applies both to the cross-compiler used within the build and to the cross-compiler produced in the SDK.

If this change causes something in the build to fail, it almost certainly means the various compiler flags and commands are not being passed correctly to the underlying piece of software. In such cases, you need to take corrective steps.

4.7.6. Rebuild Improvements

Changes have been made to the base, autotools, and cmake classes to clean out generated files when the `do_configure` task needs to be re-executed.

One of the improvements is to attempt to run "make clean" during the `do_configure` task if a Makefile exists. Some software packages do not provide a working clean target within their make files. If you have such recipes, you need to set `CLEANBROKEN` to "1" within the recipe, for example:

```
CLEANBROKEN = "1"
```

4.7.7. QA Check and Validation Changes

The following QA Check and Validation Changes have occurred:

- Usage of `PRINC` previously triggered a warning. It now triggers an error. You should remove any remaining usage of `PRINC` in any recipe or append file.
- An additional QA check has been added to detect usage of `${D}` in `FILES` values where `D` values should not be used at all. The same check ensures that `$D` is used in `pkg_preinst/pkg_postinst/pkg_prerm/pkg_postrm` functions instead of `${D}`.
- `S` now needs to be set to a valid value within a recipe. If `S` is not set in the recipe, the directory is not automatically created. If `S` does not point to a directory that exists at the time the `do_unpack` task finishes, a warning will be shown.
- `LICENSE` is now validated for correct formatting of multiple licenses. If the format is invalid (e.g. multiple licenses are specified with no operators to specify how the multiple licenses interact), then a warning will be shown.

4.7.8. Miscellaneous Changes

The following miscellaneous changes have occurred:

- The `send-error-report` script now expects a `"-s"` option to be specified before the server address. This assumes a server address is being specified.
- The `oe-pkgdata-util` script now expects a `"-p"` option to be specified before the `pkgdata` directory, which is now optional. If the `pkgdata` directory is not specified, the script will run BitBake to query `PKGDATA_DIR` from the build environment.

4.8. Moving to the Yocto Project 2.0 Release

This section provides migration information for moving to the Yocto Project 2.0 Release from the prior release.

4.8.1. GCC 5

The default compiler is now GCC 5.2. This change has required fixes for compilation errors in a number of other recipes.

One important example is a fix for when the Linux kernel freezes at boot time on ARM when built with GCC 5. If you are using your own kernel recipe or source tree and building for ARM, you will likely need to apply this patch [<https://git.kernel.org/cgit/linux/kernel/git/torvalds/linux.git/commit?id=a077224fd35b2f7fbc93f14cf67074fc792fbac2>]. The standard linux-yocto kernel source tree already has a workaround for the same issue.

For further details, see <https://gcc.gnu.org/gcc-5/changes.html> and the porting guide at https://gcc.gnu.org/gcc-5/porting_to.html.

Alternatively, you can switch back to GCC 4.9 or 4.8 by setting `GCCVERSION` in your configuration, as follows:

```
GCCVERSION = "4.9%"
```

4.8.2. Gstreamer 0.10 Removed

Gstreamer 0.10 has been removed in favor of Gstreamer 1.x. As part of the change, recipes for Gstreamer 0.10 and related software are now located in `meta-multimedia`. This change results in Qt4 having Phonon and Gstreamer support in QtWebkit disabled by default.

4.8.3. Removed Recipes

The following recipes have been moved or removed:

- `bluez4`: The recipe is obsolete and has been moved due to `bluez5` becoming fully integrated. The `bluez4` recipe now resides in `meta-oe`.
- `gamin`: The recipe is obsolete and has been removed.
- `gnome-icon-theme`: The recipe's functionality has been replaced by `adwaita-icon-theme`.
- `Gstreamer 0.10 Recipes`: Recipes for Gstreamer 0.10 have been removed in favor of the recipes for Gstreamer 1.x.
- `insserv`: The recipe is obsolete and has been removed.
- `libunique`: The recipe is no longer used and has been moved to `meta-oe`.
- `midori`: The recipe's functionality has been replaced by `epiphany`.
- `python-gst`: The recipe is obsolete and has been removed since it only contains bindings for Gstreamer 0.10.
- `qt-mobility`: The recipe is obsolete and has been removed since it requires Gstreamer 0.10, which has been replaced.
- `subversion`: All 1.6.x versions of this recipe have been removed.
- `webkit-gtk`: The older 1.8.3 version of this recipe has been removed in favor of `webkitgtk`.

4.8.4. BitBake datastore improvements

The method by which BitBake's datastore handles overrides has changed. Overrides are now applied dynamically and `bb.data.update_data()` is now a no-op. Thus, `bb.data.update_data()` is no longer required in order to apply the correct overrides. In practice, this change is unlikely to require any changes to Metadata. However, these minor changes in behavior exist:

- All potential overrides are now visible in the variable history as seen when you run the following:

```
$ bitbake -e
```

- `d.delVar('VARNAME')` and `d.setVar('VARNAME', None)` result in the variable and all of its overrides being cleared out. Before the change, only the non-overridden values were cleared.

4.8.5. Shell Message Function Changes

The shell versions of the BitBake message functions (i.e. `bbdebug`, `bbnote`, `bbwarn`, `bbplain`, `bberror`, and `bbfatal`) are now connected through to their BitBake equivalents `bb.debug()`, `bb.note()`, `bb.warn()`, `bb.plain()`, `bb.error()`, and `bb.fatal()`, respectively. Thus, those message functions that you would expect to be printed by the BitBake UI are now actually printed. In practice, this change means two things:

- If you now see messages on the console that you did not previously see as a result of this change, you might need to clean up the calls to `bbwarn`, `bberro`, and so forth. Or, you might want to simply remove the calls.
- The `bbfatal` message function now suppresses the full error log in the UI, which means any calls to `bbfatal` where you still wish to see the full error log should be replaced by `die` or `bbfatal_log`.

4.8.6. Extra Development/Debug Package Cleanup

The following recipes have had extra dev/dbg packages removed:

- `acl`
- `apmd`
- `aspell`
- `attr`
- `augeas`
- `bzip2`
- `cogl`
- `curl`
- `elfutils`
- `gcc-target`
- `libgcc`
- `libtool`
- `libxmu`
- `opkg`
- `pciutils`
- `rpm`
- `sysfsutils`
- `tiff`
- `xz`

All of the above recipes now conform to the standard packaging scheme where a single `-dev`, `-dbg`, and `-staticdev` package exists per recipe.

4.8.7. Recipe Maintenance Tracking Data Moved to OE-Core

Maintenance tracking data for recipes that was previously part of `meta-yocto` has been moved to OE-Core. The change includes `package_regex.inc` and `distro_alias.inc`, which are typically enabled when using the `distrodata` class. Additionally, the contents of `upstream_tracking.inc` has now been split out to the relevant recipes.

4.8.8. Automatic Stale Sysroot File Cleanup

Stale files from recipes that no longer exist in the current configuration are now automatically removed from sysroot as well as removed from any other place managed by shared state. This automatic cleanup means that the build system now properly handles situations such as renaming the build system side of recipes, removal of layers from `bbayers.conf`, and `DISTRO_FEATURES` changes.

Additionally, work directories for old versions of recipes are now pruned. If you wish to disable pruning old work directories, you can set the following variable in your configuration:

```
SSTATE_PRUNE_OBSOLETEWORKDIR = "0"
```

4.8.9. **linux-yocto** Kernel Metadata Repository Now Split from Source

The `linux-yocto` tree has up to now been a combined set of kernel changes and configuration (meta) data carried in a single tree. While this format is effective at keeping kernel configuration and source modifications synchronized, it is not always obvious to developers how to manipulate the Metadata as compared to the source.

Metadata processing has now been removed from the `kernel-yocto` class and the external Metadata repository `yocto-kernel-cache`, which has always been used to seed the `linux-yocto` "meta" branch. This separate `linux-yocto` cache repository is now the primary location for this data. Due to this change, `linux-yocto` is no longer able to process combined trees. Thus, if you need to have your own combined kernel repository, you must do the split there as well and update your recipes accordingly. See the `meta/recipes-kernel/linux/linux-yocto_4.1.bb` recipe for an example.

4.8.10. Additional QA checks

The following QA checks have been added:

- Added a "host-user-contaminated" check for ownership issues for packaged files outside of `/home`. The check looks for files that are incorrectly owned by the user that ran BitBake instead of owned by a valid user in the target system.
- Added an "invalid-chars" check for invalid (non-UTF8) characters in recipe metadata variable values (i.e. `DESCRIPTION`, `SUMMARY`, `LICENSE`, and `SECTION`). Some package managers do not support these characters.
- Added an "invalid-packageconfig" check for any options specified in `PACKAGECONFIG` that do not match any `PACKAGECONFIG` option defined for the recipe.

4.8.11. Miscellaneous Changes

These additional changes exist:

- `gtk-update-icon-cache` has been renamed to `gtk-icon-utils`.
- The `tools-profile` `IMAGE_FEATURES` item as well as its corresponding `packagegroup` and `packagegroup-core-tools-profile` no longer bring in `oprofile`. Bringing in `oprofile` was originally added to aid compilation on resource-constrained targets. However, this aid has not been widely used and is not likely to be used going forward due to the more powerful target platforms and the existence of better cross-compilation tools.
- The `IMAGE_FSTYPES` variable's default value now specifies `ext4` instead of `ext3`.
- All support for the `PRINC` variable has been removed.
- The `packagegroup-core-full-cmdline` `packagegroup` no longer brings in `lighttpd` due to the fact that bringing in `lighttpd` is not really in line with the `packagegroup`'s purpose, which is to add full versions of command-line tools that by default are provided by `busybox`.

4.9. Moving to the Yocto Project 2.1 Release

This section provides migration information for moving to the Yocto Project 2.1 Release from the prior release.

4.9.1. Variable Expansion in Python Functions

Variable expressions, such as `${VARNAME}` no longer expand automatically within Python functions. Suppressing expansion was done to allow Python functions to construct shell scripts or other code

for situations in which you do not want such expressions expanded. For any existing code that relies on these expansions, you need to change the expansions to expand the value of individual variables through `d.getVar()`. To alternatively expand more complex expressions, use `d.expand()`.

4.9.2. Overrides Must Now be Lower-Case

The convention for overrides has always been for them to be lower-case characters. This practice is now a requirement as BitBake's datastore now assumes lower-case characters in order to give a slight performance boost during parsing. In practical terms, this requirement means that anything that ends up in `OVERRIDES` must now appear in lower-case characters (e.g. values for `MACHINE`, `TARGET_ARCH`, `DISTRO`, and also recipe names if `_pn-recipe` overrides are to be effective).

4.9.3. Expand Parameter to `getVar()` and `getVarFlag()` is Now Mandatory

The `expand` parameter to `getVar()` and `getVarFlag()` previously defaulted to `False` if not specified. Now, however, no default exists so one must be specified. You must change any `getVar()` calls that do not specify the final `expand` parameter to calls that do specify the parameter. You can run the following `sed` command at the base of a layer to make this change:

```
sed -e 's:\(\\.getVar([^\,()]*\)):\1, False):g' -i `grep -ril getVar *`
sed -e 's:\(\\.getVarFlag([^\,()]*, [^\,()]*\)):\1, False):g' -i `grep -ril getVarFlag *`
```

Note

The reason for this change is that it prepares the way for changing the default to `True` in a future Yocto Project release. This future change is a much more sensible default than `False`. However, the change needs to be made gradually as a sudden change of the default would potentially cause side-effects that would be difficult to detect.

4.9.4. Makefile Environment Changes

`EXTRA_OEMAKE` now defaults to `""` instead of `"-e MAKEFLAGS="`. Setting `EXTRA_OEMAKE` to `"-e MAKEFLAGS="` by default was a historical accident that has required many classes (e.g. `autotools`, `module`) and recipes to override this default in order to work with sensible build systems. When upgrading to the release, you must edit any recipe that relies upon this old default by either setting `EXTRA_OEMAKE` back to `"-e MAKEFLAGS="` or by explicitly setting any required variable value overrides using `EXTRA_OEMAKE`, which is typically only needed when a Makefile sets a default value for a variable that is inappropriate for cross-compilation using the `"="` operator rather than the `"?="` operator.

4.9.5. `libexecdir` Reverted to `${prefix}/libexec`

The use of `${libdir}/${BPN}` as `libexecdir` is different as compared to all other mainstream distributions, which either uses `${prefix}/libexec` or `${libdir}`. The use is also contrary to the GNU Coding Standards (i.e. https://www.gnu.org/prep/standards/html_node/Directory-Variables.html) that suggest `${prefix}/libexec` and also notes that any package-specific nesting should be done by the package itself. Finally, having `libexecdir` change between recipes makes it very difficult for different recipes to invoke binaries that have been installed into `libexecdir`. The Filesystem Hierarchy Standard (i.e. http://refspecs.linuxfoundation.org/FHS_3.0/fhs/ch04s07.html) now recognizes the use of `${prefix}/libexec/`, giving distributions the choice between `${prefix}/lib` or `${prefix}/libexec` without breaking FHS.

4.9.6. `ac_cv_sizeof_off_t` is No Longer Cached in Site Files

For recipes inheriting the `autotools` class, `ac_cv_sizeof_off_t` is no longer cached in the site files for `autoconf`. The reason for this change is because the `ac_cv_sizeof_off_t` value is not necessarily static per architecture as was previously assumed. Rather, the value changes based on whether large file support is enabled. For most software that uses `autoconf`, this change should not be a problem. However, if you have a recipe that bypasses the standard `do_configure` task from the `autotools`

class and the software the recipe is building uses a very old version of `autoconf`, the recipe might be incapable of determining the correct size of `off_t` during `do_configure`.

The best course of action is to patch the software as necessary to allow the default implementation from the `autotools` class to work such that `autoreconf` succeeds and produces a working configure script, and to remove the overridden `do_configure` task such that the default implementation does get used.

4.9.7. Image Generation is Now Split Out from Filesystem Generation

Previously, for image recipes the `do_rootfs` task assembled the filesystem and then from that filesystem generated images. With this Yocto Project release, image generation is split into separate `do_image_*` tasks for clarity both in operation and in the code.

For most cases, this change does not present any problems. However, if you have made customizations that directly modify the `do_rootfs` task or that mention `do_rootfs`, you might need to update those changes. In particular, if you had added any tasks after `do_rootfs`, you should make edits so that those tasks are after the `do_image_complete` task rather than after `do_rootfs` so that the your added tasks run at the correct time.

A minor part of this restructuring is that the post-processing definitions and functions have been moved from the `image` class to the `rootfs-postcommands` class. Functionally, however, they remain unchanged.

4.9.8. Removed Recipes

The following recipes have been removed in the 2.1 release:

- `gcc` version 4.8: Versions 4.9 and 5.3 remain.
- `qt4`: All support for Qt 4.x has been moved out to a separate `meta-qt4` layer because Qt 4 is no longer supported upstream.
- `x11vnc`: Moved to the `meta-oe` layer.
- `linux-yocto-3.14`: No longer supported.
- `linux-yocto-3.19`: No longer supported.
- `libjpeg`: Replaced by the `libjpeg-turbo` recipe.
- `pth`: Became obsolete.
- `liboil`: Recipe is no longer needed and has been moved to the `meta-multimedia` layer.
- `gtk-theme-torturer`: Recipe is no longer needed and has been moved to the `meta-gnome` layer.
- `gnome-mime-data`: Recipe is no longer needed and has been moved to the `meta-gnome` layer.
- `udev`: Replaced by the `eudev` recipe for compatibility when using `sysvinit` with newer kernels.
- `python-pygtk`: Recipe became obsolete.
- `adt-installer`: Recipe became obsolete. See the "ADT Removed" section for more information.

4.9.9. Class Changes

The following classes have changed:

- `autotools_stage`: Removed because the `autotools` class now provides its functionality. Recipes that inherited from `autotools_stage` should now inherit from `autotools` instead.
- `boot-directdisk`: Merged into the `image-vm` class. The `boot-directdisk` class was rarely directly used. Consequently, this change should not cause any issues.

- `bootimg`: Merged into the `image-live` class. The `bootimg` class was rarely directly used. Consequently, this change should not cause any issues.
- `packageinfo`: Removed due to its limited use by the Hob UI, which has itself been removed.

4.9.10. Build System User Interface Changes

The following changes have been made to the build system user interface:

- Hob GTK+-based UI: Removed because it is unmaintained and based on the outdated GTK + 2 library. The Toaster web-based UI is much more capable and is actively maintained. See the "Using the Toaster Web Interface [<http://www.yoctoproject.org/docs/3.0.3/toaster-manual/toaster-manual.html#using-the-toaster-web-interface>]" section in the Toaster User Manual for more information on this interface.
- "puccho" BitBake UI: Removed because is unmaintained and no longer useful.

4.9.11. ADT Removed

The Application Development Toolkit (ADT) has been removed because its functionality almost completely overlapped with the standard SDK [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-using-the-standard-sdk>] and the extensible SDK [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-extensible>]. For information on these SDKs and how to build and use them, see the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html>] manual.

Note

The Yocto Project Eclipse IDE Plug-in is still supported and is not affected by this change.

4.9.12. Poky Reference Distribution Changes

The following changes have been made for the Poky distribution:

- The `meta-yocto` layer has been renamed to `meta-poky` to better match its purpose, which is to provide the Poky reference distribution. The `meta-yocto-bsp` layer retains its original name since it provides reference machines for the Yocto Project and it is otherwise unrelated to Poky. References to `meta-yocto` in your `conf/bblayers.conf` should automatically be updated, so you should not need to change anything unless you are relying on this naming elsewhere.
- The `uninative` class is now enabled by default in Poky. This class attempts to isolate the build system from the host distribution's C library and makes re-use of native shared state artifacts across different host distributions practical. With this class enabled, a tarball containing a pre-built C library is downloaded at the start of the build.

The `uninative` class is enabled through the `meta/conf/distro/include/yocto-uninative.inc` file, which for those not using the Poky distribution, can include to easily enable the same functionality.

Alternatively, if you wish to build your own `uninative` tarball, you can do so by building the `uninative-tarball` recipe, making it available to your build machines (e.g. over HTTP/HTTPS) and setting a similar configuration as the one set by `yocto-uninative.inc`.

- Static library generation, for most cases, is now disabled by default in the Poky distribution. Disabling this generation saves some build time as well as the size used for build output artifacts.

Disabling this library generation is accomplished through a `meta/conf/distro/include/no-static-libs.inc`, which for those not using the Poky distribution can easily include to enable the same functionality.

Any recipe that needs to opt-out of having the `--disable-static` option specified on the configure command line either because it is not a supported option for the configure script or because static libraries are needed should set the following variable:


```
DISABLE_STATIC = ""
```

- The separate poky-tiny distribution now uses the musl C library instead of a heavily pared down glibc. Using musl results in a smaller distribution and facilitates much greater maintainability because musl is designed to have a small footprint.

If you have used poky-tiny and have customized the glibc configuration you will need to redo those customizations with musl when upgrading to the new release.

4.9.13. Packaging Changes

The following changes have been made to packaging:

- The runuser and mountpoint binaries, which were previously in the main util-linux package, have been split out into the util-linux-runuser and util-linux-mountpoint packages, respectively.
- The python-elementtree package has been merged into the python-xml package.

4.9.14. Tuning File Changes

The following changes have been made to the tuning files:

- The "no-thumb-interwork" tuning feature has been dropped from the ARM tune include files. Because interworking is required for ARM EABI, attempting to disable it through a tuning feature no longer makes sense.

Note

Support for ARM OABI was deprecated in gcc 4.7.

- The tune-cortexm*.inc and tune-cortexr4.inc files have been removed because they are poorly tested. Until the OpenEmbedded build system officially gains support for CPUs without an MMU, these tuning files would probably be better maintained in a separate layer if needed.

4.9.15. Supporting GObject Introspection

This release supports generation of GLib Introspective Repository (GIR) files through GObject introspection, which is the standard mechanism for accessing GObject-based software from runtime environments. You can enable, disable, and test the generation of this data. See the "Enabling GObject Introspection Support [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#enabling-gobject-introspection-support>]" section in the Yocto Project Development Tasks Manual for more information.

4.9.16. Miscellaneous Changes

These additional changes exist:

- The minimum Git version has been increased to 1.8.3.1. If your host distribution does not provide a sufficiently recent version, you can install the buildtools, which will provide it. See the "Required Git, tar, and Python Versions" section for more information on the buildtools tarball.
- The buggy and incomplete support for the RPM version 4 package manager has been removed. The well-tested and maintained support for RPM version 5 remains.
- Previously, the following list of packages were removed if package-management was not in IMAGE_FEATURES, regardless of any dependencies:

```
update-rc.d
base-passwd
shadow
update-alternatives
run-postinsts
```

With the Yocto Project 2.1 release, these packages are only removed if "read-only-rootfs" is in `IMAGE_FEATURES`, since they might still be needed for a read-write image even in the absence of a package manager (e.g. if users need to be added, modified, or removed at runtime).

- The `devtool modify` [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-devtool-use-devtool-modify-to-modify-the-source-of-an-existing-component>] command now defaults to extracting the source since that is most commonly expected. The `"-x"` or `"--extract"` options are now no-ops. If you wish to provide your own existing source tree, you will now need to specify either the `"-n"` or `"--no-extract"` options when running `devtool modify`.
- If the formfactor for a machine is either not supplied or does not specify whether a keyboard is attached, then the default is to assume a keyboard is attached rather than assume no keyboard. This change primarily affects the Sato UI.
- The `.debug` directory packaging is now automatic. If your recipe builds software that installs binaries into directories other than the standard ones, you no longer need to take care of setting `FILES_${PN}-dbg` to pick up the resulting `.debug` directories as these directories are automatically found and added.
- Inaccurate disk and CPU percentage data has been dropped from `buildstats` output. This data has been replaced with `getrusage()` data and corrected IO statistics. You will probably need to update any custom code that reads the `buildstats` data.
- The `meta/conf/distro/include/package_regex.inc` is now deprecated. The contents of this file have been moved to individual recipes.

Tip

Because this file will likely be removed in a future Yocto Project release, it is suggested that you remove any references to the file that might be in your configuration.

- The `v86d/uvesafb` has been removed from the `genericx86` and `genericx86-64` reference machines, which are provided by the `meta-yocto-bsp` layer. Most modern x86 boards do not rely on this file and it only adds kernel error messages during startup. If you do still need to support `uvesafb`, you can simply add `v86d` to your image.
- Build `sysroot` paths are now removed from debug symbol files. Removing these paths means that remote GDB using an unstripped build system `sysroot` will no longer work (although this was never documented to work). The supported method to accomplish something similar is to set `IMAGE_GEN_DEBUGFS` to `"1"`, which will generate a companion debug image containing unstripped binaries and associated debug sources alongside the image.

4.10. Moving to the Yocto Project 2.2 Release

This section provides migration information for moving to the Yocto Project 2.2 Release from the prior release.

4.10.1. Minimum Kernel Version

The minimum kernel version for the target system and for SDK is now 3.2.0, due to the upgrade to `glibc 2.24`. Specifically, for AArch64-based targets the version is 3.14. For Nios II-based targets, the minimum kernel version is 3.19.

Note

For `x86` and `x86_64`, you can reset `OLDEST_KERNEL` to anything down to 2.6.32 if desired.

4.10.2. Staging Directories in Sysroot Has Been Simplified

The way directories are staged in `sysroot` has been simplified and introduces the new `SYSR00T_DIRS`, `SYSR00T_DIRS_NATIVE`, and `SYSR00T_DIRS_BLACKLIST`. See the `v2` patch series on the OE-Core Mailing List [<http://lists.openembedded.org/pipermail/openembedded-core/2016-May/121365.html>] for additional information.

4.10.3. Removal of Old Images and Other Files in `tmp/` `deploy` Now Enabled

Removal of old images and other files in `tmp/deploy/` is now enabled by default due to a new staging method used for those files. As a result of this change, the `RM_OLD_IMAGE` variable is now redundant.

4.10.4. Python Changes

The following changes for Python occurred:

4.10.4.1. BitBake Now Requires Python 3.4+

BitBake requires Python 3.4 or greater.

4.10.4.2. UTF-8 Locale Required on Build Host

A UTF-8 locale is required on the build host due to Python 3. Since C.UTF-8 is not a standard, the default is `en_US.UTF-8`.

4.10.4.3. Metadata Must Now Use Python 3 Syntax

The metadata is now required to use Python 3 syntax. For help preparing metadata, see any of the many Python 3 porting guides available. Alternatively, you can reference the conversion commits for Bitbake and you can use OE-Core as a guide for changes. Following are particular areas of interest:

- * subprocess command-line pipes needing locale decoding
- * the syntax for octal values changed
- * the `iter*()` functions changed name
- * iterators now return views, not lists
- * changed names for Python modules

4.10.4.4. Target Python Recipes Switched to Python 3

Most target Python recipes have now been switched to Python 3. Unfortunately, systems using RPM as a package manager and providing online package-manager support through SMART still require Python 2.

Note

Python 2 and recipes that use it can still be built for the target as with previous versions.

4.10.4.5. `buildtools-tarball` Includes Python 3

`buildtools-tarball` now includes Python 3.

4.10.5. uClibc Replaced by musl

uClibc has been removed in favor of musl. Musl has matured, is better maintained, and is compatible with a wider range of applications as compared to uClibc.

4.10.6. `${B}` No Longer Default Working Directory for Tasks

`${B}` is no longer the default working directory for tasks. Consequently, any custom tasks you define now need to either have the `[dirs [http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#variable-flags]]` flag set, or the task needs to change into the appropriate working directory manually (e.g using `cd` for a shell task).

Note

The preferred method is to use the `[dirs]` flag.

4.10.7. runqemu Ported to Python

runqemu has been ported to Python and has changed behavior in some cases. Previous usage patterns continue to be supported.

The new runqemu is a Python script. Machine knowledge is no longer hardcoded into runqemu. You can choose to use the qemuboot configuration file to define the BSP's own arguments and to make it bootable with runqemu. If you use a configuration file, use the following form:

```
image-name-machine.qemuboot.conf
```

The configuration file enables fine-grained tuning of options passed to QEMU without the runqemu script hard-coding any knowledge about different machines. Using a configuration file is particularly convenient when trying to use QEMU with machines other than the qemu* machines in OE-Core. The qemuboot.conf file is generated by the qemuboot class when the root filesystem is being build (i.e. build rootfs). QEMU boot arguments can be set in BSP's configuration file and the qemuboot class will save them to qemuboot.conf.

If you want to use runqemu without a configuration file, use the following command form:

```
$ runqemu machine rootfs kernel [options]
```

Supported machines are as follows:

```
qemuarm
qemuarm64
qemux86
qemux86-64
qemuppc
qemumips
qemumips64
qemumipsel
qemumips64el
```

Consider the following example, which uses the qemux86-64 machine, provides a root filesystem, provides an image, and uses the nographic option:

```
$ runqemu qemux86-64 tmp/deploy/images/qemux86-64/core-image-minimal-qemux86-64.ext4 tmp/deploy/i
```

Following is a list of variables that can be set in configuration files such as bsp.conf to enable the BSP to be booted by runqemu:

Note

"QB" means "QEMU Boot".

```
QB_SYSTEM_NAME: QEMU name (e.g. "qemu-system-i386")
QB_OPT_APPEND: Options to append to QEMU (e.g. "-show-cursor")
QB_DEFAULT_KERNEL: Default kernel to boot (e.g. "bzImage")
QB_DEFAULT_FSTYPE: Default FSTYPE to boot (e.g. "ext4")
QB_MEM: Memory (e.g. "-m 512")
QB_MACHINE: QEMU machine (e.g. "-machine virt")
QB_CPU: QEMU cpu (e.g. "-cpu qemu32")
QB_CPU_KVM: Similar to QB_CPU except used for kvm support (e.g. "-cpu kvm64")
QB_KERNEL_CMDLINE_APPEND: Options to append to the kernel's -append
                           option (e.g. "console=ttyS0 console=tty")
QB_DTB: QEMU dtb name
QB_AUDIO_DRV: QEMU audio driver (e.g. "alsa", set it when support audio)
```

QB_AUDIO_OPT: QEMU audio option (e.g. "-soundhw ac97,es1370"), which is used when **QB_AUDIO_DRV** is set.
QB_KERNEL_ROOT: Kernel's root (e.g. /dev/vda)
QB_TAP_OPT: Network option for 'tap' mode (e.g. "-netdev tap,id=net0,ifname=@TAP@,script=no,downscript=no -device virtio-net-device,netdev=net0").
 runqemu will replace "@TAP@" with the one that is used, such as tap0, tap1 ...
QB_SLIRP_OPT: Network option for SLIRP mode (e.g. "-netdev user,id=net0 -device virtio-net-device,netdev=net0").
QB_ROOTFS_OPT: Used as rootfs (e.g. "-drive id=disk0,file=@R00TFS@,if=none,format=raw -device virtio-blk-device,netdev=net0").
 runqemu will replace "@R00TFS@" with the one which is used, such as core-image-minimal-qemuarm64.ext4.
QB_SERIAL_OPT: Serial port (e.g. "-serial mon:stdio")
QB_TCPSERIAL_OPT: tcp serial port option (e.g. "-device virtio-serial-device -chardev socket,id=virtcon,port=@PORT@,host=localhost").
 runqemu will replace "@PORT@" with the port number which is used.

To use runqemu, set **IMAGE_CLASSES** as follows and run runqemu:

Note

For command-line syntax, use runqemu help.

```
IMAGE_CLASSES += "qemuboot"
```

4.10.8. Default Linker Hash Style Changed

The default linker hash style for gcc-cross is now "sysv" in order to catch recipes that are building software without using the OpenEmbedded LDFLAGS. This change could result in seeing some "No GNU_HASH in the elf binary" QA issues when building such recipes. You need to fix these recipes so that they use the expected LDFLAGS. Depending on how the software is built, the build system used by the software (e.g. a Makefile) might need to be patched. However, sometimes making this fix is as simple as adding the following to the recipe:

```
TARGET_CC_ARCH += "${LDFLAGS}"
```

4.10.9. KERNEL_IMAGE_BASE_NAME no Longer Uses KERNEL_IMAGETYPE

The **KERNEL_IMAGE_BASE_NAME** variable no longer uses the **KERNEL_IMAGETYPE** variable to create the image's base name. Because the OpenEmbedded build system can now build multiple kernel image types, this part of the kernel image base name has been removed leaving only the following:

```
KERNEL_IMAGE_BASE_NAME ?= "${PKGGE}-${PKGVS}-${PKGR}-${MACHINE}-${DATETIME}"
```

If you have recipes or classes that use **KERNEL_IMAGE_BASE_NAME** directly, you might need to update the references to ensure they continue to work.

4.10.10. BitBake Changes

The following changes took place for BitBake:

- The "goggle" UI and standalone image-writer tool have been removed as they both require GTK+ 2.0 and were not being maintained.
- The Perforce fetcher now supports SRCREV for specifying the source revision to use, be it \${AUTOREV}, changelist number, p4date, or label, in preference to separate SRC_URI parameters to specify these. This change is more in-line with how the other fetchers work for source control

systems. Recipes that fetch from Perforce will need to be updated to use SRCREV in place of specifying the source revision within SRC_URI.

- Some of BitBake's internal code structures for accessing the recipe cache needed to be changed to support the new multi-configuration functionality. These changes will affect external tools that use BitBake's tinfoil module. For information on these changes, see the changes made to the scripts supplied with OpenEmbedded-Core: 1 [<http://git.yoctoproject.org/cgi/cgit.cgi/poky/commit/?id=189371f8393971d00bca0fcedd67cc07784f6ee>] and 2 [<http://git.yoctoproject.org/cgi/cgit.cgi/poky/commit/?id=4a5aa7ea4d07c2c90a1654b174873abb018acc67>].
- The task management code has been rewritten to avoid using ID indirection in order to improve performance. This change is unlikely to cause any problems for most users. However, the setscene verification function as pointed to by BB_SETSCENE_VERIFY_FUNCTION needed to change signature. Consequently, a new variable named BB_SETSCENE_VERIFY_FUNCTION2 has been added allowing multiple versions of BitBake to work with suitably written metadata, which includes OpenEmbedded-Core and Poky. Anyone with custom BitBake task scheduler code might also need to update the code to handle the new structure.

4.10.11. Swabber has Been Removed

Swabber, a tool that was intended to detect host contamination in the build process, has been removed, as it has been unmaintained and unused for some time and was never particularly effective. The OpenEmbedded build system has since incorporated a number of mechanisms including enhanced QA checks that mean that there is less of a need for such a tool.

4.10.12. Removed Recipes

The following recipes have been removed:

- augeas: No longer needed and has been moved to meta-oe.
- directfb: Unmaintained and has been moved to meta-oe.
- gcc: Removed 4.9 version. Versions 5.4 and 6.2 are still present.
- gnome-doc-utils: No longer needed.
- gtk-doc-stub: Replaced by gtk-doc.
- gtk-engines: No longer needed and has been moved to meta-gnome.
- gtk-sato-engine: Became obsolete.
- libglade: No longer needed and has been moved to meta-oe.
- libmad: Unmaintained and functionally replaced by libmpg123. libmad has been moved to meta-oe.
- libowl: Became obsolete.
- libxsettings-client: No longer needed.
- oh-puzzles: Functionally replaced by puzzles.
- oprofileui: Became obsolete. OProfile has been largely supplanted by perf.
- packagegroup-core-directfb.bb: Removed.
- core-image-directfb.bb: Removed.
- pointercal: No longer needed and has been moved to meta-oe.
- python-imaging: No longer needed and moved to meta-python
- python-pyrex: No longer needed and moved to meta-python.
- sato-icon-theme: Became obsolete.

- `swabber-native`: Swabber has been removed. See the entry on Swabber.
- `tslib`: No longer needed and has been moved to `meta-oe`.
- `uclibc`: Removed in favor of `musl`.
- `xtscal`: No longer needed and moved to `meta-oe`

4.10.13. Removed Classes

The following classes have been removed:

- `distutils-native-base`: No longer needed.
- `distutils3-native-base`: No longer needed.
- `sdl`: Only set `DEPENDS` and `SECTION`, which are better set within the recipe instead.
- `sip`: Mostly unused.
- `swabber`: See the entry on Swabber.

4.10.14. Minor Packaging Changes

The following minor packaging changes have occurred:

- `grub`: Split `grub-editenv` into its own package.
- `systemd`: Split container and vm related units into a new package, `systemd-container`.
- `util-linux`: Moved `prlimit` to a separate `util-linux-prlimit` package.

4.10.15. Miscellaneous Changes

The following miscellaneous changes have occurred:

- `package_regex.inc`: Removed because the definitions `package_regex.inc` previously contained have been moved to their respective recipes.
- Both `devtool add` and `recipetool create` now use a fixed `SRCREV` by default when fetching from a Git repository. You can override this in either case to use `${AUTOREV}` instead by using the `-a` or `##autorev` command-line option
- `distcc`: GTK+ UI is now disabled by default.
- `packagegroup-core-tools-testapps`: Removed Piglit.
- `image.bbclass`: Renamed `COMPRESS(ION)` to `CONVERSION`. This change means that `COMPRESSIONTYPES`, `COMPRESS_DEPENDS` and `COMPRESS_CMD` are deprecated in favor of `CONVERSIONTYPES`, `CONVERSION_DEPENDS` and `CONVERSION_CMD`. The `COMPRESS*` variable names will still work in the 2.2 release but metadata that does not need to be backwards-compatible should be changed to use the new names as the `COMPRESS*` ones will be removed in a future release.
- `gtk-doc`: A full version of `gtk-doc` is now made available. However, some old software might not be capable of using the current version of `gtk-doc` to build documentation. You need to change recipes that build such software so that they explicitly disable building documentation with `gtk-doc`.

4.11. Moving to the Yocto Project 2.3 Release

This section provides migration information for moving to the Yocto Project 2.3 Release from the prior release.

4.11.1. Recipe-specific Sysroots

The OpenEmbedded build system now uses one sysroot per recipe to resolve long-standing issues with configuration script auto-detection of undeclared dependencies. Consequently, you might find

that some of your previously written custom recipes are missing declared dependencies, particularly those dependencies that are incidentally built earlier in a typical build process and thus are already likely to be present in the shared sysroot in previous releases.

Consider the following:

- **Declare Build-Time Dependencies:** Because of this new feature, you must explicitly declare all build-time dependencies for your recipe. If you do not declare these dependencies, they are not populated into the sysroot for the recipe.
- **Specify Pre-Installation and Post-Installation Native Tool Dependencies:** You must specifically specify any special native tool dependencies of `pkg_preinst` and `pkg_postinst` scripts by using the `PACKAGE_WRITE_DEPS` variable. Specifying these dependencies ensures that these tools are available if these scripts need to be run on the build host during the `do_rootfs` task.

As an example, see the `dbus` recipe. You will see that this recipe has a `pkg_postinst` that calls `systemctl` if "systemd" is in `DISTRO_FEATURES`. In the example, `systemd-systemctl-native` is added to `PACKAGE_WRITE_DEPS`, which is also conditional on "systemd" being in `DISTRO_FEATURES`.

- **Examine Recipes that Use `SSTATEPOSTINSTFUNCS`:** You need to examine any recipe that uses `SSTATEPOSTINSTFUNCS` and determine steps to take.

Functions added to `SSTATEPOSTINSTFUNCS` are still called as they were in previous Yocto Project releases. However, since a separate sysroot is now being populated for every recipe and if existing functions being called through `SSTATEPOSTINSTFUNCS` are doing relocation, then you will need to change these to use a post-installation script that is installed by a function added to `SYSROOT_PREPROCESS_FUNCS`.

For an example, see the `pixbufcache` class in `meta/classes/` in the Yocto Project Source Repositories [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#source-repositories>].

Note

The `SSTATEPOSTINSTFUNCS` variable itself is now deprecated in favor of the `do_populate_sysroot[postfuncs]` task. Consequently, if you do still have any function or functions that need to be called after the sysroot component is created for a recipe, then you would be well advised to take steps to use a post installation script as described previously. Taking these steps prepares your code for when `SSTATEPOSTINSTFUNCS` is removed in a future Yocto Project release.

- **Specify the Sysroot when Using Certain External Scripts:** Because the shared sysroot is now gone, the scripts `oe-find-native-sysroot` and `oe-run-native` have been changed such that you need to specify which recipe's `STAGING_DIR_NATIVE` is used.

Note

You can find more information on how recipe-specific sysroots work in the "staging.bbclass" section.

4.11.2. PATH Variable

Within the environment used to run build tasks, the environment variable `PATH` is now sanitized such that the normal native binary paths (`/bin`, `/sbin`, `/usr/bin` and so forth) are removed and a directory containing symbolic links linking only to the binaries from the host mentioned in the `HOSTTOOLS` and `HOSTTOOLS_NONFATAL` variables is added to `PATH`.

Consequently, any native binaries provided by the host that you need to call needs to be in one of these two variables at the configuration level.

Alternatively, you can add a native recipe (i.e. `-native`) that provides the binary to the recipe's `DEPENDS` value.

Note

`PATH` is not sanitized in the same way within `devshell`. If it were, you would have difficulty running host tools for development and debugging within the shell.

4.11.3. Changes to Scripts

The following changes to scripts took place:

- `oe-find-native-sysroot`: The usage for the `oe-find-native-sysroot` script has changed to the following:

```
$ . oe-find-native-sysroot recipe
```

You must now supply a recipe for `recipe` as part of the command. Prior to the Yocto Project 3.0.3 release, it was not necessary to provide the script with the command.

- `oe-run-native`: The usage for the `oe-run-native` script has changed to the following:

```
$ oe-run-native native_recipe tool
```

You must supply the name of the native recipe and the tool you want to run as part of the command. Prior to the Yocto Project 3.0.3 release, it was not necessary to provide the native recipe with the command.

- `cleanup-workdir`: The `cleanup-workdir` script has been removed because the script was found to be deleting files it should not have, which lead to broken build trees. Rather than trying to delete portions of `TMPDIR` and getting it wrong, it is recommended that you delete `TMPDIR` and have it restored from shared state (`sstate`) on subsequent builds.
- `wipe-sysroot`: The `wipe-sysroot` script has been removed as it is no longer needed with recipe-specific sysroots.

4.11.4. Changes to Functions

The previously deprecated `bb.data.getVar()`, `bb.data.setVar()`, and related functions have been removed in favor of `d.getVar()`, `d.setVar()`, and so forth.

You need to fix any references to these old functions.

4.11.5. BitBake Changes

The following changes took place for BitBake:

- **BitBake's Graphical Dependency Explorer UI Replaced**: BitBake's graphical dependency explorer UI `depexp` was replaced by `taskexp` ("Task Explorer"), which provides a graphical way of exploring the `task-depends.dot` file. The data presented by Task Explorer is much more accurate than the data that was presented by `depexp`. Being able to visualize the data is an often requested feature as standard *.dot file viewers cannot usually cope with the size of the `task-depends.dot` file.
- **BitBake "-g" Output Changes**: The `package-depends.dot` and `pn-depends.dot` files as previously generated using the `bitbake -g` command have been removed. A `recipe-depends.dot` file is now generated as a collapsed version of `task-depends.dot` instead.

The reason for this change is because `package-depends.dot` and `pn-depends.dot` largely date back to a time before task-based execution and do not take into account task-level dependencies between recipes, which could be misleading.

- **Mirror Variable Splitting Changes**: Mirror variables including `MIRRORS`, `PREMIRRORS`, and `SSTATE_MIRRORS` can now separate values entirely with spaces. Consequently, you no longer need `"\\n"`. BitBake looks for pairs of values, which simplifies usage. There should be no change required to existing mirror variable values themselves.
- **The Subversion (SVN) Fetcher Uses an "ssh" Parameter and Not an "rsh" Parameter**: The SVN fetcher now takes an `"ssh"` parameter instead of an `"rsh"` parameter. This new optional parameter is used when the `"protocol"` parameter is set to `"svn+ssh"`. You can only use the new parameter to specify

the `ssh` program used by `SVN`. The `SVN` fetcher passes the new parameter through the `SVN_SSH` environment variable during the `do_fetch` task.

See the "Subversion (SVN) Fetcher (`svn://`) [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#svn-fetcher>]" section in the BitBake User Manual for additional information.

- `BB_SETSCENE_VERIFY_FUNCTION` and `BB_SETSCENE_VERIFY_FUNCTION2` Removed: Because the mechanism they were part of is no longer necessary with recipe-specific sysroots, the `BB_SETSCENE_VERIFY_FUNCTION` and `BB_SETSCENE_VERIFY_FUNCTION2` variables have been removed.

4.11.6. Absolute Symbolic Links

Absolute symbolic links (symlinks) within staged files are no longer permitted and now trigger an error. Any explicit creation of symlinks can use the `lnr` script, which is a replacement for `ln -r`.

If the build scripts in the software that the recipe is building are creating a number of absolute symlinks that need to be corrected, you can inherit `relative_symlinks` within the recipe to turn those absolute symlinks into relative symlinks.

4.11.7. GPLv2 Versions of GPLv3 Recipes Moved

Older GPLv2 versions of GPLv3 recipes have moved to a separate `meta-gplv2` layer.

If you use `INCOMPATIBLE_LICENSE` to exclude GPLv3 or set `PREFERRED_VERSION` to substitute a GPLv2 version of a GPLv3 recipe, then you must add the `meta-gplv2` layer to your configuration.

Note

You can find `meta-gplv2` layer in the OpenEmbedded layer index at <https://layers.openembedded.org/layerindex/branch/master/layer/meta-gplv2/>.

These relocated GPLv2 recipes do not receive the same level of maintenance as other core recipes. The recipes do not get security fixes and upstream no longer maintains them. In fact, the upstream community is actively hostile towards people that use the old versions of the recipes. Moving these recipes into a separate layer both makes the different needs of the recipes clearer and clearly identifies the number of these recipes.

Note

The long-term solution might be to move to BSD-licensed replacements of the GPLv3 components for those that need to exclude GPLv3-licensed components from the target system. This solution will be investigated for future Yocto Project releases.

4.11.8. Package Management Changes

The following package management changes took place:

- Smart package manager is replaced by DNF package manager. Smart has become unmaintained upstream, is not ported to Python 3.x. Consequently, Smart needed to be replaced. DNF is the only feasible candidate.

The change in functionality is that the on-target runtime package management from remote package feeds is now done with a different tool that has a different set of command-line options. If you have scripts that call the tool directly, or use its API, they need to be fixed.

For more information, see the DNF Documentation [<http://dnf.readthedocs.io/en/latest/>].

- Rpm 5.x is replaced with Rpm 4.x. This is done for two major reasons:
 - DNF is API-incompatible with Rpm 5.x and porting it and maintaining the port is non-trivial.
 - Rpm 5.x itself has limited maintenance upstream, and the Yocto Project is one of the very few remaining users.
- Berkeley DB 6.x is removed and Berkeley DB 5.x becomes the default:

- Version 6.x of Berkeley DB has largely been rejected by the open source community due to its AGPLv3 license. As a result, most mainstream open source projects that require DB are still developed and tested with DB 5.x.
- In OE-core, the only thing that was requiring DB 6.x was Rpm 5.x. Thus, no reason exists to continue carrying DB 6.x in OE-core.
- createrepo is replaced with createrepo_c.

createrepo_c is the current incarnation of the tool that generates remote repository metadata. It is written in C as compared to createrepo, which is written in Python. createrepo_c is faster and is maintained.

- Architecture-independent RPM packages are "noarch" instead of "all".

This change was made because too many places in DNF/RPM4 stack already make that assumption. Only the filenames and the architecture tag has changed. Nothing else has changed in OE-core system, particularly in the `allarch.bbclass` class.

- Signing of remote package feeds using `PACKAGE_FEED_SIGN` is not currently supported. This issue will be fully addressed in a future Yocto Project release. See defect 11209 [https://bugzilla.yoctoproject.org/show_bug.cgi?id=11209] for more information on a solution to package feed signing with RPM in the Yocto Project 2.3 release.
- OPKG now uses the libsolv backend for resolving package dependencies by default. This is vastly superior to OPKG's internal ad-hoc solver that was previously used. This change does have a small impact on disk (around 500 KB) and memory footprint.

Note

For further details on this change, see the commit message [<http://git.yoctoproject.org/cgit/cgit.cgi/poky/commit/?id=f4d4f99cfbc2396e49c1613a7d237b9e57f06f81>].

4.11.9. Removed Recipes

The following recipes have been removed:

- `linux-yocto 4.8`: Version 4.8 has been removed. Versions 4.1 (LTSI), 4.4 (LTS), 4.9 (LTS/LTSI) and 4.10 are now present.
- `python-smartpm`: Functionally replaced by `dnf`.
- `createrepo`: Replaced by the `createrepo-c` recipe.
- `rpmresolve`: No longer needed with the move to RPM 4 as RPM itself is used instead.
- `gststreamer`: Removed the GStreamer Git version recipes as they have been stale. 1.10.x recipes are still present.
- `alsa-conf-base`: Merged into `alsa-conf` since `libasound` depended on both. Essentially, no way existed to install only one of these.
- `tremor`: Moved to `meta-multimedia`. Fixed-integer Vorbis decoding is not needed by current hardware. Thus, GStreamer's `ivorbis` plugin has been disabled by default eliminating the need for the `tremor` recipe in OE-Core.
- `gummiboot`: Replaced by `systemd-boot`.

4.11.10. Wic Changes

The following changes have been made to Wic:

Note

For more information on Wic, see the "Creating Partitioned Images Using Wic" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#creating-partitioned-images-using-wic>] section in the Yocto Project Development Tasks Manual.

- **Default Output Directory Changed:** Wic's default output directory is now the current directory by default instead of the unusual `/var/tmp/wic`.

The `"-o"` and `"--outdir"` options remain unchanged and are used to specify your preferred output directory if you do not want to use the default directory.

- **fsimage Plug-in Removed:** The Wic fsimage plugin has been removed as it duplicates functionality of the rawcopy plugin.

4.11.11. QA Changes

The following QA checks have changed:

- **unsafe-references-in-binaries:** The `unsafe-references-in-binaries` QA check, which was disabled by default, has now been removed. This check was intended to detect binaries in `/bin` that link to libraries in `/usr/lib` and have the case where the user has `/usr` on a separate filesystem to `/`.

The removed QA check was buggy. Additionally, `/usr` residing on a separate partition from `/` is now a rare configuration. Consequently, `unsafe-references-in-binaries` was removed.

- **file-rdeps:** The `file-rdeps` QA check is now an error by default instead of a warning. Because it is an error instead of a warning, you need to address missing runtime dependencies.

For additional information, see the `insane` class and the "Errors and Warnings" section.

4.11.12. Miscellaneous Changes

The following miscellaneous changes have occurred:

- In this release, a number of recipes have been changed to ignore the `largefile` `DISTRO_FEATURES` item, enabling large file support unconditionally. This feature has always been enabled by default. Disabling the feature has not been widely tested.

Note

Future releases of the Yocto Project will remove entirely the ability to disable the `largefile` feature, which would make it unconditionally enabled everywhere.

- If the `DISTRO_VERSION` value contains the value of the `DATE` variable, which is the default between Poky releases, the `DATE` value is explicitly excluded from `/etc/issue` and `/etc/issue.net`, which is displayed at the login prompt, in order to avoid conflicts with Multilib enabled. Regardless, the `DATE` value is inaccurate if the `base-files` recipe is restored from shared state (`sstate`) rather than rebuilt.

If you need the build date recorded in `/etc/issue*` or anywhere else in your image, a better method is to define a post-processing function to do it and have the function called from `ROOTFS_POSTPROCESS_COMMAND`. Doing so ensures the value is always up-to-date with the created image.

- Dropbear's `init` script now disables DSA host keys by default. This change is in line with the `systemd` service file, which supports RSA keys only, and with recent versions of OpenSSH, which deprecates DSA host keys.
- The `buildhistory` class now correctly uses tabs as separators between all columns in `installed-package-sizes.txt` in order to aid import into other tools.
- The `USE_LDCONFIG` variable has been replaced with the `"ldconfig"` `DISTRO_FEATURES` feature. Distributions that previously set:

```
USE_LDCONFIG = "0"
```

should now instead use the following:

```
DISTRO_FEATURES_BACKFILL_CONSIDERED_append = " ldconfig"
```

- The default value of `COPYLEFT_LICENSE_INCLUDE` now includes all versions of AGPL licenses in addition to GPL and LGPL.

Note

The default list is not intended to be guaranteed as a complete safe list. You should seek legal advice based on what you are distributing if you are unsure.

- Kernel module packages are now suffixed with the kernel version in order to allow module packages from multiple kernel versions to co-exist on a target system. If you wish to return to the previous naming scheme that does not include the version suffix, use the following:

```
KERNEL_MODULE_PACKAGE_SUFFIX to ""
```

- Removal of `libtool *.la` files is now enabled by default. The `*.la` files are not actually needed on Linux and relocating them is an unnecessary burden.

If you need to preserve these `.la` files (e.g. in a custom distribution), you must change `INHERIT_DISTRO` such that "remove-libtool" is not included in the value.

- Extensible SDKs built for GCC 5+ now refuse to install on a distribution where the host GCC version is 4.8 or 4.9. This change resulted from the fact that the installation is known to fail due to the way the univariate shared state (`sstate`) package is built. See the `univariate` class for additional information.
- All native and `nativesdk` recipes now use a separate `DISTRO_FEATURES` value instead of sharing the value used by recipes for the target, in order to avoid unnecessary rebuilds.

The `DISTRO_FEATURES` for native recipes is `DISTRO_FEATURES_NATIVE` added to an intersection of `DISTRO_FEATURES` and `DISTRO_FEATURES_FILTER_NATIVE`.

For `nativesdk` recipes, the corresponding variables are `DISTRO_FEATURES_NATIVESDK` and `DISTRO_FEATURES_FILTER_NATIVESDK`.

- The `FILES_DIRS` variable, which was previously deprecated and rarely used, has now been removed. You should change any recipes that set `FILES_DIRS` to set `FILES_PATH` instead.
- The `MULTIMACH_HOST_SYS` variable has been removed as it is no longer needed with recipe-specific sysroots.

4.12. Moving to the Yocto Project 2.4 Release

This section provides migration information for moving to the Yocto Project 2.4 Release from the prior release.

4.12.1. Memory Resident Mode

A persistent mode is now available in BitBake's default operation, replacing its previous "memory resident mode" (i.e. `oe-init-build-env-memres`). Now you only need to set `BB_SERVER_TIMEOUT` to a timeout (in seconds) and BitBake's server stays resident for that amount of time between invocations. The `oe-init-build-env-memres` script has been removed since a separate environment setup script is no longer needed.

4.12.2. Packaging Changes

This section provides information about packaging changes that have occurred:

- `python3` Changes:
 - The main "python3" package now brings in all of the standard Python 3 distribution rather than a subset. This behavior matches what is expected based on traditional Linux distributions. If

you wish to install a subset of Python 3, specify `python-core` plus one or more of the individual packages that are still produced.

- `python3`: The `bz2.py`, `lzma.py`, and `_compression.py` scripts have been moved from the `python3-misc` package to the `python3-compression` package.
- `binutils`: The `libbfd` library is now packaged in a separate "`libbfd`" package. This packaging saves space when certain tools (e.g. `perf`) are installed. In such cases, the tools only need `libbfd` rather than all the packages in `binutils`.
- `util-linux` Changes:
 - The `su` program is now packaged in a separate "`util-linux-su`" package, which is only built when "`pam`" is listed in the `DISTRO_FEATURES` variable. `util-linux` should not be installed unless it is needed because `su` is normally provided through the shadow file format. The main `util-linux` package has runtime dependencies (i.e. `RDEPENDS`) on the `util-linux-su` package when "`pam`" is in `DISTRO_FEATURES`.
 - The `switch_root` program is now packaged in a separate "`util-linux-switch-root`" package for small `initramfs` images that do not need the whole `util-linux` package or the `busybox` binary, which are both much larger than `switch_root`. The main `util-linux` package has a recommended runtime dependency (i.e. `RRECOMMENDS`) on the `util-linux-switch-root` package.
 - The `ionice` program is now packaged in a separate "`util-linux-ionice`" package. The main `util-linux` package has a recommended runtime dependency (i.e. `RRECOMMENDS`) on the `util-linux-ionice` package.
- `initscripts`: The `sushell` program is now packaged in a separate "`initscripts-sushell`" package. This packaging change allows systems to pull `sushell` in when `selinux` is enabled. The change also eliminates needing to pull in the entire `initscripts` package. The main `initscripts` package has a runtime dependency (i.e. `RDEPENDS`) on the `sushell` package when "`selinux`" is in `DISTRO_FEATURES`.
- `glib-2.0`: The `glib-2.0` package now has a recommended runtime dependency (i.e. `RRECOMMENDS`) on the `shared-mime-info` package, since large portions of `GIO` are not useful without the `MIME` database. You can remove the dependency by using the `BAD_RECOMMENDATIONS` variable if `shared-mime-info` is too large and is not required.
- `Go Standard Runtime`: The `Go` standard runtime has been split out from the main `go` recipe into a separate `go-runtime` recipe.

4.12.3. Removed Recipes

The following recipes have been removed:

- `acpitests`: This recipe is not maintained.
- `autogen-native`: No longer required by `Grub`, `oe-core`, or `meta-oe`.
- `bdwgc`: Nothing in `OpenEmbedded-Core` requires this recipe. It has moved to `meta-oe`.
- `byacc`: This recipe was only needed by `rpm 5.x` and has moved to `meta-oe`.
- `gcc (5.4)`: The 5.4 series dropped the recipe in favor of 6.3 / 7.2.
- `gnome-common`: Deprecated upstream and no longer needed.
- `go-bootstrap-native`: `Go 1.9` does its own bootstrapping so this recipe has been removed.
- `guile`: This recipe was only needed by `autogen-native` and `remake`. The recipe is no longer needed by either of these programs.
- `libclass-isa-perl`: This recipe was previously needed for `LSB 4`, no longer needed.
- `libdumpvalue-perl`: This recipe was previously needed for `LSB 4`, no longer needed.
- `libenv-perl`: This recipe was previously needed for `LSB 4`, no longer needed.

- `libfile-checktree-perl`: This recipe was previously needed for LSB 4, no longer needed.
- `libi18n-collate-perl`: This recipe was previously needed for LSB 4, no longer needed.
- `libiconv`: This recipe was only needed for `uclibc`, which was removed in the previous release. `glibc` and `musl` have their own implementations. `meta-mingw` still needs `libiconv`, so it has been moved to `meta-mingw`.
- `libpng12`: This recipe was previously needed for LSB. The current `libpng` is 1.6.x.
- `libpod-plainer-perl`: This recipe was previously needed for LSB 4, no longer needed.
- `linux-yocto (4.1)`: This recipe was removed in favor of 4.4, 4.9, 4.10 and 4.12.
- `mailx`: This recipe was previously only needed for LSB compatibility, and upstream is defunct.
- `mesa (git version only)`: The git version recipe was stale with respect to the release version.
- `ofono (git version only)`: The git version recipe was stale with respect to the release version.
- `portmap`: This recipe is obsolete and is superseded by `rpcbind`.
- `python3-pygpme`: This recipe is old and unmaintained. It was previously required by `dnf`, which has switched to official `gpme` Python bindings.
- `python-async`: This recipe has been removed in favor of the Python 3 version.
- `python-gitdb`: This recipe has been removed in favor of the Python 3 version.
- `python-git`: This recipe was removed in favor of the Python 3 version.
- `python-mako`: This recipe was removed in favor of the Python 3 version.
- `python-pexpect`: This recipe was removed in favor of the Python 3 version.
- `python-ptyprocess`: This recipe was removed in favor of Python the 3 version.
- `python-pycurl`: Nothing is using this recipe in OpenEmbedded-Core (i.e. `meta-oe`).
- `python-six`: This recipe was removed in favor of the Python 3 version.
- `python-smmmap`: This recipe was removed in favor of the Python 3 version.
- `remake`: Using `remake` as the provider of `virtual/make` is broken. Consequently, this recipe is not needed in OpenEmbedded-Core.

4.12.4. Kernel Device Tree Move

Kernel Device Tree support is now easier to enable in a kernel recipe. The Device Tree code has moved to a `kernel-devicetree` class. Functionality is automatically enabled for any recipe that inherits the `kernel` class and sets the `KERNEL_DEVICETREE` variable. The previous mechanism for doing this, `meta/recipes-kernel/linux/linux-dtb.inc`, is still available to avoid breakage, but triggers a deprecation warning. Future releases of the Yocto Project will remove `meta/recipes-kernel/linux/linux-dtb.inc`. It is advisable to remove any `require` statements that request `meta/recipes-kernel/linux/linux-dtb.inc` from any custom kernel recipes you might have. This will avoid breakage in post 2.4 releases.

4.12.5. Package QA Changes

The following package QA changes took place:

- The "unsafe-references-in-scripts" QA check has been removed.
- If you refer to `${COREBASE}/LICENSE` within `LIC_FILES_CHKSUM` you receive a warning because this file is a description of the license for OE-Core. Use `${COMMON_LICENSE_DIR}/MIT` if your recipe is MIT-licensed and you cannot use the preferred method of referring to a file within the source tree.

4.12.6. README File Changes

The following are changes to README files:

- The main Poky README file has been moved to the meta-poky layer and has been renamed `README.poky`. A symlink has been created so that references to the old location work.
- The `README.hardware` file has been moved to meta-yocto-bsp. A symlink has been created so that references to the old location work.
- A `README.qemu` file has been created with coverage of the qemu* machines.

4.12.7. Miscellaneous Changes

The following are additional changes:

- The `R00TFS_PKGMANAGE_BOOTSTRAP` variable and any references to it have been removed. You should remove this variable from any custom recipes.
- The meta-yocto directory has been removed.

Note

In the Yocto Project 2.1 release meta-yocto was renamed to meta-poky and the meta-yocto subdirectory remained to avoid breaking existing configurations.

- The `maintainers.inc` file, which tracks maintainers by listing a primary person responsible for each recipe in OE-Core, has been moved from meta-poky to OE-Core (i.e. from meta-poky/conf/distro/include to meta/conf/distro/include).
- The `buildhistory` class now makes a single commit per build rather than one commit per subdirectory in the repository. This behavior assumes the commits are enabled with `BUILDHISTORY_COMMIT = "1"`, which is typical. Previously, the `buildhistory` class made one commit per subdirectory in the repository in order to make it easier to see the changes for a particular subdirectory. To view a particular change, specify that subdirectory as the last parameter on the `git show` or `git diff` commands.
- The `x86-base.inc` file, which is included by all x86-based machine configurations, now sets `IMAGE_FSTYPES` using `+=` to "live" rather than appending with `+=`. This change makes the default easier to override.
- BitBake fires multiple "BuildStarted" events when multiconfig is enabled (one per configuration). For more information, see the "Events [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#events>]" section in the BitBake User Manual.
- By default, the `security_flags.inc` file sets a `GCCPIE` variable with an option to enable Position Independent Executables (PIE) within gcc. Enabling PIE in the GNU C Compiler (GCC), makes Return Oriented Programming (ROP) attacks much more difficult to execute.
- OE-Core now provides a `bitbake-layers` plugin that implements a "create-layer" subcommand. The implementation of this subcommand has resulted in the `yocto-layer` script being deprecated and will likely be removed in the next Yocto Project release.
- The `vmdk`, `vdi`, and `qcow2` image file types are now used in conjunction with the "wic" image type through `CONVERSION_CMD`. Consequently, the equivalent image types are now `wic.vmdk`, `wic.vdi`, and `wic.qcow2`, respectively.
- `do_image_<type>[depends]` has replaced `IMAGE_DEPENDS_<type>`. If you have your own classes that implement custom image types, then you need to update them.
- OpenSSL 1.1 has been introduced. However, the default is still 1.0.x through the `PREFERRED_VERSION` variable. This preference is set is due to the remaining compatibility issues with other software. The `PROVIDES` variable in the openssl 1.0 recipe now includes "openssl10" as a marker that can be used in `DEPENDS` within recipes that build software that still depend on OpenSSL 1.0.

- To ensure consistent behavior, BitBake's "-r" and "-R" options (i.e. prefile and postfile), which are used to read or post-read additional configuration files from the command line, now only affect the current BitBake command. Before these BitBake changes, these options would "stick" for future executions.

4.13. Moving to the Yocto Project 2.5 Release

This section provides migration information for moving to the Yocto Project 2.5 Release from the prior release.

4.13.1. Packaging Changes

This section provides information about packaging changes that have occurred:

- `bind-libs`: The libraries packaged by the `bind` recipe are in a separate `bind-libs` package.
- `libfm-gtk`: The `libfm` GTK+ bindings are split into a separate `libfm-gtk` package.
- `flex-libfl`: The `flex` recipe splits out `libfl` into a separate `flex-libfl` package to avoid too many dependencies being pulled in where only the library is needed.
- `grub-efi`: The `grub-efi` configuration is split into a separate `grub-bootconf` recipe. However, the dependency relationship from `grub-efi` is through a `virtual/grub-bootconf` provider making it possible to have your own recipe provide the dependency. Alternatively, you can use a BitBake append file to bring the configuration back into the `grub-efi` recipe.
- `armv7a` Legacy Package Feed Support: Legacy support is removed for transitioning from `armv7a` to `armv7a-vfp-neon` in package feeds, which was previously enabled by setting `PKGARCHCOMPAT_ARMV7A`. This transition occurred in 2011 and active package feeds should by now be updated to the new naming.

4.13.2. Removed Recipes

The following recipes have been removed:

- `gcc`: The version 6.4 recipes are replaced by 7.x.
- `gst-player`: Renamed to `gst-examples` as per upstream.
- `hostap-utils`: This software package is obsolete.
- `latencytop`: This recipe is no longer maintained upstream. The last release was in 2009.
- `libpfm4`: The only file that requires this recipe is `oprofile`, which has been removed.
- `linux-yocto`: The version 4.4, 4.9, and 4.10 recipes have been removed. Versions 4.12, 4.14, and 4.15 remain.
- `man`: This recipe has been replaced by `modern man-db`.
- `mkelfimage`: This tool has been removed in the upstream `coreboot` project, and is no longer needed with the removal of the ELF image type.
- `nativesdk-postinst-intercept`: This recipe is not maintained.
- `neon`: This software package is no longer maintained upstream and is no longer needed by anything in `OpenEmbedded-Core`.
- `oprofile`: The functionality of this recipe is replaced by `perf` and keeping compatibility on an ongoing basis with `musl` is difficult.
- `pax`: This software package is obsolete.
- `stat`: This software package is not maintained upstream. `coreutils` provides a modern `stat` binary.

- `zisofs-tools-native`: This recipe is no longer needed because the compressed ISO image feature has been removed.

4.13.3. Scripts and Tools Changes

The following are changes to scripts and tools:

- `yocto-bsp`, `yocto-kernel`, and `yocto-layer`: The `yocto-bsp`, `yocto-kernel`, and `yocto-layer` scripts previously shipped with poky but not in OpenEmbedded-Core have been removed. These scripts are not maintained and are outdated. In many cases, they are also limited in scope. The `bitbake-layers create-layer` command is a direct replacement for `yocto-layer`. See the documentation to create a BSP or kernel recipe in the "BSP Kernel Recipe Example [<http://www.yoctoproject.org/docs/3.0.3/bsp-guide/bsp-guide.html#bsp-kernel-recipe-example>]" section.
- `devtool finish`: `devtool finish` now exits with an error if there are uncommitted changes or a rebase/am in progress in the recipe's source repository. If this error occurs, there might be uncommitted changes that will not be included in updates to the patches applied by the recipe. A `-f/--force` option is provided for situations that the uncommitted changes are inconsequential and you want to proceed regardless.
- `scripts/oe-setup-rpmrepo` script: The functionality of `scripts/oe-setup-rpmrepo` is replaced by `bitbake package-index`.
- `scripts/test-dependencies.sh` script: The script is largely made obsolete by the recipe-specific `sysroots` functionality introduced in the previous release.

4.13.4. BitBake Changes

The following are BitBake changes:

- The `--runall` option has changed. There are two different behaviors people might want:
 - Behavior A: For a given target (or set of targets) look through the task graph and run task X only if it is present and will be built.
 - Behavior B: For a given target (or set of targets) look through the task graph and run task X if any recipe in the taskgraph has such a target, even if it is not in the original task graph. The `--runall` option now performs "Behavior B". Previously `--runall` behaved like "Behavior A". A `--runonly` option has been added to retain the ability to perform "Behavior A".
- Several explicit "run this task for all recipes in the dependency tree" tasks have been removed (e.g. `fetchall`, `checkuriall`, and the `*all` tasks provided by the `distrodata` and `archiver` classes). There is a BitBake option to complete this for any arbitrary task. For example:

```
bitbake <target> -c fetchall
```

should now be replaced with:

```
bitbake <target> --runall=fetch
```

4.13.5. Python and Python 3 Changes

The following are auto-packaging changes to Python and Python 3:

The script-managed `python-*-manifest.inc` files that were previously used to generate Python and Python 3 packages have been replaced with a JSON-based file that is easier to read and maintain. A new task is available for maintainers of the Python recipes to update the JSON file when upgrading to new Python versions. You can now edit the file directly instead of having to edit a script and run it to update the file.

One particular change to note is that the Python recipes no longer have build-time provides for their packages. This assumes `python-foo` is one of the packages provided by the Python recipe. You can

no longer run `bitbake python-foo` or have a `DEPENDS` [<http://www.yoctoproject.org/docs/3.0.3/ref-manual/ref-manual.html#var-DEPENDS>] on `python-foo`, but doing either of the following causes the package to work as expected:

```
IMAGE_INSTALL_append = " python-foo"
```

or

```
RDEPENDS_${PN} = "python-foo"
```

The earlier build-time provides behavior was a quirk of the way the Python manifest file was created. For more information on this change please see this commit [<http://git.yoctoproject.org/cgit/cgit.cgi/poky/commit/?id=8d94b9db221d1def42f091b991903faa2d1651ce>].

4.13.6. Miscellaneous Changes

The following are additional changes:

- The `kernel` class supports building packages for multiple kernels. If your kernel recipe or `.bbappend` file mentions packaging at all, you should replace references to the kernel in package names with `${KERNEL_PACKAGE_NAME}`. For example, if you disable automatic installation of the kernel image using `RDEPENDS_kernel-base = ""` you can avoid warnings using `RDEPENDS_${KERNEL_PACKAGE_NAME}-base = ""` instead.
- The `buildhistory` class commits changes to the repository by default so you no longer need to set `BUILDHISTORY_COMMIT = "1"`. If you want to disable commits you need to set `BUILDHISTORY_COMMIT = "0"` in your configuration.
- The beaglebone reference machine has been renamed to `beaglebone-yocto`. The `beaglebone-yocto` BSP is a reference implementation using only mainline components available in `OpenEmbedded-Core` and `meta-yocto-bsp`, whereas Texas Instruments maintains a full-featured BSP in the `meta-ti` layer. This rename avoids the previous name clash that existed between the two BSPs.
- The `update-alternatives` class no longer works with SysV init scripts because this usage has been problematic. Also, the `sysklogd` recipe no longer uses `update-alternatives` because it is incompatible with other implementations.
- By default, the `cmake` class uses `ninja` instead of `make` for building. This improves build performance. If a recipe is broken with `ninja`, then the recipe can set `OECMAKE_GENERATOR = "Unix Makefiles"` to change back to `make`.
- The previously deprecated `base_*` functions have been removed in favor of their replacements in `meta/lib/oe` and `bitbake/lib/bb`. These are typically used from recipes and classes. Any references to the old functions must be updated. The following table shows the removed functions and their replacements:

Removed

```
=====
base_path_join()
base_path_relative()
base_path_out()
base_read_file()
base_ifelse()
base_conditional()
base_less_or_equal()
base_version_less_or_equal()
base_contains()
base_both_contain()
base_prune_suffix()
oe_filter()
oe_filter_out()
```

Replacement

```
=====
oe.path.join()
oe.path.relative()
oe.path.format_display()
oe.utils.read_file()
oe.utils.ifelse()
oe.utils.conditional()
oe.utils.less_or_equal()
oe.utils.version_less_or_equal()
bb.utils.contains()
oe.utils.both_contain()
oe.utils.prune_suffix()
oe.utils.str_filter()
oe.utils.str_filter_out() (or use the _remove oper
```

- Using `exit 1` to explicitly defer a postinstall script until first boot is now deprecated since it is not an obvious mechanism and can mask actual errors. If you want to explicitly defer a postinstall to first boot on the target rather than at rootfs creation time, use `pkg_postinst_ontarget()` or call `postinst-intercepts defer_to_first_boot` from `pkg_postinst()`. Any failure of a `pkg_postinst()` script (including `exit 1`) will trigger a warning during `do_rootfs`.

For more information, see the "Post-Installation Scripts [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#new-recipe-post-installation-scripts>]" section in the Yocto Project Development Tasks Manual.

- The `elf` image type has been removed. This image type was removed because the `mkelfimage` tool that was required to create it is no longer provided by `coreboot` upstream and required updating every time `binutils` updated.
- Support for `.iso` image compression (previously enabled through `COMPRESSISO = "1"`) has been removed. The userspace tools (`zisofs-tools`) are unmaintained and `squashfs` provides better performance and compression. In order to build a live image with `squashfs+lz4` compression enabled you should now set `LIVE_ROOTFS_TYPE = "squashfs-lz4"` and ensure that `live` is in `IMAGE_FSTYPES`.
- Recipes with an unconditional dependency on `libpam` are only buildable with `pam` in `DISTRO_FEATURES`. If the dependency is truly optional then it is recommended that the dependency be conditional upon `pam` being in `DISTRO_FEATURES`.
- For EFI-based machines, the bootloader (`grub-efi` by default) is installed into the image at `/boot`. `Wic` can be used to split the bootloader into separate boot and rootfs partitions if necessary.
- Patches whose context does not match exactly (i.e. where patch reports "fuzz" when applying) will generate a warning. For an example of this see this commit [<http://git.yoctoproject.org/cgit/cgit.cgi/poky/commit/?id=cc97bc08125b63821ce3f616771830f77c456f57>].
- Layers are expected to set `LAYERSERIES_COMPAT_layername` to match the version(s) of `OpenEmbedded-Core` they are compatible with. This is specified as codenames using spaces to separate multiple values (e.g. "rocko sumo"). If a layer does not set `LAYERSERIES_COMPAT_layername`, a warning will be shown. If a layer sets a value that does not include the current version ("sumo" for the 2.5 release), then an error will be produced.
- The `TZ` environment variable is set to "UTC" within the build environment in order to fix reproducibility problems in some recipes.

4.14. Moving to the Yocto Project 2.6 Release

This section provides migration information for moving to the Yocto Project 2.6 Release from the prior release.

4.14.1. GCC 8.2 is Now Used by Default

The GNU Compiler Collection version 8.2 is now used by default for compilation. For more information on what has changed in the GCC 8.x release, see <https://gcc.gnu.org/gcc-8/changes.html>.

If you still need to compile with version 7.x, GCC 7.3 is also provided. You can select this version by setting the and can be selected by setting the `GCCVERSION` variable to "7.%" in your configuration.

4.14.2. Removed Recipes

The following recipes have been removed:

```
beecrypt: No longer needed since moving to RPM 4.
bigreqsproto: Replaced by xorgproto.
calibrateproto: Removed in favor of xinput.
compositeproto: Replaced by xorgproto.
damageproto: Replaced by xorgproto.
dmxproto: Replaced by xorgproto.
```

dri2proto: Replaced by xorgproto.
dri3proto: Replaced by xorgproto.
eee-acpi-scripts: Became obsolete.
fixesproto: Replaced by xorgproto.
fontspROTO: Replaced by xorgproto.
fstests: Became obsolete.
gccmakedep: No longer used.
glproto: Replaced by xorgproto.
gnome-desktop3: No longer needed. This recipe has moved to meta-oe.
icon-naming-utils: No longer used since the Sato theme was removed in 2016.
inputproto: Replaced by xorgproto.
kbproto: Replaced by xorgproto.
libusb-compat: Became obsolete.
libuser: Became obsolete.
libnfsidmap: No longer an external requirement since nfs-utils 2.2.1. libnfsidmap is now in meta-oe.
libxcalibrate: No longer needed with xinput.
mktemp: Became obsolete. The mktemp command is provided by both busybox and coreutils.
ossp-uuid: Is not being maintained and has mostly been replaced by uuid.h in util-linux.
pax-utils: No longer needed. Previous QA tests that did use this recipe are now done at build time.
pcmciautils: Became obsolete.
pixz: No longer needed. xz now supports multi-threaded compression.
presentproto: Replaced by xorgproto.
randrproto: Replaced by xorgproto.
recordproto: Replaced by xorgproto.
renderproto: Replaced by xorgproto.
resourceproto: Replaced by xorgproto.
scrnsaverproto: Replaced by xorgproto.
trace-cmd: Became obsolete. perf replaced this recipe's functionality.
videoproto: Replaced by xorgproto.
wireless-tools: Became obsolete. Superseded by iw.
xcmiscproto: Replaced by xorgproto.
xextproto: Replaced by xorgproto.
xf86dgaproto: Replaced by xorgproto.
xf86driproto: Replaced by xorgproto.
xf86miscproto: Replaced by xorgproto.
xf86-video-omapfb: Became obsolete. Use kernel modesetting driver instead.
xf86-video-omap: Became obsolete. Use kernel modesetting driver instead.
xf86vidmodeproto: Replaced by xorgproto.
xineramaproto: Replaced by xorgproto.
xproto: Replaced by xorgproto.
yasm: No longer needed since previous usages are now satisfied by nasm.

4.14.3. Packaging Changes

The following packaging changes have been made:

- **cmake**: `cmake.m4` and `toolchain` files have been moved to the main package.
- **iptables**: The `iptables` modules have been split into separate packages.
- **alsa-lib**: `libasound` is now in the main `alsa-lib` package instead of `libasound`.
- **glibc**: `libnss-db` is now in its own package along with a `/var/db/makedbs.sh` script to update databases.
- **python** and **python3**: The main package has been removed from the recipe. You must install specific packages or `python-modules` / `python3-modules` for everything.
- **systemtap**: Moved `systemtap-exporter` into its own package.

4.14.4. XOrg Protocol dependencies

The `"*proto"` upstream repositories have been combined into one `"xorgproto"` repository. Thus, the corresponding recipes have also been combined into a single `xorgproto` recipe. Any recipes that

depend upon the older `*proto` recipes need to be changed to depend on the newer `xorgproto` recipe instead.

For names of recipes removed because of this repository change, see the Removed Recipes section.

4.14.5. `distutils` and `distutils3` Now Prevent Fetching Dependencies During the `do_configure` Task

Previously, it was possible for Python recipes that inherited the `distutils` and `distutils3` classes to fetch code during the `do_configure` task to satisfy dependencies mentioned in `setup.py` if those dependencies were not provided in the `sysroot` (i.e. recipes providing the dependencies were missing from `DEPENDS`).

Note

This change affects classes beyond just the two mentioned (i.e. `distutils` and `distutils3`). Any recipe that inherits `distutils*` classes are affected. For example, the `setuptools` and `setuptools3` recipes are affected since they inherit the `distutils*` classes.

Fetching these types of dependencies that are not provided in the `sysroot` negatively affects the ability to reproduce builds. This type of fetching is now explicitly disabled. Consequently, any missing dependencies in Python recipes that use these classes now result in an error during the `do_configure` task.

4.14.6. `linux-yocto` Configuration Audit Issues Now Correctly Reported

Due to a bug, the kernel configuration audit functionality was not writing out any resulting warnings during the build. This issue is now corrected. You might notice these warnings now if you have a custom kernel configuration with a `linux-yocto` style kernel recipe.

4.14.7. Image/Kernel Artifact Naming Changes

The following changes have been made:

- Name variables (e.g. `IMAGE_NAME`) use a new `IMAGE_VERSION_SUFFIX` variable instead of `DATETIME`. Using `IMAGE_VERSION_SUFFIX` allows easier and more direct changes.

The `IMAGE_VERSION_SUFFIX` variable is set in the `bitbake.conf` configuration file as follows:

```
IMAGE_VERSION_SUFFIX = "-${DATETIME}"
```

- Several variables have changed names for consistency:

Old Variable Name	New Variable Name
=====	
<code>KERNEL_IMAGE_BASE_NAME</code>	<code>KERNEL_IMAGE_NAME</code>
<code>KERNEL_IMAGE_SYMLINK_NAME</code>	<code>KERNEL_IMAGE_LINK_NAME</code>
<code>MODULE_TARBALL_BASE_NAME</code>	<code>MODULE_TARBALL_NAME</code>
<code>MODULE_TARBALL_SYMLINK_NAME</code>	<code>MODULE_TARBALL_LINK_NAME</code>
<code>INITRAMFS_BASE_NAME</code>	<code>INITRAMFS_NAME</code>

- The `MODULE_IMAGE_BASE_NAME` variable has been removed. The module tarball name is now controlled directly with the `MODULE_TARBALL_NAME` variable.
- The `KERNEL_DTB_NAME` and `KERNEL_DTB_LINK_NAME` variables have been introduced to control kernel Device Tree Binary (DTB) artifact names instead of mangling `KERNEL_IMAGE_*` variables.
- The `KERNEL_FIT_NAME` and `KERNEL_FIT_LINK_NAME` variables have been introduced to specify the name of flattened image tree (FIT) kernel images similar to other deployed artifacts.

- The `MODULE_TARBALL_NAME` and `MODULE_TARBALL_LINK_NAME` variable values no longer include the "module-" prefix or ".tgz" suffix. These parts are now hardcoded so that the values are consistent with other artifact naming variables.
- Added the `INITRAMFS_LINK_NAME` variable so that the symlink can be controlled similarly to other artifact types.
- `INITRAMFS_NAME` now uses `"${PKGGE}-${PKGVS}-${PKGR}-${MACHINE}-${IMAGE_VERSION_SUFFIX}"` instead of `"${PV}-${PR}-${MACHINE}-${DATETIME}"`, which makes it consistent with other variables.

4.14.8. **SERIAL_CONSOLE** Deprecated

The `SERIAL_CONSOLE` variable has been functionally replaced by the `SERIAL_CONSOLES` variable for some time. With the Yocto Project 2.6 release, `SERIAL_CONSOLE` has been officially deprecated.

`SERIAL_CONSOLE` will continue to work as before for the 2.6 release. However, for the sake of future compatibility, it is recommended that you replace all instances of `SERIAL_CONSOLE` with `SERIAL_CONSOLES`.

Note

The only difference in usage is that `SERIAL_CONSOLES` expects entries to be separated using semicolons as compared to `SERIAL_CONSOLE`, which expects spaces.

4.14.9. Configure Script Reports Unknown Options as Errors

If the configure script reports an unknown option, this now triggers a QA error instead of a warning. Any recipes that previously got away with specifying such unknown options now need to be fixed.

4.14.10. Override Changes

The following changes have occurred:

- The `virtclass-native` and `virtclass-nativesdk` Overrides Have Been Removed: The `virtclass-native` and `virtclass-nativesdk` overrides have been deprecated since 2012 in favor of `class-native` and `class-nativesdk`, respectively. Both `virtclass-native` and `virtclass-nativesdk` are now dropped.

Note

The `virtclass-multilib` overrides for multilib are still valid.

- The `forcevariable` Override Now Has a Higher Priority Than `libc` Overrides: The `forcevariable` override is documented to be the highest priority override. However, due to a long-standing quirk of how `OVERRIDES` is set, the `libc` overrides (e.g. `libc-glibc`, `libc-musl`, and so forth) erroneously had a higher priority. This issue is now corrected.

It is likely this change will not cause any problems. However, it is possible with some unusual configurations that you might see a change in behavior if you were relying on the previous behavior. Be sure to check how you use `forcevariable` and `libc-*` overrides in your custom layers and configuration files to ensure they make sense.

- The `build-${BUILD_OS}` Override Has Been Removed: The `build-${BUILD_OS}`, which is typically `build-linux`, override has been removed because building on a host operating system other than a recent version of Linux is neither supported nor recommended. Dropping the override avoids giving the impression that other host operating systems might be supported.
- The `"_remove"` operator now preserves whitespace. Consequently, when specifying list items to remove, be aware that leading and trailing whitespace resulting from the removal is retained.

See the "Removal (Override Style Syntax)" [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#removing-override-style-syntax>] section in the BitBake User Manual for a detailed example.

4.14.11. systemd Configuration is Now Split Into systemd-conf

The configuration for the systemd recipe has been moved into a system-conf recipe. Moving this configuration to a separate recipe avoids the systemd recipe from becoming machine-specific for cases where machine-specific configurations need to be applied (e.g. for qemu* machines).

Currently, the new recipe packages the following files:

```
${sysconfdir}/machine-id  
${sysconfdir}/systemd/coredump.conf  
${sysconfdir}/systemd/journald.conf  
${sysconfdir}/systemd/logind.conf  
${sysconfdir}/systemd/system.conf  
${sysconfdir}/systemd/user.conf
```

If you previously used bbappend files to append the systemd recipe to change any of the listed files, you must do so for the systemd-conf recipe instead.

4.14.12. Automatic Testing Changes

This section provides information about automatic testing changes:

- **TEST_IMAGE Variable Removed:** Prior to this release, you set the TEST_IMAGE variable to "1" to enable automatic testing for successfully built images. The TEST_IMAGE variable no longer exists and has been replaced by the TESTIMAGE_AUTO variable.
- **Inheriting the testimage and testsdk Classes:** Best practices now dictate that you use the IMAGE_CLASSES variable rather than the INHERIT variable when you inherit the testimage and testsdk classes used for automatic testing.

4.14.13. OpenSSL Changes

OpenSSL [<https://www.openssl.org/>] has been upgraded from 1.0 to 1.1. By default, this upgrade could cause problems for recipes that have both versions in their dependency chains. The problem is that both versions cannot be installed together at build time.

Note

It is possible to have both versions of the library at runtime.

4.14.14. BitBake Changes

The server logfile bitbake-cookerdaemon.log is now always placed in the Build Directory instead of the current directory.

4.14.15. Security Changes

The Poky distribution now uses security compiler flags by default. Inclusion of these flags could cause new failures due to stricter checking for various potential security issues in code.

4.14.16. Post Installation Changes

You must explicitly mark post installs to defer to the target. If you want to explicitly defer a postinstall to first boot on the target rather than at rootfs creation time, use pkg_postinst_ontarget() or call postinst-intercepts defer_to_first_boot from pkg_postinst(). Any failure of a pkg_postinst() script (including exit 1) triggers an error during the do_rootfs task.

For more information on post-installation behavior, see the "Post-Installation Scripts [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#new-recipe-post-installation-scripts>]" section in the Yocto Project Development Tasks Manual.

4.14.17. Python 3 Profile-Guided Optimization

The python3 recipe now enables profile-guided optimization. Using this optimization requires a little extra build time in exchange for improved performance on the target at runtime. Additionally, the optimization is only enabled if the current MACHINE has support for user-mode emulation in QEMU (i.e. "qemu-usermode" is in MACHINE_FEATURES, which it is by default).

If you wish to disable Python profile-guided optimization regardless of the value of MACHINE_FEATURES, then ensure that PACKAGECONFIG for the python3 recipe does not contain "pgo". You could accomplish the latter using the following at the configuration level:

```
PACKAGECONFIG_remove_pn-python3 = "pgo"
```

Alternatively, you can set PACKAGECONFIG using an append file for the python3 recipe.

4.14.18. Miscellaneous Changes

The following miscellaneous changes occurred:

- Default to using the Thumb-2 instruction set for armv7a and above. If you have any custom recipes that build software that needs to be built with the ARM instruction set, change the recipe to set the instruction set as follows:

```
ARM_INSTRUCTION_SET = "arm"
```

- run-postinsts no longer uses /etc/*-postinsts for dpkg/opkg in favor of built-in postinst support. RPM behavior remains unchanged.
- The NOISO and NOHDD variables are no longer used. You now control building *.iso and *.hddimg image types directly by using the IMAGE_FSTYPES variable.
- The scripts/contrib/mkefidisk.sh has been removed in favor of Wic.
- kernel-modules has been removed from RRECOMMENDS for qemumips and qemumips64 machines. Removal also impacts the x86-base.inc file.

Note

genericx86 and genericx86-64 retain kernel-modules as part of the RRECOMMENDS variable setting.

- The LGPLv2_WHITELIST_GPL-3.0 variable has been removed. If you are setting this variable in your configuration, set or append it to the WHITELIST_GPL-3.0 variable instead.
- \${ASNEEDED} is now included in the TARGET_LDFLAGS variable directly. The remaining definitions from meta/conf/distro/include/as-needed.inc have been moved to corresponding recipes.
- Support for DSA host keys has been dropped from the OpenSSH recipes. If you are still using DSA keys, you must switch over to a more secure algorithm as recommended by OpenSSH upstream.
- The dhcp recipe now uses the dhcpd6.conf configuration file in dhcpd6.service for IPv6 DHCP rather than re-using dhcpd.conf, which is now reserved for IPv4.

4.15. Moving to the Yocto Project 2.7 Release

This section provides migration information for moving to the Yocto Project 2.7 Release from the prior release.

4.15.1. BitBake Changes

The following changes have been made to BitBake:

- BitBake now checks anonymous Python functions and pure Python functions (e.g. `def funcname():`) in the metadata for tab indentation. If found, BitBake produces a warning.
- Bitbake now checks `BBFILE_COLLECTIONS` for duplicate entries and triggers an error if any are found.

4.15.2. Eclipse™ Support Removed

Support for the Eclipse IDE has been removed. Support continues for those releases prior to 2.7 that did include support. The 2.7 release does not include the Eclipse Yocto plugin.

4.15.3. **qemu-native** Splits the System and User-Mode Parts

The system and user-mode parts of `qemu-native` are now split. `qemu-native` provides the user-mode components and `qemu-system-native` provides the system components. If you have recipes that depend on QEMU's system emulation functionality at build time, they should now depend upon `qemu-system-native` instead of `qemu-native`.

4.15.4. The **upstream-tracking.inc** File Has Been Removed

The previously deprecated `upstream-tracking.inc` file is now removed. Any `UPSTREAM_TRACKING*` variables are now set in the corresponding recipes instead.

Remove any references you have to the `upstream-tracking.inc` file in your configuration.

4.15.5. The **DISTRO_FEATURES_LIBC** Variable Has Been Removed

The `DISTRO_FEATURES_LIBC` variable is no longer used. The ability to configure `glibc` using `kconfig` has been removed for quite some time making the `libc-*` features set no longer effective.

Remove any references you have to `DISTRO_FEATURES_LIBC` in your own layers.

4.15.6. License Value Corrections

The following corrections have been made to the `LICENSE` values set by recipes:

socat: Corrected `LICENSE` to be "GPLv2" rather than "GPLv2+".

libgfortran: Set license to "GPL-3.0-with-GCC-exception".

elfutils: Removed "Elfutils-Exception" and set to "GPLv2" for shared libraries

4.15.7. Packaging Changes

This section provides information about packaging changes.

- `bind`: The `nsupdate` binary has been moved to the `bind-utils` package.
- `Debug split`: The default debug split has been changed to create separate source packages (i.e. `package_name-dbg` and `package_name-src`). If you are currently using `dbg-pkgs` in `IMAGE_FEATURES` to bring in debug symbols and you still need the sources, you must now also add `src-pkgs` to `IMAGE_FEATURES`. Source packages remain in the target portion of the SDK by default, unless you have set your own value for `SDKIMAGE_FEATURES` that does not include `src-pkgs`.
- `Mount all using util-linux`: `/etc/default/mountall` has moved into the `-mount` sub-package.

- Splitting binaries using util-linux: util-linux now splits each binary into its own package for fine-grained control. The main util-linux package pulls in the individual binary packages using the RRECOMMENDS and RDEPENDS variables. As a result, existing images should not see any changes assuming NO_RECOMMENDATIONS is not set.
- netbase/base-files: /etc/hosts has moved from netbase to base-files.
- tzdata: The main package has been converted to an empty meta package that pulls in all tzdata packages by default.
- lrzsz: This package has been removed from packagegroup-self-hosted and packagegroup-core-tools-testapps. The X/Y/ZModem support is less likely to be needed on modern systems. If you are relying on these packagegroups to include the lrzsz package in your image, you now need to explicitly add the package.

4.15.8. Removed Recipes

The following recipes have been removed:

gcc: Drop version 7.3 recipes. Version 8.3 now remains.

linux-yocto: Drop versions 4.14 and 4.18 recipes. Versions 4.19 and 5.0 remain.

go: Drop version 1.9 recipes. Versions 1.11 and 1.12 remain.

xvideo-tests: Became obsolete.

libart-lgpl: Became obsolete.

gtk-icon-utils-native: These tools are now provided by gtk+3-native

gcc-cross-initial: No longer needed. gcc-cross/gcc-crosssdk is now used instead.

gcc-crosssdk-initial: No longer needed. gcc-cross/gcc-crosssdk is now used instead.

glibc-initial: Removed because the benefits of having it for site_config are currently outweighed by the cost of building the recipe.

4.15.9. Removed Classes

The following classes have been removed:

distutils-tools: This class was never used.

bugzilla.bbclass: Became obsolete.

distrodata: This functionality has been replaced by a more modern tinfoil-based implementation.

4.15.10. Miscellaneous Changes

The following miscellaneous changes occurred:

- The distro subdirectory of the Poky repository has been removed from the top-level scripts directory.
- Perl now builds for the target using perl-cross [<http://arsv.github.io/perl-cross/>] for better maintainability and improved build performance. This change should not present any problems unless you have heavily customized your Perl recipe.
- arm-tunes: Removed the "-march" option if mcu is already added.

- `update-alternatives`: Convert file renames to `PACKAGE_PREPROCESS_FUNCS`
- `base/pixbufcache`: Obsolete `sstatecompletions` code has been removed.
- `native class`: `RDEPENDS` handling has been enabled.
- `inetutils`: This recipe has `rsh` disabled.

4.16. Moving to the Yocto Project 3.0 Release

This section provides migration information for moving to the Yocto Project 3.0 Release from the prior release.

4.16.1. Init System Selection

Changing the init system manager previously required setting a number of different variables. You can now change the manager by setting the `INIT_MANAGER` variable and the corresponding include files (i.e. `conf/distro/include/init-manager-*.conf`). Include files are provided for four values: `"none"`, `"sysvinit"`, `"systemd"`, and `"mdev-busybox"`. The default value, `"none"`, for `INIT_MANAGER` should allow your current settings to continue working. However, it is advisable to explicitly set `INIT_MANAGER`.

4.16.2. LSB Support Removed

Linux Standard Base (LSB) as a standard is not current, and is not well suited for embedded applications. Support can be continued in a separate layer if needed. However, presently LSB support has been removed from the core.

As a result of this change, the `poky-lsb` derivative distribution configuration that was also used for testing alternative configurations has been replaced with a `poky-altcfg` distribution that has LSB parts removed.

4.16.3. Removed Recipes

The following recipes have been removed.

- `core-image-lsb-dev`: Part of removed LSB support.
- `core-image-lsb`: Part of removed LSB support.
- `core-image-lsb-sdk`: Part of removed LSB support.
- `cve-check-tool`: Functionally replaced by the `cve-update-db` recipe and `cve-check` class.
- `eglinf`: No longer maintained. `eglinf` from `mesa-demos` is an adequate and maintained alternative.
- `gcc-8.3`: Version 8.3 removed. Replaced by 9.2.
- `gnome-themes-standard`: Only needed by `gtk+ 2.x`, which has been removed.
- `gtk+`: `GTK+ 2` is obsolete and has been replaced by `gtk+3`.
- `irda-utils`: Has become obsolete. IrDA support has been removed from the Linux kernel in version 4.17 and later.
- `libnewt-python`: `libnewt` Python support merged into main `libnewt` recipe.
- `libSDL`: Replaced by newer `libSDL2`.
- `libx11-diet`: Became obsolete.
- `libxx86dga`: Removed obsolete client library.
- `libxx86misc`: Removed. Library is redundant.

- `linux-yocto`: Version 5.0 removed, which is now redundant (5.2 / 4.19 present).
- `lsbinitscripts`: Part of removed LSB support.
- `lsb`: Part of removed LSB support.
- `lsbtest`: Part of removed LSB support.
- `openssl10`: Replaced by newer `openssl` version 1.1.
- `packagegroup-core-lsb`: Part of removed LSB support.
- `python-nose`: Removed the Python 2.x version of the recipe.
- `python-numpy`: Removed the Python 2.x version of the recipe.
- `python-scons`: Removed the Python 2.x version of the recipe.
- `source-highlight`: No longer needed.
- `stress`: Replaced by `stress-ng`.
- `vulkan`: Split into `vulkan-loader`, `vulkan-headers`, and `vulkan-tools`.
- `weston-conf`: Functionality moved to `weston-init`.

4.16.4. Packaging Changes

The following packaging changes have occurred.

- The Epiphany [https://en.wikipedia.org/wiki/GNOME_Web] browser has been dropped from `packagegroup-self-hosted` as it has not been needed inside `build-appliance-image` for quite some time and was causing resource problems.
- `libcap-ng` Python support has been moved to a separate `libcap-ng-python` recipe to streamline the build process when the Python bindings are not needed.
- `libdrm` now packages the file `amdgpu.ids` into a separate `libdrm-amdgpu` package.
- `python3`: The `runpy` module is now in the `python3-core` package as it is required to support the common "`python3 -m`" command usage.
- `distcc` now provides separate `distcc-client` and `distcc-server` packages as typically one or the other are needed, rather than both.
- `python*-setuptools` recipes now separately package the `pkg_resources` module in a `python-pkg-resources` / `python3-pkg-resources` package as the module is useful independent of the rest of the `setuptools` package. The main `python-setuptools` / `python3-setuptools` package depends on this new package so you should only need to update dependencies unless you want to take advantage of the increased granularity.

4.16.5. CVE Checking

`cve-check-tool` has been functionally replaced by a new `cve-update-db` recipe and functionality built into the `cve-check` class. The result uses NVD JSON data feeds rather than the deprecated XML feeds that `cve-check-tool` was using, supports CVSSv3 scoring, and makes other improvements.

Additionally, the `CVE_CHECK_CVE_WHITELIST` variable has been replaced by `CVE_CHECK_WHITELIST`.

4.16.6. Bitbake Changes

The following BitBake changes have occurred.

- `addtask` statements now properly validate dependent tasks. Previously, an invalid task was silently ignored. With this change, the invalid task generates a warning.
- Other invalid `addtask` and `deltask` usages now trigger these warnings: "multiple target tasks arguments with `addtask` / `deltask`", and "multiple before/after clauses".

- The "multiconfig" prefix is now shortened to "mc". "multiconfig" will continue to work, however it may be removed in a future release.
- The `bitbake -g` command no longer generates a `recipe-depends.dot` file as the contents (i.e. a reprocessed version of `task-depends.dot`) were confusing.
- The `bb.build.FuncFailed` exception, previously raised by `bb.build.exec_func()` when certain other exceptions have occurred, has been removed. The real underlying exceptions will be raised instead. If you have calls to `bb.build.exec_func()` in custom classes or tinfoil-using scripts, any references to `bb.build.FuncFailed` should be cleaned up.
- Additionally, the `bb.build.exec_func()` no longer accepts the "pythonexception" parameter. The function now always raises exceptions. Remove this argument in any calls to `bb.build.exec_func()` in custom classes or scripts.
- The `BB_SETSCENE_VERIFY_FUNCTION2` [http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#var-bb-BB_SETSCENE_VERIFY_FUNCTION2] is no longer used. In the unlikely event that you have any references to it, they should be removed.
- The `RunQueueExecuteScenequeue` and `RunQueueExecuteTasks` events have been removed since `setscene` tasks are now executed as part of the normal `runqueue`. Any event handling code in custom classes or scripts that handles these two events need to be updated.
- The arguments passed to functions used with `BB_HASHCHECK_FUNCTION` [http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#var-bb-BB_HASHCHECK_FUNCTION] have changed. If you are using your own custom hash check function, see <http://git.yoctoproject.org/cgit/cgit.cgi/poky/commit/?id=40a5e193c4ba45c928fccd899415ea56b5417725> for details.
- Task specifications in `BB_TASKDEPDATA` and class implementations used in signature generator classes now use "<fn>:<task>" everywhere rather than the "." delimiter that was being used in some places. This change makes it consistent with all areas in the code. Custom signature generator classes and code that reads `BB_TASKDEPDATA` need to be updated to use ':' as a separator rather than '.'.

4.16.7. Sanity Checks

The following sanity check changes occurred.

- `SRC_URI` is now checked for usage of two problematic items:
 - "\${PN}" prefix/suffix use - Warnings always appear if `${PN}` is used. You must fix the issue regardless of whether `multiconfig` or anything else that would cause prefixing/suffixing to happen.
 - Github archive tarballs - these are not guaranteed to be stable. Consequently, it is likely that the tarballs will be refreshed and thus the `SRC_URI` checksums will fail to apply. It is recommended that you fetch either an official release tarball or a specific revision from the actual Git repository instead.Either one of these items now trigger a warning by default. If you wish to disable this check, remove `src-uri-bad` from `WARN_QA`.
- The `file-rdeps` runtime dependency check no longer expands `RDEPENDS` recursively as there is no mechanism to ensure they can be fully computed, and thus races sometimes result in errors either showing up or not. Thus, you might now see errors for missing runtime dependencies that were previously satisfied recursively. Here is an example: package A contains a shell script starting with `#!/bin/bash` but has no dependency on `bash`. However, package A depends on package B, which does depend on `bash`. You need to add the missing dependency or dependencies to resolve the warning.
- Setting `DEPENDS_${PN}` anywhere (i.e. typically in a recipe) now triggers an error. The error is triggered because `DEPENDS` is not a package-specific variable unlike `RDEPENDS`. You should set `DEPENDS` instead.
- `systemd` currently does not work well with the `musl` C library because only upstream officially supports linking the library with `glibc`. Thus, a warning is shown when building `systemd` in conjunction with `musl`.

4.16.8. Miscellaneous Changes

The following miscellaneous changes have occurred.

- The `gnome` class has been removed because it now does very little. You should update recipes that previously inherited this class to do the following:

```
inherit gnomebase gtk-icon-cache gconf mime
```

- The `meta/recipes-kernel/linux/linux-dtb.inc` file has been removed. This file was previously deprecated in favor of setting `KERNEL_DEVICETREE` in any kernel recipe and only produced a warning. Remove any `include` or `require` statements pointing to this file.
- `TARGET_CFLAGS`, `TARGET_CPPFLAGS`, `TARGET_CXXFLAGS`, and `TARGET_LDFLAGS` are no longer exported to the external environment. This change did not require any changes to core recipes, which is a good indicator that no changes will be required. However, if for some reason the software being built by one of your recipes is expecting these variables to be set, then building the recipe will fail. In such cases, you must either export the variable or variables in the recipe or change the scripts so that exporting is not necessary.
- You must change the host distro identifier used in `NATIVELSBSTRING` to use all lowercase characters even if it does not contain a version number. This change is necessary only if you are not using `uninative` and `SANITY_TESTED_DISTROS`.
- In the `base-files` recipe, writing the hostname into `/etc/hosts` and `/etc/hostname` is now done within the main `do_install` function rather than in the `do_install_basefilesissue` function. The reason for the change is because `do_install_basefilesissue` is more easily overridden without having to duplicate the hostname functionality. If you have done the latter (e.g. in a `base-files` `bbappend`), then you should remove it from your customized `do_install_basefilesissue` function.
- The `wic --expand` command now uses commas to separate "key:value" pairs rather than hyphens.

Note

The `wic` command-line help is not updated.

You must update any scripts or commands where you use `wic --expand` with multiple "key:value" pairs.

- UEFI image variable settings have been moved from various places to a central `conf/image-uefi.conf`. This change should not influence any existing configuration as the `meta/conf/image-uefi.conf` in the core metadata sets defaults that can be overridden in the same manner as before.
- `conf/distro/include/world-broken.inc` has been removed. For cases where certain recipes need to be disabled when using the `musl` C library, these recipes now have `COMPATIBLE_HOST_libc-musl` set with a comment that explains why.

Chapter 5. Source Directory Structure

The Source Directory consists of several components. Understanding them and knowing where they are located is key to using the Yocto Project well. This chapter describes the Source Directory and gives information about the various files and directories.

For information on how to establish a local Source Directory on your development system, see the "Locating Yocto Project Source Files [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#locating-yocto-project-source-files>]" section in the Yocto Project Development Tasks Manual.

Note

The OpenEmbedded build system does not support file or directory names that contain spaces. Be sure that the Source Directory you use does not contain these types of names.

5.1. Top-Level Core Components

This section describes the top-level components of the Source Directory.

5.1.1. **bitbake/**

This directory includes a copy of BitBake for ease of use. The copy usually matches the current stable BitBake release from the BitBake project. BitBake, a Metadata interpreter, reads the Yocto Project Metadata and runs the tasks defined by that data. Failures are usually from the Metadata and not from BitBake itself. Consequently, most users do not need to worry about BitBake.

When you run the `bitbake` command, the main BitBake executable, which resides in the `bitbake/bin/` directory, starts. Sourcing the environment setup script (i.e. `oe-init-build-env`) places the scripts and `bitbake/bin` directories (in that order) into the shell's `PATH` environment variable.

For more information on BitBake, see the BitBake User Manual [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html>].

5.1.2. **build/**

This directory contains user configuration files and the output generated by the OpenEmbedded build system in its standard configuration where the source tree is combined with the output. The Build Directory is created initially when you source the OpenEmbedded build environment setup script (i.e. `oe-init-build-env`).

It is also possible to place output and configuration files in a directory separate from the Source Directory by providing a directory name when you source the setup script. For information on separating output from your local Source Directory files, see the "`oe-init-build-env`" section.

5.1.3. **documentation/**

This directory holds the source for the Yocto Project documentation as well as templates and tools that allow you to generate PDF and HTML versions of the manuals. Each manual is contained in a sub-folder. For example, the files for this manual reside in the `ref-manual/` directory.

5.1.4. **meta/**

This directory contains the OpenEmbedded-Core metadata. The directory holds recipes, common classes, and machine configuration for emulated targets (`qemux86`, `qemuarm`, and so forth.)

5.1.5. **meta-poky/**

This directory contains the configuration for the Poky reference distribution.

5.1.6. meta-yocto-bsp/

This directory contains the Yocto Project reference hardware Board Support Packages (BSPs). For more information on BSPs, see the Yocto Project Board Support Package (BSP) Developer's Guide [<http://www.yoctoproject.org/docs/3.0.3/bsp-guide/bsp-guide.html>].

5.1.7. meta-selftest/

This directory adds additional recipes and append files used by the OpenEmbedded selftests to verify the behavior of the build system.

You do not have to add this layer to your `bblayers.conf` file unless you want to run the selftests.

5.1.8. meta-skeleton/

This directory contains template recipes for BSP and kernel development.

5.1.9. scripts/

This directory contains various integration scripts that implement extra functionality in the Yocto Project environment (e.g. QEMU scripts). The `oe-init-build-env` script appends this directory to the shell's `PATH` environment variable.

The `scripts` directory has useful scripts that assist in contributing back to the Yocto Project, such as `create-pull-request` and `send-pull-request`.

5.1.10. oe-init-build-env

This script sets up the OpenEmbedded build environment. Running this script with the `source` command in a shell makes changes to `PATH` and sets other core BitBake variables based on the current working directory. You need to run an environment setup script before running BitBake commands. The script uses other scripts within the `scripts` directory to do the bulk of the work.

When you run this script, your Yocto Project environment is set up, a Build Directory is created, your working directory becomes the Build Directory, and you are presented with a list of common BitBake targets. Here is an example:

```
$ source oe-init-build-env

### Shell environment set up for builds. ###

You can now run 'bitbake <target>'

Common targets are:
  core-image-minimal
  core-image-sato
  meta-toolchain
  meta-ide-support

You can also run generated qemu images with a command like 'runqemu qemu86'
```

The script gets its default list of common targets from the `conf-notes.txt` file, which is found in the `meta-poky` directory within the Source Directory. Should you have custom distributions, it is very easy to modify this configuration file to include your targets for your distribution. See the "Creating a Custom Template Configuration Directory [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#creating-a-custom-template-configuration-directory>]" section in the Yocto Project Development Tasks Manual for more information.

By default, running this script without a Build Directory argument creates the build directory in your current working directory. If you provide a Build Directory argument when you source the script, you direct the OpenEmbedded build system to create a Build Directory of your choice. For example, the following command creates a Build Directory named `mybuilds` that is outside of the Source Directory:

```
$ source oe-init-build-env ~/mybuilds
```

The OpenEmbedded build system uses the template configuration files, which are found by default in the `meta-poky/conf` directory in the Source Directory. See the "Creating a Custom Template Configuration Directory [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#creating-a-custom-template-configuration-directory>]" section in the Yocto Project Development Tasks Manual for more information.

Note

The OpenEmbedded build system does not support file or directory names that contain spaces. If you attempt to run the `oe-init-build-env` script from a Source Directory that contains spaces in either the filenames or directory names, the script returns an error indicating no such file or directory. Be sure to use a Source Directory free of names containing spaces.

5.1.11. LICENSE, README, and README.hardware

These files are standard top-level files.

5.2. The Build Directory -**build**/

The OpenEmbedded build system creates the Build Directory when you run the build environment setup scripts (i.e. `oe-init-build-env`).

If you do not give the Build Directory a specific name when you run a setup script, the name defaults to `build`.

The `TOPDIR` variable points to the Build Directory.

5.2.1. **build/buildhistory**

The OpenEmbedded build system creates this directory when you enable the build history feature. The directory tracks build information into image, packages, and SDK subdirectories. For information on the build history feature, see the "Maintaining Build Output Quality [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#maintaining-build-output-quality>]" section in the Yocto Project Development Tasks Manual.

5.2.2. **build/conf/local.conf**

This configuration file contains all the local user configurations for your build environment. The `local.conf` file contains documentation on the various configuration options. Any variable set here overrides any variable set elsewhere within the environment unless that variable is hard-coded within a file (e.g. by using `'='` instead of `'?='`). Some variables are hard-coded for various reasons but these variables are relatively rare.

Edit this file to set the `MACHINE` for which you want to build, which package types you wish to use (`PACKAGE_CLASSES`), and the location from which you want to access downloaded files (`DL_DIR`).

If `local.conf` is not present when you start the build, the OpenEmbedded build system creates it from `local.conf.sample` when you source the top-level build environment setup script (i.e. `oe-init-build-env`).

The source `local.conf.sample` file used depends on the `$TEMPLATECONF` script variable, which defaults to `meta-poky/conf` when you are building from the Yocto Project development environment and defaults to `meta/conf` when you are building from the OpenEmbedded-Core environment. Because the script variable points to the source of the `local.conf.sample` file, this implies that you can configure your build environment from any layer by setting the variable in the top-level build environment setup script as follows:

```
TEMPLATECONF=your_layer/conf
```

Once the build process gets the sample file, it uses sed to substitute final `${0ER00T}` values for all `##0ER00T##` values.

Note

You can see how the `TEMPLATECONF` variable is used by looking at the `scripts/oe-setup-buildddir` script in the Source Directory. You can find the Yocto Project version of the `local.conf.sample` file in the `meta-poky/conf` directory.

5.2.3. **build/conf/bblayers.conf**

This configuration file defines layers [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#understanding-and-creating-layers>], which are directory trees, traversed (or walked) by BitBake. The `bblayers.conf` file uses the `BBLAYERS` variable to list the layers BitBake tries to find.

If `bblayers.conf` is not present when you start the build, the OpenEmbedded build system creates it from `bblayers.conf.sample` when you source the top-level build environment setup script (i.e. `oe-init-build-env`).

The source `bblayers.conf.sample` file used depends on the `$TEMPLATECONF` script variable, which defaults to `meta-poky/conf` when you are building from the Yocto Project development environment and defaults to `meta/conf` when you are building from the OpenEmbedded-Core environment. Because the script variable points to the source of the `bblayers.conf.sample` file, this implies that you can base your build from any layer by setting the variable in the top-level build environment setup script as follows:

```
TEMPLATECONF=your_layer/conf
```

Once the build process gets the sample file, it uses sed to substitute final `${0ER00T}` values for all `##0ER00T##` values.

Note

You can see how the `TEMPLATECONF` variable `scripts/oe-setup-buildddir` script in the Source Directory. You can find the Yocto Project version of the `bblayers.conf.sample` file in the `meta-poky/conf` directory.

5.2.4. **build/conf/sanity_info**

This file indicates the state of the sanity checks and is created during the build.

5.2.5. **build/downloads/**

This directory contains downloaded upstream source tarballs. You can reuse the directory for multiple builds or move the directory to another location. You can control the location of this directory through the `DL_DIR` variable.

5.2.6. **build/sstate-cache/**

This directory contains the shared state cache. You can reuse the directory for multiple builds or move the directory to another location. You can control the location of this directory through the `SSTATE_DIR` variable.

5.2.7. **build/tmp/**

The OpenEmbedded build system creates and uses this directory for all the build system's output. The `TMPDIR` variable points to this directory.

BitBake creates this directory if it does not exist. As a last resort, to clean up a build and start it from scratch (other than the downloads), you can remove everything in the `tmp` directory or get rid of the directory completely. If you do, you should also completely remove the `build/sstate-cache` directory.

5.2.8. **build/tmp/buildstats/**

This directory stores the build statistics.

5.2.9. **build/tmp/cache/**

When BitBake parses the metadata (recipes and configuration files), it caches the results in `build/tmp/cache/` to speed up future builds. The results are stored on a per-machine basis.

During subsequent builds, BitBake checks each recipe (together with, for example, any files included or appended to it) to see if they have been modified. Changes can be detected, for example, through file modification time (mtime) changes and hashing of file contents. If no changes to the file are detected, then the parsed result stored in the cache is reused. If the file has changed, it is reparsed.

5.2.10. **build/tmp/deploy/**

This directory contains any "end result" output from the OpenEmbedded build process. The `DEPLOY_DIR` variable points to this directory. For more detail on the contents of the deploy directory, see the "Images [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#images-dev-environment>]" and "Application Development SDK [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#sdk-dev-environment>]" sections in the Yocto Project Overview and Concepts Manual.

5.2.11. **build/tmp/deploy/deb/**

This directory receives any `.deb` packages produced by the build process. The packages are sorted into feeds for different architecture types.

5.2.12. **build/tmp/deploy/rpm/**

This directory receives any `.rpm` packages produced by the build process. The packages are sorted into feeds for different architecture types.

5.2.13. **build/tmp/deploy/ipk/**

This directory receives `.ipk` packages produced by the build process.

5.2.14. **build/tmp/deploy/licenses/**

This directory receives package licensing information. For example, the directory contains sub-directories for `bash`, `busybox`, and `glibc` (among others) that in turn contain appropriate `COPYING` license files with other licensing information. For information on licensing, see the "Maintaining Open Source License Compliance During Your Product's Lifecycle [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#maintaining-open-source-license-compliance-during-your-products-lifecycle>]" section in the Yocto Project Development Tasks Manual.

5.2.15. **build/tmp/deploy/images/**

This directory receives complete filesystem images. If you want to flash the resulting image from a build onto a device, look here for the image.

Be careful when deleting files in this directory. You can safely delete old images from this directory (e.g. `core-image-*`). However, the kernel (`*zImage*`, `*uImage*`, etc.), bootloader and other supplementary files might be deployed here prior to building an image. Because these files are not directly produced from the image, if you delete them they will not be automatically re-created when you build the image again.

If you do accidentally delete files here, you will need to force them to be re-created. In order to do that, you will need to know the target that produced them. For example, these commands rebuild and re-create the kernel files:

```
$ bitbake -c clean virtual/kernel
$ bitbake virtual/kernel
```

5.2.16. **build/tmp/deploy/sdk/**

The OpenEmbedded build system creates this directory to hold toolchain installer scripts, which when executed, install the sysroot that matches your target hardware. You can find out more about these installers in the "Building an SDK Installer [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-building-an-sdk-installer>]" section in the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) manual.

5.2.17. **build/tmp/sstate-control/**

The OpenEmbedded build system uses this directory for the shared state manifest files. The shared state code uses these files to record the files installed by each sstate task so that the files can be removed when cleaning the recipe or when a newer version is about to be installed. The build system also uses the manifests to detect and produce a warning when files from one task are overwriting those from another.

5.2.18. **build/tmp/sysroots-components/**

This directory is the location of the sysroot contents that the task `do_prepare_recipe_sysroot` links or copies into the recipe-specific sysroot for each recipe listed in `DEPENDS`. Population of this directory is handled through shared state, while the path is specified by the `COMPONENTS_DIR` variable. Apart from a few unusual circumstances, handling of the `sysroots-components` directory should be automatic, and recipes should not directly reference `build/tmp/sysroots-components`.

5.2.19. **build/tmp/sysroots/**

Previous versions of the OpenEmbedded build system used to create a global shared sysroot per machine along with a native sysroot. Beginning with the 3.0.3 version of the Yocto Project, sysroots exist in recipe-specific `WORKDIR` directories. Thus, the `build/tmp/sysroots/` directory is unused.

Note

The `build/tmp/sysroots/` directory can still be populated using the `bitbake build-sysroots` command and can be used for compatibility in some cases. However, in general it is not recommended to populate this directory. Individual recipe-specific sysroots should be used.

5.2.20. **build/tmp/stamps/**

This directory holds information that BitBake uses for accounting purposes to track what tasks have run and when they have run. The directory is sub-divided by architecture, package name, and version. Following is an example:

```
stamps/all-poky-linux/distcc-config/1.0-r0.do_build-2fdd....2do
```

Although the files in the directory are empty of data, BitBake uses the filenames and timestamps for tracking purposes.

For information on how BitBake uses stamp files to determine if a task should be rerun, see the "Stamp Files and the Rerunning of Tasks [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#stamp-files-and-the-rerunning-of-tasks>]" section in the Yocto Project Overview and Concepts Manual.

5.2.21. **build/tmp/log/**

This directory contains general logs that are not otherwise placed using the package's `WORKDIR`. Examples of logs are the output from the `do_check_pkg` or `do_distro_check` tasks. Running a build does not necessarily mean this directory is created.

5.2.22. **build/tmp/work/**

This directory contains architecture-specific work sub-directories for packages built by BitBake. All tasks execute from the appropriate work directory. For example, the source for a particular package is unpacked, patched, configured and compiled all within its own work directory. Within the work directory, organization is based on the package group and version for which the source is being compiled as defined by the WORKDIR.

It is worth considering the structure of a typical work directory. As an example, consider `linux-yocto-kernel-3.0` on the machine `qemux86` built within the Yocto Project. For this package, a work directory of `tmp/work/qemux86-poky-linux/linux-yocto/3.0+git1+<...>`, referred to as the WORKDIR, is created. Within this directory, the source is unpacked to `linux-qemux86-standard-build` and then patched by Quilt. (See the "Using Quilt in Your Workflow [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#using-a-quilt-workflow>]" section in the Yocto Project Development Tasks Manual for more information.) Within the `linux-qemux86-standard-build` directory, standard Quilt directories `linux-3.0/patches` and `linux-3.0/.pc` are created, and standard Quilt commands can be used.

There are other directories generated within WORKDIR. The most important directory is WORKDIR/`temp/`, which has log files for each task (`log.do_*.pid`) and contains the scripts BitBake runs for each task (`run.do_*.pid`). The WORKDIR/`image/` directory is where "make install" places its output that is then split into sub-packages within WORKDIR/`packages-split/`.

5.2.23. **build/tmp/work/tunearch/recipe/version/**

The recipe work directory - `${WORKDIR}`.

As described earlier in the "build/tmp/sysroots/" section, beginning with the 3.0.3 release of the Yocto Project, the OpenEmbedded build system builds each recipe in its own work directory (i.e. WORKDIR). The path to the work directory is constructed using the architecture of the given build (e.g. `TUNE_PKGARCH`, `MACHINE_ARCH`, or "allarch"), the recipe name, and the version of the recipe (i.e. `PE:PV-PR`).

A number of key subdirectories exist within each recipe work directory:

- `${WORKDIR}/temp`: Contains the log files of each task executed for this recipe, the "run" files for each executed task, which contain the code run, and a `log.task_order` file, which lists the order in which tasks were executed.
- `${WORKDIR}/image`: Contains the output of the `do_install` task, which corresponds to the `${D}` variable in that task.
- `${WORKDIR}/pseudo`: Contains the pseudo database and log for any tasks executed under pseudo for the recipe.
- `${WORKDIR}/sysroot-destdir`: Contains the output of the `do_populate_sysroot` task.
- `${WORKDIR}/package`: Contains the output of the `do_package` task before the output is split into individual packages.
- `${WORKDIR}/packages-split`: Contains the output of the `do_package` task after the output has been split into individual packages. Subdirectories exist for each individual package created by the recipe.
- `${WORKDIR}/recipe-sysroot`: A directory populated with the target dependencies of the recipe. This directory looks like the target filesystem and contains libraries that the recipe might need to link against (e.g. the C library).
- `${WORKDIR}/recipe-sysroot-native`: A directory populated with the native dependencies of the recipe. This directory contains the tools the recipe needs to build (e.g. the compiler, Autoconf, libtool, and so forth).
- `${WORKDIR}/build`: This subdirectory applies only to recipes that support builds where the source is separate from the build artifacts. The OpenEmbedded build system uses this directory as a separate build directory (i.e. `${B}`).

5.2.24. **build/tmp/work-shared/**

For efficiency, the OpenEmbedded build system creates and uses this directory to hold recipes that share a work directory with other recipes. In practice, this is only used for gcc and its variants (e.g. gcc-cross, libgcc, gcc-runtime, and so forth).

5.3. The Metadata **-meta/**

As mentioned previously, Metadata is the core of the Yocto Project. Metadata has several important subdivisions:

5.3.1. **meta/classes/**

This directory contains the *.bbclass files. Class files are used to abstract common code so it can be reused by multiple packages. Every package inherits the base.bbclass file. Examples of other important classes are autotools.bbclass, which in theory allows any Autotool-enabled package to work with the Yocto Project with minimal effort. Another example is kernel.bbclass that contains common code and functions for working with the Linux kernel. Functions like image generation or packaging also have their specific class files such as image.bbclass, rootfs_*.bbclass and package*.bbclass.

For reference information on classes, see the "Classes" chapter.

5.3.2. **meta/conf/**

This directory contains the core set of configuration files that start from bitbake.conf and from which all other configuration files are included. See the include statements at the end of the bitbake.conf file and you will note that even local.conf is loaded from there. While bitbake.conf sets up the defaults, you can often override these by using the (local.conf) file, machine file or the distribution configuration file.

5.3.3. **meta/conf/machine/**

This directory contains all the machine configuration files. If you set MACHINE = "qemux86", the OpenEmbedded build system looks for a qemux86.conf file in this directory. The include directory contains various data common to multiple machines. If you want to add support for a new machine to the Yocto Project, look in this directory.

5.3.4. **meta/conf/distro/**

The contents of this directory controls any distribution-specific configurations. For the Yocto Project, the defaultsetup.conf is the main file here. This directory includes the versions and the SRCDATE definitions for applications that are configured here. An example of an alternative configuration might be poky-bleeding.conf. Although this file mainly inherits its configuration from Poky.

5.3.5. **meta/conf/machine-sdk/**

The OpenEmbedded build system searches this directory for configuration files that correspond to the value of SDKMACHINE. By default, 32-bit and 64-bit x86 files ship with the Yocto Project that support some SDK hosts. However, it is possible to extend that support to other SDK hosts by adding additional configuration files in this subdirectory within another layer.

5.3.6. **meta/files/**

This directory contains common license files and several text files used by the build system. The text files contain minimal device information and lists of files and directories with known permissions.

5.3.7. **meta/lib/**

This directory contains OpenEmbedded Python library code used during the build process.

5.3.8. **meta/recipes-bsp/**

This directory contains anything linking to specific hardware or hardware configuration information such as "u-boot" and "grub".

5.3.9. **meta/recipes-connectivity/**

This directory contains libraries and applications related to communication with other devices.

5.3.10. **meta/recipes-core/**

This directory contains what is needed to build a basic working Linux image including commonly used dependencies.

5.3.11. **meta/recipes-devtools/**

This directory contains tools that are primarily used by the build system. The tools, however, can also be used on targets.

5.3.12. **meta/recipes-extended/**

This directory contains non-essential applications that add features compared to the alternatives in core. You might need this directory for full tool functionality or for Linux Standard Base (LSB) compliance.

5.3.13. **meta/recipes-gnome/**

This directory contains all things related to the GTK+ application framework.

5.3.14. **meta/recipes-graphics/**

This directory contains X and other graphically related system libraries

5.3.15. **meta/recipes-kernel/**

This directory contains the kernel and generic applications and libraries that have strong kernel dependencies.

5.3.16. **meta/recipes-lsb4/**

This directory contains recipes specifically added to support the Linux Standard Base (LSB) version 4.x.

5.3.17. **meta/recipes-multimedia/**

This directory contains codecs and support utilities for audio, images and video.

5.3.18. **meta/recipes-rt/**

This directory contains package and image recipes for using and testing the PREEMPT_RT kernel.

5.3.19. **meta/recipes-sato/**

This directory contains the Sato demo/reference UI/UX and its associated applications and configuration data.

5.3.20. **meta/recipes-support/**

This directory contains recipes used by other recipes, but that are not directly included in images (i.e. dependencies of other recipes).

5.3.21. **meta/site/**

This directory contains a list of cached results for various architectures. Because certain "autoconf" test results cannot be determined when cross-compiling due to the tests not able to run on a live system, the information in this directory is passed to "autoconf" for the various architectures.

5.3.22. **meta/recipes.txt**

This file is a description of the contents of recipes-.*.

Chapter 6. Classes

Class files are used to abstract common functionality and share it amongst multiple recipe (.bb) files. To use a class file, you simply make sure the recipe inherits the class. In most cases, when a recipe inherits a class it is enough to enable its features. There are cases, however, where in the recipe you might need to set variables or override some default behavior.

Any Metadata usually found in a recipe can also be placed in a class file. Class files are identified by the extension `.bbclass` and are usually placed in a `classes/` directory beneath the `meta*/` directory found in the Source Directory. Class files can also be pointed to by `BUILDDIR` (e.g. `build/`) in the same way as `.conf` files in the `conf` directory. Class files are searched for in `BBPATH` using the same method by which `.conf` files are searched.

This chapter discusses only the most useful and important classes. Other classes do exist within the `meta/classes` directory in the Source Directory. You can reference the `.bbclass` files directly for more information.

6.1. `allarch.bbclass`

The `allarch` class is inherited by recipes that do not produce architecture-specific output. The class disables functionality that is normally needed for recipes that produce executable binaries (such as building the cross-compiler and a C library as pre-requisites, and splitting out of debug symbols during packaging).

Note

Unlike some distro recipes (e.g. Debian), OpenEmbedded recipes that produce packages that depend on tunings through use of the `RDEPENDS` and `TUNE_PKGARCH` variables, should never be configured for all architectures using `allarch`. This is the case even if the recipes do not produce architecture-specific output.

Configuring such recipes for all architectures causes the `do_package_write_*` tasks to have different signatures for the machines with different tunings. Additionally, unnecessary rebuilds occur every time an image for a different `MACHINE` is built even when the recipe never changes.

By default, all recipes inherit the base and package classes, which enable functionality needed for recipes that produce executable output. If your recipe, for example, only produces packages that contain configuration files, media files, or scripts (e.g. Python and Perl), then it should inherit the `allarch` class.

6.2. `archiver.bbclass`

The `archiver` class supports releasing source code and other materials with the binaries.

For more details on the source archiver, see the "Maintaining Open Source License Compliance During Your Product's Lifecycle [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#maintaining-open-source-license-compliance-during-your-products-lifecycle>]" section in the Yocto Project Development Tasks Manual. You can also see the `ARCHIVER_MODE` variable for information about the variable flags (varflags) that help control archive creation.

6.3. `autotools*.bbclass`

The `autotools*` classes support Autotooled packages.

The `autoconf`, `automake`, and `libtool` packages bring standardization. This class defines a set of tasks (e.g. `configure`, `compile` and so forth) that work for all Autotooled packages. It should usually be enough to define a few standard variables and then simply inherit `autotools`. These classes can also work with software that emulates Autotools. For more information, see the "Autotooled Package [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#new-recipe-autotooled-package>]" section in the Yocto Project Development Tasks Manual.

By default, the `autotools*` classes use out-of-tree builds (i.e. `autotools.bbclass` building with `B != S`).

If the software being built by a recipe does not support using out-of-tree builds, you should have the recipe inherit the `autotools-brokensep` class. The `autotools-brokensep` class behaves the same as the `autotools` class but builds with `B == S`. This method is useful when out-of-tree build support is either not present or is broken.

Note

It is recommended that out-of-tree support be fixed and used if at all possible.

It's useful to have some idea of how the tasks defined by the `autotools*` classes work and what they do behind the scenes.

- `do_configure` - Regenerates the configure script (using `autoreconf`) and then launches it with a standard set of arguments used during cross-compilation. You can pass additional parameters to configure through the `EXTRA_OECONF` or `PACKAGECONFIG_CONFARGS` variables.
- `do_compile` - Runs `make` with arguments that specify the compiler and linker. You can pass additional arguments through the `EXTRA_OEMAKE` variable.
- `do_install` - Runs `make install` and passes in `${D}` as `DESTDIR`.

6.4. `base.bbclass`

The `base` class is special in that every `.bb` file implicitly inherits the class. This class contains definitions for standard basic tasks such as fetching, unpacking, configuring (empty by default), compiling (runs any Makefile present), installing (empty by default) and packaging (empty by default). These classes are often overridden or extended by other classes such as the `autotools` class or the `package` class.

The class also contains some commonly used functions such as `oe_runmake`, which runs `make` with the arguments specified in `EXTRA_OEMAKE` variable as well as the arguments passed directly to `oe_runmake`.

6.5. `bash-completion.bbclass`

Sets up packaging and dependencies appropriate for recipes that build software that includes bash-completion data.

6.6. `bin_package.bbclass`

The `bin_package` class is a helper class for recipes that extract the contents of a binary package (e.g. an RPM) and install those contents rather than building the binary from source. The binary package is extracted and new packages in the configured output package format are created. Extraction and installation of proprietary binaries is a good example use for this class.

Note

For RPMs and other packages that do not contain a subdirectory, you should specify an appropriate `fetcher` parameter to point to the subdirectory. For example, if BitBake is using the Git fetcher (`git://`), the `"subpath"` parameter limits the checkout to a specific subpath of the tree. Here is an example where `${BP}` is used so that the files are extracted into the subdirectory expected by the default value of `S`:

```
SRC_URI = "git://example.com/downloads/somepackage.rpm;subpath=${BP}"
```

See the "Fetchers [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#bb-fetchers>]" section in the BitBake User Manual for more information on supported BitBake Fetchers.

6.7. `binconfig.bbclass`

The `binconfig` class helps to correct paths in shell scripts.

Before `pkg-config` had become widespread, libraries shipped shell scripts to give information about the libraries and include paths needed to build software (usually named `LIBNAME-config`). This class assists any recipe using such scripts.

During staging, the OpenEmbedded build system installs such scripts into the `sysroots/` directory. Inheriting this class results in all paths in these scripts being changed to point into the `sysroots/` directory so that all builds that use the script use the correct directories for the cross compiling layout. See the `BINCONFIG_GLOB` variable for more information.

6.8. `binconfig-disabled.bbclass`

An alternative version of the `binconfig` class, which disables binary configuration scripts by making them return an error in favor of using `pkg-config` to query the information. The scripts to be disabled should be specified using the `BINCONFIG` variable within the recipe inheriting the class.

6.9. `blacklist.bbclass`

The `blacklist` class prevents the OpenEmbedded build system from building specific recipes (blacklists them). To use this class, inherit the class globally and set `PNBLACKLIST` for each recipe you wish to blacklist. Specify the `PN` value as a variable flag (`varflag`) and provide a reason, which is reported, if the package is requested to be built as the value. For example, if you want to blacklist a recipe called "exoticware", you add the following to your `local.conf` or distribution configuration:

```
INHERIT += "blacklist"
PNBLACKLIST[exoticware] = "Not supported by our organization."
```

6.10. `buildhistory.bbclass`

The `buildhistory` class records a history of build output metadata, which can be used to detect possible regressions as well as used for analysis of the build output. For more information on using Build History, see the "Maintaining Build Output Quality [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#maintaining-build-output-quality>]" section in the Yocto Project Development Tasks Manual.

6.11. `buildstats.bbclass`

The `buildstats` class records performance statistics about each task executed during the build (e.g. elapsed time, CPU usage, and I/O usage).

When you use this class, the output goes into the `BUILDSTATS_BASE` directory, which defaults to `${TMPDIR}/buildstats/`. You can analyze the elapsed time using `scripts/pybootchartgui/pybootchartgui.py`, which produces a cascading chart of the entire build process and can be useful for highlighting bottlenecks.

Collecting build statistics is enabled by default through the `USER_CLASSES` variable from your `local.conf` file. Consequently, you do not have to do anything to enable the class. However, if you want to disable the class, simply remove "buildstats" from the `USER_CLASSES` list.

6.12. `buildstats-summary.bbclass`

When inherited globally, prints statistics at the end of the build on `sstate` re-use. In order to function, this class requires the `buildstats` class be enabled.

6.13. `ccache.bbclass`

The `ccache` class enables the C/C++ Compiler Cache for the build. This class is used to give a minor performance boost during the build. However, using the class can lead to unexpected side-effects. Thus, it is recommended that you do not use this class. See <http://ccache.samba.org/> for information on the C/C++ Compiler Cache.

6.14. chrpath.bbclass

The chrpath class is a wrapper around the "chrpath" utility, which is used during the build process for nativesdk, cross, and cross-canadian recipes to change RPATH records within binaries in order to make them relocatable.

6.15. clutter.bbclass

The clutter class consolidates the major and minor version naming and other common items used by Clutter and related recipes.

Note

Unlike some other classes related to specific libraries, recipes building other software that uses Clutter do not need to inherit this class unless they use the same recipe versioning scheme that the Clutter and related recipes do.

6.16. cmake.bbclass

The cmake class allows for recipes that need to build software using the CMake [<https://cmake.org/overview/>] build system. You can use the EXTRA_OECMAKE variable to specify additional configuration options to be passed using the cmake command line.

On the occasion that you would be installing custom CMake toolchain files supplied by the application being built, you should install them to the preferred CMake Module directory: `${D}${datadir}/cmake/ Modules` during `do_install` [<http://www.yoctoproject.org/docs/3.0.3/ref-manual/ref-manual.html#ref-tasks-install>].

6.17. cml1.bbclass

The cml1 class provides basic support for the Linux kernel style build configuration system.

6.18. compress_doc.bbclass

Enables compression for man pages and info pages. This class is intended to be inherited globally. The default compression mechanism is gz (gzip) but you can select an alternative mechanism by setting the DOC_COMPRESS variable.

6.19. copyleft_compliance.bbclass

The copyleft_compliance class preserves source code for the purposes of license compliance. This class is an alternative to the archiver class and is still used by some users even though it has been deprecated in favor of the archiver class.

6.20. copyleft_filter.bbclass

A class used by the archiver and copyleft_compliance classes for filtering licenses. The copyleft_filter class is an internal class and is not intended to be used directly.

6.21. core-image.bbclass

The core-image class provides common definitions for the core-image-* image recipes, such as support for additional IMAGE_FEATURES.

6.22. cpan*.bbclass

The cpan* classes support Perl modules.

Recipes for Perl modules are simple. These recipes usually only need to point to the source's archive and then inherit the proper class file. Building is split into two methods depending on which method the module authors used.

- Modules that use old `Makefile.PL`-based build system require `cpan.bbclass` in their recipes.
- Modules that use `Build.PL`-based build system require using `cpan_build.bbclass` in their recipes.

Both build methods inherit the `cpan`-base class for basic Perl support.

6.23. `cross.bbclass`

The `cross` class provides support for the recipes that build the cross-compilation tools.

6.24. `cross-canadian.bbclass`

The `cross-canadian` class provides support for the recipes that build the Canadian Cross-compilation tools for SDKs. See the "Cross-Development Toolchain Generation [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#cross-development-toolchain-generation>]" section in the Yocto Project Overview and Concepts Manual for more discussion on these cross-compilation tools.

6.25. `crosssdk.bbclass`

The `crosssdk` class provides support for the recipes that build the cross-compilation tools used for building SDKs. See the "Cross-Development Toolchain Generation [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#cross-development-toolchain-generation>]" section in the Yocto Project Overview and Concepts Manual for more discussion on these cross-compilation tools.

6.26. `debian.bbclass`

The `debian` class renames output packages so that they follow the Debian naming policy (i.e. `glibc` becomes `libc6` and `glibc-devel` becomes `libc6-dev`.) Renaming includes the library name and version as part of the package name.

If a recipe creates packages for multiple libraries (shared object files of `.so` type), use the `LEAD_SONAME` variable in the recipe to specify the library on which to apply the naming scheme.

6.27. `deploy.bbclass`

The `deploy` class handles deploying files to the `DEPLOY_DIR_IMAGE` directory. The main function of this class is to allow the `deploy` step to be accelerated by shared state. Recipes that inherit this class should define their own `do_deploy` function to copy the files to be deployed to `DEPLOYDIR`, and use `addtask` to add the task at the appropriate place, which is usually after `do_compile` or `do_install`. The class then takes care of staging the files from `DEPLOYDIR` to `DEPLOY_DIR_IMAGE`.

6.28. `devshell.bbclass`

The `devshell` class adds the `do_devshell` task. Distribution policy dictates whether to include this class. See the "Using a Development Shell [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#platdev-appdev-devshell>]" section in the Yocto Project Development Tasks Manual for more information about using `devshell`.

6.29. `devupstream.bbclass`

The `devupstream` class uses `BBCLASSEXTEND` to add a variant of the recipe that fetches from an alternative URI (e.g. Git) instead of a tarball. Following is an example:

```
BBCLASSEXTEND = "devupstream:target"
SRC_URI_class-devupstream = "git://git.example.com/example"
SRCREV_class-devupstream = "abcd1234"
```

Adding the above statements to your recipe creates a variant that has `DEFAULT_PREFERENCE` set to `"-1"`. Consequently, you need to select the variant of the recipe to use it. Any development-specific adjustments can be done by using the `class-devupstream` override. Here is an example:

```
DEPENDS_append_class-devupstream = " gperf-native"

do_configure_prepend_class-devupstream() {
    touch ${S}/README
}
```

The class currently only supports creating a development variant of the target recipe, not native or nativesdk variants.

The `BBCLASSEXTEND` syntax (i.e. `devupstream:target`) provides support for native and nativesdk variants. Consequently, this functionality can be added in a future release.

Support for other version control systems such as Subversion is limited due to BitBake's automatic fetch dependencies (e.g. `subversion-native`).

6.30. `distro_features_check.bbclass`

The `distro_features_check` class allows individual recipes to check for required and conflicting `DISTRO_FEATURES`.

This class provides support for the `REQUIRED_DISTRO_FEATURES` and `CONFLICT_DISTRO_FEATURES` variables. If any conditions specified in the recipe using the above variables are not met, the recipe will be skipped.

6.31. `distutils*.bbclass`

The `distutils*` classes support recipes for Python version 2.x extensions, which are simple. These recipes usually only need to point to the source's archive and then inherit the proper class. Building is split into two methods depending on which method the module authors used.

- Extensions that use an Autotools-based build system require Autotools and the classes based on `distutils` in their recipes.
- Extensions that use build systems based on `distutils` require the `distutils` class in their recipes.
- Extensions that use build systems based on `setuptools` require the `setuptools` class in their recipes.

The `distutils-common-base` class is required by some of the `distutils*` classes to provide common Python2 support.

6.32. `distutils3*.bbclass`

The `distutils3*` classes support recipes for Python version 3.x extensions, which are simple. These recipes usually only need to point to the source's archive and then inherit the proper class. Building is split into three methods depending on which method the module authors used.

- Extensions that use an Autotools-based build system require Autotools and `distutils`-based classes in their recipes.
- Extensions that use `distutils`-based build systems require the `distutils` class in their recipes.
- Extensions that use build systems based on `setuptools3` require the `setuptools3` class in their recipes.

The `distutils3*` classes either inherit their corresponding `distutils*` class or replicate them using a Python3 version instead (e.g. `distutils3-base` inherits `distutils-common-base`, which is the same as `distutils-base` but inherits `python3native` instead of `pythonnative`).

6.33. `externalsrc.bbclass`

The `externalsrc` class supports building software from source code that is external to the OpenEmbedded build system. Building software from an external source tree means that the build system's normal fetch, unpack, and patch process is not used.

By default, the OpenEmbedded build system uses the `S` and `B` variables to locate unpacked recipe source code and to build it, respectively. When your recipe inherits the `externalsrc` class, you use the `EXTERNALSRC` and `EXTERNALSRC_BUILD` variables to ultimately define `S` and `B`.

By default, this class expects the source code to support recipe builds that use the `B` variable to point to the directory in which the OpenEmbedded build system places the generated objects built from the recipes. By default, the `B` directory is set to the following, which is separate from the source directory (`S`):

```
${WORKDIR}/${BPN}/${PV}/
```

See these variables for more information: `WORKDIR`, `BPN`, and `PV`,

For more information on the `externalsrc` class, see the comments in `meta/classes/externalsrc.bbclass` in the Source Directory. For information on how to use the `externalsrc` class, see the "Building Software from an External Source [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#building-software-from-an-external-source>]" section in the Yocto Project Development Tasks Manual.

6.34. `extrausers.bbclass`

The `extrausers` class allows additional user and group configuration to be applied at the image level. Inheriting this class either globally or from an image recipe allows additional user and group operations to be performed using the `EXTRA_USERS_PARAMS` variable.

Note

The user and group operations added using the `extrausers` class are not tied to a specific recipe outside of the recipe for the image. Thus, the operations can be performed across the image as a whole. Use the `useradd` class to add user and group configuration to a specific recipe.

Here is an example that uses this class in an image recipe:

```
inherit extrausers
EXTRA_USERS_PARAMS = "\
    useradd -p '' tester; \
    groupadd developers; \
    userdel nobody; \
    groupdel -g video; \
    groupmod -g 1020 developers; \
    usermod -s /bin/sh tester; \
"
```

Here is an example that adds two users named "tester-jim" and "tester-sue" and assigns passwords:

```
inherit extrausers
EXTRA_USERS_PARAMS = "\
    useradd -P tester01 tester-jim; \
    useradd -P tester01 tester-sue; \
"
```


Finally, here is an example that sets the root password to "1876*18":

```
inherit extrausers
EXTRA_USERS_PARAMS = "\
    usermod -P 1876*18 root; \
"
```

6.35. fontcache.bbclass

The fontcache class generates the proper post-install and post-remove (postinst and postrm) scriptlets for font packages. These scriptlets call fc-cache (part of Fontconfig) to add the fonts to the font information cache. Since the cache files are architecture-specific, fc-cache runs using QEMU if the postinst scriptlets need to be run on the build host during image creation.

If the fonts being installed are in packages other than the main package, set FONT_PACKAGES to specify the packages containing the fonts.

6.36. fs-uuid.bbclass

The fs-uuid class extracts UUID from \${R00TFS}, which must have been built by the time that this function gets called. The fs-uuid class only works on ext file systems and depends on tune2fs.

6.37. gconf.bbclass

The gconf class provides common functionality for recipes that need to install GConf schemas. The schemas will be put into a separate package (\${PN}-gconf) that is created automatically when this class is inherited. This package uses the appropriate post-install and post-remove (postinst/postrm) scriptlets to register and unregister the schemas in the target image.

6.38. gettext.bbclass

The gettext class provides support for building software that uses the GNU gettext internationalization and localization system. All recipes building software that use gettext should inherit this class.

6.39. gnomebase.bbclass

The gnomebase class is the base class for recipes that build software from the GNOME stack. This class sets SRC_URI to download the source from the GNOME mirrors as well as extending FILES with the typical GNOME installation paths.

6.40. gobject-introspection.bbclass

Provides support for recipes building software that supports GObject introspection. This functionality is only enabled if the "gobject-introspection-data" feature is in DISTRO_FEATURES as well as "qemu-usermode" being in MACHINE_FEATURES.

Note

This functionality is backfilled by default and, if not applicable, should be disabled through DISTRO_FEATURES_BACKFILL_CONSIDERED or MACHINE_FEATURES_BACKFILL_CONSIDERED, respectively.

6.41. grub-efi.bbclass

The grub-efi class provides grub-efi-specific functions for building bootable images.

This class supports several variables:

- **INITRD**: Indicates list of filesystem images to concatenate and use as an initial RAM disk (initrd) (optional).
- **R00TFS**: Indicates a filesystem image to include as the root filesystem (optional).
- **GRUB_GFXSERIAL**: Set this to "1" to have graphics and serial in the boot menu.
- **LABELS**: A list of targets for the automatic configuration.
- **APPEND**: An override list of append strings for each LABEL.
- **GRUB_OPTS**: Additional options to add to the configuration (optional). Options are delimited using semi-colon characters (;).
- **GRUB_TIMEOUT**: Timeout before executing the default LABEL (optional).

6.42. **gsettings.bbclass**

The `gsettings` class provides common functionality for recipes that need to install GSettings (glib) schemas. The schemas are assumed to be part of the main package. Appropriate post-install and post-remove (postinst/postrm) scriptlets are added to register and unregister the schemas in the target image.

6.43. **gtk-doc.bbclass**

The `gtk-doc` class is a helper class to pull in the appropriate `gtk-doc` dependencies and disable `gtk-doc`.

6.44. **gtk-icon-cache.bbclass**

The `gtk-icon-cache` class generates the proper post-install and post-remove (postinst/postrm) scriptlets for packages that use GTK+ and install icons. These scriptlets call `gtk-update-icon-cache` to add the fonts to GTK+'s icon cache. Since the cache files are architecture-specific, `gtk-update-icon-cache` is run using QEMU if the postinst scriptlets need to be run on the build host during image creation.

6.45. **gtk-immodules-cache.bbclass**

The `gtk-immodules-cache` class generates the proper post-install and post-remove (postinst/postrm) scriptlets for packages that install GTK+ input method modules for virtual keyboards. These scriptlets call `gtk-update-icon-cache` to add the input method modules to the cache. Since the cache files are architecture-specific, `gtk-update-icon-cache` is run using QEMU if the postinst scriptlets need to be run on the build host during image creation.

If the input method modules being installed are in packages other than the main package, set `GTKIMMODULES_PACKAGES` to specify the packages containing the modules.

6.46. **gzipnative.bbclass**

The `gzipnative` class enables the use of different native versions of `gzip` and `pigz` rather than the versions of these tools from the build host.

6.47. **icecc.bbclass**

The `icecc` class supports Icecream [<https://github.com/icecc/icecream>], which facilitates taking compile jobs and distributing them among remote machines.

The class stages directories with symlinks from `gcc` and `g++` to `icecc`, for both native and cross compilers. Depending on each configure or compile, the OpenEmbedded build system adds the directories at the head of the `PATH` list and then sets the `ICECC_CXX` and `ICEC_CC` variables, which are the paths to the `g++` and `gcc` compilers, respectively.

For the cross compiler, the class creates a `tar.gz` file that contains the Yocto Project toolchain and sets `ICECC_VERSION`, which is the version of the cross-compiler used in the cross-development toolchain, accordingly.

The class handles all three different compile stages (i.e native ,cross-kernel and target) and creates the necessary environment `tar.gz` file to be used by the remote machines. The class also supports SDK generation.

If `ICECC_PATH` is not set in your `local.conf` file, then the class tries to locate the `icecc` binary using `which`. If `ICECC_ENV_EXEC` is set in your `local.conf` file, the variable should point to the `icecc-create-env` script provided by the user. If you do not point to a user-provided script, the build system uses the default script provided by the recipe `icecc-create-env-native.bb`.

Note

This script is a modified version and not the one that comes with `icecc`.

If you do not want the Icecream distributed compile support to apply to specific recipes or classes, you can effectively "blacklist" them by listing the recipes and classes using the `ICECC_USER_PACKAGE_BL` and `ICECC_USER_CLASS_BL`, variables, respectively, in your `local.conf` file. Doing so causes the OpenEmbedded build system to handle these compilations locally.

Additionally, you can list recipes using the `ICECC_USER_PACKAGE_WL` variable in your `local.conf` file to force `icecc` to be enabled for recipes using an empty `PARALLEL_MAKE` variable.

Inheriting the `icecc` class changes all sstate signatures. Consequently, if a development team has a dedicated build system that populates `STATE_MIRRORS` and they want to reuse sstate from `STATE_MIRRORS`, then all developers and the build system need to either inherit the `icecc` class or nobody should.

At the distribution level, you can inherit the `icecc` class to be sure that all builders start with the same sstate signatures. After inheriting the class, you can then disable the feature by setting the `ICECC_DISABLED` variable to "1" as follows:

```
INHERIT_DISTRO_append = " icecc"
ICECC_DISABLED ??= "1"
```

This practice makes sure everyone is using the same signatures but also requires individuals that do want to use Icecream to enable the feature individually as follows in your `local.conf` file:

```
ICECC_DISABLED = ""
```

6.48. `image.bbclass`

The `image` class helps support creating images in different formats. First, the root filesystem is created from packages using one of the `rootfs*.bbclass` files (depending on the package format used) and then one or more image files are created.

- The `IMAGE_FSTYPES` variable controls the types of images to generate.
- The `IMAGE_INSTALL` variable controls the list of packages to install into the image.

For information on customizing images, see the "Customizing Images [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#usingpoky-extend-customimage>]" section in the Yocto Project Development Tasks Manual. For information on how images are created, see the "Images [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#images-dev-environment>]" section in the Yocto Project Overview and Concepts Manual.

6.49. `image-buildinfo.bbclass`

The `image-buildinfo` class writes information to the target filesystem on `/etc/build`.

6.50. `image_types.bbclass`

The `image_types` class defines all of the standard image output types that you can enable through the `IMAGE_FSTYPES` variable. You can use this class as a reference on how to add support for custom image output types.

By default, the `image` class automatically enables the `image_types` class. The `image` class uses the `IMGCLASSES` variable as follows:

```
IMGCLASSES = "rootfs_${IMAGE_PKGTYPE} image_types ${IMAGE_CLASSES}"
IMGCLASSES += "${@[ 'populate_sdk_base', 'populate_sdk_ext' ]['linux' in d.getVar("SDK_OS")]}"
IMGCLASSES += "${@bb.utils.contains_any('IMAGE_FSTYPES', 'live iso hddimg', 'image-live', '')}"
IMGCLASSES += "${@bb.utils.contains('IMAGE_FSTYPES', 'container', 'image-container', '', d)}"
IMGCLASSES += "image_types_wic"
IMGCLASSES += "rootfs-postcommands"
IMGCLASSES += "image-postinst-intercepts"
inherit ${IMGCLASSES}
```

The `image_types` class also handles conversion and compression of images.

Note

To build a VMware VMDK image, you need to add `"wic.vmdk"` to `IMAGE_FSTYPES`. This would also be similar for Virtual Box Virtual Disk Image (`"vdi"`) and QEMU Copy On Write Version 2 (`"qcow2"`) images.

6.51. `image-live.bbclass`

This class controls building "live" (i.e. HDDIMG and ISO) images. Live images contain `syslinux` for legacy booting, as well as the bootloader specified by `EFI_PROVIDER` if `MACHINE_FEATURES` contains `"efi"`.

Normally, you do not use this class directly. Instead, you add `"live"` to `IMAGE_FSTYPES`.

6.52. `image-mklibs.bbclass`

The `image-mklibs` class enables the use of the `mklibs` utility during the `do_rootfs` task, which optimizes the size of libraries contained in the image.

By default, the class is enabled in the `local.conf.template` using the `USER_CLASSES` variable as follows:

```
USER_CLASSES ?= "buildstats image-mklibs image-prelink"
```

6.53. `image-prelink.bbclass`

The `image-prelink` class enables the use of the `prelink` utility during the `do_rootfs` task, which optimizes the dynamic linking of shared libraries to reduce executable startup time.

By default, the class is enabled in the `local.conf.template` using the `USER_CLASSES` variable as follows:

```
USER_CLASSES ?= "buildstats image-mklibs image-prelink"
```

6.54. `insane.bbclass`

The `insane` class adds a step to the package generation process so that output quality assurance checks are generated by the OpenEmbedded build system. A range of checks are performed that

check the build's output for common problems that show up during runtime. Distribution policy usually dictates whether to include this class.

You can configure the sanity checks so that specific test failures either raise a warning or an error message. Typically, failures for new tests generate a warning. Subsequent failures for the same test would then generate an error message once the metadata is in a known and good condition. See the "QA Error and Warning Messages" Chapter for a list of all the warning and error messages you might encounter using a default configuration.

Use the `WARN_QA` and `ERROR_QA` variables to control the behavior of these checks at the global level (i.e. in your custom distro configuration). However, to skip one or more checks in recipes, you should use `INSANE_SKIP`. For example, to skip the check for symbolic link `.so` files in the main package of a recipe, add the following to the recipe. You need to realize that the package name override, in this example `${PN}`, must be used:

```
INSANE_SKIP_${PN} += "dev-so"
```

Please keep in mind that the QA checks exist in order to detect real or potential problems in the packaged output. So exercise caution when disabling these checks.

The following list shows the tests you can list with the `WARN_QA` and `ERROR_QA` variables:

- `already-stripped`: Checks that produced binaries have not already been stripped prior to the build system extracting debug symbols. It is common for upstream software projects to default to stripping debug symbols for output binaries. In order for debugging to work on the target using `-dbg` packages, this stripping must be disabled.
- `arch`: Checks the Executable and Linkable Format (ELF) type, bit size, and endianness of any binaries to ensure they match the target architecture. This test fails if any binaries do not match the type since there would be an incompatibility. The test could indicate that the wrong compiler or compiler options have been used. Sometimes software, like bootloaders, might need to bypass this check.
- `buildpaths`: Checks for paths to locations on the build host inside the output files. Currently, this test triggers too many false positives and thus is not normally enabled.
- `build-deps`: Determines if a build-time dependency that is specified through `DEPENDS`, explicit `RDEPENDS`, or task-level dependencies exists to match any runtime dependency. This determination is particularly useful to discover where runtime dependencies are detected and added during packaging. If no explicit dependency has been specified within the metadata, at the packaging stage it is too late to ensure that the dependency is built, and thus you can end up with an error when the package is installed into the image during the `do_rootfs` task because the auto-detected dependency was not satisfied. An example of this would be where the `update-rc.d` class automatically adds a dependency on the `initscripts-functions` package to packages that install an `initscript` that refers to `/etc/init.d/functions`. The recipe should really have an explicit `RDEPENDS` for the package in question on `initscripts-functions` so that the OpenEmbedded build system is able to ensure that the `initscripts` recipe is actually built and thus the `initscripts-functions` package is made available.
- `compile-host-path`: Checks the `do_compile` log for indications that paths to locations on the build host were used. Using such paths might result in host contamination of the build output.
- `debug-deps`: Checks that all packages except `-dbg` packages do not depend on `-dbg` packages, which would cause a packaging bug.
- `debug-files`: Checks for `.debug` directories in anything but the `-dbg` package. The debug files should all be in the `-dbg` package. Thus, anything packaged elsewhere is incorrect packaging.
- `dep-cmp`: Checks for invalid version comparison statements in runtime dependency relationships between packages (i.e. in `RDEPENDS`, `RRECOMMENDS`, `RSUGGESTS`, `RPROVIDES`, `RREPLACES`, and `RCONFLICTS` variable values). Any invalid comparisons might trigger failures or undesirable behavior when passed to the package manager.
- `desktop`: Runs the `desktop-file-validate` program against any `.desktop` files to validate their contents against the specification for `.desktop` files.

- **dev-deps**: Checks that all packages except `-dev` or `-staticdev` packages do not depend on `-dev` packages, which would be a packaging bug.
- **dev-so**: Checks that the `.so` symbolic links are in the `-dev` package and not in any of the other packages. In general, these symlinks are only useful for development purposes. Thus, the `-dev` package is the correct location for them. Some very rare cases do exist for dynamically loaded modules where these symlinks are needed instead in the main package.
- **file-rdeps**: Checks that file-level dependencies identified by the OpenEmbedded build system at packaging time are satisfied. For example, a shell script might start with the line `#!/bin/bash`. This line would translate to a file dependency on `/bin/bash`. Of the three package managers that the OpenEmbedded build system supports, only RPM directly handles file-level dependencies, resolving them automatically to packages providing the files. However, the lack of that functionality in the other two package managers does not mean the dependencies do not still need resolving. This QA check attempts to ensure that explicitly declared `RDEPENDS` exist to handle any file-level dependency detected in packaged files.
- **files-invalid**: Checks for `FILES` variable values that contain `"/"`, which is invalid.
- **host-user-contaminated**: Checks that no package produced by the recipe contains any files outside of `/home` with a user or group ID that matches the user running BitBake. A match usually indicates that the files are being installed with an incorrect UID/GID, since target IDs are independent from host IDs. For additional information, see the section describing the `do_install` task.
- **incompatible-license**: Report when packages are excluded from being created due to being marked with a license that is in `INCOMPATIBLE_LICENSE`.
- **install-host-path**: Checks the `do_install` log for indications that paths to locations on the build host were used. Using such paths might result in host contamination of the build output.
- **installed-vs-shipped**: Reports when files have been installed within `do_install` but have not been included in any package by way of the `FILES` variable. Files that do not appear in any package cannot be present in an image later on in the build process. Ideally, all installed files should be packaged or not installed at all. These files can be deleted at the end of `do_install` if the files are not needed in any package.
- **invalid-chars**: Checks that the recipe metadata variables `DESCRIPTION`, `SUMMARY`, `LICENSE`, and `SECTION` do not contain non-UTF-8 characters. Some package managers do not support such characters.
- **invalid-packageconfig**: Checks that no undefined features are being added to `PACKAGECONFIG`. For example, any name `"foo"` for which the following form does not exist:

```
PACKAGECONFIG[foo] = "..."
```

- **la**: Checks `.la` files for any `TMPLDIR` paths. Any `.la` file containing these paths is incorrect since `libtool` adds the correct `sysroot` prefix when using the files automatically itself.
- **ldflags**: Ensures that the binaries were linked with the `LDFLAGS` options provided by the build system. If this test fails, check that the `LDFLAGS` variable is being passed to the linker command.
- **libdir**: Checks for libraries being installed into incorrect (possibly hardcoded) installation paths. For example, this test will catch recipes that install `/lib/bar.so` when `${base_libdir}` is `"lib32"`. Another example is when recipes install `/usr/lib64/foo.so` when `${libdir}` is `"usr/lib"`.
- **libexec**: Checks if a package contains files in `/usr/libexec`. This check is not performed if the `libexecdir` variable has been set explicitly to `/usr/libexec`.
- **packages-list**: Checks for the same package being listed multiple times through the `PACKAGES` variable value. Installing the package in this manner can cause errors during packaging.
- **perm-config**: Reports lines in `fs-perms.txt` that have an invalid format.
- **perm-line**: Reports lines in `fs-perms.txt` that have an invalid format.

- `perm-link`: Reports lines in `fs-perms.txt` that specify 'link' where the specified target already exists.
- `perms`: Currently, this check is unused but reserved.
- `pkgconfig`: Checks `.pc` files for any `TMPDIR`/`WORKDIR` paths. Any `.pc` file containing these paths is incorrect since `pkg-config` itself adds the correct `sysroot` prefix when the files are accessed.
- `pkgname`: Checks that all packages in `PACKAGES` have names that do not contain invalid characters (i.e. characters other than 0-9, a-z, ., +, and -).
- `pkgv-undefined`: Checks to see if the `PKG_V` variable is undefined during `do_package`.
- `pkgvarcheck`: Checks through the variables `RDEPENDS`, `RRECOMMENDS`, `RSUGGESTS`, `RCONFLICTS`, `RPROVIDES`, `RREPLACES`, `FILES`, `ALLOW_EMPTY`, `pkg_preinst`, `pkg_postinst`, `pkg_prerm` and `pkg_postrm`, and reports if there are variable sets that are not package-specific. Using these variables without a package suffix is bad practice, and might unnecessarily complicate dependencies of other packages within the same recipe or have other unintended consequences.
- `pn-overrides`: Checks that a recipe does not have a name (PN) value that appears in `OVERRIDES`. If a recipe is named such that its PN value matches something already in `OVERRIDES` (e.g. PN happens to be the same as `MACHINE` or `DISTRO`), it can have unexpected consequences. For example, assignments such as `FILES_${PN} = "xyz"` effectively turn into `FILES = "xyz"`.
- `rpaths`: Checks for `rpaths` in the binaries that contain build system paths such as `TMPDIR`. If this test fails, bad `-rpath` options are being passed to the linker commands and your binaries have potential security issues.
- `split-strip`: Reports that splitting or stripping debug symbols from binaries has failed.
- `staticdev`: Checks for static library files (`*.a`) in non-`staticdev` packages.
- `symlink-to-sysroot`: Checks for symlinks in packages that point into `TMPDIR` on the host. Such symlinks will work on the host, but are clearly invalid when running on the target.
- `textrel`: Checks for ELF binaries that contain relocations in their `.text` sections, which can result in a performance impact at runtime. See the explanation for the ELF binary message for more information regarding runtime performance issues.
- `useless-rpaths`: Checks for dynamic library load paths (`rpaths`) in the binaries that by default on a standard system are searched by the linker (e.g. `/lib` and `/usr/lib`). While these paths will not cause any breakage, they do waste space and are unnecessary.
- `var-undefined`: Reports when variables fundamental to packaging (i.e. `WORKDIR`, `DEPLOY_DIR`, `D`, `PN`, and `PKG_D`) are undefined during `do_package`.
- `version-going-backwards`: If Build History is enabled, reports when a package being written out has a lower version than the previously written package under the same name. If you are placing output packages into a feed and upgrading packages on a target system using that feed, the version of a package going backwards can result in the target system not correctly upgrading to the "new" version of the package.

Note

If you are not using runtime package management on your target system, then you do not need to worry about this situation.

- `xorg-driver-abi`: Checks that all packages containing Xorg drivers have ABI dependencies. The `xserver-xorg` recipe provides driver ABI names. All drivers should depend on the ABI versions that they have been built against. Driver recipes that include `xorg-driver-input.inc` or `xorg-driver-video.inc` will automatically get these versions. Consequently, you should only need to explicitly add dependencies to binary driver recipes.

6.55. `insserv.bbclass`

The `insserv` class uses the `insserv` utility to update the order of symbolic links in `/etc/rc?.d/` within an image based on dependencies specified by LSB headers in the `init.d` scripts themselves.

6.56. `kernel.bbclass`

The `kernel` class handles building Linux kernels. The class contains code to build all kernel trees. All needed headers are staged into the `STAGING_KERNEL_DIR` directory to allow out-of-tree module builds using the `module` class.

This means that each built kernel module is packaged separately and inter-module dependencies are created by parsing the `modinfo` output. If all modules are required, then installing the `kernel-modules` package installs all packages with modules and various other kernel packages such as `kernel-vmlinux`.

The `kernel` class contains logic that allows you to embed an initial RAM filesystem (`initramfs`) image when you build the kernel image. For information on how to build an `initramfs`, see the "Building an Initial RAM Filesystem (`initramfs`) Image [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#building-an-initramfs-image>]" section in the Yocto Project Development Tasks Manual.

Various other classes are used by the `kernel` and `module` classes internally including the `kernel-arch`, `module-base`, and `linux-kernel-base` classes.

6.57. `kernel-arch.bbclass`

The `kernel-arch` class sets the `ARCH` environment variable for Linux kernel compilation (including modules).

6.58. `kernel-devicetree.bbclass`

The `kernel-devicetree` class, which is inherited by the `kernel` class, supports device tree generation.

6.59. `kernel-fitimage.bbclass`

The `kernel-fitimage` class provides support to pack `zImages`.

6.60. `kernel-grub.bbclass`

The `kernel-grub` class updates the boot area and the boot menu with the kernel as the priority boot mechanism while installing a RPM to update the kernel on a deployed target.

6.61. `kernel-module-split.bbclass`

The `kernel-module-split` class provides common functionality for splitting Linux kernel modules into separate packages.

6.62. `kernel-uboot.bbclass`

The `kernel-uboot` class provides support for building from `vmlinux`-style kernel sources.

6.63. `kernel-uimage.bbclass`

The `kernel-uimage` class provides support to pack `uimage`.

6.64. `kernel-yocto.bbclass`

The `kernel-yocto` class provides common functionality for building from `linux-yocto` style kernel source repositories.

6.65. `kernelsrc.bbclass`

The `kernelsrc` class sets the Linux kernel source and version.

6.66. **lib_package.bbclass**

The `lib_package` class supports recipes that build libraries and produce executable binaries, where those binaries should not be installed by default along with the library. Instead, the binaries are added to a separate `${PN}-bin` package to make their installation optional.

6.67. **libc*.bbclass**

The `libc*` classes support recipes that build packages with `libc`:

- The `libc-common` class provides common support for building with `libc`.
- The `libc-package` class supports packaging up `glibc` and `eglibc`.

6.68. **license.bbclass**

The `license` class provides license manifest creation and license exclusion. This class is enabled by default using the default value for the `INHERIT_DISTRO` variable.

6.69. **linux-kernel-base.bbclass**

The `linux-kernel-base` class provides common functionality for recipes that build out of the Linux kernel source tree. These builds goes beyond the kernel itself. For example, the `Perf` recipe also inherits this class.

6.70. **linuxloader.bbclass**

Provides the function `linuxloader()`, which gives the value of the dynamic loader/linker provided on the platform. This value is used by a number of other classes.

6.71. **logging.bbclass**

The `logging` class provides the standard shell functions used to log messages for various BitBake severity levels (i.e. `bbplain`, `bbnote`, `bbwarn`, `bberror`, `bbfatal`, and `bbdebug`).

This class is enabled by default since it is inherited by the base class.

6.72. **meta.bbclass**

The `meta` class is inherited by recipes that do not build any output packages themselves, but act as a "meta" target for building other recipes.

6.73. **metadata_scm.bbclass**

The `metadata_scm` class provides functionality for querying the branch and revision of a Source Code Manager (SCM) repository.

The base class uses this class to print the revisions of each layer before starting every build. The `metadata_scm` class is enabled by default because it is inherited by the base class.

6.74. **migrate_localcount.bbclass**

The `migrate_localcount` class verifies a recipe's `localcount` data and increments it appropriately.

6.75. **mime.bbclass**

The `mime` class generates the proper post-install and post-remove (`postinst`/`postrm`) scriptlets for packages that install MIME type files. These scriptlets call `update-mime-database` to add the MIME types to the shared database.

6.76. `mirrors.bbclass`

The `mirrors` class sets up some standard MIRRORS entries for source code mirrors. These mirrors provide a fall-back path in case the upstream source specified in `SRC_URI` within recipes is unavailable.

This class is enabled by default since it is inherited by the base class.

6.77. `module.bbclass`

The `module` class provides support for building out-of-tree Linux kernel modules. The class inherits the `module-base` and `kernel-module-split` classes, and implements the `do_compile` and `do_install` tasks. The class provides everything needed to build and package a kernel module.

For general information on out-of-tree Linux kernel modules, see the "Incorporating Out-of-Tree Modules [<http://www.yoctoproject.org/docs/3.0.3/kernel-dev/kernel-dev.html#incorporating-out-of-tree-modules>]" section in the Yocto Project Linux Kernel Development Manual.

6.78. `module-base.bbclass`

The `module-base` class provides the base functionality for building Linux kernel modules. Typically, a recipe that builds software that includes one or more kernel modules and has its own means of building the module inherits this class as opposed to inheriting the `module` class.

6.79. `multilib*.bbclass`

The `multilib*` classes provide support for building libraries with different target optimizations or target architectures and installing them side-by-side in the same image.

For more information on using the Multilib feature, see the "Combining Multiple Versions of Library Files into One Image [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#combining-multiple-versions-library-files-into-one-image>]" section in the Yocto Project Development Tasks Manual.

6.80. `native.bbclass`

The `native` class provides common functionality for recipes that build tools to run on the build host (i.e. tools that use the compiler or other tools from the build host).

You can create a recipe that builds tools that run natively on the host a couple different ways:

- Create a `myrecipe-native.bb` recipe that inherits the `native` class. If you use this method, you must order the `inherit` statement in the recipe after all other `inherit` statements so that the `native` class is inherited last.

Warning

When creating a recipe this way, the recipe name must follow this naming convention:

```
myrecipe-native.bb
```

Not using this naming convention can lead to subtle problems caused by existing code that depends on that naming convention.

- Create or modify a target recipe that contains the following:

```
BBCLASSEXTEND = "native"
```

Inside the recipe, use `_class-native` and `_class-target` overrides to specify any functionality specific to the respective native or target case.

Although applied differently, the native class is used with both methods. The advantage of the second method is that you do not need to have two separate recipes (assuming you need both) for native and target. All common parts of the recipe are automatically shared.

6.81. nativesdk.bbclass

The nativesdk class provides common functionality for recipes that wish to build tools to run as part of an SDK (i.e. tools that run on SDKMACHINE).

You can create a recipe that builds tools that run on the SDK machine a couple different ways:

- Create a nativesdk-myrecipe.bb recipe that inherits the nativesdk class. If you use this method, you must order the inherit statement in the recipe after all other inherit statements so that the nativesdk class is inherited last.
- Create a nativesdk variant of any recipe by adding the following:

```
BBCLASSEXTEND = "nativesdk"
```

Inside the recipe, use `_class-nativesdk` and `_class-target` overrides to specify any functionality specific to the respective SDK machine or target case.

Warning

When creating a recipe, you must follow this naming convention:

```
nativesdk-myrecipe.bb
```

Not doing so can lead to subtle problems because code exists that depends on the naming convention.

Although applied differently, the nativesdk class is used with both methods. The advantage of the second method is that you do not need to have two separate recipes (assuming you need both) for the SDK machine and the target. All common parts of the recipe are automatically shared.

6.82. nopackages.bbclass

Disables packaging tasks for those recipes and classes where packaging is not needed.

6.83. npm.bbclass

Provides support for building Node.js software fetched using the node package manager (NPM) [[https://en.wikipedia.org/wiki/Npm_\(software\)](https://en.wikipedia.org/wiki/Npm_(software))].

Note

Currently, recipes inheriting this class must use the `npm://` fetcher to have dependencies fetched and packaged automatically.

For information on how to create NPM packages, see the "Creating Node Package Manager (NPM) Packages" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#creating-node-package-manager-npm-packages>] section in the Yocto Project Development Tasks Manual.

6.84. oelint.bbclass

The oelint class is an obsolete lint checking tool that exists in meta/classes in the Source Directory.

A number of classes exist that could be generally useful in OE-Core but are never actually used within OE-Core itself. The oelint class is one such example. However, being aware of this class can reduce the proliferation of different versions of similar classes across multiple layers.

6.85. `own-mirrors.bbclass`

The `own-mirrors` class makes it easier to set up your own `PREMIRRORS` from which to first fetch source before attempting to fetch it from the upstream specified in `SRC_URI` within each recipe.

To use this class, inherit it globally and specify `SOURCE_MIRROR_URL`. Here is an example:

```
INHERIT += "own-mirrors"
SOURCE_MIRROR_URL = "http://example.com/my-source-mirror"
```

You can specify only a single URL in `SOURCE_MIRROR_URL`.

6.86. `package.bbclass`

The `package` class supports generating packages from a build's output. The core generic functionality is in `package.bbclass`. The code specific to particular package types resides in these package-specific classes: `package_deb`, `package_rpm`, `package_ipk`, and `package_tar`.

Warning

The `package_tar` class is broken and not supported. It is recommended that you do not use this class.

You can control the list of resulting package formats by using the `PACKAGE_CLASSES` variable defined in your `conf/local.conf` configuration file, which is located in the Build Directory. When defining the variable, you can specify one or more package types. Since images are generated from packages, a packaging class is needed to enable image generation. The first class listed in this variable is used for image generation.

If you take the optional step to set up a repository (package feed) on the development host that can be used by DNF, you can install packages from the feed while you are running the image on the target (i.e. runtime installation of packages). For more information, see the "Using Runtime Package Management [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#using-runtime-package-management>]" section in the Yocto Project Development Tasks Manual.

The package-specific class you choose can affect build-time performance and has space ramifications. In general, building a package with IPK takes about thirty percent less time as compared to using RPM to build the same or similar package. This comparison takes into account a complete build of the package with all dependencies previously built. The reason for this discrepancy is because the RPM package manager creates and processes more Metadata than the IPK package manager. Consequently, you might consider setting `PACKAGE_CLASSES` to `"package_ipk"` if you are building smaller systems.

Before making your package manager decision, however, you should consider some further things about using RPM:

- RPM starts to provide more abilities than IPK due to the fact that it processes more Metadata. For example, this information includes individual file types, file checksum generation and evaluation on install, sparse file support, conflict detection and resolution for Multilib systems, ACID style upgrade, and repackaging abilities for rollbacks.
- For smaller systems, the extra space used for the Berkeley Database and the amount of metadata when using RPM can affect your ability to perform on-device upgrades.

You can find additional information on the effects of the package class at these two Yocto Project mailing list links:

- <https://lists.yoctoproject.org/pipermail/poky/2011-May/006362.html> [<http://lists.yoctoproject.org/pipermail/poky/2011-May/006362.html>]
- <https://lists.yoctoproject.org/pipermail/poky/2011-May/006363.html> [<http://lists.yoctoproject.org/pipermail/poky/2011-May/006363.html>]

6.87. `package_deb.bbclass`

The `package_deb` class provides support for creating packages that use the Debian (i.e. `.deb`) file format. The class ensures the packages are written out in a `.deb` file format to the `${DEPLOY_DIR_DEB}` directory.

This class inherits the `package` class and is enabled through the `PACKAGE_CLASSES` variable in the `local.conf` file.

6.88. `package_ipk.bbclass`

The `package_ipk` class provides support for creating packages that use the IPK (i.e. `.ipk`) file format. The class ensures the packages are written out in a `.ipk` file format to the `${DEPLOY_DIR_IPK}` directory.

This class inherits the `package` class and is enabled through the `PACKAGE_CLASSES` variable in the `local.conf` file.

6.89. `package_rpm.bbclass`

The `package_rpm` class provides support for creating packages that use the RPM (i.e. `.rpm`) file format. The class ensures the packages are written out in a `.rpm` file format to the `${DEPLOY_DIR_RPM}` directory.

This class inherits the `package` class and is enabled through the `PACKAGE_CLASSES` variable in the `local.conf` file.

6.90. `package_tar.bbclass`

The `package_tar` class provides support for creating tarballs. The class ensures the packages are written out in a tarball format to the `${DEPLOY_DIR_TAR}` directory.

This class inherits the `package` class and is enabled through the `PACKAGE_CLASSES` variable in the `local.conf` file.

Note

You cannot specify the `package_tar` class first using the `PACKAGE_CLASSES` variable. You must use `.deb`, `.ipk`, or `.rpm` file formats for your image or SDK.

6.91. `packagedata.bbclass`

The `packagedata` class provides common functionality for reading `pkgdata` files found in `PKGDATA_DIR`. These files contain information about each output package produced by the OpenEmbedded build system.

This class is enabled by default because it is inherited by the `package` class.

6.92. `packagegroup.bbclass`

The `packagegroup` class sets default values appropriate for package group recipes (e.g. `PACKAGES`, `PACKAGE_ARCH`, `ALLOW_EMPTY`, and so forth). It is highly recommended that all package group recipes inherit this class.

For information on how to use this class, see the "Customizing Images Using Custom Package Groups [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#usingpoky-extend-customimage-customtasks>]" section in the Yocto Project Development Tasks Manual.

Previously, this class was called the `task` class.

6.93. `patch.bbclass`

The `patch` class provides all functionality for applying patches during the `do_patch` task.

This class is enabled by default because it is inherited by the base class.

6.94. **perlnative.bbclass**

When inherited by a recipe, the `perlnative` class supports using the native version of Perl built by the build system rather than using the version provided by the build host.

6.95. **pixbufcache.bbclass**

The `pixbufcache` class generates the proper post-install and post-remove (`postinst/postrm`) scriptlets for packages that install `pixbuf` loaders, which are used with `gdk-pixbuf`. These scriptlets call `update_pixbuf_cache` to add the `pixbuf` loaders to the cache. Since the cache files are architecture-specific, `update_pixbuf_cache` is run using QEMU if the `postinst` scriptlets need to be run on the build host during image creation.

If the `pixbuf` loaders being installed are in packages other than the recipe's main package, set `PIXBUF_PACKAGES` to specify the packages containing the loaders.

6.96. **pkgconfig.bbclass**

The `pkgconfig` class provides a standard way to get header and library information by using `pkg-config`. This class aims to smooth integration of `pkg-config` into libraries that use it.

During staging, BitBake installs `pkg-config` data into the `sysroots/` directory. By making use of `sysroot` functionality within `pkg-config`, the `pkgconfig` class no longer has to manipulate the files.

6.97. **populate_sdk.bbclass**

The `populate_sdk` class provides support for SDK-only recipes. For information on advantages gained when building a cross-development toolchain using the `do_populate_sdk` task, see the "Building an SDK Installer [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-building-an-sdk-installer>]" section in the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) manual.

6.98. **populate_sdk_*.bbclass**

The `populate_sdk_*` classes support SDK creation and consist of the following classes:

- `populate_sdk_base`: The base class supporting SDK creation under all package managers (i.e. DEB, RPM, and `opkg`).
- `populate_sdk_deb`: Supports creation of the SDK given the Debian package manager.
- `populate_sdk_rpm`: Supports creation of the SDK given the RPM package manager.
- `populate_sdk_ipk`: Supports creation of the SDK given the `opkg` (IPK format) package manager.
- `populate_sdk_ext`: Supports extensible SDK creation under all package managers.

The `populate_sdk_base` class inherits the appropriate `populate_sdk_*` (i.e. `deb`, `rpm`, and `ipk`) based on `IMAGE_PKGTYPE`.

The base class ensures all source and destination directories are established and then populates the SDK. After populating the SDK, the `populate_sdk_base` class constructs two `sysroots`: `${SDK_ARCH}-nativesdk`, which contains the cross-compiler and associated tooling, and the target, which contains a target root filesystem that is configured for the SDK usage. These two images reside in `SDK_OUTPUT`, which consists of the following:

```
${SDK_OUTPUT}/${SDK_ARCH}-nativesdk-pkgs  
${SDK_OUTPUT}/${SDKTARGETSYSROOT}/target-pkgs
```

Finally, the base `populate SDK` class creates the toolchain environment setup script, the tarball of the SDK, and the installer.

The respective `populate_sdk_deb`, `populate_sdk_rpm`, and `populate_sdk_ipk` classes each support the specific type of SDK. These classes are inherited by and used with the `populate_sdk_base` class.

For more information on the cross-development toolchain generation, see the "Cross-Development Toolchain Generation [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#cross-development-toolchain-generation>]" section in the Yocto Project Overview and Concepts Manual. For information on advantages gained when building a cross-development toolchain using the `do_populate_sdk` task, see the "Building an SDK Installer [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-building-an-sdk-installer>]" section in the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) manual.

6.99. `prexport.bbclass`

The `prexport` class provides functionality for exporting PR values.

Note

This class is not intended to be used directly. Rather, it is enabled when using "`bitbake-prserv-tool export`".

6.100. `primport.bbclass`

The `primport` class provides functionality for importing PR values.

Note

This class is not intended to be used directly. Rather, it is enabled when using "`bitbake-prserv-tool import`".

6.101. `prserv.bbclass`

The `prserv` class provides functionality for using a PR service [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#working-with-a-pr-service>] in order to automatically manage the incrementing of the PR variable for each recipe.

This class is enabled by default because it is inherited by the package class. However, the OpenEmbedded build system will not enable the functionality of this class unless `PRSERV_HOST` has been set.

6.102. `ptest.bbclass`

The `ptest` class provides functionality for packaging and installing runtime tests for recipes that build software that provides these tests.

This class is intended to be inherited by individual recipes. However, the class' functionality is largely disabled unless "`ptest`" appears in `DISTRO_FEATURES`. See the "Testing Packages With `ptest`" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#testing-packages-with-ptest>]" section in the Yocto Project Development Tasks Manual for more information on `ptest`.

6.103. `ptest-gnome.bbclass`

Enables package tests (ptests) specifically for GNOME packages, which have tests intended to be executed with `gnome-desktop-testing`.

For information on setting up and running ptests, see the "Testing Packages With `ptest`" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#testing-packages-with-ptest>]" section in the Yocto Project Development Tasks Manual.

6.104. `python-dir.bbclass`

The `python-dir` class provides the base version, location, and site package location for Python.

6.105. `python3native.bbclass`

The `python3native` class supports using the native version of Python 3 built by the build system rather than support of the version provided by the build host.

6.106. `pythonnative.bbclass`

When inherited by a recipe, the `pythonnative` class supports using the native version of Python built by the build system rather than using the version provided by the build host.

6.107. `qemu.bbclass`

The `qemu` class provides functionality for recipes that either need QEMU or test for the existence of QEMU. Typically, this class is used to run programs for a target system on the build host using QEMU's application emulation mode.

6.108. `recipe_sanity.bbclass`

The `recipe_sanity` class checks for the presence of any host system recipe prerequisites that might affect the build (e.g. variables that are set or software that is present).

6.109. `relocatable.bbclass`

The `relocatable` class enables relocation of binaries when they are installed into the sysroot.

This class makes use of the `chrtpath` class and is used by both the cross and native classes.

6.110. `remove-libtool.bbclass`

The `remove-libtool` class adds a post function to the `do_install` task to remove all `.la` files installed by `libtool`. Removing these files results in them being absent from both the sysroot and target packages.

If a recipe needs the `.la` files to be installed, then the recipe can override the removal by setting `REMOVE_LIBTOOL_LA` to `"0"` as follows:

```
REMOVE_LIBTOOL_LA = "0"
```

Note

The `remove-libtool` class is not enabled by default.

6.111. `report-error.bbclass`

The `report-error` class supports enabling the error reporting tool [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#using-the-error-reporting-tool>], which allows you to submit build error information to a central database.

The class collects debug information for recipe, recipe version, task, machine, distro, build system, target system, host distro, branch, commit, and log. From the information, report files using a JSON format are created and stored in `${LOG_DIR}/error-report`.

6.112. `rm_work.bbclass`

The `rm_work` class supports deletion of temporary workspace, which can ease your hard drive demands during builds.

The OpenEmbedded build system can use a substantial amount of disk space during the build process. A portion of this space is the work files under the `${TMPDIR}/work` directory for each recipe. Once the

build system generates the packages for a recipe, the work files for that recipe are no longer needed. However, by default, the build system preserves these files for inspection and possible debugging purposes. If you would rather have these files deleted to save disk space as the build progresses, you can enable `rm_work` by adding the following to your `local.conf` file, which is found in the Build Directory.

```
INHERIT += "rm_work"
```

If you are modifying and building source code out of the work directory for a recipe, enabling `rm_work` will potentially result in your changes to the source being lost. To exclude some recipes from having their work directories deleted by `rm_work`, you can add the names of the recipe or recipes you are working on to the `RM_WORK_EXCLUDE` variable, which can also be set in your `local.conf` file. Here is an example:

```
RM_WORK_EXCLUDE += "busybox glibc"
```

6.113. `rootfs*.bbclass`

The `rootfs*` classes support creating the root filesystem for an image and consist of the following classes:

- The `rootfs-postcommands` class, which defines filesystem post-processing functions for image recipes.
- The `rootfs_deb` class, which supports creation of root filesystems for images built using `.deb` packages.
- The `rootfs_rpm` class, which supports creation of root filesystems for images built using `.rpm` packages.
- The `rootfs_ipk` class, which supports creation of root filesystems for images built using `.ipk` packages.
- The `rootfsdebugfiles` class, which installs additional files found on the build host directly into the root filesystem.

The root filesystem is created from packages using one of the `rootfs*.bbclass` files as determined by the `PACKAGE_CLASSES` variable.

For information on how root filesystem images are created, see the "Image Generation [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#image-generation-dev-environment>]" section in the Yocto Project Overview and Concepts Manual.

6.114. `sanity.bbclass`

The `sanity` class checks to see if prerequisite software is present on the host system so that users can be notified of potential problems that might affect their build. The class also performs basic user configuration checks from the `local.conf` configuration file to prevent common mistakes that cause build failures. Distribution policy usually determines whether to include this class.

6.115. `scons.bbclass`

The `scons` class supports recipes that need to build software that uses the SCons build system. You can use the `EXTRA_OESCONS` variable to specify additional configuration options you want to pass SCons command line.

6.116. `SDL.bbclass`

The `SDL` class supports recipes that need to build software that uses the Simple DirectMedia Layer (SDL) library.

6.117. **setuptools.bbclass**

The `setuptools` class supports Python version 2.x extensions that use build systems based on `setuptools`. If your recipe uses these build systems, the recipe needs to inherit the `setuptools` class.

6.118. **setuptools3.bbclass**

The `setuptools3` class supports Python version 3.x extensions that use build systems based on `setuptools3`. If your recipe uses these build systems, the recipe needs to inherit the `setuptools3` class.

6.119. **sign_rpm.bbclass**

The `sign_rpm` class supports generating signed RPM packages.

6.120. **sip.bbclass**

The `sip` class supports recipes that build or package SIP-based Python bindings.

6.121. **siteconfig.bbclass**

The `siteconfig` class provides functionality for handling site configuration. The class is used by the `autotools` class to accelerate the `do_configure` task.

6.122. **siteinfo.bbclass**

The `siteinfo` class provides information about the targets that might be needed by other classes or recipes.

As an example, consider Autotools, which can require tests that must execute on the target hardware. Since this is not possible in general when cross compiling, site information is used to provide cached test results so these tests can be skipped over but still make the correct values available. The `meta/site` directory contains test results sorted into different categories such as architecture, endianness, and the `libc` used. Site information provides a list of files containing data relevant to the current build in the `CONFIG_SITE` variable that Autotools automatically picks up.

The class also provides variables like `SITEINFO_ENDIANNESS` and `SITEINFO_BITS` that can be used elsewhere in the metadata.

6.123. **spdx.bbclass**

The `spdx` class integrates real-time license scanning, generation of SPDX standard output, and verification of license information during the build.

Note

This class is currently at the prototype stage in the 1.6 release.

6.124. **sstate.bbclass**

The `sstate` class provides support for Shared State (`sstate`). By default, the class is enabled through the `INHERIT_DISTRO` variable's default value.

For more information on `sstate`, see the "Shared State Cache [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#shared-state-cache>]" section in the Yocto Project Overview and Concepts Manual.

6.125. **staging.bbclass**

The `staging` class installs files into individual recipe work directories for sysroots. The class contains the following key tasks:

- The `do_populate_sysroot` task, which is responsible for handing the files that end up in the recipe sysroots.
- The `do_prepare_recipe_sysroot` task (a "partner" task to the `populate_sysroot` task), which installs the files into the individual recipe work directories (i.e. `WORKDIR`).

The code in the staging class is complex and basically works in two stages:

- Stage One: The first stage addresses recipes that have files they want to share with other recipes that have dependencies on the originating recipe. Normally these dependencies are installed through the `do_install` task into `${D}`. The `do_populate_sysroot` task copies a subset of these files into `${SYSROOT_DESTDIR}`. This subset of files is controlled by the `SYSROOT_DIRS`, `SYSROOT_DIRS_NATIVE`, and `SYSROOT_DIRS_BLACKLIST` variables.

Note

Additionally, a recipe can customize the files further by declaring a processing function in the `SYSROOT_PREPROCESS_FUNCS` variable.

A shared state (`sstate`) object is built from these files and the files are placed into a subdirectory of `tmp/sysroots-components/`. The files are scanned for hardcoded paths to the original installation location. If the location is found in text files, the hardcoded locations are replaced by tokens and a list of the files needing such replacements is created. These adjustments are referred to as "FIXMEs". The list of files that are scanned for paths is controlled by the `SSTATE_SCAN_FILES` variable.

- Stage Two: The second stage addresses recipes that want to use something from another recipe and declare a dependency on that recipe through the `DEPENDS` variable. The recipe will have a `do_prepare_recipe_sysroot` task and when this task executes, it creates the `recipe-sysroot` and `recipe-sysroot-native` in the recipe work directory (i.e. `WORKDIR`). The OpenEmbedded build system creates hard links to copies of the relevant files from `sysroots-components` into the recipe work directory.

Note

If hard links are not possible, the build system uses actual copies.

The build system then addresses any "FIXMEs" to paths as defined from the list created in the first stage.

Finally, any files in `${bindir}` within the sysroot that have the prefix "postinst-" are executed.

Note

Although such sysroot post installation scripts are not recommended for general use, the files do allow some issues such as user creation and module indexes to be addressed.

Because recipes can have other dependencies outside of `DEPENDS` (e.g. `do_unpack[depends] += "tar-native:do_populate_sysroot"`), the sysroot creation function `extend_recipe_sysroot` is also added as a pre-function for those tasks whose dependencies are not through `DEPENDS` but operate similarly.

When installing dependencies into the sysroot, the code traverses the dependency graph and processes dependencies in exactly the same way as the dependencies would or would not be when installed from `sstate`. This processing means, for example, a native tool would have its native dependencies added but a target library would not have its dependencies traversed or installed. The same `sstate` dependency code is used so that builds should be identical regardless of whether `sstate` was used or not. For a closer look, see the `setscene_depvalid()` function in the `sstate` class.

The build system is careful to maintain manifests of the files it installs so that any given dependency can be installed as needed. The `sstate` hash of the installed item is also stored so that if it changes, the build system can reinstall it.

6.126. `syslinux.bbclass`

The `syslinux` class provides `syslinux`-specific functions for building bootable images.

The class supports the following variables:

- **INITRD**: Indicates list of filesystem images to concatenate and use as an initial RAM disk (initrd). This variable is optional.
- **R00TFS**: Indicates a filesystem image to include as the root filesystem. This variable is optional.
- **AUTO_SYSLINUXMENU**: Enables creating an automatic menu when set to "1".
- **LABELS**: Lists targets for automatic configuration.
- **APPEND**: Lists append string overrides for each label.
- **SYSLINUX_OPTS**: Lists additional options to add to the syslinux file. Semicolon characters separate multiple options.
- **SYSLINUX_SPLASH**: Lists a background for the VGA boot menu when you are using the boot menu.
- **SYSLINUX_DEFAULT_CONSOLE**: Set to "console=ttyX" to change kernel boot default console.
- **SYSLINUX_SERIAL**: Sets an alternate serial port. Or, turns off serial when the variable is set with an empty string.
- **SYSLINUX_SERIAL_TTY**: Sets an alternate "console=tty..." kernel boot argument.

6.127. **systemd.bbclass**

The `systemd` class provides support for recipes that install `systemd` unit files.

The functionality for this class is disabled unless you have "systemd" in `DISTRO_FEATURES`.

Under this class, the recipe or Makefile (i.e. whatever the recipe is calling during the `do_install` task) installs unit files into `${D}${systemd_unitdir}/system`. If the unit files being installed go into packages other than the main package, you need to set `SYSTEMD_PACKAGES` in your recipe to identify the packages in which the files will be installed.

You should set `SYSTEMD_SERVICE` to the name of the service file. You should also use a package name override to indicate the package to which the value applies. If the value applies to the recipe's main package, use `${PN}`. Here is an example from the `connman` recipe:

```
SYSTEMD_SERVICE_${PN} = "connman.service"
```

Services are set up to start on boot automatically unless you have set `SYSTEMD_AUTO_ENABLE` to "disable".

For more information on `systemd`, see the "Selecting an Initialization Manager [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#selecting-an-initialization-manager>]" section in the Yocto Project Development Tasks Manual.

6.128. **systemd-boot.bbclass**

The `systemd-boot` class provides functions specific to the `systemd-boot` bootloader for building bootable images. This is an internal class and is not intended to be used directly.

Note

The `systemd-boot` class is a result from merging the `gummiboot` class used in previous Yocto Project releases with the `systemd` project.

Set the `EFI_PROVIDER` variable to "systemd-boot" to use this class. Doing so creates a standalone EFI bootloader that is not dependent on `systemd`.

For information on more variables used and supported in this class, see the `SYSTEMD_BOOT_CFG`, `SYSTEMD_BOOT_ENTRIES`, and `SYSTEMD_BOOT_TIMEOUT` variables.

You can also see the `Systemd-boot` documentation [<http://www.freedesktop.org/wiki/Software/systemd/systemd-boot/>] for more information.

6.129. **terminal.bbclass**

The `terminal` class provides support for starting a terminal session. The `OE_TERMINAL` variable controls which terminal emulator is used for the session.

Other classes use the `terminal` class anywhere a separate terminal session needs to be started. For example, the `patch` class assuming `PATCHRESOLVE` is set to "user", the `cm11` class, and the `devshell` class all use the `terminal` class.

6.130. **testimage*.bbclass**

The `testimage*` classes support running automated tests against images using QEMU and on actual hardware. The classes handle loading the tests and starting the image. To use the classes, you need to perform steps to set up the environment.

Tip

Best practices include using `IMAGE_CLASSES` rather than `INHERIT` to inherit the `testimage` class for automated image testing.

The tests are commands that run on the target system over ssh. Each test is written in Python and makes use of the `unittest` module.

The `testimage.bbclass` runs tests on an image when called using the following:

```
$ bitbake -c testimage image
```

The `testimage-auto` class runs tests on an image after the image is constructed (i.e. `TESTIMAGE_AUTO` must be set to "1").

For information on how to enable, run, and create new tests, see the "Performing Automated Runtime Testing [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#performing-automated-runtime-testing>]" section in the Yocto Project Development Tasks Manual.

6.131. **testsdk.bbclass**

This class supports running automated tests against software development kits (SDKs). The `testsdk` class runs tests on an SDK when called using the following:

```
$ bitbake -c testsdk image
```

Tip

Best practices include using `IMAGE_CLASSES` rather than `INHERIT` to inherit the `testsdk` class for automated SDK testing.

6.132. **texinfo.bbclass**

This class should be inherited by recipes whose upstream packages invoke the `texinfo` utilities at build-time. Native and cross recipes are made to use the dummy scripts provided by `texinfo-dummy-native`, for improved performance. Target architecture recipes use the genuine `Texinfo` utilities. By default, they use the `Texinfo` utilities on the host system.

Note

If you want to use the `Texinfo` recipe shipped with the build system, you can remove "texinfo-native" from `ASSUME_PROVIDED` and `makeinfo` from `SANITY_REQUIRED_UTILITIES`.

6.133. **tinderclient.bbclass**

The `tinderclient` class submits build results to an external `Tinderbox` instance.

Note

This class is currently unmaintained.

6.134. **toaster.bbclass**

The toaster class collects information about packages and images and sends them as events that the BitBake user interface can receive. The class is enabled when the Toaster user interface is running.

This class is not intended to be used directly.

6.135. **toolchain-scripts.bbclass**

The toolchain-scripts class provides the scripts used for setting up the environment for installed SDKs.

6.136. **typecheck.bbclass**

The typecheck class provides support for validating the values of variables set at the configuration level against their defined types. The OpenEmbedded build system allows you to define the type of a variable using the "type" varflag. Here is an example:

```
IMAGE_FEATURES[type] = "list"
```

6.137. **uboot-config.bbclass**

The uboot-config class provides support for U-Boot configuration for a machine. Specify the machine in your recipe as follows:

```
UBOOT_CONFIG ??= <default>  
UBOOT_CONFIG[foo] = "config,images"
```

You can also specify the machine using this method:

```
UBOOT_MACHINE = "config"
```

See the UBOOT_CONFIG and UBOOT_MACHINE variables for additional information.

6.138. **uninative.bbclass**

Attempts to isolate the build system from the host distribution's C library in order to make re-use of native shared state artifacts across different host distributions practical. With this class enabled, a tarball containing a pre-built C library is downloaded at the start of the build. In the Poky reference distribution this is enabled by default through meta/conf/distro/include/yocto-uninative.inc. Other distributions that do not derive from poky can also "require conf/distro/include/yocto-uninative.inc" to use this. Alternatively if you prefer, you can build the uninative-tarball recipe yourself, publish the resulting tarball (e.g. via HTTP) and set UNINATIVE_URL and UNINATIVE_CHECKSUM appropriately. For an example, see the meta/conf/distro/include/yocto-uninative.inc.

The uninative class is also used unconditionally by the extensible SDK. When building the extensible SDK, uninative-tarball is built and the resulting tarball is included within the SDK.

6.139. **update-alternatives.bbclass**

The update-alternatives class helps the alternatives system when multiple sources provide the same command. This situation occurs when several programs that have the same or similar function

are installed with the same name. For example, the `ar` command is available from the `busybox`, `binutils` and `elfutils` packages. The `update-alternatives` class handles renaming the binaries so that multiple packages can be installed without conflicts. The `ar` command still works regardless of which packages are installed or subsequently removed. The class renames the conflicting binary in each package and symlinks the highest priority binary during installation or removal of packages.

To use this class, you need to define a number of variables:

- `ALTERNATIVE`
- `ALTERNATIVE_LINK_NAME`
- `ALTERNATIVE_TARGET`
- `ALTERNATIVE_PRIORITY`

These variables list alternative commands needed by a package, provide pathnames for links, default links for targets, and so forth. For details on how to use this class, see the comments in the `update-alternatives.bbclass` [<http://git.yoctoproject.org/cgit/cgit.cgi/poky/tree/meta/classes/update-alternatives.bbclass>] file.

Note

You can use the `update-alternatives` command directly in your recipes. However, this class simplifies things in most cases.

6.140. `update-rc.d.bbclass`

The `update-rc.d` class uses `update-rc.d` to safely install an initialization script on behalf of the package. The OpenEmbedded build system takes care of details such as making sure the script is stopped before a package is removed and started when the package is installed.

Three variables control this class: `INITSCRIPT_PACKAGES`, `INITSCRIPT_NAME` and `INITSCRIPT_PARAMS`. See the variable links for details.

6.141. `useradd*.bbclass`

The `useradd*` classes support the addition of users or groups for usage by the package on the target. For example, if you have packages that contain system services that should be run under their own user or group, you can use these classes to enable creation of the user or group. The `meta-skeleton/recipes-skeleton/useradd/useradd-example.bb` recipe in the Source Directory provides a simple example that shows how to add three users and groups to two packages. See the `useradd-example.bb` recipe for more information on how to use these classes.

The `useradd_base` class provides basic functionality for user or groups settings.

The `useradd*` classes support the `USERADD_PACKAGES`, `USERADD_PARAM`, `GROUPADD_PARAM`, and `GROUPMEMS_PARAM` variables.

The `useradd-staticids` class supports the addition of users or groups that have static user identification (`uid`) and group identification (`gid`) values.

The default behavior of the OpenEmbedded build system for assigning `uid` and `gid` values when packages add users and groups during package install time is to add them dynamically. This works fine for programs that do not care what the values of the resulting users and groups become. In these cases, the order of the installation determines the final `uid` and `gid` values. However, if non-deterministic `uid` and `gid` values are a problem, you can override the default, dynamic application of these values by setting static values. When you set static values, the OpenEmbedded build system looks in `BBPATH` for `files/passwd` and `files/group` files for the values.

To use static `uid` and `gid` values, you need to set some variables. See the `USERADDEXTENSION`, `USERADD_UID_TABLES`, `USERADD_GID_TABLES`, and `USERADD_ERROR_DYNAMIC` variables. You can also see the `useradd` class for additional information.

Notes

You do not use the `useradd-staticids` class directly. You either enable or disable the class by setting the `USERADDEXTENSION` variable. If you enable or disable the class in a configured

system, TMPDIR might contain incorrect uid and gid values. Deleting the TMPDIR directory will correct this condition.

6.142. **utility-tasks.bbclass**

The `utility-tasks` class provides support for various "utility" type tasks that are applicable to all recipes, such as `do_clean` and `do_listtasks`.

This class is enabled by default because it is inherited by the base class.

6.143. **utils.bbclass**

The `utils` class provides some useful Python functions that are typically used in inline Python expressions (e.g. `${@...}`). One example use is for `bb.utils.contains()`.

This class is enabled by default because it is inherited by the base class.

6.144. **vala.bbclass**

The `vala` class supports recipes that need to build software written using the Vala programming language.

6.145. **waf.bbclass**

The `waf` class supports recipes that need to build software that uses the Waf build system. You can use the `EXTRA_OECONF` or `PACKAGECONFIG_CONFARGS` variables to specify additional configuration options to be passed on the Waf command line.

Chapter 7. Tasks

Tasks are units of execution for BitBake. Recipes (.bb files) use tasks to complete configuring, compiling, and packaging software. This chapter provides a reference of the tasks defined in the OpenEmbedded build system.

7.1. Normal Recipe Build Tasks

The following sections describe normal tasks associated with building a recipe. For more information on tasks and dependencies, see the "Tasks [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#tasks>]" and "Dependencies [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#dependencies>]" sections in the BitBake User Manual.

7.1.1. do_build

The default task for all recipes. This task depends on all other normal tasks required to build a recipe.

7.1.2. do_compile

Compiles the source code. This task runs with the current working directory set to `${B}`.

The default behavior of this task is to run the `oe_runmake` function if a makefile (Makefile, makefile, or GNUmakefile) is found. If no such file is found, the `do_compile` task does nothing.

7.1.3. do_compile_ptest_base

Compiles the runtime test suite included in the software being built.

7.1.4. do_configure

Configures the source by enabling and disabling any build-time and configuration options for the software being built. The task runs with the current working directory set to `${B}`.

The default behavior of this task is to run `oe_runmake clean` if a makefile (Makefile, makefile, or GNUmakefile) is found and `CLEANBROKEN` is not set to "1". If no such file is found or the `CLEANBROKEN` variable is set to "1", the `do_configure` task does nothing.

7.1.5. do_configure_ptest_base

Configures the runtime test suite included in the software being built.

7.1.6. do_deploy

Writes output files that are to be deployed to `${DEPLOY_DIR_IMAGE}`. The task runs with the current working directory set to `${B}`.

Recipes implementing this task should inherit the `deploy` class and should write the output to `${DEPLOYDIR}`, which is not to be confused with `${DEPLOY_DIR}`. The `deploy` class sets up `do_deploy` as a shared state (sstate) task that can be accelerated through sstate use. The sstate mechanism takes care of copying the output from `${DEPLOYDIR}` to `${DEPLOY_DIR_IMAGE}`.

Caution

Do not write the output directly to `${DEPLOY_DIR_IMAGE}`, as this causes the sstate mechanism to malfunction.

The `do_deploy` task is not added as a task by default and consequently needs to be added manually. If you want the task to run after `do_compile`, you can add it by doing the following:

```
addtask deploy after do_compile
```

Adding `do_deploy` after other tasks works the same way.

Note

You do not need to add `before do_build` to the `addtask` command (though it is harmless), because the base class contains the following:

```
do_build[recrdeptask] += "do_deploy"
```

See the "Dependencies [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#dependencies>]" section in the BitBake User Manual for more information.

If the `do_deploy` task re-executes, any previous output is removed (i.e. "cleaned").

7.1.7. `do_fetch`

Fetches the source code. This task uses the `SRC_URI` variable and the argument's prefix to determine the correct fetcher [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#bb-fetchers>] module.

7.1.8. `do_image`

Starts the image generation process. The `do_image` task runs after the OpenEmbedded build system has run the `do_rootfs` task during which packages are identified for installation into the image and the root filesystem is created, complete with post-processing.

The `do_image` task performs pre-processing on the image through the `IMAGE_PREPROCESS_COMMAND` and dynamically generates supporting `do_image_*` tasks as needed.

For more information on image creation, see the "Image Generation [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#image-generation-dev-environment>]" section in the Yocto Project Overview and Concepts Manual.

7.1.9. `do_image_complete`

Completes the image generation process. The `do_image_complete` task runs after the OpenEmbedded build system has run the `do_image` task during which image pre-processing occurs and through dynamically generated `do_image_*` tasks the image is constructed.

The `do_image_complete` task performs post-processing on the image through the `IMAGE_POSTPROCESS_COMMAND`.

For more information on image creation, see the "Image Generation [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#image-generation-dev-environment>]" section in the Yocto Project Overview and Concepts Manual.

7.1.10. `do_install`

Copies files that are to be packaged into the holding area `${D}`. This task runs with the current working directory set to `${B}`, which is the compilation directory. The `do_install` task, as well as other tasks that either directly or indirectly depend on the installed files (e.g. `do_package`, `do_package_write_*`, and `do_rootfs`), run under `fakeroot` [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#fakeroot-and-pseudo>].

Caution

When installing files, be careful not to set the owner and group IDs of the installed files to unintended values. Some methods of copying files, notably when using the recursive `cp` command, can preserve the UID and/or GID of the original file, which is usually not what you want. The host-user-contaminated QA check checks for files that probably have the wrong ownership.

Safe methods for installing files include the following:

- The `install` utility. This utility is the preferred method.
- The `cp` command with the `--no-preserve=ownership` option.
- The `tar` command with the `--no-same-owner` option. See the `bin_package.bbclass` file in the `meta/classes` directory of the Source Directory for an example.

7.1.11. `do_install_ptest_base`

Copies the runtime test suite files from the compilation directory to a holding area.

7.1.12. `do_package`

Analyzes the content of the holding area `${D}` and splits the content into subsets based on available packages and files. This task makes use of the `PACKAGES` and `FILES` variables.

The `do_package` task, in conjunction with the `do_packagedata` task, also saves some important package metadata. For additional information, see the `PKGDESTWORK` variable and the "Automatically Added Runtime Dependencies [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#automatically-added-runtime-dependencies>]" section in the Yocto Project Overview and Concepts Manual.

7.1.13. `do_package_qa`

Runs QA checks on packaged files. For more information on these checks, see the `insane` class.

7.1.14. `do_package_write_deb`

Creates Debian packages (i.e. `*.deb` files) and places them in the `${DEPLOY_DIR_DEB}` directory in the package feeds area. For more information, see the "Package Feeds [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#package-feeds-dev-environment>]" section in the Yocto Project Overview and Concepts Manual.

7.1.15. `do_package_write_ipk`

Creates IPK packages (i.e. `*.ipk` files) and places them in the `${DEPLOY_DIR_IPK}` directory in the package feeds area. For more information, see the "Package Feeds [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#package-feeds-dev-environment>]" section in the Yocto Project Overview and Concepts Manual.

7.1.16. `do_package_write_rpm`

Creates RPM packages (i.e. `*.rpm` files) and places them in the `${DEPLOY_DIR_RPM}` directory in the package feeds area. For more information, see the "Package Feeds [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#package-feeds-dev-environment>]" section in the Yocto Project Overview and Concepts Manual.

7.1.17. `do_package_write_tar`

Creates tarballs and places them in the `${DEPLOY_DIR_TAR}` directory in the package feeds area. For more information, see the "Package Feeds [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#package-feeds-dev-environment>]" section in the Yocto Project Overview and Concepts Manual.

7.1.18. `do_packagedata`

Saves package metadata generated by the `do_package` task in `PKGDATA_DIR` to make it available globally.

7.1.19. `do_patch`

Locates patch files and applies them to the source code.

After fetching and unpacking source files, the build system uses the recipe's SRC_URI [http://www.yoctoproject.org/docs/3.0.3/ref-manual/ref-manual.html#var-SRC_URI] statements to locate and apply patch files to the source code.

Note

The build system uses the FILESPATH [<http://www.yoctoproject.org/docs/3.0.3/ref-manual/ref-manual.html#var-FILESPATH>] variable to determine the default set of directories when searching for patches.

Patch files, by default, are *.patch and *.diff files created and kept in a subdirectory of the directory holding the recipe file. For example, consider the bluez5 [<http://git.yoctoproject.org/cgit/cgit.cgi/poky/tree/meta/recipes-connectivity/bluez5>] recipe from the OE-Core layer (i.e. poky/meta):

```
poky/meta/recipes-connectivity/bluez5
```

This recipe has two patch files located here:

```
poky/meta/recipes-connectivity/bluez5/bluez5
```

In the bluez5 recipe, the SRC_URI statements point to the source and patch files needed to build the package.

Note

In the case for the bluez5_5.48.bb recipe, the SRC_URI statements are from an include file bluez5.inc.

As mentioned earlier, the build system treats files whose file types are .patch and .diff as patch files. However, you can use the "apply=yes" parameter with the SRC_URI statement to indicate any file as a patch file:

```
SRC_URI = " \
    git://path_to_repo/some_package \
    file://file;apply=yes \
"
```

Conversely, if you have a directory full of patch files and you want to exclude some so that the do_patch task does not apply them during the patch phase, you can use the "apply=no" parameter with the SRC_URI statement:

```
SRC_URI = " \
    git://path_to_repo/some_package \
    file://path_to_lots_of_patch_files \
    file://path_to_lots_of_patch_files/patch_file5;apply=no \
"
```

In the previous example, assuming all the files in the directory holding the patch files end with either .patch or .diff, every file would be applied as a patch by default except for the patch_file5 patch.

You can find out more about the patching process in the "Patching [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#patching-dev-environment>]" section in the Yocto Project Overview and Concepts Manual and the "Patching Code [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#new-recipe-patching-code>]" section in the Yocto Project Development Tasks Manual.

7.1.20. do_populate_lic

Writes license information for the recipe that is collected later when the image is constructed.

7.1.21. **do_populate_sdk**

Creates the file and directory structure for an installable SDK. See the "SDK Generation [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#sdk-generation-dev-environment>]" section in the Yocto Project Overview and Concepts Manual for more information.

7.1.22. **do_populate_sysroot**

Stages (copies) a subset of the files installed by the `do_install` task into the appropriate sysroot. For information on how to access these files from other recipes, see the `STAGING_DIR*` variables. Directories that would typically not be needed by other recipes at build time (e.g. `/etc`) are not copied by default.

For information on what directories are copied by default, see the `SYSROOT_DIRS*` variables. You can change these variables inside your recipe if you need to make additional (or fewer) directories available to other recipes at build time.

The `do_populate_sysroot` task is a shared state (sstate) task, which means that the task can be accelerated through sstate use. Realize also that if the task is re-executed, any previous output is removed (i.e. "cleaned").

7.1.23. **do_prepare_recipe_sysroot**

Installs the files into the individual recipe specific sysroots (i.e. `recipe-sysroot` and `recipe-sysroot-native` under `${WORKDIR}` based upon the dependencies specified by `DEPENDS`). See the "staging" class for more information.

7.1.24. **do_rm_work**

Removes work files after the OpenEmbedded build system has finished with them. You can learn more by looking at the "`rm_work.bbclass`" section.

7.1.25. **do_unpack**

Unpacks the source code into a working directory pointed to by `${WORKDIR}`. The `S` variable also plays a role in where unpacked source files ultimately reside. For more information on how source files are unpacked, see the "Source Fetching [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#source-fetching-dev-environment>]" section in the Yocto Project Overview and Concepts Manual and also see the `WORKDIR` and `S` variable descriptions.

7.2. Manually Called Tasks

These tasks are typically manually triggered (e.g. by using the `bitbake -c` command-line option):

7.2.1. **do_checkpkg**

Provides information about the recipe including its upstream version and status. The upstream version and status reveals whether or not a version of the recipe exists upstream and a status of not updated, updated, or unknown.

To check the upstream version and status of a recipe, use the following devtool commands:

```
$ devtool latest-version
$ devtool check-upgrade-status
```

See the "devtool Quick Reference" chapter for more information on devtool. See the "Checking on the Upgrade Status of a Recipe [<http://www.yoctoproject.org/docs/3.0.3/ref-manual/ref-manual.html#devtool-checking-on-the-upgrade-status-of-a-recipe>]" section for information on checking the upgrade status of a recipe.

To build the checkpkg task, use the bitbake command with the "-c" option and task name:

```
$ bitbake core-image-minimal -c checkpkg
```

By default, the results are stored in \$LOG_DIR (e.g. \$BUILD_DIR/tmp/log).

7.2.2. do_checkuri

Validates the SRC_URI value.

7.2.3. do_clean

Removes all output files for a target from the do_unpack task forward (i.e. do_unpack, do_configure, do_compile, do_install, and do_package).

You can run this task using BitBake as follows:

```
$ bitbake -c clean recipe
```

Running this task does not remove the sstate [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#shared-state-cache>] cache files. Consequently, if no changes have been made and the recipe is rebuilt after cleaning, output files are simply restored from the sstate cache. If you want to remove the sstate cache files for the recipe, you need to use the do_cleansstate task instead (i.e. bitbake -c cleansstate recipe).

7.2.4. do_cleanall

Removes all output files, shared state (sstate [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#shared-state-cache>]) cache, and downloaded source files for a target (i.e. the contents of DL_DIR). Essentially, the do_cleanall task is identical to the do_cleansstate task with the added removal of downloaded source files.

You can run this task using BitBake as follows:

```
$ bitbake -c cleanall recipe
```

Typically, you would not normally use the cleanall task. Do so only if you want to start fresh with the do_fetch task.

7.2.5. do_cleansstate

Removes all output files and shared state (sstate [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#shared-state-cache>]) cache for a target. Essentially, the do_cleansstate task is identical to the do_clean task with the added removal of shared state (sstate [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#shared-state-cache>]) cache.

You can run this task using BitBake as follows:

```
$ bitbake -c cleansstate recipe
```

When you run the do_cleansstate task, the OpenEmbedded build system no longer uses any sstate. Consequently, building the recipe from scratch is guaranteed.

Note

The do_cleansstate task cannot remove sstate from a remote sstate mirror. If you need to build a target from scratch using remote mirrors, use the "-f" option as follows:

```
$ bitbake -f -c do_cleansstate target
```

7.2.6. do_devpyshell

Starts a shell in which an interactive Python interpreter allows you to interact with the BitBake build environment. From within this shell, you can directly examine and set bits from the data store and execute functions as if within the BitBake environment. See the "Using a Development Python Shell [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#platdev-appdev-devpyshell>]" section in the Yocto Project Development Tasks Manual for more information about using devpyshell.

7.2.7. do_devshell

Starts a shell whose environment is set up for development, debugging, or both. See the "Using a Development Shell [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#platdev-appdev-devshell>]" section in the Yocto Project Development Tasks Manual for more information about using devshell.

7.2.8. do_listtasks

Lists all defined tasks for a target.

7.2.9. do_package_index

Creates or updates the index in the Package Feeds [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#package-feeds-dev-environment>] area.

Note

This task is not triggered with the `bitbake -c` command-line option as are the other tasks in this section. Because this task is specifically for the package-index recipe, you run it using `bitbake package-index`.

7.3. Image-Related Tasks

The following tasks are applicable to image recipes.

7.3.1. do_bootimg

Creates a bootable live image. See the `IMAGE_FSTYPES` variable for additional information on live image types.

7.3.2. do_bundle_initramfs

Combines an initial RAM disk (initramfs) image and kernel together to form a single image. The `CONFIG_INITRAMFS_SOURCE` variable has some more information about these types of images.

7.3.3. do_rootfs

Creates the root filesystem (file and directory structure) for an image. See the "Image Generation [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#image-generation-dev-environment>]" section in the Yocto Project Overview and Concepts Manual for more information on how the root filesystem is created.

7.3.4. do_testimage

Boots an image and performs runtime tests within the image. For information on automatically testing images, see the "Performing Automated Runtime Testing [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#performing-automated-runtime-testing>]" section in the Yocto Project Development Tasks Manual.

7.3.5. do_testimage_auto

Boots an image and performs runtime tests within the image immediately after it has been built. This task is enabled when you set `TESTIMAGE_AUTO` equal to "1".

For information on automatically testing images, see the "Performing Automated Runtime Testing [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#performing-automated-runtime-testing>]" section in the Yocto Project Development Tasks Manual.

7.4. Kernel-Related Tasks

The following tasks are applicable to kernel recipes. Some of these tasks (e.g. the `do_menuconfig` task) are also applicable to recipes that use Linux kernel style configuration such as the BusyBox recipe.

7.4.1. do_compile_kernelmodules

Runs the step that builds the kernel modules (if needed). Building a kernel consists of two steps: 1) the kernel (`vmlinux`) is built, and 2) the modules are built (i.e. `make modules`).

7.4.2. do_diffconfig

When invoked by the user, this task creates a file containing the differences between the original config as produced by `do_kernel_configme` task and the changes made by the user with other methods (i.e. using `do_kernel_menuconfig`). Once the file of differences is created, it can be used to create a config fragment that only contains the differences. You can invoke this task from the command line as follows:

```
$ bitbake linux-yocto -c diffconfig
```

For more information, see the "Creating Configuration Fragments [<http://www.yoctoproject.org/docs/3.0.3/kernel-dev/kernel-dev.html#creating-config-fragments>]" section in the Yocto Project Linux Kernel Development Manual.

7.4.3. do_kernel_checkout

Converts the newly unpacked kernel source into a form with which the OpenEmbedded build system can work. Because the kernel source can be fetched in several different ways, the `do_kernel_checkout` task makes sure that subsequent tasks are given a clean working tree copy of the kernel with the correct branches checked out.

7.4.4. do_kernel_configcheck

Validates the configuration produced by the `do_kernel_menuconfig` task. The `do_kernel_configcheck` task produces warnings when a requested configuration does not appear in the final `.config` file or when you override a policy configuration in a hardware configuration fragment. You can run this task explicitly and view the output by using the following command:

```
$ bitbake linux-yocto -c kernel_configcheck -f
```

For more information, see the "Validating Configuration [<http://www.yoctoproject.org/docs/3.0.3/kernel-dev/kernel-dev.html#validating-configuration>]" section in the Yocto Project Linux Kernel Development Manual.

7.4.5. do_kernel_configme

After the kernel is patched by the `do_patch` task, the `do_kernel_configme` task assembles and merges all the kernel config fragments into a merged configuration that can then be passed to the

kernel configuration phase proper. This is also the time during which user-specified defconfigs are applied if present, and where configuration modes such as `--allnoconfig` are applied.

7.4.6. `do_kernel_menuconfig`

Invoked by the user to manipulate the `.config` file used to build a linux-yocto recipe. This task starts the Linux kernel configuration tool, which you then use to modify the kernel configuration.

Note

You can also invoke this tool from the command line as follows:

```
$ bitbake linux-yocto -c menuconfig
```

See the "Using `menuconfig` [<http://www.yoctoproject.org/docs/3.0.3/kernel-dev/kernel-dev.html#using-menuconfig>]" section in the Yocto Project Linux Kernel Development Manual for more information on this configuration tool.

7.4.7. `do_kernel_metadata`

Collects all the features required for a given kernel build, whether the features come from `SRC_URI` or from Git repositories. After collection, the `do_kernel_metadata` task processes the features into a series of config fragments and patches, which can then be applied by subsequent tasks such as `do_patch` and `do_kernel_configme`.

7.4.8. `do_menuconfig`

Runs `make menuconfig` for the kernel. For information on `menuconfig`, see the "Using `menuconfig` [<http://www.yoctoproject.org/docs/3.0.3/kernel-dev/kernel-dev.html#using-menuconfig>]" section in the Yocto Project Linux Kernel Development Manual.

7.4.9. `do_savedefconfig`

When invoked by the user, creates a defconfig file that can be used instead of the default defconfig. The saved defconfig contains the differences between the default defconfig and the changes made by the user using other methods (i.e. the `do_kernel_menuconfig` task. You can invoke the task using the following command:

```
$ bitbake linux-yocto -c savedefconfig
```

7.4.10. `do_shared_workdir`

After the kernel has been compiled but before the kernel modules have been compiled, this task copies files required for module builds and which are generated from the kernel build into the shared work directory. With these copies successfully copied, the `do_compile_kernelmodules` task can successfully build the kernel modules in the next step of the build.

7.4.11. `do_sizecheck`

After the kernel has been built, this task checks the size of the stripped kernel image against `KERNEL_IMAGE_MAXSIZE`. If that variable was set and the size of the stripped kernel exceeds that size, the kernel build produces a warning to that effect.

7.4.12. `do_strip`

If `KERNEL_IMAGE_STRIP_EXTRA_SECTIONS` is defined, this task strips the sections named in that variable from `vmlinux`. This stripping is typically used to remove nonessential sections such as `.comment` sections from a size-sensitive configuration.

7.4.13. **do_validate_branches**

After the kernel is unpacked but before it is patched, this task makes sure that the machine and metadata branches as specified by the SRCREV variables actually exist on the specified branches. If these branches do not exist and AUTOREV is not being used, the do_validate_branches task fails during the build.

7.5. Miscellaneous Tasks

The following sections describe miscellaneous tasks.

7.5.1. **do_spdx**

A build stage that takes the source code and scans it on a remote FOSSOLOGY server in order to produce an SPDX document. This task applies only to the spdx class.

Chapter 8.devtool Quick Reference

The devtool command-line tool provides a number of features that help you build, test, and package software. This command is available alongside the bitbake command. Additionally, the devtool command is a key part of the extensible SDK.

This chapter provides a Quick Reference for the devtool command. For more information on how to apply the command when using the extensible SDK, see the "Using the Extensible SDK [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-extensible>]" chapter in the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) manual.

8.1. Getting Help

The devtool command line is organized similarly to Git in that it has a number of sub-commands for each function. You can run `devtool --help` to see all the commands:

```
$ devtool -h
NOTE: Starting bitbake server...
usage: devtool [--basepath BASEPATH] [--bbpath BBPATH] [-d] [-q]
        [--color COLOR] [-h]
        <subcommand> ...
```

OpenEmbedded development tool

options:

<code>--basepath BASEPATH</code>	Base directory of SDK / build directory
<code>--bbpath BBPATH</code>	Explicitly specify the BBPATH, rather than getting it from the metadata
<code>-d, --debug</code>	Enable debug output
<code>-q, --quiet</code>	Print only errors
<code>--color COLOR</code>	Colorize output (where COLOR is auto, always, never)
<code>-h, --help</code>	show this help message and exit

subcommands:

Beginning work on a recipe:

<code>add</code>	Add a new recipe
<code>modify</code>	Modify the source for an existing recipe
<code>upgrade</code>	Upgrade an existing recipe

Getting information:

<code>status</code>	Show workspace status
<code>search</code>	Search available recipes
<code>latest-version</code>	Report the latest version of an existing recipe
<code>check-upgrade-status</code>	Report upgradability for multiple (or all) recipes

Working on a recipe in the workspace:

<code>build</code>	Build a recipe
<code>rename</code>	Rename a recipe file in the workspace
<code>edit-recipe</code>	Edit a recipe file
<code>find-recipe</code>	Find a recipe file
<code>configure-help</code>	Get help on configure script options
<code>update-recipe</code>	Apply changes from external source tree to recipe
<code>reset</code>	Remove a recipe from your workspace
<code>finish</code>	Finish working on a recipe in your workspace

Testing changes on target:

<code>deploy-target</code>	Deploy recipe output files to live target machine
<code>undeploy-target</code>	Undeploy recipe output files in live target machine
<code>build-image</code>	Build image including workspace recipe packages

Advanced:

<code>create-workspace</code>	Set up workspace in an alternative location
<code>export</code>	Export workspace into a tar archive

import	Import exported tar archive into workspace
extract	Extract the source for an existing recipe
sync	Synchronize the source tree for an existing recipe

Use devtool <subcommand> --help to get help on a specific command

As directed in the general help output, you can get more syntax on a specific command by providing the command name and using "--help":

```
$ devtool add --help
NOTE: Starting bitbake server...
usage: devtool add [-h] [--same-dir | --no-same-dir] [--fetch URI]
                  [--fetch-dev] [--version VERSION] [--no-git]
                  [--srcrev SRCREV | --autorev] [--srcbranch SRCBRANCH]
                  [--binary] [--also-native] [--src-subdir SUBDIR]
                  [--mirrors] [--provides PROVIDES]
                  [recipeName] [srcTree] [fetchUri]
```

Adds a new recipe to the workspace to build a specified source tree. Can optionally fetch a remote URI and unpack it to create the source tree.

arguments:

recipeName	Name for new recipe to add (just name - no version, path or extension). If not specified, will attempt to auto-detect it.
srcTree	Path to external source tree. If not specified, a subdirectory of /home/scottrif/poky/build/workspace/sources will be used.
fetchUri	Fetch the specified URI and extract it to create the source tree

options:

-h, --help	show this help message and exit
--same-dir, -s	Build in same directory as source
--no-same-dir	Force build in a separate build directory
--fetch URI, -f URI	Fetch the specified URI and extract it to create the source tree (deprecated - pass as positional argument instead)
--fetch-dev	For npm, also fetch devDependencies
--version VERSION, -V VERSION	Version to use within recipe (PV)
--no-git, -g	If fetching source, do not set up source tree as a git repository
--srcrev SRCREV, -S SRCREV	Source revision to fetch if fetching from an SCM such as git (default latest)
--autorev, -a	When fetching from a git repository, set SRCREV in the recipe to a floating revision instead of fixed
--srcbranch SRCBRANCH, -B SRCBRANCH	Branch in source repository if fetching from an SCM such as git (default master)
--binary, -b	Treat the source tree as something that should be installed verbatim (no compilation, same directory structure). Useful with binary packages e.g. RPMs.
--also-native	Also add native variant (i.e. support building recipe for the build host as well as the target machine)
--src-subdir SUBDIR	Specify subdirectory within source tree to use
--mirrors	Enable PREMIRRORS and MIRRORS for source tree fetching (disable by default).
--provides PROVIDES, -p PROVIDES	Specify an alias for the item provided by the recipe. E.g. virtual/libgl

8.2. The Workspace Layer Structure

devtool uses a "Workspace" layer in which to accomplish builds. This layer is not specific to any single devtool command but is rather a common working area used across the tool.

The following figure shows the workspace structure:

- attic - A directory created if devtool believes it must preserve anything when you run "devtool reset". For example, if you run "devtool add", make changes to the recipe, and then run "devtool reset", devtool takes notice that the file has been changed and moves it into the attic should you still want the recipe.
- README - Provides information on what is in workspace layer and how to manage it.
- .devtool_md5 - A checksum file used by devtool.
- appends - A directory that contains *.bbappend files, which point to external source.
- conf - A configuration directory that contains the layer.conf file.
- recipes - A directory containing recipes. This directory contains a folder for each directory added whose name matches that of the added recipe. devtool places the recipe.bb file within that sub-directory.

`sources` - A directory containing a working copy of the source files used when building the recipe. This is the default directory used as the location of the source tree when you do not provide a source tree path. This directory contains a folder for each set of source files matched to a corresponding recipe.

8.3. Adding a New Recipe to the Workspace Layer

Use the `devtool add` command to add a new recipe to the workspace layer. The recipe you add should not exist - `devtool` creates it for you. The source files the recipe uses should exist in an external area.

The following example creates and adds a new recipe named `jackson` to a workspace layer the tool creates. The source code built by the recipes resides in `/home/user/sources/jackson`:

```
$ devtool add jackson /home/user/sources/jackson
```

If you add a recipe and the workspace layer does not exist, the command creates the layer and populates it as described in "The Workspace Layer Structure" section.

Running `devtool add` when the workspace layer exists causes the tool to add the recipe, append files, and source files into the existing workspace layer. The `.bbappend` file is created to point to the external source tree.

Note

If your recipe has runtime dependencies defined, you must be sure that these packages exist on the target hardware before attempting to run your application. If dependent packages (e.g. libraries) do not exist on the target, your application, when run, will fail to find those functions. For more information, see the "Deploying Your Software on the Target Machine" section.

By default, `devtool add` uses the latest revision (i.e. master) when unpacking files from a remote URI. In some cases, you might want to specify a source revision by branch, tag, or commit hash. You can specify these options when using the `devtool add` command:

- To specify a source branch, use the `--srcbranch` option:

```
$ devtool add --srcbranch zeus jackson /home/user/sources/jackson
```

In the previous example, you are checking out the `zeus` branch.

- To specify a specific tag or commit hash, use the `--srcrev` option:

```
$ devtool add --srcrev yocto-3.0.3 jackson /home/user/sources/jackson
$ devtool add --srcrev some_commit_hash /home/user/sources/jackson
```

The previous examples check out the `yocto-3.0.3` tag and the commit associated with the `some_commit_hash` hash.

Note

If you prefer to use the latest revision every time the recipe is built, use the options `--autorev` or `-a`.

8.4. Extracting the Source for an Existing Recipe

Use the `devtool extract` command to extract the source for an existing recipe. When you use this command, you must supply the root name of the recipe (i.e. no version, paths, or extensions), and you must supply the directory to which you want the source extracted.

Additional command options let you control the name of a development branch into which you can checkout the source and whether or not to keep a temporary directory, which is useful for debugging.

8.5. Synchronizing a Recipe's Extracted Source Tree

Use the `devtool sync` command to synchronize a previously extracted source tree for an existing recipe. When you use this command, you must supply the root name of the recipe (i.e. no version, paths, or extensions), and you must supply the directory to which you want the source extracted.

Additional command options let you control the name of a development branch into which you can checkout the source and whether or not to keep a temporary directory, which is useful for debugging.

8.6. Modifying an Existing Recipe

Use the `devtool modify` command to begin modifying the source of an existing recipe. This command is very similar to the `add` command except that it does not physically create the recipe in the workspace layer because the recipe already exists in an another layer.

The `devtool modify` command extracts the source for a recipe, sets it up as a Git repository if the source had not already been fetched from Git, checks out a branch for development, and applies any patches from the recipe as commits on top. You can use the following command to checkout the source files:

```
$ devtool modify recipe
```

Using the above command form, `devtool` uses the existing recipe's `SRC_URI` statement to locate the upstream source, extracts the source into the default sources location in the workspace. The default development branch used is "devtool".

8.7. Edit an Existing Recipe

Use the `devtool edit-recipe` command to run the default editor, which is identified using the `EDITOR` variable, on the specified recipe.

When you use the `devtool edit-recipe` command, you must supply the root name of the recipe (i.e. no version, paths, or extensions). Also, the recipe file itself must reside in the workspace as a result of the `devtool add` or `devtool upgrade` commands. However, you can override that requirement by using the `-a` or `--any-recipe` option. Using either of these options allows you to edit any recipe regardless of its location.

8.8. Updating a Recipe

Use the `devtool update-recipe` command to update your recipe with patches that reflect changes you make to the source files. For example, if you know you are going to work on some code, you could first use the `devtool modify` command to extract the code and set up the workspace. After which, you could modify, compile, and test the code.

When you are satisfied with the results and you have committed your changes to the Git repository, you can then run the `devtool update-recipe` to create the patches and update the recipe:

```
$ devtool update-recipe recipe
```

If you run the `devtool update-recipe` without committing your changes, the command ignores the changes.

Often, you might want to apply customizations made to your software in your own layer rather than apply them to the original recipe. If so, you can use the `-a` or `--append` option with the `devtool update-recipe` command. These options allow you to specify the layer into which to write an append file:

```
$ devtool update-recipe recipe -a base-layer-directory
```

The `*.bbappend` file is created at the appropriate path within the specified layer directory, which may or may not be in your `bblayers.conf` file. If an append file already exists, the command updates it appropriately.

8.9. Checking on the Upgrade Status of a Recipe

Upstream recipes change over time. Consequently, you might find that you need to determine if you can upgrade a recipe to a newer version.

To check on the upgrade status of a recipe, use the `devtool check-upgrade-status` command. The command displays a table of your current recipe versions, the latest upstream versions, the email address of the recipe's maintainer, and any additional information such as commit hash strings and reasons you might not be able to upgrade a particular recipe.

NOTES:

- For the `oe-core` layer, recipe maintainers come from the `maintainers.inc` [<http://git.yoctoproject.org/cgi/cgit.cgi/poky/tree/meta/conf/distro/include/maintainers.inc>] file.
- If the recipe is using the Git fetcher [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#git-fetcher>] rather than a tarball, the commit hash points to the commit that matches the recipe's latest version tag.

As with all `devtool` commands, you can get help on the individual command:

```
$ devtool check-upgrade-status -h
NOTE: Starting bitbake server...
usage: devtool check-upgrade-status [-h] [--all] [recipe [recipe ...]]
```

Prints a table of recipes together with versions currently provided by recipes, and latest upstream versions, when there is a later version available

arguments:

recipe	Name of the recipe to report (omit to report upgrade info for all recipes)
--------	--

options:

<code>-h, --help</code>	show this help message and exit
<code>--all, -a</code>	Show all recipes, not just recipes needing upgrade

Unless you provide a specific recipe name on the command line, the command checks all recipes in all configured layers.

Following is a partial example table that reports on all the recipes. Notice the reported reason for not upgrading the `base-passwd` recipe. In this example, while a new version is available upstream, you do not want to use it because the dependency on `cdebconf` is not easily satisfied.

Note

When a reason for not upgrading displays, the reason is usually written into the recipe using the `RECIPE_NO_UPDATE_REASON` variable. See the `base-passwd.bb` [http://git.yoctoproject.org/cgiit/cgiit.cgi/poky/tree/meta/recipes-core/base-passwd/base-passwd_3.5.29.bb] recipe for an example.

```
$ devtool check-upgrade-status
...
NOTE: acpid 2.0.30 2.0.31
Ross Burton <ross.burton@intel.com>
NOTE: u-boot-fw-utils 2018.11 2019.01
Marek Vasut <marek.vasut@gmail.com>
d3689267f92c5956e09cc7d1baa4700141662bff
NOTE: u-boot-tools 2018.11 2019.01
Marek Vasut <marek.vasut@gmail.com>
d3689267f92c5956e09cc7d1baa4700141662bff
.
.
NOTE: base-passwd 3.5.29 3.5.45
Anuj Mittal <anuj.mittal@intel.com> cannot be updated due to: Version
3.5.38 requires cdebconf for update-passwd utility
NOTE: busybox 1.29.2 1.30.0
Andrej Valek <andrej.valek@siemens.com>
NOTE: dbus-test 1.12.10 1.12.12
Chen Qi <Qi.Chen@windriver.com>
```

8.10. Upgrading a Recipe

As software matures, upstream recipes are upgraded to newer versions. As a developer, you need to keep your local recipes up-to-date with the upstream version releases. Several methods exist by which you can upgrade recipes. You can read about them in the "Upgrading Recipes [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#gs-upgrading-recipes>]" section of the Yocto Project Development Tasks Manual. This section overviews the `devtool upgrade` command.

Note

Before you upgrade a recipe, you can check on its upgrade status. See the "Checking on the Upgrade Status of a Recipe" for more information.

The `devtool upgrade` command upgrades an existing recipe to a more recent version of the recipe upstream. The command puts the upgraded recipe file along with any associated files into a "workspace" and, if necessary, extracts the source tree to a specified location. During the upgrade, patches associated with the recipe are rebased or added as needed.

When you use the `devtool upgrade` command, you must supply the root name of the recipe (i.e. no version, paths, or extensions), and you must supply the directory to which you want the source extracted. Additional command options let you control things such as the version number to which you want to upgrade (i.e. the PV), the source revision to which you want to upgrade (i.e. the SRCREV), whether or not to apply patches, and so forth.

You can read more on the `devtool upgrade` workflow in the "Use `devtool upgrade` to Create a Version of the Recipe that Supports a Newer Version of the Software" [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-devtool-use-devtool-upgrade-to-create-a-version-of-the-recipe-that-supports-a-newer-version-of-the-software>]" section in the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) manual. You can also see an example of how to use `devtool upgrade` in the "Using `devtool upgrade`" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#gs-using-devtool-upgrade>]" section in the Yocto Project Development Tasks Manual.

8.11. Resetting a Recipe

Use the `devtool reset` command to remove a recipe and its configuration (e.g. the corresponding `.bbappend` file) from the workspace layer. Realize that this command deletes the recipe and the append file. The command does not physically move them for you. Consequently, you must be sure to physically relocate your updated recipe and the append file outside of the workspace layer before running the `devtool reset` command.

If the `devtool reset` command detects that the recipe or the append files have been modified, the command preserves the modified files in a separate "attic" subdirectory under the workspace layer.

Here is an example that resets the workspace directory that contains the `mtr` recipe:

```
$ devtool reset mtr
NOTE: Cleaning sysroot for recipe mtr...
NOTE: Leaving source tree /home/scottrif/poky/build/workspace/sources/mtr as-is; if you no
      longer need it then please delete it manually
$
```

8.12. Building Your Recipe

Use the `devtool build` command to build your recipe. The `devtool build` command is equivalent to the `bitbake -c populate_sysroot` command.

When you use the `devtool build` command, you must supply the root name of the recipe (i.e. do not provide versions, paths, or extensions). You can use either the `-s` or the `--disable-parallel-make` options to disable parallel makes during the build. Here is an example:

```
$ devtool build recipe
```

8.13. Building Your Image

Use the `devtool build-image` command to build an image, extending it to include packages from recipes in the workspace. Using this command is useful when you want an image that ready for immediate deployment onto a device for testing. For proper integration into a final image, you need to edit your custom image recipe appropriately.

When you use the `devtool build-image` command, you must supply the name of the image. This command has no command line options:

```
$ devtool build-image image
```

8.14. Deploying Your Software on the Target Machine

Use the `devtool deploy-target` command to deploy the recipe's build output to the live target machine:

```
$ devtool deploy-target recipe target
```

The `target` is the address of the target machine, which must be running an SSH server (i.e. `user@hostname[:destdir]`).

This command deploys all files installed during the `do_install` task. Furthermore, you do not need to have package management enabled within the target machine. If you do, the package manager is bypassed.

Notes

The `deploy-target` functionality is for development only. You should never use it to update an image that will be used in production.

Some conditions exist that could prevent a deployed application from behaving as expected. When both of the following conditions exist, your application has the potential to not behave correctly when run on the target:

- You are deploying a new application to the target and the recipe you used to build the application had correctly defined runtime dependencies.
- The target does not physically have the packages on which the application depends installed.

If both of these conditions exist, your application will not behave as expected. The reason for this misbehavior is because the `devtool deploy-target` command does not deploy the packages (e.g. libraries) on which your new application depends. The assumption is that the packages are already on the target. Consequently, when a runtime call is made in the application for a dependent function (e.g. a library call), the function cannot be found.

To be sure you have all the dependencies local to the target, you need to be sure that the packages are pre-deployed (installed) on the target before attempting to run your application.

8.15. Removing Your Software from the Target Machine

Use the `devtool undeploy-target` command to remove deployed build output from the target machine. For the `devtool undeploy-target` command to work, you must have previously used the `devtool deploy-target` command.

```
$ devtool undeploy-target recipe target
```

The `target` is the address of the target machine, which must be running an SSH server (i.e. `user@hostname`).

8.16. Creating the Workspace Layer in an Alternative Location

Use the `devtool create-workspace` command to create a new workspace layer in your Build Directory. When you create a new workspace layer, it is populated with the README file and the conf directory only.

The following example creates a new workspace layer in your current working and by default names the workspace layer "workspace":

```
$ devtool create-workspace
```

You can create a workspace layer anywhere by supplying a pathname with the command. The following command creates a new workspace layer named "new-workspace":

```
$ devtool create-workspace /home/scottrif/new-workspace
```

8.17. Get the Status of the Recipes in Your Workspace

Use the `devtool status` command to list the recipes currently in your workspace. Information includes the paths to their respective external source trees.

The `devtool status` command has no command-line options:

```
$ devtool status
```

Following is sample output after using `devtool add` to create and add the `mtr_0.86.bb` recipe to the workspace directory:

```
$ devtool status
mtr: /home/scottrif/poky/build/workspace/sources/mtr (/home/scottrif/poky/build/workspace/re
$
```

8.18. Search for Available Target Recipes

Use the `devtool search` command to search for available target recipes. The command matches the recipe name, package name, description, and installed files. The command displays the recipe name as a result of a match.

When you use the `devtool search` command, you must supply a keyword. The command uses the keyword when searching for a match.

Chapter 9. OpenEmbedded Kickstart (.wks) Reference

9.1. Introduction

The current Wic implementation supports only the basic kickstart partitioning commands: `partition` (or `part` for short) and `bootloader`.

Note

Future updates will implement more commands and options. If you use anything that is not specifically supported, results can be unpredictable.

This chapter provides a reference on the available kickstart commands. The information lists the commands, their syntax, and meanings. Kickstart commands are based on the Fedora kickstart versions but with modifications to reflect Wic capabilities. You can see the original documentation for those commands at the following link:

<http://pykickstart.readthedocs.io/en/latest/kickstart-docs.html>

9.2. Command: `part` or `partition`

Either of these commands creates a partition on the system and uses the following syntax:

```
part [mntpoint]
partition [mntpoint]
```

If you do not provide `mntpoint`, Wic creates a partition but does not mount it.

The `mntpoint` is where the partition is mounted and must be in one of the following forms:

- `/path`: For example, `/`, `/usr`, or `/home`
- `swap`: The created partition is used as swap space

Specifying a `mntpoint` causes the partition to automatically be mounted. Wic achieves this by adding entries to the filesystem table (`fstab`) during image generation. In order for Wic to generate a valid `fstab`, you must also provide one of the `--ondrive`, `--ondisk`, or `--use-uuid` partition options as part of the command.

Note

The mount program must understand the PARTUUID syntax you use with `--use-uuid` and non-root `mntpoint`, including `swap`. The busybox versions of these application are currently excluded.

Here is an example that uses `/` as the `mntpoint`. The command uses `--ondisk` to force the partition onto the `sdb` disk:

```
part / --source rootfs --ondisk sdb --fstype=ext3 --label platform --align 1024
```

Here is a list that describes other supported options you can use with the `part` and `partition` commands:

- `--size`: The minimum partition size in MBytes. Specify an integer value such as 500. Do not append the number with "MB". You do not need this option if you use `--source`.
- `--fixed-size`: The exact partition size in MBytes. You cannot specify with `--size`. An error occurs when assembling the disk image if the partition data is larger than `--fixed-size`.

- `--source`: This option is a Wic-specific option that names the source of the data that populates the partition. The most common value for this option is "rootfs", but you can use any value that maps to a valid source plugin. For information on the source plugins, see the "Using the Wic Plugins Interface [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#wic-using-the-wic-plugin-interface>]" section in the Yocto Project Development Tasks Manual.

If you use `--source rootfs`, Wic creates a partition as large as needed and fills it with the contents of the root filesystem pointed to by the `-r` command-line option or the equivalent `rootfs` derived from the `-e` command-line option. The filesystem type used to create the partition is driven by the value of the `--fstype` option specified for the partition. See the entry on `--fstype` that follows for more information.

If you use `--source plugin-name`, Wic creates a partition as large as needed and fills it with the contents of the partition that is generated by the specified plugin name using the data pointed to by the `-r` command-line option or the equivalent `rootfs` derived from the `-e` command-line option. Exactly what those contents are and filesystem type used are dependent on the given plugin implementation.

If you do not use the `--source` option, the `wic` command creates an empty partition. Consequently, you must use the `--size` option to specify the size of the empty partition.

- `--ondisk` or `--ondrive`: Forces the partition to be created on a particular disk.
- `--fstype`: Sets the file system type for the partition. Valid values are:
 - `ext4`
 - `ext3`
 - `ext2`
 - `btrfs`
 - `squashfs`
 - `swap`
- `--fsoptions`: Specifies a free-form string of options to be used when mounting the filesystem. This string is copied into the `/etc/fstab` file of the installed system and should be enclosed in quotes. If not specified, the default string is "defaults".
- `--label label`: Specifies the label to give to the filesystem to be made on the partition. If the given label is already in use by another filesystem, a new label is created for the partition.
- `--active`: Marks the partition as active.
- `--align (in KBytes)`: This option is a Wic-specific option that says to start partitions on boundaries given x KBytes.
- `--no-table`: This option is a Wic-specific option. Using the option reserves space for the partition and causes it to become populated. However, the partition is not added to the partition table.
- `--exclude-path`: This option is a Wic-specific option that excludes the given relative path from the resulting image. This option is only effective with the `rootfs` source plugin.
- `--extra-space`: This option is a Wic-specific option that adds extra space after the space filled by the content of the partition. The final size can exceed the size specified by the `--size` option. The default value is 10 Mbytes.
- `--overhead-factor`: This option is a Wic-specific option that multiplies the size of the partition by the option's value. You must supply a value greater than or equal to "1". The default value is "1.3".
- `--part-name`: This option is a Wic-specific option that specifies a name for GPT partitions.
- `--part-type`: This option is a Wic-specific option that specifies the partition type globally unique identifier (GUID) for GPT partitions. You can find the list of partition type GUIDs at http://en.wikipedia.org/wiki/GUID_Partition_Table#Partition_type_GUIDs.

- `--use-uuid`: This option is a Wic-specific option that causes Wic to generate a random GUID for the partition. The generated identifier is used in the bootloader configuration to specify the root partition.
- `--uuid`: This option is a Wic-specific option that specifies the partition UUID.
- `--fsuuid`: This option is a Wic-specific option that specifies the filesystem UUID. You can generate or modify `WKS_FILE` with this option if a preconfigured filesystem UUID is added to the kernel command line in the bootloader configuration before you run Wic.
- `--system-id`: This option is a Wic-specific option that specifies the partition system ID, which is a one byte long, hexadecimal parameter with or without the 0x prefix.
- `--mkfs-extraopts`: This option specifies additional options to pass to the `mkfs` utility. Some default options for certain filesystems do not take effect. See Wic's help on kickstart (i.e. `wic help kickstart`).

9.3. Command: bootloader

This command specifies how the bootloader should be configured and supports the following options:

Note

Bootloader functionality and boot partitions are implemented by the various `--source` plugins that implement bootloader functionality. The `bootloader` command essentially provides a means of modifying bootloader configuration.

- `--timeout`: Specifies the number of seconds before the bootloader times out and boots the default option.
- `--append`: Specifies kernel parameters. These parameters will be added to the `syslinux APPEND` or `grub kernel` command line.
- `--configfile`: Specifies a user-defined configuration file for the bootloader. You can provide a full pathname for the file or a file that exists in the `canned-wks` folder. This option overrides all other bootloader options.

Chapter 10. QA Error and Warning Messages

10.1. Introduction

When building a recipe, the OpenEmbedded build system performs various QA checks on the output to ensure that common issues are detected and reported. Sometimes when you create a new recipe to build new software, it will build with no problems. When this is not the case, or when you have QA issues building any software, it could take a little time to resolve them.

While it is tempting to ignore a QA message or even to disable QA checks, it is best to try and resolve any reported QA issues. This chapter provides a list of the QA messages and brief explanations of the issues you could encounter so that you can properly resolve problems.

The next section provides a list of all QA error and warning messages based on a default configuration. Each entry provides the message or error form along with an explanation.

Notes

- At the end of each message, the name of the associated QA test (as listed in the "insane.bbclass" section) appears within square brackets.
- As mentioned, this list of error and warning messages is for QA checks only. The list does not cover all possible build errors or warnings you could encounter.
- Because some QA checks are disabled by default, this list does not include all possible QA check errors and warnings.

10.2. Errors and Warnings

- `<packagename>: <path> is using libexec please relocate to <libexecdir> [libexec]`

The specified package contains files in `/usr/libexec` when the distro configuration uses a different path for `<libexecdir>`. By default, `<libexecdir>` is `$prefix/libexec`. However, this default can be changed (e.g. `${libdir}`).

- `package <packagename> contains bad RPATH <rpath> in file <file> [rpaths]`

The specified binary produced by the recipe contains dynamic library load paths (rpaths) that contain build system paths such as `TMPLDIR`, which are incorrect for the target and could potentially be a security issue. Check for bad `-rpath` options being passed to the linker in your `do_compile` log. Depending on the build system used by the software being built, there might be a configure option to disable rpath usage completely within the build of the software.

- `<packagename>: <file> contains probably-redundant RPATH <rpath> [useless-rpaths]`

The specified binary produced by the recipe contains dynamic library load paths (rpaths) that on a standard system are searched by default by the linker (e.g. `/lib` and `/usr/lib`). While these paths will not cause any breakage, they do waste space and are unnecessary. Depending on the build system used by the software being built, there might be a configure option to disable rpath usage completely within the build of the software.

- `<packagename> requires <files>, but no providers in its RDEPENDS [file-rdeps]`

A file-level dependency has been identified from the specified package on the specified files, but there is no explicit corresponding entry in `RDEPENDS`. If particular files are required at runtime then `RDEPENDS` should be declared in the recipe to ensure the packages providing them are built.

- `<packagename1> rdepends on <packagename2>`, but it isn't a build dependency? [build-deps]

A runtime dependency exists between the two specified packages, but there is nothing explicit within the recipe to enable the OpenEmbedded build system to ensure that dependency is satisfied. This condition is usually triggered by an RDEPENDS value being added at the packaging stage rather than up front, which is usually automatic based on the contents of the package. In most cases, you should change the recipe to add an explicit RDEPENDS for the dependency.

- `non -dev/-dbg/nativesdk- package contains symlink .so: <packagename> path '<path>' [dev-so]`

Symlink .so files are for development only, and should therefore go into the -dev package. This situation might occur if you add *.so* rather than *.so.* to a non-dev package. Change FILES (and possibly PACKAGES) such that the specified .so file goes into an appropriate -dev package.

- `non -staticdev package contains static .a library: <packagename> path '<path>' [staticdev]`

Static .a library files should go into a -staticdev package. Change FILES (and possibly PACKAGES) such that the specified .a file goes into an appropriate -staticdev package.

- `<packagename>: found library in wrong location [libdir]`

The specified file may have been installed into an incorrect (possibly hardcoded) installation path. For example, this test will catch recipes that install /lib/bar.so when `${base_libdir}` is "lib32". Another example is when recipes install /usr/lib64/foo.so when `${libdir}` is "/usr/lib". False positives occasionally exist. For these cases add "libdir" to INSANE_SKIP for the package.

- `non debug package contains .debug directory: <packagename> path <path> [debug-files]`

The specified package contains a .debug directory, which should not appear in anything but the -dbg package. This situation might occur if you add a path which contains a .debug directory and do not explicitly add the .debug directory to the -dbg package. If this is the case, add the .debug directory explicitly to FILES_\${PN}-dbg. See FILES for additional information on FILES.

- `Architecture did not match (<machine_arch> to <file_arch>) on <file> [arch]`

By default, the OpenEmbedded build system checks the Executable and Linkable Format (ELF) type, bit size, and endianness of any binaries to ensure they match the target architecture. This test fails if any binaries do not match the type since there would be an incompatibility. The test could indicate that the wrong compiler or compiler options have been used. Sometimes software, like bootloaders, might need to bypass this check. If the file you receive the error for is firmware that is not intended to be executed within the target operating system or is intended to run on a separate processor within the device, you can add "arch" to INSANE_SKIP for the package. Another option is to check the do_compile log and verify that the compiler options being used are correct.

- `Bit size did not match (<machine_bits> to <file_bits>) <recipe> on <file> [arch]`

By default, the OpenEmbedded build system checks the Executable and Linkable Format (ELF) type, bit size, and endianness of any binaries to ensure they match the target architecture. This test fails if any binaries do not match the type since there would be an incompatibility. The test could indicate that the wrong compiler or compiler options have been used. Sometimes software, like

bootloaders, might need to bypass this check. If the file you receive the error for is firmware that is not intended to be executed within the target operating system or is intended to run on a separate processor within the device, you can add "arch" to INSANE_SKIP for the package. Another option is to check the do_compile log and verify that the compiler options being used are correct.

- Endianness did not match (<machine_endianness> to <file_endianness>) on <file> [arch]

By default, the OpenEmbedded build system checks the Executable and Linkable Format (ELF) type, bit size, and endianness of any binaries to ensure they match the target architecture. This test fails if any binaries do not match the type since there would be an incompatibility. The test could indicate that the wrong compiler or compiler options have been used. Sometimes software, like bootloaders, might need to bypass this check. If the file you receive the error for is firmware that is not intended to be executed within the target operating system or is intended to run on a separate processor within the device, you can add "arch" to INSANE_SKIP for the package. Another option is to check the do_compile log and verify that the compiler options being used are correct.

- ELF binary '<file>' has relocations in .text [textrel]

The specified ELF binary contains relocations in its .text sections. This situation can result in a performance impact at runtime.

Typically, the way to solve this performance issue is to add "-fPIC" or "-fpic" to the compiler command-line options. For example, given software that reads CFLAGS when you build it, you could add the following to your recipe:

```
CFLAGS_append = " -fPIC "
```

For more information on text relocations at runtime, see <http://www.akkadia.org/drepper/textrelocs.html>.

- No GNU_HASH in the elf binary: '<file>' [ldflags]

This indicates that binaries produced when building the recipe have not been linked with the LDFLAGS options provided by the build system. Check to be sure that the LDFLAGS variable is being passed to the linker command. A common workaround for this situation is to pass in LDFLAGS using TARGET_CC_ARCH within the recipe as follows:

```
TARGET_CC_ARCH += "${LDFLAGS}"
```

- Package <packagename> contains Xorg driver (<driver>) but no xorg-abi- dependencies [xorg-driver-abi]

The specified package contains an Xorg driver, but does not have a corresponding ABI package dependency. The xserver-xorg recipe provides driver ABI names. All drivers should depend on the ABI versions that they have been built against. Driver recipes that include xorg-driver-input.inc or xorg-driver-video.inc will automatically get these versions. Consequently, you should only need to explicitly add dependencies to binary driver recipes.

- The /usr/share/info/dir file is not meant to be shipped in a particular package. [infodir]

The /usr/share/info/dir should not be packaged. Add the following line to your do_install task or to your do_install_append within the recipe as follows:

```
rm ${D}${infodir}/dir
```

- Symlink `<path>` in `<packagename>` points to TMPDIR [symlink-to-sysroot]

The specified symlink points into TMPDIR on the host. Such symlinks will work on the host. However, they are clearly invalid when running on the target. You should either correct the symlink to use a relative path or remove the symlink.

- `<file>` failed sanity test (workdir) in path `<path>` [la]

The specified `.la` file contains TMPDIR paths. Any `.la` file containing these paths is incorrect since `libtool` adds the correct sysroot prefix when using the files automatically itself.

- `<file>` failed sanity test (tmpdir) in path `<path>` [pkgconfig]

The specified `.pc` file contains TMPDIR/WORKDIR paths. Any `.pc` file containing these paths is incorrect since `pkg-config` itself adds the correct sysroot prefix when the files are accessed.

- `<packagename>` rdepends on `<debug_packagename>` [debug-deps]

A dependency exists between the specified non-dbg package (i.e. a package whose name does not end in `-dbg`) and a package that is a dbg package. The dbg packages contain debug symbols and are brought in using several different methods:

- Using the dbg-pkgs `IMAGE_FEATURES` value.
- Using `IMAGE_INSTALL`.
- As a dependency of another dbg package that was brought in using one of the above methods. The dependency might have been automatically added because the dbg package erroneously contains files that it should not contain (e.g. a non-symlink `.so` file) or it might have been added manually (e.g. by adding to `RDEPENDS`).

- `<packagename>` rdepends on `<dev_packagename>` [dev-deps]

A dependency exists between the specified non-dev package (a package whose name does not end in `-dev`) and a package that is a dev package. The dev packages contain development headers and are usually brought in using several different methods:

- Using the dev-pkgs `IMAGE_FEATURES` value.
- Using `IMAGE_INSTALL`.
- As a dependency of another dev package that was brought in using one of the above methods. The dependency might have been automatically added (because the dev package erroneously contains files that it should not have (e.g. a non-symlink `.so` file) or it might have been added manually (e.g. by adding to `RDEPENDS`).

- `<var>_<packagename>` is invalid: `<comparison>` (`<value>`) only comparisons `<`, `=`, `>`, `<=`, and `>=` are allowed [dep-cmp]

If you are adding a versioned dependency relationship to one of the dependency variables (`RDEPENDS`, `RRECOMMENDS`, `RSUGGESTS`, `RPROVIDES`, `RREPLACES`, or `RCONFLICTS`), you must only use

the named comparison operators. Change the versioned dependency values you are adding to match those listed in the message.

- `<recipe>`: The compile log indicates that host include and/or library paths were used. Please check the log '`<logfile>`' for more information. [compile-host-path]

The log for the `do_compile` task indicates that paths on the host were searched for files, which is not appropriate when cross-compiling. Look for "is unsafe for cross-compilation" or "CROSS COMPILE Badness" in the specified log file.

- `<recipe>`: The install log indicates that host include and/or library paths were used. Please check the log '`<logfile>`' for more information. [install-host-path]

The log for the `do_install` task indicates that paths on the host were searched for files, which is not appropriate when cross-compiling. Look for "is unsafe for cross-compilation" or "CROSS COMPILE Badness" in the specified log file.

- This autoconf log indicates errors, it looked at host include and/or library paths while determining system capabilities. Rerun configure task after fixing this. The path was '`<path>`'

The log for the `do_configure` task indicates that paths on the host were searched for files, which is not appropriate when cross-compiling. Look for "is unsafe for cross-compilation" or "CROSS COMPILE Badness" in the specified log file.

- `<package>` doesn't match the `[a-z0-9.+~]+` regex [pkgname]

The convention within the OpenEmbedded build system (sometimes enforced by the package manager itself) is to require that package names are all lower case and to allow a restricted set of characters. If your recipe name does not match this, or you add packages to `PACKAGES` that do not conform to the convention, then you will receive this error. Rename your recipe. Or, if you have added a non-conforming package name to `PACKAGES`, change the package name appropriately.

- `<recipe>`: configure was passed unrecognized options: `<options>` [unknown-configure-option]

The configure script is reporting that the specified options are unrecognized. This situation could be because the options were previously valid but have been removed from the configure script. Or, there was a mistake when the options were added and there is another option that should be used instead. If you are unsure, consult the upstream build documentation, the `./configure --help` output, and the upstream change log or release notes. Once you have worked out what the appropriate change is, you can update `EXTRA_OECONF`, `PACKAGECONFIG_CONFGARGS`, or the individual `PACKAGECONFIG` option values accordingly.

- Recipe `<recipefile>` has PN of "`<recipe>`" which is in `OVERRIDES`, this can result in unexpected behavior. [pn-overrides]

The specified recipe has a name (PN) value that appears in `OVERRIDES`. If a recipe is named such that its PN value matches something already in `OVERRIDES` (e.g. PN happens to be the same as `MACHINE` or `DISTRO`), it can have unexpected consequences. For example, assignments such as `FILES_${PN} = "xyz"` effectively turn into `FILES = "xyz"`. Rename your recipe (or if PN is being set explicitly, change the PN value) so that the conflict does not occur. See `FILES` for additional information.

- `<recipefile>`: Variable `<variable>` is set as not being package specific, please fix this. [pkgvarcheck]

Certain variables (RDEPENDS, RRECOMMENDS, RSUGGESTS, RCONFLICTS, RPROVIDES, RREPLACES, FILES, pkg_preinst, pkg_postinst, pkg_prerm, pkg_postrm, and ALLOW_EMPTY) should always be set specific to a package (i.e. they should be set with a package name override such as `RDEPENDS_${PN} = "value"` rather than `RDEPENDS = "value"`). If you receive this error, correct any assignments to these variables within your recipe.

- File '<file>' from <recipe> was already stripped, this will prevent future debugging! [already-stripped]

Produced binaries have already been stripped prior to the build system extracting debug symbols. It is common for upstream software projects to default to stripping debug symbols for output binaries. In order for debugging to work on the target using -dbg packages, this stripping must be disabled.

Depending on the build system used by the software being built, disabling this stripping could be as easy as specifying an additional configure option. If not, disabling stripping might involve patching the build scripts. In the latter case, look for references to "strip" or "STRIP", or the "-s" or "-S" command-line options being specified on the linker command line (possibly through the compiler command line if preceded with "-Wl,").

Note

Disabling stripping here does not mean that the final packaged binaries will be unstripped. Once the OpenEmbedded build system splits out debug symbols to the -dbg package, it will then strip the symbols from the binaries.

- <packagename> is listed in PACKAGES multiple times, this leads to packaging errors. [packages-list]

Package names must appear only once in the PACKAGES variable. You might receive this error if you are attempting to add a package to PACKAGES that is already in the variable's value.

- FILES variable for package <packagename> contains '/' which is invalid. Attempting to fix this but you should correct the metadata. [files-invalid]

The string "/" is invalid in a Unix path. Correct all occurrences where this string appears in a FILES variable so that there is only a single "/".

- <recipe>: Files/directories were installed but not shipped in any package [installed-vs-shipped]

Files have been installed within the do_install task but have not been included in any package by way of the FILES variable. Files that do not appear in any package cannot be present in an image later on in the build process. You need to do one of the following:

- Add the files to FILES for the package you want them to appear in (e.g. FILES_\${PN} for the main package).
- Delete the files at the end of the do_install task if the files are not needed in any package.

- <oldpackage>-<oldpkgversion> was registered as shlib provider for <library>, changing it to <newpackage>-<newpkgversion> because it was built later

This message means that both <oldpackage> and <newpackage> provide the specified shared library. You can expect this message when a recipe has been renamed. However, if that is not the case, the message might indicate that a private version of a library is being erroneously picked up as the provider for a common library. If that is the case, you should add the library's .so file name to PRIVATE_LIBS in the recipe that provides the private version of the library.

10.3. Configuring and Disabling QA Checks

You can configure the QA checks globally so that specific check failures either raise a warning or an error message, using the `WARN_QA` and `ERROR_QA` variables, respectively. You can also disable checks within a particular recipe using `INSANE_SKIP`. For information on how to work with the QA checks, see the "insane.bbclass" section.

Tip

Please keep in mind that the QA checks exist in order to detect real or potential problems in the packaged output. So exercise caution when disabling these checks.

Chapter 11. Images

The OpenEmbedded build system provides several example images to satisfy different needs. When you issue the `bitbake` command you provide a “top-level” recipe that essentially begins the build for the type of image you want.

Note

Building an image without GNU General Public License Version 3 (GPLv3), GNU Lesser General Public License Version 3 (LGPLv3), and the GNU Affero General Public License Version 3 (AGPL-3.0) components is only supported for minimal and base images. Furthermore, if you are going to build an image using non-GPLv3 and similarly licensed components, you must make the following changes in the `local.conf` file before using the BitBake command to build the minimal or base image:

1. Comment out the `EXTRA_IMAGE_FEATURES` line
2. Set `INCOMPATIBLE_LICENSE = "GPL-3.0 LGPL-3.0 AGPL-3.0"`

From within the poky Git repository, you can use the following command to display the list of directories within the Source Directory that contain image recipe files:

```
$ ls meta*/recipes*/images/*.bb
```

Following is a list of supported recipes:

- **build-appliance-image:** An example virtual machine that contains all the pieces required to run builds using the build system as well as the build system itself. You can boot and run the image using either the VMware Player [<http://www.vmware.com/products/player/overview.html>] or VMware Workstation [<http://www.vmware.com/products/workstation/overview.html>]. For more information on this image, see the Build Appliance [<http://www.yoctoproject.org/software-item/build-appliance/>] page on the Yocto Project website.
- **core-image-base:** A console-only image that fully supports the target device hardware.
- **core-image-clutter:** An image with support for the Open GL-based toolkit Clutter, which enables development of rich and animated graphical user interfaces.
- **core-image-full-cmdline:** A console-only image with more full-featured Linux system functionality installed.
- **core-image-lsb:** An image that conforms to the Linux Standard Base (LSB) specification. This image requires a distribution configuration that enables LSB compliance (e.g. `poky-lsb`). If you build `core-image-lsb` without that configuration, the image will not be LSB-compliant.
- **core-image-lsb-dev:** A `core-image-lsb` image that is suitable for development work using the host. The image includes headers and libraries you can use in a host development environment. This image requires a distribution configuration that enables LSB compliance (e.g. `poky-lsb`). If you build `core-image-lsb-dev` without that configuration, the image will not be LSB-compliant.
- **core-image-lsb-sdk:** A `core-image-lsb` that includes everything in the cross-toolchain but also includes development headers and libraries to form a complete standalone SDK. This image requires a distribution configuration that enables LSB compliance (e.g. `poky-lsb`). If you build `core-image-lsb-sdk` without that configuration, the image will not be LSB-compliant. This image is suitable for development using the target.
- **core-image-minimal:** A small image just capable of allowing a device to boot.
- **core-image-minimal-dev:** A `core-image-minimal` image suitable for development work using the host. The image includes headers and libraries you can use in a host development environment.
- **core-image-minimal-initramfs:** A `core-image-minimal` image that has the Minimal RAM-based Initial Root Filesystem (initramfs) as part of the kernel, which allows the system to find the first

"init" program more efficiently. See the `PACKAGE_INSTALL` variable for additional information helpful when working with `initramfs` images.

- `core-image-minimal-mtdutils`: A `core-image-minimal` image that has support for the Minimal MTD Utilities, which let the user interact with the MTD subsystem in the kernel to perform operations on flash devices.
- `core-image-rt`: A `core-image-minimal` image plus a real-time test suite and tools appropriate for real-time use.
- `core-image-rt-sdk`: A `core-image-rt` image that includes everything in the cross-toolchain. The image also includes development headers and libraries to form a complete stand-alone SDK and is suitable for development using the target.
- `core-image-sato`: An image with Sato support, a mobile environment and visual style that works well with mobile devices. The image supports X11 with a Sato theme and applications such as a terminal, editor, file manager, media player, and so forth.
- `core-image-sato-dev`: A `core-image-sato` image suitable for development using the host. The image includes libraries needed to build applications on the device itself, testing and profiling tools, and debug symbols. This image was formerly `core-image-sdk`.
- `core-image-sato-sdk`: A `core-image-sato` image that includes everything in the cross-toolchain. The image also includes development headers and libraries to form a complete standalone SDK and is suitable for development using the target.
- `core-image-testmaster`: A "master" image designed to be used for automated runtime testing. Provides a "known good" image that is deployed to a separate partition so that you can boot into it and use it to deploy a second image to be tested. You can find more information about runtime testing in the "Performing Automated Runtime Testing [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#performing-automated-runtime-testing>]" section in the Yocto Project Development Tasks Manual.
- `core-image-testmaster-initramfs`: A RAM-based Initial Root Filesystem (`initramfs`) image tailored for use with the `core-image-testmaster` image.
- `core-image-weston`: A very basic Wayland image with a terminal. This image provides the Wayland protocol libraries and the reference Weston compositor. For more information, see the "Using Wayland and Weston [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#dev-using-wayland-and-weston>]" section in the Yocto Project Development Tasks Manual.
- `core-image-x11`: A very basic X11 image with a terminal.

Chapter 12. Features

This chapter provides a reference of shipped machine and distro features you can include as part of your image, a reference on image features you can select, and a reference on feature backfilling.

Features provide a mechanism for working out which packages should be included in the generated images. Distributions can select which features they want to support through the `DISTRO_FEATURES` variable, which is set or appended to in a distribution's configuration file such as `poky.conf`, `poky-tiny.conf`, `poky-lsb.conf` and so forth. Machine features are set in the `MACHINE_FEATURES` variable, which is set in the machine configuration file and specifies the hardware features for a given machine.

These two variables combine to work out which kernel modules, utilities, and other packages to include. A given distribution can support a selected subset of features so some machine features might not be included if the distribution itself does not support them.

One method you can use to determine which recipes are checking to see if a particular feature is contained or not is to `grep` through the Metadata for the feature. Here is an example that discovers the recipes whose build is potentially changed based on a given feature:

```
$ cd poky
$ git grep 'contains.*MACHINE_FEATURES.*feature'
```

12.1. Machine Features

The items below are features you can use with `MACHINE_FEATURES`. Features do not have a one-to-one correspondence to packages, and they can go beyond simply controlling the installation of a package or packages. Sometimes a feature can influence how certain recipes are built. For example, a feature might determine whether a particular configure option is specified within the `do_configure` task for a particular recipe.

This feature list only represents features as shipped with the Yocto Project metadata:

- `acpi`: Hardware has ACPI (x86/x86_64 only)
- `alsa`: Hardware has ALSA audio drivers
- `apm`: Hardware uses APM (or APM emulation)
- `bluetooth`: Hardware has integrated BT
- `efi`: Support for booting through EFI
- `ext2`: Hardware HDD or Microdrive
- `keyboard`: Hardware has a keyboard
- `pcbios`: Support for booting through BIOS
- `pci`: Hardware has a PCI bus
- `pcmcia`: Hardware has PCMCIA or CompactFlash sockets
- `phone`: Mobile phone (voice) support
- `qvga`: Machine has a QVGA (320x240) display
- `rtc`: Machine has a Real-Time Clock
- `screen`: Hardware has a screen
- `serial`: Hardware has serial support (usually RS232)
- `touchscreen`: Hardware has a touchscreen
- `usb gadget`: Hardware is USB gadget device capable

- `usbhost`: Hardware is USB Host capable
- `vfat`: FAT file system support
- `wifi`: Hardware has integrated WiFi

12.2. Distro Features

The items below are features you can use with `DISTRO_FEATURES` to enable features across your distribution. Features do not have a one-to-one correspondence to packages, and they can go beyond simply controlling the installation of a package or packages. In most cases, the presence or absence of a feature translates to the appropriate option supplied to the configure script during the `do_configure` task for the recipes that optionally support the feature.

Some distro features are also machine features. These select features make sense to be controlled both at the machine and distribution configuration level. See the `COMBINED_FEATURES` variable for more information.

This list only represents features as shipped with the Yocto Project metadata:

- `alsa`: Include ALSA support (OSS compatibility kernel modules installed if available).
- `api-documentation`: Enables generation of API documentation during recipe builds. The resulting documentation is added to SDK tarballs when the `bitbake -c populate_sdk` command is used. See the "Adding API Documentation to the Standard SDK [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#adding-api-documentation-to-the-standard-sdk>]" section in the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) manual.
- `bluetooth`: Include bluetooth support (integrated BT only).
- `cramfs`: Include CramFS support.
- `directfb`: Include DirectFB support.
- `ext2`: Include tools for supporting for devices with internal HDD/Microdrive for storing files (instead of Flash only devices).
- `ipsec`: Include IPSec support.
- `ipv6`: Include IPv6 support.
- `keyboard`: Include keyboard support (e.g. keymaps will be loaded during boot).
- `ldconfig`: Include support for `ldconfig` and `ld.so.conf` on the target.
- `nfs`: Include NFS client support (for mounting NFS exports on device).
- `opengl`: Include the Open Graphics Library, which is a cross-language, multi-platform application programming interface used for rendering two and three-dimensional graphics.
- `pci`: Include PCI bus support.
- `pcmcia`: Include PCMCIA/CompactFlash support.
- `ppp`: Include PPP dialup support.
- `ptest`: Enables building the package tests where supported by individual recipes. For more information on package tests, see the "Testing Packages With ptest [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#testing-packages-with-ptest>]" section in the Yocto Project Development Tasks Manual.
- `smbfs`: Include SMB networks client support (for mounting Samba/Microsoft Windows shares on device).
- `systemd`: Include support for this `init` manager, which is a full replacement of for `init` with parallel starting of services, reduced shell overhead, and other features. This `init` manager is used by many distributions.

- `usb gadget`: Include USB Gadget Device support (for USB networking/serial/storage).
- `usb host`: Include USB Host support (allows to connect external keyboard, mouse, storage, network etc).
- `wayland`: Include the Wayland display server protocol and the library that supports it.
- `wifi`: Include WiFi support (integrated only).
- `x11`: Include the X server and libraries.

12.3. Image Features

The contents of images generated by the OpenEmbedded build system can be controlled by the `IMAGE_FEATURES` and `EXTRA_IMAGE_FEATURES` variables that you typically configure in your image recipes. Through these variables, you can add several different predefined packages such as development utilities or packages with debug information needed to investigate application problems or profile applications.

The following image features are available for all images:

- `allow-empty-password`: Allows Dropbear and OpenSSH to accept root logins and logins from accounts having an empty password string.
- `dbg-pkgs`: Installs debug symbol packages for all packages installed in a given image.
- `debug-tweaks`: Makes an image suitable for development (e.g. allows root logins without passwords and enables post-installation logging). See the 'allow-empty-password', 'empty-root-password', and 'post-install-logging' features in this list for additional information.
- `dev-pkgs`: Installs development packages (headers and extra library links) for all packages installed in a given image.
- `doc-pkgs`: Installs documentation packages for all packages installed in a given image.
- `empty-root-password`: Sets the root password to an empty string, which allows logins with a blank password.
- `package-management`: Installs package management tools and preserves the package manager database.
- `post-install-logging`: Enables logging postinstall script runs to the `/var/log/postinstall.log` file on first boot of the image on the target system.

Note

To make the `/var/log` directory on the target persistent, use the `VOLATILE_LOG_DIR` variable by setting it to "no".

- `ptest-pkgs`: Installs ptest packages for all ptest-enabled recipes.
- `read-only-rootfs`: Creates an image whose root filesystem is read-only. See the "Creating a Read-Only Root Filesystem [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#creating-a-read-only-root-filesystem>]" section in the Yocto Project Development Tasks Manual for more information.
- `splash`: Enables showing a splash screen during boot. By default, this screen is provided by `psplash`, which does allow customization. If you prefer to use an alternative splash screen package, you can do so by setting the `SPLASH` variable to a different package name (or names) within the image recipe or at the distro configuration level.
- `staticdev-pkgs`: Installs static development packages, which are static libraries (i.e. *.a files), for all packages installed in a given image.

Some image features are available only when you inherit the `core-image` class. The current list of these valid features is as follows:

- `hwcodecs`: Installs hardware acceleration codecs.

- `nfs-server`: Installs an NFS server.
- `perf`: Installs profiling tools such as `perf`, `systemtap`, and `LTTng`. For general information on user-space tools, see the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html>] manual.
- `ssh-server-dropbear`: Installs the Dropbear minimal SSH server.
- `ssh-server-openssh`: Installs the OpenSSH SSH server, which is more full-featured than Dropbear. Note that if both the OpenSSH SSH server and the Dropbear minimal SSH server are present in `IMAGE_FEATURES`, then OpenSSH will take precedence and Dropbear will not be installed.
- `tools-debug`: Installs debugging tools such as `strace` and `gdb`. For information on GDB, see the "Debugging With the GNU Project Debugger (GDB) Remotely [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#platdev-gdb-remotedebug>]" section in the Yocto Project Development Tasks Manual. For information on tracing and profiling, see the Yocto Project Profiling and Tracing Manual [<http://www.yoctoproject.org/docs/3.0.3/profile-manual/profile-manual.html>].
- `tools-sdk`: Installs a full SDK that runs on the device.
- `tools-testapps`: Installs device testing tools (e.g. touchscreen debugging).
- `x11`: Installs the X server.
- `x11-base`: Installs the X server with a minimal environment.
- `x11-sato`: Installs the OpenedHand Sato environment.

12.4. Feature Backfilling

Sometimes it is necessary in the OpenEmbedded build system to extend `MACHINE_FEATURES` or `DISTRO_FEATURES` to control functionality that was previously enabled and not able to be disabled. For these cases, we need to add an additional feature item to appear in one of these variables, but we do not want to force developers who have existing values of the variables in their configuration to add the new feature in order to retain the same overall level of functionality. Thus, the OpenEmbedded build system has a mechanism to automatically "backfill" these added features into existing distro or machine configurations. You can see the list of features for which this is done by finding the `DISTRO_FEATURES_BACKFILL` and `MACHINE_FEATURES_BACKFILL` variables in the `meta/conf/bitbake.conf` file.

Because such features are backfilled by default into all configurations as described in the previous paragraph, developers who wish to disable the new features need to be able to selectively prevent the backfilling from occurring. They can do this by adding the undesired feature or features to the `DISTRO_FEATURES_BACKFILL_CONSIDERED` or `MACHINE_FEATURES_BACKFILL_CONSIDERED` variables for distro features and machine features respectively.

Here are two examples to help illustrate feature backfilling:

- The "pulseaudio" distro feature option: Previously, PulseAudio support was enabled within the Qt and GStreamer frameworks. Because of this, the feature is backfilled and thus enabled for all distros through the `DISTRO_FEATURES_BACKFILL` variable in the `meta/conf/bitbake.conf` file. However, your distro needs to disable the feature. You can disable the feature without affecting other existing distro configurations that need PulseAudio support by adding "pulseaudio" to `DISTRO_FEATURES_BACKFILL_CONSIDERED` in your distro's `.conf` file. Adding the feature to this variable when it also exists in the `DISTRO_FEATURES_BACKFILL` variable prevents the build system from adding the feature to your configuration's `DISTRO_FEATURES`, effectively disabling the feature for that particular distro.
- The "rtc" machine feature option: Previously, real time clock (RTC) support was enabled for all target devices. Because of this, the feature is backfilled and thus enabled for all machines through the `MACHINE_FEATURES_BACKFILL` variable in the `meta/conf/bitbake.conf` file. However, your target device does not have this capability. You can disable RTC support for your machine without affecting other machines that need RTC support by adding the feature to your machine's `MACHINE_FEATURES_BACKFILL_CONSIDERED` list in the machine's `.conf` file. Adding the feature to this variable when it also exists in the `MACHINE_FEATURES_BACKFILL` variable prevents the build

system from adding the feature to your configuration's `MACHINE_FEATURES`, effectively disabling RTC support for that particular machine.

Chapter 13. Variables Glossary

This chapter lists common variables used in the OpenEmbedded build system and gives an overview of their function and contents.

Glossary

A B C D E F G H I K L M N O P R S T U V W X

A

ABIEXTENSION Extension to the Application Binary Interface (ABI) field of the GNU canonical architecture name (e.g. "eabi").

ABI extensions are set in the machine include files. For example, the `meta/conf/machine/include/arm/arch-arm.inc` file sets the following extension:

```
ABIEXTENSION = "eabi"
```

ALLOW_EMPTY Specifies whether to produce an output package even if it is empty. By default, BitBake does not produce empty packages. This default behavior can cause issues when there is an `RDEPENDS` or some other hard runtime requirement on the existence of the package.

Like all package-controlling variables, you must always use them in conjunction with a package name override, as in:

```
ALLOW_EMPTY_${PN} = "1"  
ALLOW_EMPTY_${PN}-dev = "1"  
ALLOW_EMPTY_${PN}-staticdev = "1"
```

ALTERNATIVE Lists commands in a package that need an alternative binary naming scheme. Sometimes the same command is provided in multiple packages. When this occurs, the OpenEmbedded build system needs to use the alternatives system to create a different binary naming scheme so the commands can co-exist.

To use the variable, list out the package's commands that also exist as part of another package. For example, if the `busybox` package has four commands that also exist as part of another package, you identify them as follows:

```
ALTERNATIVE_busybox = "sh sed test bracket"
```

For more information on the alternatives system, see the `"update-alternatives.bbclass"` section.

ALTERNATIVE_LINK_NAME Used by the alternatives system to map duplicated commands to actual locations. For example, if the `bracket` command provided by the `busybox` package is duplicated through another package, you must use the `ALTERNATIVE_LINK_NAME` variable to specify the actual location:

```
ALTERNATIVE_LINK_NAME[bracket] = "/usr/bin/["
```

In this example, the binary for the bracket command (i.e. []) from the busybox package resides in /usr/bin/.

Note

If `ALTERNATIVE_LINK_NAME` is not defined, it defaults to `${bindir}/name`.

For more information on the alternatives system, see the "update-alternatives.bbclass" section.

ALTERNATIVE_PRIORITY

Used by the alternatives system to create default priorities for duplicated commands. You can use the variable to create a single default regardless of the command name or package, a default for specific duplicated commands regardless of the package, or a default for specific commands tied to particular packages. Here are the available syntax forms:

```
ALTERNATIVE_PRIORITY = "priority"
ALTERNATIVE_PRIORITY[name] = "priority"
ALTERNATIVE_PRIORITY_pkg[name] = "priority"
```

For more information on the alternatives system, see the "update-alternatives.bbclass" section.

ALTERNATIVE_TARGET

Used by the alternatives system to create default link locations for duplicated commands. You can use the variable to create a single default location for all duplicated commands regardless of the command name or package, a default for specific duplicated commands regardless of the package, or a default for specific commands tied to particular packages. Here are the available syntax forms:

```
ALTERNATIVE_TARGET = "target"
ALTERNATIVE_TARGET[name] = "target"
ALTERNATIVE_TARGET_pkg[name] = "target"
```

Note

If `ALTERNATIVE_TARGET` is not defined, it inherits the value from the `ALTERNATIVE_LINK_NAME` variable.

If `ALTERNATIVE_LINK_NAME` and `ALTERNATIVE_TARGET` are the same, the target for `ALTERNATIVE_TARGET` has ".{BPN}" appended to it.

Finally, if the file referenced has not been renamed, the alternatives system will rename it to avoid the need to rename alternative files in the `do_install` task while retaining support for the command if necessary.

For more information on the alternatives system, see the "update-alternatives.bbclass" section.

APPEND

An override list of append strings for each target specified with LABELS.

See the grub-efi class for more information on how this variable is used.

AR

The minimal command and arguments used to run ar.

ARCHIVER_MODE

When used with the archiver class, determines the type of information used to create a released archive. You can use this variable to create archives of patched source, original source, configured source, and so forth by employing the following variable flags (varflags):

```
ARCHIVER_MODE[src] = "original"           # Uses original (
# files.

ARCHIVER_MODE[src] = "patched"           # Uses patched so
# the default.

ARCHIVER_MODE[src] = "configured"        # Uses configured

ARCHIVER_MODE[diff] = "1"               # Uses patches be
# do_patch.

ARCHIVER_MODE[diff-exclude] ?= "file file ..." # Lists files and
# exclude from di

ARCHIVER_MODE[dumpdata] = "1"           # Uses environmen

ARCHIVER_MODE[recipe] = "1"             # Uses recipe and

ARCHIVER_MODE[srpm] = "1"               # Uses RPM packag
```

For information on how the variable works, see the meta/classes/archiver.bbclass file in the Source Directory.

AS

Minimal command and arguments needed to run the assembler.

ASSUME_PROVIDED

Lists recipe names (PN values) BitBake does not attempt to build. Instead, BitBake assumes these recipes have already been built.

In OpenEmbedded-Core, ASSUME_PROVIDED mostly specifies native tools that should not be built. An example is `git-native`, which when specified, allows for the Git binary from the host to be used rather than building `git-native`.

ASSUME_SHLIBS

Provides additional shlibs provider mapping information, which adds to or overwrites the information provided automatically by the system. Separate multiple entries using spaces.

As an example, use the following form to add an shlib provider of shlibname in packagename with the optional version:

```
shlibname:packagename[_version]
```

Here is an example that adds a shared library named `libEGL.so.1` as being provided by the `libegl-implementation` package:

```
ASSUME_SHLIBS = "libEGL.so.1:libegl-implementation"
```

AUTHOR

The email address used to contact the original author or authors in order to send patches and forward bugs.

AUTO_LIBNAME_PKGS

When the debian class is inherited, which is the default behavior, AUTO_LIBNAME_PKGS specifies which packages should be checked for libraries and renamed according to Debian library package naming.

The default value is "\${PACKAGES}", which causes the debian class to act on all packages that are explicitly generated by the recipe.

AUTO_SYSLINUXMENU Enables creating an automatic menu for the syslinux bootloader. You must set this variable in your recipe. The syslinux class checks this variable.

AUTOREV When SRCREV is set to the value of this variable, it specifies to use the latest source revision in the repository. Here is an example:

```
SRCREV = "${AUTOREV}"
```

If you use the previous statement to retrieve the latest version of software, you need to be sure PV contains \${SRCPV}. For example, suppose you have a kernel recipe that inherits the kernel class and you use the previous statement. In this example, \${SRCPV} does not automatically get into PV. Consequently, you need to change PV in your recipe so that it does contain \${SRCPV}.

For more information see the "Automatically Incrementing a Binary Package Revision Number [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#automatically-incrementing-a-binary-package-revision-number>]" section in the Yocto Project Development Tasks Manual.

AVAILTUNES The list of defined CPU and Application Binary Interface (ABI) tunings (i.e. "tunes") available for use by the OpenEmbedded build system.

The list simply presents the tunes that are available. Not all tunes may be compatible with a particular machine configuration, or with each other in a Multilib [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#combining-multiple-versions-library-files-into-one-image>] configuration.

To add a tune to the list, be sure to append it with spaces using the "+=" BitBake operator. Do not simply replace the list by using the "=" operator. See the "Basic Syntax [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#basic-syntax>]" section in the BitBake User Manual for more information.

B

B The directory within the Build Directory in which the OpenEmbedded build system places generated objects during a recipe's build process. By default, this directory is the same as the S directory, which is defined as:

```
S = "${WORKDIR}/${BP}"
```

You can separate the (S) directory and the directory pointed to by the B variable. Most Autotools-based recipes support separating these directories. The build system defaults to using separate directories for gcc and some kernel recipes.

BAD_RECOMMENDATIONS Lists "recommended-only" packages to not install. Recommended-only packages are packages installed only through the RRECOMMENDS variable. You can prevent any of these "recommended" packages from being installed by listing them with the BAD_RECOMMENDATIONS variable:

```
BAD_RECOMMENDATIONS = "package_name package_name package_name ..."
```

You can set this variable globally in your `local.conf` file or you can attach it to a specific image recipe by using the recipe name override:

```
BAD_RECOMMENDATIONS_pn-target_image = "package_name"
```

It is important to realize that if you choose to not install packages using this variable and some other packages are dependent on them (i.e. listed in a recipe's `RDEPENDS` variable), the OpenEmbedded build system ignores your request and will install the packages to avoid dependency errors.

Support for this variable exists only when using the IPK and RPM packaging backend. Support does not exist for DEB.

See the `NO_RECOMMENDATIONS` and the `PACKAGE_EXCLUDE` variables for related information.

BASE_LIB

The library directory name for the CPU or Application Binary Interface (ABI) tune. The `BASE_LIB` applies only in the Multilib context. See the "Combining Multiple Versions of Library Files into One Image" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#combining-multiple-versions-library-files-into-one-image>] section in the Yocto Project Development Tasks Manual for information on Multilib.

The `BASE_LIB` variable is defined in the machine include files in the Source Directory. If Multilib is not being used, the value defaults to "lib".

BASE_WORKDIR

Points to the base of the work directory for all recipes. The default value is "`${TMPDIR}/work`".

BB_ALLOWED_NETWORKS

Specifies a space-delimited list of hosts that the fetcher is allowed to use to obtain the required source code. Following are considerations surrounding this variable:

- This host list is only used if `BB_NO_NETWORK` is either not set or set to "0".
- Limited support for wildcard matching against the beginning of host names exists. For example, the following setting matches `git.gnu.org`, `ftp.gnu.org`, and `foo.git.gnu.org`.

```
BB_ALLOWED_NETWORKS = "*.gnu.org"
```

Important

The use of the "*" character only works at the beginning of a host name and it must be isolated from the remainder of the host name. You cannot use the wildcard character in any other location of the name or combined with the front part of the name.

For example, `*.foo.bar` is supported, while `*aa.foo.bar` is not.

- Mirrors not in the host list are skipped and logged in debug.

- Attempts to access networks not in the host list cause a failure.

Using `BB_ALLOWED_NETWORKS` in conjunction with `PREMIRRORS` is very useful. Adding the host you want to use to `PREMIRRORS` results in the source code being fetched from an allowed location and avoids raising an error when a host that is not allowed is in a `SRC_URI` statement. This is because the fetcher does not attempt to use the host listed in `SRC_URI` after a successful fetch from the `PREMIRRORS` occurs.

BB_DANGLINGAPPENDS_WARNONLY Defines how BitBake handles situations where an append file (`.bbappend`) has no corresponding recipe file (`.bb`). This condition often occurs when layers get out of sync (e.g. `oe-core` bumps a recipe version and the old recipe no longer exists and the other layer has not been updated to the new version of the recipe yet).

The default fatal behavior is safest because it is the sane reaction given something is out of sync. It is important to realize when your changes are no longer being applied.

You can change the default behavior by setting this variable to `"1"`, `"yes"`, or `"true"` in your `local.conf` file, which is located in the Build Directory: Here is an example:

```
BB_DANGLINGAPPENDS_WARNONLY = "1"
```

BB_DISKMON_DIRS

Monitors disk space and available inodes during the build and allows you to control the build based on these parameters.

Disk space monitoring is disabled by default. To enable monitoring, add the `BB_DISKMON_DIRS` variable to your `conf/local.conf` file found in the Build Directory. Use the following form:

```
BB_DISKMON_DIRS = "action,dir,threshold [...]"
```

where:

action is:

ABORT:	Immediately abort the build when a threshold is broken.
STOPTASKS:	Stop the build after the currently executing tasks have finished when a threshold is broken.
WARN:	Issue a warning but continue the build when a threshold is broken. Subsequent warnings are issued as defined by the <code>BB_DISKMON_WARNINTERVAL</code> variable, which must be defined in the <code>conf/local.conf</code> file.

dir is:

Any directory you choose. You can specify one or more directories to monitor by separating the groupings with a space. If two directories are on the same device, only the first directory is monitored.

threshold is:

Either the minimum available disk space, the minimum number of free inodes, or both. You must specify at least one. To omit one or the other, simply omit the value.

Specify the threshold using G, M, K for Gbytes, Mbytes, and Kbytes, respectively. If you do not specify G, M, or K, Kbytes is assumed by default. Do not use GB, MB, or KB.

Here are some examples:

```
BB_DISKMON_DIRS = "ABORT,${TMPDIR},1G,100K WARN,${SSTATE_DIR},1G,  
BB_DISKMON_DIRS = "STOPTASKS,${TMPDIR},1G"  
BB_DISKMON_DIRS = "ABORT,${TMPDIR},,100K"
```

The first example works only if you also provide the `BB_DISKMON_WARNINTERVAL` variable in the `conf/local.conf`. This example causes the build system to immediately abort when either the disk space in `${TMPDIR}` drops below 1 Gbyte or the available free inodes drops below 100 Kbytes. Because two directories are provided with the variable, the build system also issue a warning when the disk space in the `${SSTATE_DIR}` directory drops below 1 Gbyte or the number of free inodes drops below 100 Kbytes. Subsequent warnings are issued during intervals as defined by the `BB_DISKMON_WARNINTERVAL` variable.

The second example stops the build after all currently executing tasks complete when the minimum disk space in the `${TMPDIR}` directory drops below 1 Gbyte. No disk monitoring occurs for the free inodes in this case.

The final example immediately aborts the build when the number of free inodes in the `${TMPDIR}` directory drops below 100 Kbytes. No disk space monitoring for the directory itself occurs in this case.

BB_DISKMON_WARNINTERVAL Defines the disk space and free inode warning intervals. To set these intervals, define the variable in your `conf/local.conf` file in the Build Directory.

If you are going to use the `BB_DISKMON_WARNINTERVAL` variable, you must also use the `BB_DISKMON_DIRS` variable and define its action as "WARN". During the build, subsequent warnings are issued each time disk space or number of free inodes further reduces by the respective interval.

If you do not provide a `BB_DISKMON_WARNINTERVAL` variable and you do use `BB_DISKMON_DIRS` with the "WARN" action, the disk monitoring interval defaults to the following:

```
BB_DISKMON_WARNINTERVAL = "50M,5K"
```

When specifying the variable in your configuration file, use the following form:

```
BB_DISKMON_WARNINTERVAL = "disk_space_interval,disk_inode_interva
```

where:

`disk_space_interval` is:

An interval of memory expressed in either G, M, or K for Gbytes, Mbytes, or Kbytes, respectively. You cannot use GB, MB, or KB.

`disk_inode_interval` is:

An interval of free inodes expressed in either G, M, or K for Gbytes, Mbytes, or Kbytes, respectively. You cannot use GB, MB, or KB.

Here is an example:

```
BB_DISKMON_DIRS = "WARN,${SSTATE_DIR},1G,100K"  
BB_DISKMON_WARNINTERVAL = "50M,5K"
```

These variables cause the OpenEmbedded build system to issue subsequent warnings each time the available disk space further reduces by 50 Mbytes or the number of free inodes further reduces by 5 Kbytes in the `${SSTATE_DIR}` directory. Subsequent warnings based on the interval occur each time a respective interval is reached beyond the initial warning (i.e. 1 Gbytes and 100 Kbytes).

BB_GENERATE_MIRROR_TARBALLS Causes tarballs of the source control repositories (e.g. Git repositories), including metadata, to be placed in the `DL_DIR` directory.

For performance reasons, creating and placing tarballs of these repositories is not the default action by the OpenEmbedded build system.

```
BB_GENERATE_MIRROR_TARBALLS = "1"
```

Set this variable in your `local.conf` file in the Build Directory.

Once you have the tarballs containing your source files, you can clean up your `DL_DIR` directory by deleting any Git or other source control work directories.

BB_NUMBER_THREADS

The maximum number of tasks BitBake should run in parallel at any one time. The OpenEmbedded build system automatically configures this variable to be equal to the number of cores on the build system. For example, a system with a dual core processor that also uses hyper-threading causes the `BB_NUMBER_THREADS` variable to default to "4".

For single socket systems (i.e. one CPU), you should not have to override this variable to gain optimal parallelism during builds. However, if you have very large systems that employ multiple physical CPUs, you might want to make sure the `BB_NUMBER_THREADS` variable is not set higher than "20".

For more information on speeding up builds, see the "Speeding Up a Build [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#speeding-up-a-build>]" section in the Yocto Project Development Tasks Manual.

BB_SERVER_TIMEOUT

Specifies the time (in seconds) after which to unload the BitBake server due to inactivity. Set `BB_SERVER_TIMEOUT` to determine how long the BitBake server stays resident between invocations.

For example, the following statement in your `local.conf` file instructs the server to be unloaded after 20 seconds of inactivity:

```
BB_SERVER_TIMEOUT = "20"
```

If you want the server to never be unloaded, set `BB_SERVER_TIMEOUT` to `"-1"`.

BBCLASSEXTEND

Allows you to extend a recipe so that it builds variants of the software. Common variants for recipes exist such as "natives" like quilt-native, which is a copy of Quilt built to run on the build system; "crosses" such as gcc-cross, which is a compiler built to run on the build machine but produces binaries that run on the target MACHINE; "nativesdk", which targets the SDK machine instead of MACHINE; and "multilibs" in the form "multilib:multilib_name".

To build a different variant of the recipe with a minimal amount of code, it usually is as simple as adding the following to your recipe:

```
BBCLASSEXTEND += "native nativesdk"
BBCLASSEXTEND += "multilib:multilib_name"
```

Note

Internally, the BBCLASSEXTEND mechanism generates recipe variants by rewriting variable values and applying overrides such as `_class-native`. For example, to generate a native version of a recipe, a `DEPENDS` on "foo" is rewritten to a `DEPENDS` on "foo-native".

Even when using BBCLASSEXTEND, the recipe is only parsed once. Parsing once adds some limitations. For example, it is not possible to include a different file depending on the variant, since include statements are processed when the recipe is parsed.

BBFILE_COLLECTIONS

Lists the names of configured layers. These names are used to find the other `BBFILE_*` variables. Typically, each layer will append its name to this variable in its `conf/layer.conf` file.

BBFILE_PATTERN

Variable that expands to match files from BBFILES in a particular layer. This variable is used in the `conf/layer.conf` file and must be suffixed with the name of the specific layer (e.g. `BBFILE_PATTERN_emenlow`).

BBFILE_PRIORITY

Assigns the priority for recipe files in each layer.

This variable is useful in situations where the same recipe appears in more than one layer. Setting this variable allows you to prioritize a layer against other layers that contain the same recipe - effectively letting you control the precedence for the multiple layers. The precedence established through this variable stands regardless of a recipe's version (PV variable). For example, a layer that has a recipe with a higher PV value but for which the `BBFILE_PRIORITY` is set to have a lower precedence still has a lower precedence.

A larger value for the `BBFILE_PRIORITY` variable results in a higher precedence. For example, the value 6 has a higher precedence than the value 5. If not specified, the `BBFILE_PRIORITY` variable is set based on layer dependencies (see the `LAYERDEPENDS` variable for more information). The default priority, if unspecified for a layer with no dependencies, is the lowest defined priority + 1 (or 1 if no priorities are defined).

Tip

You can use the command `bitbake-layers show-layers` to list all configured layers along with their priorities.

BBFILES A space-separated list of recipe files BitBake uses to build software.

When specifying recipe files, you can pattern match using Python's `glob` [<https://docs.python.org/3/library/glob.html>] syntax. For details on the syntax, see the documentation by following the previous link.

BBFILES_DYNAMIC Activates content when identified layers are present. You identify the layers by the collections that the layers define.

Use the `BBFILES_DYNAMIC` variable to avoid `.bbappend` files whose corresponding `.bb` file is in a layer that attempts to modify other layers through `.bbappend` but does not want to introduce a hard dependency on those other layers.

Use the following form for `BBFILES_DYNAMIC`:

```
collection_name:filename_pattern
```

The following example identifies two collection names and two filename patterns:

```
BBFILES_DYNAMIC += " \
clang-layer:${LAYERDIR}/bbappends/meta-clang/*/*/*.bbappend \
core:${LAYERDIR}/bbappends/openembedded-core/meta/*/*/*.bbappend"
"
```

This next example shows an error message that occurs because invalid entries are found, which cause parsing to abort:

```
ERROR: BBFILES_DYNAMIC entries must be of the form <collection name>
/work/my-layer/bbappends/meta-security-isafw/*/*/*.bbappend
/work/my-layer/bbappends/openembedded-core/meta/*/*/*.bbappend
```

BBINCLUDELOGS Variable that controls how BitBake displays logs on build failure.

BBINCLUDELOGS_LINES If `BBINCLUDELOGS` is set, specifies the maximum number of lines from the task log file to print when reporting a failed task. If you do not set `BBINCLUDELOGS_LINES`, the entire log is printed.

BBLAYERS Lists the layers to enable during the build. This variable is defined in the `bblayers.conf` configuration file in the Build Directory. Here is an example:

```
BBLAYERS = " \
/home/scottrif/poky/meta \
/home/scottrif/poky/meta-poky \
/home/scottrif/poky/meta-yocto-bsp \
/home/scottrif/poky/meta-mykernel \
"
```

This example enables four layers, one of which is a custom, user-defined layer named `meta-mykernel`.

BBMASK Prevents BitBake from processing recipes and recipe append files.

You can use the `BBMASK` variable to "hide" these `.bb` and `.bbappend` files. BitBake ignores any recipe or recipe append files that match any of the expressions. It is as if BitBake does not see them at all. Consequently, matching files are not parsed or otherwise used by BitBake.

The values you provide are passed to Python's regular expression compiler. Consequently, the syntax follows Python's Regular Expression (re) syntax. The expressions are compared against the full paths to the files. For complete syntax information, see Python's documentation at <http://docs.python.org/3/library/re.html#re>.

The following example uses a complete regular expression to tell BitBake to ignore all recipe and recipe append files in the meta-ti/recipes-misc/ directory:

```
BBMASK = "meta-ti/recipes-misc/"
```

If you want to mask out multiple directories or recipes, you can specify multiple regular expression fragments. This next example masks out multiple directories and individual recipes:

```
BBMASK += "/meta-ti/recipes-misc/ meta-ti/recipes-ti/packagegroup"
BBMASK += "/meta-oe/recipes-support/"
BBMASK += "/meta-foo/.*/openldap"
BBMASK += "opencv.*\bbappend"
BBMASK += "lzma"
```

Note

When specifying a directory name, use the trailing slash character to ensure you match just that directory name.

BBMULTICONFIG

Specifies each additional separate configuration when you are building targets with multiple configurations. Use this variable in your conf/local.conf configuration file. Specify a multiconfigname for each configuration file you are using. For example, the following line specifies three configuration files:

```
BBMULTICONFIG = "configA configB configC"
```

Each configuration file you use must reside in the Build Directory conf/multiconfig directory (e.g. build_directory/conf/multiconfig/configA.conf).

For information on how to use BBMULTICONFIG in an environment that supports building targets with multiple configurations, see the "Building Images for Multiple Targets Using Multiple Configurations [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#dev-building-images-for-multiple-targets-using-multiple-configurations>]" section in the Yocto Project Development Tasks Manual.

BBPATH

Used by BitBake to locate .bbclass and configuration files. This variable is analogous to the PATH variable.

Note

If you run BitBake from a directory outside of the Build Directory, you must be sure to set BBPATH to point to the Build Directory. Set the variable as you would any environment variable and then run BitBake:

```
$ BBPATH = "build_directory"
$ export BBPATH
$ bitbake target
```


BBSERVER If defined in the BitBake environment, BBSERVER points to the BitBake remote server.

Use the following format to export the variable to the BitBake environment:

```
export BBSERVER=localhost:$port"
```

By default, BBSERVER also appears in BB_HASHBASE_WHITELIST [http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#var-BB_HASHBASE_WHITELIST]. Consequently, BBSERVER is excluded from checksum and dependency data.

BINCONFIG When inheriting the binconfig-disabled class, this variable specifies binary configuration scripts to disable in favor of using pkg-config to query the information. The binconfig-disabled class will modify the specified scripts to return an error so that calls to them can be easily found and replaced.

To add multiple scripts, separate them by spaces. Here is an example from the libpng recipe:

```
BINCONFIG = "${bindir}/libpng-config ${bindir}/libpng16-config"
```

BINCONFIG_GLOB When inheriting the binconfig class, this variable specifies a wildcard for configuration scripts that need editing. The scripts are edited to correct any paths that have been set up during compilation so that they are correct for use when installed into the sysroot and called by the build processes of other recipes.

Note

The BINCONFIG_GLOB variable uses shell globbing [<http://tldp.org/LDP/abs/html/globbingref.html>], which is recognition and expansion of wildcards during pattern matching. Shell globbing is very similar to fnmatch [<https://docs.python.org/2/library/fnmatch.html#module-fnmatch>] and glob [<https://docs.python.org/2/library/glob.html>].

For more information on how this variable works, see meta/classes/binconfig.bbclass in the Source Directory. You can also find general information on the class in the "binconfig.bbclass" section.

BP The base recipe name and version but without any special recipe name suffix (i.e. -native, lib64-, and so forth). BP is comprised of the following:

```
${BPN}-${PV}
```

BPN This variable is a version of the PN variable with common prefixes and suffixes removed, such as nativesdk-, -cross, -native, and multilib's lib64- and lib32-. The exact lists of prefixes and suffixes removed are specified by the MLPREFIX and SPECIAL_PKGSUFFIX variables, respectively.

BUGTRACKER Specifies a URL for an upstream bug tracking website for a recipe. The OpenEmbedded build system does not use this variable. Rather,

	the variable is a useful pointer in case a bug in the software being built needs to be manually reported.
BUILD_ARCH	Specifies the architecture of the build host (e.g. i686). The OpenEmbedded build system sets the value of BUILD_ARCH from the machine name reported by the uname command.
BUILD_AS_ARCH	Specifies the architecture-specific assembler flags for the build host. By default, the value of BUILD_AS_ARCH is empty.
BUILD_CC_ARCH	Specifies the architecture-specific C compiler flags for the build host. By default, the value of BUILD_CC_ARCH is empty.
BUILD_CCLD	Specifies the linker command to be used for the build host when the C compiler is being used as the linker. By default, BUILD_CCLD points to GCC and passes as arguments the value of BUILD_CC_ARCH, assuming BUILD_CC_ARCH is set.
BUILD_CFLAGS	Specifies the flags to pass to the C compiler when building for the build host. When building in the -native context, CFLAGS is set to the value of this variable by default.
BUILD_CPPFLAGS	Specifies the flags to pass to the C preprocessor (i.e. to both the C and the C++ compilers) when building for the build host. When building in the -native context, CPPFLAGS is set to the value of this variable by default.
BUILD_CXXFLAGS	Specifies the flags to pass to the C++ compiler when building for the build host. When building in the -native context, CXXFLAGS is set to the value of this variable by default.
BUILD_FC	Specifies the Fortran compiler command for the build host. By default, BUILD_FC points to Gfortran and passes as arguments the value of BUILD_CC_ARCH, assuming BUILD_CC_ARCH is set.
BUILD_LD	Specifies the linker command for the build host. By default, BUILD_LD points to the GNU linker (ld) and passes as arguments the value of BUILD_LD_ARCH, assuming BUILD_LD_ARCH is set.
BUILD_LD_ARCH	Specifies architecture-specific linker flags for the build host. By default, the value of BUILD_LD_ARCH is empty.
BUILD_LDFLAGS	Specifies the flags to pass to the linker when building for the build host. When building in the -native context, LDFLAGS is set to the value of this variable by default.
BUILD_OPTIMIZATION	<p>Specifies the optimization flags passed to the C compiler when building for the build host or the SDK. The flags are passed through the BUILD_CFLAGS and BUILDSDK_CFLAGS default values.</p> <p>The default value of the BUILD_OPTIMIZATION variable is "-O2 -pipe".</p>
BUILD_OS	Specifies the operating system in use on the build host (e.g. "linux"). The OpenEmbedded build system sets the value of BUILD_OS from the OS reported by the uname command - the first word, converted to lower-case characters.
BUILD_PREFIX	The toolchain binary prefix used for native recipes. The OpenEmbedded build system uses the BUILD_PREFIX value to set the TARGET_PREFIX when building for native recipes.
BUILD_STRIP	Specifies the command to be used to strip debugging symbols from binaries produced for the build host. By default, BUILD_STRIP points to \${BUILD_PREFIX}strip.
BUILD_SYS	Specifies the system, including the architecture and the operating system, to use when building for the build host (i.e. when building native recipes).

The OpenEmbedded build system automatically sets this variable based on `BUILD_ARCH`, `BUILD_VENDOR`, and `BUILD_OS`. You do not need to set the `BUILD_SYS` variable yourself.

BUILD_VENDOR Specifies the vendor name to use when building for the build host. The default value is an empty string (`""`).

BUILDDIR Points to the location of the Build Directory. You can define this directory indirectly through the `oe-init-build-env` script by passing in a Build Directory path when you run the script. If you run the script and do not provide a Build Directory path, the `BUILDDIR` defaults to build in the current directory.

BUILDHISTORY_COMMIT When inheriting the `buildhistory` class, this variable specifies whether or not to commit the build history output in a local Git repository. If set to `"1"`, this local repository will be maintained automatically by the `buildhistory` class and a commit will be created on every build for changes to each top-level subdirectory of the build history output (images, packages, and `sdk`). If you want to track changes to build history over time, you should set this value to `"1"`.

By default, the `buildhistory` class does not commit the build history output in a local Git repository:

```
BUILDHISTORY_COMMIT ?= "0"
```

BUILDHISTORY_COMMIT_AUTHOR When inheriting the `buildhistory` class, this variable specifies the author to use for each Git commit. In order for the `BUILDHISTORY_COMMIT_AUTHOR` variable to work, the `BUILDHISTORY_COMMIT` variable must be set to `"1"`.

Git requires that the value you provide for the `BUILDHISTORY_COMMIT_AUTHOR` variable takes the form of `"name email@host"`. Providing an email address or host that is not valid does not produce an error.

By default, the `buildhistory` class sets the variable as follows:

```
BUILDHISTORY_COMMIT_AUTHOR ?= "buildhistory <buildhistory@${DISTRO}@${BUILDHOST}>"
```

BUILDHISTORY_DIR When inheriting the `buildhistory` class, this variable specifies the directory in which build history information is kept. For more information on how the variable works, see the `buildhistory.class`.

By default, the `buildhistory` class sets the directory as follows:

```
BUILDHISTORY_DIR ?= "${TOPDIR}/buildhistory"
```

BUILDHISTORY_FEATURES When inheriting the `buildhistory` class, this variable specifies the build history features to be enabled. For more information on how build history works, see the "Maintaining Build Output Quality [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#maintaining-build-output-quality>]" section in the Yocto Project Development Tasks Manual.

You can specify these features in the form of a space-separated list:

- `image`: Analysis of the contents of images, which includes the list of installed packages among other things.

- package: Analysis of the contents of individual packages.
- sdk: Analysis of the contents of the software development kit (SDK).
- task: Save output file signatures for shared state [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#shared-state-cache>] (sstate) tasks. This saves one file per task and lists the SHA-256 checksums for each file staged (i.e. the output of the task).

By default, the buildhistory class enables the following features:

```
BUILDHISTORY_FEATURES ?= "image package sdk"
```

BUILDHISTORY_IMAGE_FILES When inheriting the buildhistory class, this variable specifies a list of paths to files copied from the image contents into the build history directory under an "image-files" directory in the directory for the image, so that you can track the contents of each file. The default is to copy /etc/passwd and /etc/group, which allows you to monitor for changes in user and group entries. You can modify the list to include any file. Specifying an invalid path does not produce an error. Consequently, you can include files that might not always be present.

By default, the buildhistory class provides paths to the following files:

```
BUILDHISTORY_IMAGE_FILES ?= "/etc/passwd /etc/group"
```

BUILDHISTORY_PUSH_REPO When inheriting the buildhistory class, this variable optionally specifies a remote repository to which build history pushes Git changes. In order for BUILDHISTORY_PUSH_REPO to work, BUILDHISTORY_COMMIT must be set to "1".

The repository should correspond to a remote address that specifies a repository as understood by Git, or alternatively to a remote name that you have set up manually using `git remote` within the local repository.

By default, the buildhistory class sets the variable as follows:

```
BUILDHISTORY_PUSH_REPO ?= ""
```

BUILDSDK_CFLAGS Specifies the flags to pass to the C compiler when building for the SDK. When building in the nativesdk- context, CFLAGS is set to the value of this variable by default.

BUILDSDK_CPPFLAGS Specifies the flags to pass to the C pre-processor (i.e. to both the C and the C++ compilers) when building for the SDK. When building in the nativesdk- context, CPPFLAGS is set to the value of this variable by default.

BUILDSDK_CXXFLAGS Specifies the flags to pass to the C++ compiler when building for the SDK. When building in the nativesdk- context, CXXFLAGS is set to the value of this variable by default.

BUILDSDK_LDFLAGS Specifies the flags to pass to the linker when building for the SDK. When building in the nativesdk- context, LDFLAGS is set to the value of this variable by default.

BUILDSTATS_BASE Points to the location of the directory that holds build statistics when you use and enable the `buildstats` class. The `BUILDSTATS_BASE` directory defaults to `${TMPDIR}/buildstats/`.

BUSYBOX_SPLIT_SUID For the BusyBox recipe, specifies whether to split the output executable file into two parts: one for features that require `setuid root`, and one for the remaining features (i.e. those that do not require `setuid root`).

The `BUSYBOX_SPLIT_SUID` variable defaults to "1", which results in splitting the output executable file. Set the variable to "0" to get a single output executable file.

C

CACHE Specifies the directory BitBake uses to store a cache of the Metadata so it does not need to be parsed every time BitBake is started.

CC The minimal command and arguments used to run the C compiler.

CFLAGS Specifies the flags to pass to the C compiler. This variable is exported to an environment variable and thus made visible to the software being built during the compilation step.

Default initialization for `CFLAGS` varies depending on what is being built:

- `TARGET_CFLAGS` when building for the target
- `BUILD_CFLAGS` when building for the build host (i.e. `-native`)
- `BUILDSDK_CFLAGS` when building for an SDK (i.e. `nativesdk-`)

CLASSOVERRIDE An internal variable specifying the special class override that should currently apply (e.g. "class-target", "class-native", and so forth). The classes that use this variable (e.g. `native`, `nativesdk`, and so forth) set the variable to appropriate values.

Note

`CLASSOVERRIDE` gets its default "class-target" value from the `bitbake.conf` file.

As an example, the following override allows you to install extra files, but only when building for the target:

```
do_install_append_class-target() {  
    install my-extra-file ${D}${sysconfdir}  
}
```

Here is an example where `F00` is set to "native" when building for the build host, and to "other" when not building for the build host:

```
F00_class-native = "native"  
F00 = "other"
```

The underlying mechanism behind `CLASSOVERRIDE` is simply that it is included in the default value of `OVERRIDES`.

CLEANBROKEN If set to "1" within a recipe, `CLEANBROKEN` specifies that the `make clean` command does not work for the software being built. Consequently, the OpenEmbedded build system will not try to run

	make clean during the do_configure task, which is the default behavior.
COMBINED_FEATURES	Provides a list of hardware features that are enabled in both MACHINE_FEATURES and DISTRO_FEATURES. This select list of features contains features that make sense to be controlled both at the machine and distribution configuration level. For example, the "bluetooth" feature requires hardware support but should also be optional at the distribution level, in case the hardware supports Bluetooth but you do not ever intend to use it.
COMMON_LICENSE_DIR	Points to meta/files/common-licenses in the Source Directory, which is where generic license files reside.
COMPATIBLE_HOST	A regular expression that resolves to one or more hosts (when the recipe is native) or one or more targets (when the recipe is non-native) with which a recipe is compatible. The regular expression is matched against HOST_SYS. You can use the variable to stop recipes from being built for classes of systems with which the recipes are not compatible. Stopping these builds is particularly useful with kernels. The variable also helps to increase parsing speed since the build system skips parsing recipes not compatible with the current system.
COMPATIBLE_MACHINE	A regular expression that resolves to one or more target machines with which a recipe is compatible. The regular expression is matched against MACHINEOVERRIDES. You can use the variable to stop recipes from being built for machines with which the recipes are not compatible. Stopping these builds is particularly useful with kernels. The variable also helps to increase parsing speed since the build system skips parsing recipes not compatible with the current machine.
COMPLEMENTARY_GLOB	Defines wildcards to match when installing a list of complementary packages for all the packages explicitly (or implicitly) installed in an image.

Note

The COMPLEMENTARY_GLOB variable uses Unix filename pattern matching (`fnmatch` [<https://docs.python.org/2/library/fnmatch.html#module-fnmatch>]), which is similar to the Unix style pathname pattern expansion (`glob` [<https://docs.python.org/2/library/glob.html>]).

The resulting list of complementary packages is associated with an item that can be added to IMAGE_FEATURES. An example usage of this is the "dev-pkgs" item that when added to IMAGE_FEATURES will install -dev packages (containing headers and other development files) for every package in the image.

To add a new feature item pointing to a wildcard, use a variable flag to specify the feature item name and use the value to specify the wildcard. Here is an example:

```
COMPLEMENTARY_GLOB[dev-pkgs] = '*-dev'
```

COMPONENTS_DIR	Stores sysroot components for each recipe. The OpenEmbedded build system uses COMPONENTS_DIR when constructing recipe-specific sysroots for other recipes. The default is "\${STAGING_DIR}-components." (i.e. "\${TMPDIR}/sysroots-components").
CONF_VERSION	Tracks the version of the local configuration file (i.e. local.conf). The value for CONF_VERSION increments each time build/conf/compatibility changes.

CONFFILES	<p>Identifies editable or configurable files that are part of a package. If the Package Management System (PMS) is being used to update packages on the target system, it is possible that configuration files you have changed after the original installation and that you now want to remain unchanged are overwritten. In other words, editable files might exist in the package that you do not want reset as part of the package update process. You can use the CONFFILES variable to list the files in the package that you wish to prevent the PMS from overwriting during this update process.</p> <p>To use the CONFFILES variable, provide a package name override that identifies the resulting package. Then, provide a space-separated list of files. Here is an example:</p> <pre>CONFFILES_\${PN} += "\${sysconfdir}/file1 \ \${sysconfdir}/file2 \${sysconfdir}/file3"</pre> <p>A relationship exists between the CONFFILES and FILES variables. The files listed within CONFFILES must be a subset of the files listed within FILES. Because the configuration files you provide with CONFFILES are simply being identified so that the PMS will not overwrite them, it makes sense that the files must already be included as part of the package through the FILES variable.</p> <p>Note</p> <p>When specifying paths as part of the CONFFILES variable, it is good practice to use appropriate path variables. For example, <code>\${sysconfdir}</code> rather than <code>/etc</code> or <code>\${bindir}</code> rather than <code>/usr/bin</code>. You can find a list of these variables at the top of the <code>meta/conf/bitbake.conf</code> file in the Source Directory.</p>
CONFIG_INITRAMFS_SOURCE	<p>Identifies the initial RAM filesystem (initramfs) source files. The OpenEmbedded build system receives and uses this kernel Kconfig variable as an environment variable. By default, the variable is set to null (<code>""</code>).</p> <p>The CONFIG_INITRAMFS_SOURCE can be either a single cpio archive with a <code>.cpio</code> suffix or a space-separated list of directories and files for building the initramfs image. A cpio archive should contain a filesystem archive to be used as an initramfs image. Directories should contain a filesystem layout to be included in the initramfs image. Files should contain entries according to the format described by the <code>usr/gen_init_cpio</code> program in the kernel tree.</p> <p>If you specify multiple directories and files, the initramfs image will be the aggregate of all of them.</p> <p>For information on creating an initramfs, see the "Building an Initial RAM Filesystem (initramfs) Image" [http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#building-an-initramfs-image] section in the Yocto Project Development Tasks Manual.</p>
CONFIG_SITE	<p>A list of files that contains autoconf test results relevant to the current build. This variable is used by the Autotools utilities when running configure.</p>
CONFIGURE_FLAGS	<p>The minimal arguments for GNU configure.</p>
CONFLICT_DISTRO_FEATURES	<p>When inheriting the <code>distro_features_check</code> class, this variable identifies distribution features that would be in conflict should the recipe be built. In other words, if the CONFLICT_DISTRO_FEATURES variable lists a feature that also appears in DISTRO_FEATURES within the current configuration, an error occurs and the build stops.</p>

COPYLEFT_LICENSE_EXCLUDE A space-separated list of licenses to exclude from the source archived by the archiver class. In other words, if a license in a recipe's `LICENSE` value is in the value of `COPYLEFT_LICENSE_EXCLUDE`, then its source is not archived by the class.

Note

The `COPYLEFT_LICENSE_EXCLUDE` variable takes precedence over the `COPYLEFT_LICENSE_INCLUDE` variable. The default value, which is "CLOSED Proprietary", for `COPYLEFT_LICENSE_EXCLUDE` is set by the `copyleft_filter` class, which is inherited by the archiver class.

COPYLEFT_LICENSE_INCLUDE A space-separated list of licenses to include in the source archived by the archiver class. In other words, if a license in a recipe's `LICENSE` value is in the value of `COPYLEFT_LICENSE_INCLUDE`, then its source is archived by the class.

The default value is set by the `copyleft_filter` class, which is inherited by the archiver class. The default value includes "GPL*", "LGPL*", and "AGPL*".

COPYLEFT_PN_EXCLUDE A list of recipes to exclude in the source archived by the archiver class. The `COPYLEFT_PN_EXCLUDE` variable overrides the license inclusion and exclusion caused through the `COPYLEFT_LICENSE_INCLUDE` and `COPYLEFT_LICENSE_EXCLUDE` variables, respectively.

The default value, which is "" indicating to not explicitly exclude any recipes by name, for `COPYLEFT_PN_EXCLUDE` is set by the `copyleft_filter` class, which is inherited by the archiver class.

COPYLEFT_PN_INCLUDE A list of recipes to include in the source archived by the archiver class. The `COPYLEFT_PN_INCLUDE` variable overrides the license inclusion and exclusion caused through the `COPYLEFT_LICENSE_INCLUDE` and `COPYLEFT_LICENSE_EXCLUDE` variables, respectively.

The default value, which is "" indicating to not explicitly include any recipes by name, for `COPYLEFT_PN_INCLUDE` is set by the `copyleft_filter` class, which is inherited by the archiver class.

COPYLEFT_RECIPE_TYPES A space-separated list of recipe types to include in the source archived by the archiver class. Recipe types are target, native, nativesdk, cross, crosssdk, and cross-canadian.

The default value, which is "target*", for `COPYLEFT_RECIPE_TYPES` is set by the `copyleft_filter` class, which is inherited by the archiver class.

COPY_LIC_DIRS If set to "1" along with the `COPY_LIC_MANIFEST` variable, the OpenEmbedded build system copies into the image the license files, which are located in `/usr/share/common-licenses`, for each package. The license files are placed in directories within the image itself during build time.

Note

The `COPY_LIC_DIRS` does not offer a path for adding licenses for newly installed packages to an image, which might be most suitable for read-only filesystems that cannot be upgraded. See the `LICENSE_CREATE_PACKAGE` variable for additional information. You can also reference the "Providing License Text [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#providing-license-text>]" section in the Yocto Project Development Tasks Manual for information on providing license text.

COPY_LIC_MANIFEST If set to "1", the OpenEmbedded build system copies the license manifest for the image to `/usr/share/common-licenses/license.manifest` within the image itself during build time.

Note

The `COPY_LIC_MANIFEST` does not offer a path for adding licenses for newly installed packages to an image, which might be most suitable for read-only filesystems that cannot be upgraded. See the `LICENSE_CREATE_PACKAGE` variable for additional information. You can also reference the "Providing License Text [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#providing-license-text>]" section in the Yocto Project Development Tasks Manual for information on providing license text.

CORE_IMAGE_EXTRA_INSTALL Specifies the list of packages to be added to the image. You should only set this variable in the `local.conf` configuration file found in the Build Directory.

This variable replaces `POKY_EXTRA_INSTALL`, which is no longer supported.

COREBASE Specifies the parent directory of the OpenEmbedded-Core Metadata layer (i.e. meta).

It is an important distinction that `COREBASE` points to the parent of this layer and not the layer itself. Consider an example where you have cloned the Poky Git repository and retained the poky name for your local copy of the repository. In this case, `COREBASE` points to the poky folder because it is the parent directory of the poky/meta layer.

COREBASE_FILES Lists files from the `COREBASE` directory that should be copied other than the layers listed in the `bb\layers.conf` file. The `COREBASE_FILES` variable exists for the purpose of copying metadata from the OpenEmbedded build system into the extensible SDK.

Explicitly listing files in `COREBASE` is needed because it typically contains build directories and other files that should not normally be copied into the extensible SDK. Consequently, the value of `COREBASE_FILES` is used in order to only copy the files that are actually needed.

CPP The minimal command and arguments used to run the C preprocessor.

CPPFLAGS Specifies the flags to pass to the C pre-processor (i.e. to both the C and the C++ compilers). This variable is exported to an environment variable and thus made visible to the software being built during the compilation step.

Default initialization for `CPPFLAGS` varies depending on what is being built:

- `TARGET_CPPFLAGS` when building for the target
- `BUILD_CPPFLAGS` when building for the build host (i.e. `-native`)
- `BUILDSDK_CPPFLAGS` when building for an SDK (i.e. `nativesdk-`)

CROSS_COMPILE The toolchain binary prefix for the target tools. The `CROSS_COMPILE` variable is the same as the `TARGET_PREFIX` variable.

Note

The OpenEmbedded build system sets the `CROSS_COMPILE` variable only in certain contexts (e.g. when building for kernel and kernel module recipes).

CVSDIR The directory in which files checked out under the CVS system are stored.

CXX The minimal command and arguments used to run the C++ compiler.

CXXFLAGS Specifies the flags to pass to the C++ compiler. This variable is exported to an environment variable and thus made visible to the software being built during the compilation step.

Default initialization for CXXFLAGS varies depending on what is being built:

- TARGET_CXXFLAGS when building for the target
- BUILD_CXXFLAGS when building for the build host (i.e. -native)
- BUILDSDK_CXXFLAGS when building for an SDK (i.e. nativesdk-)

D

D The destination directory. The location in the Build Directory where components are installed by the do_install task. This location defaults to:

`${WORKDIR}/image`

Caution

Tasks that read from or write to this directory should run under fakeroot [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#fakeroot-and-pseudo>].

DATE The date the build was started. Dates appear using the year, month, and day (YMD) format (e.g. "20150209" for February 9th, 2015).

DATETIME The date and time on which the current build started. The format is suitable for timestamps.

DEBIAN_NOAUTONAME When the debian class is inherited, which is the default behavior, DEBIAN_NOAUTONAME specifies a particular package should not be renamed according to Debian library package naming. You must use the package name as an override when you set this variable. Here is an example from the fontconfig recipe:

`DEBIAN_NOAUTONAME_fontconfig-utils = "1"`

DEBIANNAME When the debian class is inherited, which is the default behavior, DEBIANNAME allows you to override the library name for an individual package. Overriding the library name in these cases is rare. You must use the package name as an override when you set this variable. Here is an example from the dbus recipe:

`DEBIANNAME_${PN} = "dbus-1"`

DEBUG_BUILD Specifies to build packages with debugging information. This influences the value of the SELECTED_OPTIMIZATION variable.

DEBUG_OPTIMIZATION The options to pass in TARGET_CFLAGS and CFLAGS when compiling a system for debugging. This variable defaults to "-O -fno-omit-frame-pointer \${DEBUG_FLAGS} -pipe".

DEFAULT_PREFERENCE

Specifies a weak bias for recipe selection priority.

The most common usage of this variable is to set it to "-1" within a recipe for a development version of a piece of software. Using the variable in this way causes the stable version of the recipe to build by default in the absence of `PREFERRED_VERSION` being used to build the development version.

Note

The bias provided by `DEFAULT_PREFERENCE` is weak and is overridden by `BBFILE_PRIORITY` if that variable is different between two layers that contain different versions of the same recipe.

DEFAULTTUNE

The default CPU and Application Binary Interface (ABI) tunings (i.e. the "tune") used by the OpenEmbedded build system. The `DEFAULTTUNE` helps define `TUNE_FEATURES`.

The default tune is either implicitly or explicitly set by the machine (`MACHINE`). However, you can override the setting using available tunes as defined with `AVAILTUNES`.

DEPENDS

Lists a recipe's build-time dependencies. These are dependencies on other recipes whose contents (e.g. headers and shared libraries) are needed by the recipe at build time.

As an example, consider a recipe `foo` that contains the following assignment:

```
DEPENDS = "bar"
```

The practical effect of the previous assignment is that all files installed by `bar` will be available in the appropriate staging sysroot, given by the `STAGING_DIR*` variables, by the time the `do_configure` task for `foo` runs. This mechanism is implemented by having `do_configure` depend on the `do_populate_sysroot` task of each recipe listed in `DEPENDS`, through a `[deptask [http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#variable-flags]]` declaration in the base class.

Note

It seldom is necessary to reference, for example, `STAGING_DIR_HOST` explicitly. The standard classes and build-related variables are configured to automatically use the appropriate staging sysroots.

As another example, `DEPENDS` can also be used to add utilities that run on the build machine during the build. For example, a recipe that makes use of a code generator built by the recipe `codegen` might have the following:

```
DEPENDS = "codegen-native"
```

For more information, see the `native` class and the `EXTRANATIVEPATH` variable.

Notes

- `DEPENDS` is a list of recipe names. Or, to be more precise, it is a list of `PROVIDES` names, which usually match recipe names. Putting a package name such as `"foo-dev"` in

DEPENDS does not make sense. Use "foo" instead, as this will put files from all the packages that make up foo, which includes those from foo-dev, into the sysroot.

- One recipe having another recipe in DEPENDS does not by itself add any runtime dependencies between the packages produced by the two recipes. However, as explained in the "Automatically Added Runtime Dependencies [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#automatically-added-runtime-dependencies>]" section in the Yocto Project Overview and Concepts Manual, runtime dependencies will often be added automatically, meaning DEPENDS alone is sufficient for most recipes.
- Counterintuitively, DEPENDS is often necessary even for recipes that install precompiled components. For example, if libfoo is a precompiled library that links against libbar, then linking against libfoo requires both libfoo and libbar to be available in the sysroot. Without a DEPENDS from the recipe that installs libfoo to the recipe that installs libbar, other recipes might fail to link against libfoo.

For information on runtime dependencies, see the RDEPENDS variable. You can also see the "Tasks [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#tasks>]" and "Dependencies [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#dependencies>]" sections in the BitBake User Manual for additional information on tasks and dependencies.

DEPLOY_DIR

Points to the general area that the OpenEmbedded build system uses to place images, packages, SDKs, and other output files that are ready to be used outside of the build system. By default, this directory resides within the Build Directory as `${TMPDIR}/deploy`.

For more information on the structure of the Build Directory, see "The Build Directory - build/" section. For more detail on the contents of the deploy directory, see the "Images [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#images-dev-environment>]", "Package Feeds [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#package-feeds-dev-environment>]", and "Application Development SDK [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#sdk-dev-environment>]" sections all in the Yocto Project Overview and Concepts Manual.

DEPLOY_DIR_DEB

Points to the area that the OpenEmbedded build system uses to place Debian packages that are ready to be used outside of the build system. This variable applies only when PACKAGE_CLASSES contains "package_deb".

The BitBake configuration file initially defines the DEPLOY_DIR_DEB variable as a sub-folder of DEPLOY_DIR:

```
DEPLOY_DIR_DEB = "${DEPLOY_DIR}/deb"
```

The package_deb class uses the DEPLOY_DIR_DEB variable to make sure the do_package_write_deb task writes Debian packages into the appropriate folder. For more information on how packaging works, see the "Package Feeds [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/>]

	<p>overview-manual.html#package-feeds-dev-environment]" section in the Yocto Project Overview and Concepts Manual.</p>
DEPLOY_DIR_IMAGE	<p>Points to the area that the OpenEmbedded build system uses to place images and other associated output files that are ready to be deployed onto the target machine. The directory is machine-specific as it contains the <code>\${MACHINE}</code> name. By default, this directory resides within the Build Directory as <code>\${DEPLOY_DIR}/images/\${MACHINE}/</code>.</p> <p>For more information on the structure of the Build Directory, see "The Build Directory - build/" section. For more detail on the contents of the deploy directory, see the "Images [http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#images-dev-environment]" and "Application Development SDK [http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#sdk-dev-environment]" sections both in the Yocto Project Overview and Concepts Manual.</p>
DEPLOY_DIR_IPK	<p>Points to the area that the OpenEmbedded build system uses to place IPK packages that are ready to be used outside of the build system. This variable applies only when <code>PACKAGE_CLASSES</code> contains "package_ipk".</p> <p>The BitBake configuration file initially defines this variable as a sub-folder of <code>DEPLOY_DIR</code>:</p> <pre>DEPLOY_DIR_IPK = "\${DEPLOY_DIR}/ipk"</pre> <p>The <code>package_ipk</code> class uses the <code>DEPLOY_DIR_IPK</code> variable to make sure the <code>do_package_write_ipk</code> task writes IPK packages into the appropriate folder. For more information on how packaging works, see the "Package Feeds [http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#package-feeds-dev-environment]" section in the Yocto Project Overview and Concepts Manual.</p>
DEPLOY_DIR_RPM	<p>Points to the area that the OpenEmbedded build system uses to place RPM packages that are ready to be used outside of the build system. This variable applies only when <code>PACKAGE_CLASSES</code> contains "package_rpm".</p> <p>The BitBake configuration file initially defines this variable as a sub-folder of <code>DEPLOY_DIR</code>:</p> <pre>DEPLOY_DIR_RPM = "\${DEPLOY_DIR}/rpm"</pre> <p>The <code>package_rpm</code> class uses the <code>DEPLOY_DIR_RPM</code> variable to make sure the <code>do_package_write_rpm</code> task writes RPM packages into the appropriate folder. For more information on how packaging works, see the "Package Feeds [http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#package-feeds-dev-environment]" section in the Yocto Project Overview and Concepts Manual.</p>
DEPLOY_DIR_TAR	<p>Points to the area that the OpenEmbedded build system uses to place tarballs that are ready to be used outside of the build system. This variable applies only when <code>PACKAGE_CLASSES</code> contains "package_tar".</p> <p>The BitBake configuration file initially defines this variable as a sub-folder of <code>DEPLOY_DIR</code>:</p>

```
DEPLOY_DIR_TAR = "${DEPLOY_DIR}/tar"
```

The `package_tar` class uses the `DEPLOY_DIR_TAR` variable to make sure the `do_package_write_tar` task writes TAR packages into the appropriate folder. For more information on how packaging works, see the "Package Feeds" [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#package-feeds-dev-environment>] section in the Yocto Project Overview and Concepts Manual.

DEPLOYDIR

When inheriting the `deploy` class, the `DEPLOYDIR` points to a temporary work area for deployed files that is set in the `deploy` class as follows:

```
DEPLOYDIR = "${WORKDIR}/deploy-${PN}"
```

Recipes inheriting the `deploy` class should copy files to be deployed into `DEPLOYDIR`, and the class will take care of copying them into `DEPLOY_DIR_IMAGE` afterwards.

DESCRIPTION

The package description used by package managers. If not set, `DESCRIPTION` takes the value of the `SUMMARY` variable.

DISTRO

The short name of the distribution. For information on the long name of the distribution, see the `DISTRO_NAME` variable.

The `DISTRO` variable corresponds to a distribution configuration file whose root name is the same as the variable's argument and whose filename extension is `.conf`. For example, the distribution configuration file for the Poky distribution is named `poky.conf` and resides in the `meta-poky/conf/distro` directory of the Source Directory.

Within that `poky.conf` file, the `DISTRO` variable is set as follows:

```
DISTRO = "poky"
```

Distribution configuration files are located in a `conf/distro` directory within the Metadata that contains the distribution configuration. The value for `DISTRO` must not contain spaces, and is typically all lower-case.

Note

If the `DISTRO` variable is blank, a set of default configurations are used, which are specified within `meta/conf/distro/defaultsetup.conf` also in the Source Directory.

DISTRO_CODENAME

Specifies a codename for the distribution being built.

DISTRO_EXTRA_RDEPENDS

Specifies a list of distro-specific packages to add to all images. This variable takes affect through `packagegroup-base` so the variable only really applies to the more full-featured images that include `packagegroup-base`. You can use this variable to keep distro policy out of generic images. As with all other distro variables, you set this variable in the `distro.conf` file.

DISTRO_EXTRA_RRECOMMENDS Specifies a list of distro-specific packages to add to all images if the packages exist. The packages might not exist or be empty (e.g. kernel modules). The list of packages are automatically installed but you can remove them.

DISTRO_FEATURES The software support you want in your distribution for various features. You define your distribution features in the distribution configuration file.

In most cases, the presence or absence of a feature in `DISTRO_FEATURES` is translated to the appropriate option supplied to the `configure` script during the `do_configure` task for recipes that optionally support the feature. For example, specifying "x11" in `DISTRO_FEATURES`, causes every piece of software built for the target that can optionally support X11 to have its X11 support enabled.

Two more examples are Bluetooth and NFS support. For a more complete list of features that ships with the Yocto Project and that you can provide with this variable, see the "Distro Features" section.

DISTRO_FEATURES_BACKFILL Features to be added to `DISTRO_FEATURES` if not also present in `DISTRO_FEATURES_BACKFILL_CONSIDERED`.

This variable is set in the `meta/conf/bitbake.conf` file. It is not intended to be user-configurable. It is best to just reference the variable to see which distro features are being backfilled for all distro configurations. See the Feature Backfilling section for more information.

DISTRO_FEATURES_BACKFILL_CONSIDERED Considered from `DISTRO_FEATURES_BACKFILL` that should not be backfilled (i.e. added to `DISTRO_FEATURES`) during the build. See the "Feature Backfilling" section for more information.

DISTRO_FEATURES_DEFAULT A convenience variable that gives you the default list of distro features with the exception of any features specific to the C library (`libc`).

When creating a custom distribution, you might find it useful to be able to reuse the default `DISTRO_FEATURES` options without the need to write out the full set. Here is an example that uses `DISTRO_FEATURES_DEFAULT` from a custom distro configuration file:

```
DISTRO_FEATURES ?= "${DISTRO_FEATURES_DEFAULT} myfeature"
```

DISTRO_FEATURES_FILTER_NATIVE Specifies a list of features that if present in the target `DISTRO_FEATURES` value should be included in `DISTRO_FEATURES` when building native recipes. This variable is used in addition to the features filtered using the `DISTRO_FEATURES_NATIVE` variable.

DISTRO_FEATURES_FILTER_NATIVESDK Specifies a list of features that if present in the target `DISTRO_FEATURES` value should be included in `DISTRO_FEATURES` when building nativesdk recipes. This variable is used in addition to the features filtered using the `DISTRO_FEATURES_NATIVESDK` variable.

DISTRO_FEATURES_NATIVE Specifies a list of features that should be included in `DISTRO_FEATURES` when building native recipes. This variable is used in addition to the features filtered using the `DISTRO_FEATURES_FILTER_NATIVE` variable.

DISTRO_FEATURES_NATIVESDK Specifies a list of features that should be included in `DISTRO_FEATURES` when building nativesdk recipes. This variable is used in addition to the features filtered using the `DISTRO_FEATURES_FILTER_NATIVESDK` variable.

DISTRO_NAME The long name of the distribution. For information on the short name of the distribution, see the `DISTRO` variable.

The `DISTRO_NAME` variable corresponds to a distribution configuration file whose root name is the same as the variable's argument and

whose filename extension is `.conf`. For example, the distribution configuration file for the Poky distribution is named `poky.conf` and resides in the `meta-poky/conf/distro` directory of the Source Directory.

Within that `poky.conf` file, the `DISTRO_NAME` variable is set as follows:

```
DISTRO_NAME = "Poky (Yocto Project Reference Distro)"
```

Distribution configuration files are located in a `conf/distro` directory within the Metadata that contains the distribution configuration.

Note

If the `DISTRO_NAME` variable is blank, a set of default configurations are used, which are specified within `meta/conf/distro/defaultsetup.conf` also in the Source Directory.

`DISTRO_VERSION`

The version of the distribution.

`DISTROOVERRIDES`

A colon-separated list of overrides specific to the current distribution. By default, this list includes the value of `DISTRO`.

You can extend `DISTROOVERRIDES` to add extra overrides that should apply to the distribution.

The underlying mechanism behind `DISTROOVERRIDES` is simply that it is included in the default value of `OVERRIDES`.

`DL_DIR`

The central download directory used by the build process to store downloads. By default, `DL_DIR` gets files suitable for mirroring for everything except Git repositories. If you want tarballs of Git repositories, use the `BB_GENERATE_MIRROR_TARBALLS` variable.

You can set this directory by defining the `DL_DIR` variable in the `conf/local.conf` file. This directory is self-maintaining and you should not have to touch it. By default, the directory is `downloads` in the Build Directory.

```
#DL_DIR ?= "${TOPDIR}/downloads"
```

To specify a different download directory, simply remove the comment from the line and provide your directory.

During a first build, the system downloads many different source code tarballs from various upstream projects. Downloading can take a while, particularly if your network connection is slow. Tarballs are all stored in the directory defined by `DL_DIR` and the build system looks there first to find source tarballs.

Note

When wiping and rebuilding, you can preserve this directory to speed up this part of subsequent builds.

You can safely share this directory between multiple builds on the same development machine. For additional information on how the build process gets source files when working behind a firewall or proxy server, see this specific question in the "FAQ" chapter. You can also refer to the "Working Behind a Network Proxy [https://wiki.yoctoproject.org/wiki/Working_Behind_a_Network_Proxy]" Wiki page.

DOC_COMPRESS When inheriting the `compress_doc` class, this variable sets the compression policy used when the OpenEmbedded build system compresses man pages and info pages. By default, the compression method used is `gz` (`gzip`). Other policies available are `xz` and `bz2`.

For information on policies and on how to use this variable, see the comments in the `meta/classes/compress_doc.bbclass` file.

E

EFI_PROVIDER When building bootable images (i.e. where `hddimg`, `iso`, or `wic.vmdk` is in `IMAGE_FSTYPES`), the `EFI_PROVIDER` variable specifies the EFI bootloader to use. The default is `"grub-efi"`, but `"systemd-boot"` can be used instead.

See the `systemd-boot` and `image-live` classes for more information.

ENABLE_BINARY_LOCALE_GENERATION Variable that controls which locales for `glibc` are generated during the build (useful if the target device has 64Mbytes of RAM or less).

ERR_REPORT_DIR When used with the `report-error` class, specifies the path used for storing the debug files created by the error reporting tool [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#using-the-error-reporting-tool>], which allows you to submit build errors you encounter to a central database. By default, the value of this variable is `${LOG_DIR}/error-report`.

You can set `ERR_REPORT_DIR` to the path you want the error reporting tool to store the debug files as follows in your `local.conf` file:

```
ERR_REPORT_DIR = "path"
```

ERROR_QA Specifies the quality assurance checks whose failures are reported as errors by the OpenEmbedded build system. You set this variable in your distribution configuration file. For a list of the checks you can control with this variable, see the `"insane.bbclass"` section.

EXCLUDE_FROM_SHLIBS Triggers the OpenEmbedded build system's shared libraries resolver to exclude an entire package when scanning for shared libraries.

Note

The shared libraries resolver's functionality results in part from the internal function `package_do_shlibs`, which is part of the `do_package` task. You should be aware that the shared libraries resolver might implicitly define some dependencies between packages.

The `EXCLUDE_FROM_SHLIBS` variable is similar to the `PRIVATE_LIBS` variable, which excludes a package's particular libraries only and not the whole package.

Use the `EXCLUDE_FROM_SHLIBS` variable by setting it to `"1"` for a particular package:

```
EXCLUDE_FROM_SHLIBS = "1"
```

EXCLUDE_FROM_WORLD Directs BitBake to exclude a recipe from world builds (i.e. `bitbake world`). During world builds, BitBake locates, parses and builds all recipes found in every layer exposed in the `bblayers.conf` configuration file.

To exclude a recipe from a world build using this variable, set the variable to `"1"` in the recipe.

Note

Recipes added to `EXCLUDE_FROM_WORLD` may still be built during a world build in order to satisfy dependencies of other recipes. Adding a recipe to `EXCLUDE_FROM_WORLD` only ensures that the recipe is not explicitly added to the list of build targets in a world build.

EXTENDPE Used with file and pathnames to create a prefix for a recipe's version based on the recipe's PE value. If PE is set and greater than zero for a recipe, `EXTENDPE` becomes that value (e.g if PE is equal to "1" then `EXTENDPE` becomes "1_"). If a recipe's PE is not set (the default) or is equal to zero, `EXTENDPE` becomes "".

See the `STAMP` variable for an example.

EXTENDPKG The full package version specification as it appears on the final packages produced by a recipe. The variable's value is normally used to fix a runtime dependency to the exact same version of another package in the same recipe:

```
RDEPENDS_${PN}-additional-module = "${PN} (= ${EXTENDPKG})"
```

The dependency relationships are intended to force the package manager to upgrade these types of packages in lock-step.

EXTERNAL_KERNEL_TOOLS When set, the `EXTERNAL_KERNEL_TOOLS` variable indicates that these tools are not in the source tree.

When kernel tools are available in the tree, they are preferred over any externally installed tools. Setting the `EXTERNAL_KERNEL_TOOLS` variable tells the OpenEmbedded build system to prefer the installed external tools. See the `kernel-yocto` class in `meta/classes` to see how the variable is used.

EXTERNALSRC When inheriting the `externalsrc` class, this variable points to the source tree, which is outside of the OpenEmbedded build system. When set, this variable sets the `S` variable, which is what the OpenEmbedded build system uses to locate unpacked recipe source code.

For more information on `externalsrc.bbclass`, see the "`externalsrc.bbclass`" section. You can also find information on how to use this variable in the "Building Software from an External Source" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#building-software-from-an-external-source>] section in the Yocto Project Development Tasks Manual.

EXTERNALSRC_BUILD When inheriting the `externalsrc` class, this variable points to the directory in which the recipe's source code is built, which is outside of the OpenEmbedded build system. When set, this variable sets the `B` variable, which is what the OpenEmbedded build system uses to locate the Build Directory.

For more information on `externalsrc.bbclass`, see the "`externalsrc.bbclass`" section. You can also find information on how to use this variable in the "Building Software from an External Source" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#building-software-from-an-external-source>] section in the Yocto Project Development Tasks Manual.

EXTRA_AUTORECONF For recipes inheriting the `autotools` class, you can use `EXTRA_AUTORECONF` to specify extra options to pass to the `autoreconf` command that is executed during the `do_configure` task.

The default value is "--exclude=autopoint".

EXTRA_IMAGE_FEATURES

A list of additional features to include in an image. When listing more than one feature, separate them with a space.

Typically, you configure this variable in your `local.conf` file, which is found in the Build Directory. Although you can use this variable from within a recipe, best practices dictate that you do not.

Note

To enable primary features from within the image recipe, use the `IMAGE_FEATURES` variable.

Here are some examples of features you can add:

"dbg-pkgs" - Adds -dbg packages for all installed packages including symbol information for debugging and profiling.

"debug-tweaks" - Makes an image suitable for debugging. For example, allows root logins without passwords and enables post-installation logging. See the 'allow-empty-password' and 'post-install-logging' features in the "Image Features" section for more information.

"dev-pkgs" - Adds -dev packages for all installed packages. This is useful if you want to develop against the libraries in the image.

"read-only-rootfs" - Creates an image whose root filesystem is read-only. See the "Creating a Read-Only Root Filesystem [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#usingpoky-extend-customimage-imagefeatures>]" section in the Yocto Project Development Tasks Manual for more information

"tools-debug" - Adds debugging tools such as gdb and strace.

"tools-sdk" - Adds development tools such as gcc, make, pkgconfig and so forth.

"tools-testapps" - Adds useful testing tools such as ts_print, aplay, arecord and so forth.

For a complete list of image features that ships with the Yocto Project, see the "Image Features" section.

For an example that shows how to customize your image by using this variable, see the "Customizing Images Using Custom `IMAGE_FEATURES` and `EXTRA_IMAGE_FEATURES` [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#usingpoky-extend-customimage-imagefeatures>]" section in the Yocto Project Development Tasks Manual.

EXTRA_IMAGECMD Specifies additional options for the image creation command that has been specified in `IMAGE_CMD`. When setting this variable, use an override for the associated image type. Here is an example:

```
EXTRA_IMAGECMD_ext3 ?= "-i 4096"
```

EXTRA_IMAGEDEPENDS A list of recipes to build that do not provide packages for installing into the root filesystem.

Sometimes a recipe is required to build the final image but is not needed in the root filesystem. You can use the `EXTRA_IMAGEDEPENDS` variable to list these recipes and thus specify the dependencies. A typical example is a required bootloader in a machine configuration.

Note

To add packages to the root filesystem, see the various `*RDEPENDS` and `*RRECOMMENDS` variables.

EXTRANATIVEPATH A list of subdirectories of `${STAGING_BINDIR_NATIVE}` added to the beginning of the environment variable `PATH`. As an example, the following prepends `"${STAGING_BINDIR_NATIVE}/foo:${STAGING_BINDIR_NATIVE}/bar:"` to `PATH`:

```
EXTRANATIVEPATH = "foo bar"
```

EXTRA_OECMAKE Additional CMake [<https://cmake.org/overview/>] options. See the `cmake` class for additional information.

EXTRA_OECONF Additional configure script options. See `PACKAGECONFIG_CONFARGS` for additional information on passing configure script options.

EXTRA_OEMAKE Additional GNU make options.

Because the `EXTRA_OEMAKE` defaults to `""`, you need to set the variable to specify any required GNU options.

`PARALLEL_MAKE` and `PARALLEL_MAKEINST` also make use of `EXTRA_OEMAKE` to pass the required flags.

EXTRA_OESCONS When inheriting the `scons` class, this variable specifies additional configuration options you want to pass to the `scons` command line.

EXTRA_USERS_PARAMS When inheriting the `extrausers` class, this variable provides image level user and group operations. This is a more global method of providing user and group configuration as compared to using the `useradd` class, which ties user and group configurations to a specific recipe.

The set list of commands you can configure using the `EXTRA_USERS_PARAMS` is shown in the `extrausers` class. These commands map to the normal Unix commands of the same names:

```
# EXTRA_USERS_PARAMS = "\
# useradd -p ' ' tester; \
# groupadd developers; \
# userdel nobody; \
# groupdel -g video; \
# groupmod -g 1020 developers; \
# usermod -s /bin/sh tester; \
# "
```

F

FEATURE_PACKAGES

Defines one or more packages to include in an image when a specific item is included in `IMAGE_FEATURES`. When setting the value, `FEATURE_PACKAGES` should have the name of the feature item as an override. Here is an example:

```
FEATURE_PACKAGES_widget = "package1 package2"
```

In this example, if "widget" were added to `IMAGE_FEATURES`, package1 and package2 would be included in the image.

Note

Packages installed by features defined through `FEATURE_PACKAGES` are often package groups. While similarly named, you should not confuse the `FEATURE_PACKAGES` variable with package groups, which are discussed elsewhere in the documentation.

FEED_DEPLOYDIR_BASE_URI

Points to the base URL of the server and location within the document-root that provides the metadata and packages required by `OPKG` to support runtime package management of IPK packages. You set this variable in your `local.conf` file.

Consider the following example:

```
FEED_DEPLOYDIR_BASE_URI = "http://192.168.7.1/BOARD-dir"
```

This example assumes you are serving your packages over HTTP and your databases are located in a directory named `BOARD-dir`, which is underneath your HTTP server's document-root. In this case, the OpenEmbedded build system generates a set of configuration files for you in your target that work with the feed.

FILES

The list of files and directories that are placed in a package. The `PACKAGES` variable lists the packages generated by a recipe.

To use the `FILES` variable, provide a package name override that identifies the resulting package. Then, provide a space-separated list of files or paths that identify the files you want included as part of the resulting package. Here is an example:

```
FILES_${PN} += "${bindir}/mydir1 ${bindir}/mydir2/myfile"
```

Notes

- When specifying files or paths, you can pattern match using Python's `glob` [<https://docs.python.org/2/library/glob.html>] syntax. For details on the syntax, see the documentation by following the previous link.
- When specifying paths as part of the `FILES` variable, it is good practice to use appropriate path variables. For example, use `${sysconfdir}` rather than `/etc`, or `${bindir}` rather than `/usr/bin`. You can find a list of these variables at the top of the `meta/conf/bitbake.conf` file in the Source Directory. You will also find the default values of the various `FILES_*` variables in this file.

If some of the files you provide with the FILES variable are editable and you know they should not be overwritten during the package update process by the Package Management System (PMS), you can identify these files so that the PMS will not overwrite them. See the CONFFILES variable for information on how to identify these files to the PMS.

FILES_SOLIBSDEV

Defines the file specification to match SOLIBSDEV. In other words, FILES_SOLIBSDEV defines the full path name of the development symbolic link (symlink) for shared libraries on the target platform.

The following statement from the bitbake.conf shows how it is set:

```
FILES_SOLIBSDEV ?= "${base_libdir}/lib*${SOLIBSDEV} ${libdir}/lib
```

FILESEXTRAPATHS

Extends the search path the OpenEmbedded build system uses when looking for files and patches as it processes recipes and append files. The default directories BitBake uses when it processes recipes are initially defined by the FILESPATH variable. You can extend FILESPATH variable by using FILESEXTRAPATHS.

Best practices dictate that you accomplish this by using FILESEXTRAPATHS from within a .bbappend file and that you prepend paths as follows:

```
FILESEXTRAPATHS_prepend := "${THISDIR}/${PN}:"
```

In the above example, the build system first looks for files in a directory that has the same name as the corresponding append file.

Note

When extending FILESEXTRAPATHS, be sure to use the immediate expansion (:=) operator. Immediate expansion makes sure that BitBake evaluates THISDIR at the time the directive is encountered rather than at some later time when expansion might result in a directory that does not contain the files you need.

Also, include the trailing separating colon character if you are prepending. The trailing colon character is necessary because you are directing BitBake to extend the path by prepending directories to the search path.

Here is another common use:

```
FILESEXTRAPATHS_prepend := "${THISDIR}/files:"
```

In this example, the build system extends the FILESPATH variable to include a directory named files that is in the same directory as the corresponding append file.

This next example specifically adds three paths:

```
FILESEXTRAPATHS_prepend := "path_1:path_2:path_3:"
```

A final example shows how you can extend the search path and include a MACHINE-specific override, which is useful in a BSP layer:

```
FILESEXTRAPATHS_prepend_intel-x86-common := "${THISDIR}/${PN}:"
```

The previous statement appears in the `linux-yocto-dev.bbappend` file, which is found in the Yocto Project Source Repositories [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#source-repositories>] in `meta-intel/common/recipes-kernel/linux`. Here, the machine override is a special `PACKAGE_ARCH` definition for multiple meta-intel machines.

Note

For a layer that supports a single BSP, the override could just be the value of `MACHINE`.

By prepending paths in `.bbappend` files, you allow multiple append files that reside in different layers but are used for the same recipe to correctly extend the path.

FILESOVERRIDES

A subset of `OVERRIDES` used by the OpenEmbedded build system for creating `FILESPATH`. The `FILESOVERRIDES` variable uses overrides to automatically extend the `FILESPATH` variable. For an example of how that works, see the `FILESPATH` variable description. Additionally, you find more information on how overrides are handled in the "Conditional Syntax (Overrides)" [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#conditional-syntax-overrides>] section of the BitBake User Manual.

By default, the `FILESOVERRIDES` variable is defined as:

```
FILESOVERRIDES = "${TRANSLATED_TARGET_ARCH}:${MACHINEOVERRIDES}:$
```

Note

Do not hand-edit the `FILESOVERRIDES` variable. The values match up with expected overrides and are used in an expected manner by the build system.

FILESPATH

The default set of directories the OpenEmbedded build system uses when searching for patches and files.

During the build process, BitBake searches each directory in `FILESPATH` in the specified order when looking for files and patches specified by each `file:// URI` in a recipe's `SRC_URI` statements.

The default value for the `FILESPATH` variable is defined in the `base.bbclass` class found in `meta/classes` in the Source Directory:

```
FILESPATH = "${@base_set_filespath(["${FILE_DIRNAME}/${BP}", \
    "${FILE_DIRNAME}/${BPN}", "${FILE_DIRNAME}/files"], d)}"
```

The `FILESPATH` variable is automatically extended using the overrides from the `FILESOVERRIDES` variable.

Notes

- Do not hand-edit the `FILESPATH` variable. If you want the build system to look in directories other than the

defaults, extend the `FILESPATH` variable by using the `FILESEXTRAPATHS` variable.

- Be aware that the default `FILESPATH` directories do not map to directories in custom layers where append files (`.bbappend`) are used. If you want the build system to find patches or files that reside with your append files, you need to extend the `FILESPATH` variable by using the `FILESEXTRAPATHS` variable.

You can take advantage of this searching behavior in useful ways. For example, consider a case where the following directory structure exists for general and machine-specific configurations:

```
files/defconfig
files/MACHINEA/defconfig
files/MACHINEB/defconfig
```

Also in the example, the `SRC_URI` statement contains `"file://defconfig"`. Given this scenario, you can set `MACHINE` to `"MACHINEA"` and cause the build system to use files from `files/MACHINEA`. Set `MACHINE` to `"MACHINEB"` and the build system uses files from `files/MACHINEB`. Finally, for any machine other than `"MACHINEA"` and `"MACHINEB"`, the build system uses files from `files/defconfig`.

You can find out more about the patching process in the "Patching [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#patching-dev-environment>]" section in the Yocto Project Overview and Concepts Manual and the "Patching Code [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#new-recipe-patching-code>]" section in the Yocto Project Development Tasks Manual. See the `do_patch` task as well.

`FILESYSTEM_PERMS_TABLES`

Allows you to define your own file permissions settings table as part of your configuration for the packaging process. For example, suppose you need a consistent set of custom permissions for a set of groups and users across an entire work project. It is best to do this in the packages themselves but this is not always possible.

By default, the OpenEmbedded build system uses the `fs-perms.txt`, which is located in the `meta/files` folder in the Source Directory. If you create your own file permissions setting table, you should place it in your layer or the distro's layer.

You define the `FILESYSTEM_PERMS_TABLES` variable in the `conf/local.conf` file, which is found in the Build Directory, to point to your custom `fs-perms.txt`. You can specify more than a single file permissions setting table. The paths you specify to these files must be defined within the `BBPATH` variable.

For guidance on how to create your own file permissions settings table file, examine the existing `fs-perms.txt`.

`FONT_EXTRA_RDEPENDS`

When inheriting the `fontcache` class, this variable specifies the runtime dependencies for font packages. By default, the `FONT_EXTRA_RDEPENDS` is set to `"fontconfig-utils"`.

`FONT_PACKAGES`

When inheriting the `fontcache` class, this variable identifies packages containing font files that need to be cached by `Fontconfig`. By default, the `fontcache` class assumes that fonts are in the recipe's main package (i.e. `${PN}`). Use this variable if fonts you need are in a package other than that main package.

FORCE_RO_REMOVE Forces the removal of the packages listed in `R00TFS_RO_UNNEEDED` during the generation of the root filesystem.

Set the variable to "1" to force the removal of these packages.

FULL_OPTIMIZATION The options to pass in `TARGET_CFLAGS` and `CFLAGS` when compiling an optimized system. This variable defaults to `"-O2 -pipe ${DEBUG_FLAGS}"`.

G

GCCPIE Enables Position Independent Executables (PIE) within the GNU C Compiler (GCC). Enabling PIE in the GCC makes Return Oriented Programming (ROP) attacks much more difficult to execute.

By default the `security_flags.inc` file enables PIE by setting the variable as follows:

```
GCCPIE ?= "--enable-default-pie"
```

GCCVERSION Specifies the default version of the GNU C Compiler (GCC) used for compilation. By default, `GCCVERSION` is set to "8.x" in the `meta/conf/distro/include/tcmode-default.inc` include file:

```
GCCVERSION ?= "8.%"
```

You can override this value by setting it in a configuration file such as the `local.conf`.

GDB The minimal command and arguments to run the GNU Debugger.

GITDIR The directory in which a local copy of a Git repository is stored when it is cloned.

GLIBC_GENERATE_LOCALES Specifies the list of GLIBC locales to generate should you not wish to generate all LIBC locals, which can be time consuming.

Note

If you specifically remove the locale `en_US.UTF-8`, you must set `IMAGE_LINGUAS` appropriately.

You can set `GLIBC_GENERATE_LOCALES` in your `local.conf` file. By default, all locales are generated.

```
GLIBC_GENERATE_LOCALES = "en_GB.UTF-8 en_US.UTF-8"
```

GROUPADD_PARAM When inheriting the `useradd` class, this variable specifies for a package what parameters should be passed to the `groupadd` command if you wish to add a group to the system when the package is installed.

Here is an example from the `dbus` recipe:

```
GROUPADD_PARAM_${PN} = "-r netdev"
```

For information on the standard Linux shell command `groupadd`, see <http://linux.die.net/man/8/groupadd>.

GROUPMEMS_PARAM	<p>When inheriting the <code>useradd</code> class, this variable specifies for a package what parameters should be passed to the <code>groupmems</code> command if you wish to modify the members of a group when the package is installed.</p> <p>For information on the standard Linux shell command <code>groupmems</code>, see http://linux.die.net/man/8/groupmems.</p>
GRUB_GFXSERIAL	<p>Configures the GNU GRand Unified Bootloader (GRUB) to have graphics and serial in the boot menu. Set this variable to "1" in your <code>local.conf</code> or distribution configuration file to enable graphics and serial in the menu.</p> <p>See the <code>grub-efi</code> class for more information on how this variable is used.</p>
GRUB_OPTS	<p>Additional options to add to the GNU GRand Unified Bootloader (GRUB) configuration. Use a semi-colon character (;) to separate multiple options.</p> <p>The <code>GRUB_OPTS</code> variable is optional. See the <code>grub-efi</code> class for more information on how this variable is used.</p>
GRUB_TIMEOUT	<p>Specifies the timeout before executing the default LABEL in the GNU GRand Unified Bootloader (GRUB).</p> <p>The <code>GRUB_TIMEOUT</code> variable is optional. See the <code>grub-efi</code> class for more information on how this variable is used.</p>
GTKIMMODULES_PACKAGES	<p>When inheriting the <code>gtk-immodules-cache</code> class, this variable specifies the packages that contain the GTK+ input method modules being installed when the modules are in packages other than the main package.</p>

H

HOMEPAGE	<p>Website where more information about the software the recipe is building can be found.</p>
HOST_ARCH	<p>The name of the target architecture, which is normally the same as <code>TARGET_ARCH</code>. The OpenEmbedded build system supports many architectures. Here is an example list of architectures supported. This list is by no means complete as the architecture is configurable:</p> <pre>arm i586 x86_64 powerpc powerpc64 mips mipsel</pre>
HOST_CC_ARCH	<p>Specifies architecture-specific compiler flags that are passed to the C compiler.</p> <p>Default initialization for <code>HOST_CC_ARCH</code> varies depending on what is being built:</p> <ul style="list-style-type: none">• <code>TARGET_CC_ARCH</code> when building for the target• <code>BUILD_CC_ARCH</code> when building for the build host (i.e. <code>-native</code>)• <code>BUILDSDK_CC_ARCH</code> when building for an SDK (i.e. <code>nativesdk-</code>)

HOST_OS	Specifies the name of the target operating system, which is normally the same as the TARGET_OS. The variable can be set to "linux" for glibc-based systems and to "linux-musl" for musl. For ARM/EABI targets, there are also "linux-gnueabi" and "linux-musleabi" values possible.
HOST_PREFIX	Specifies the prefix for the cross-compile toolchain. HOST_PREFIX is normally the same as TARGET_PREFIX.
HOST_SYS	<p>Specifies the system, including the architecture and the operating system, for which the build is occurring in the context of the current recipe.</p> <p>The OpenEmbedded build system automatically sets this variable based on HOST_ARCH, HOST_VENDOR, and HOST_OS variables.</p>

Note

You do not need to set the variable yourself.

Consider these two examples:

- Given a native recipe on a 32-bit x86 machine running Linux, the value is "i686-linux".
- Given a recipe being built for a little-endian MIPS target running Linux, the value might be "mipsel-linux".

HOSTTOOLS	A space-separated list (filter) of tools on the build host that should be allowed to be called from within build tasks. Using this filter helps reduce the possibility of host contamination. If a tool specified in the value of HOSTTOOLS is not found on the build host, the OpenEmbedded build system produces an error and the build is not started.
-----------	---

For additional information, see HOSTTOOLS_NONFATAL.

HOSTTOOLS_NONFATAL	A space-separated list (filter) of tools on the build host that should be allowed to be called from within build tasks. Using this filter helps reduce the possibility of host contamination. Unlike HOSTTOOLS, the OpenEmbedded build system does not produce an error if a tool specified in the value of HOSTTOOLS_NONFATAL is not found on the build host. Thus, you can use HOSTTOOLS_NONFATAL to filter optional host tools.
--------------------	--

HOST_VENDOR	Specifies the name of the vendor. HOST_VENDOR is normally the same as TARGET_VENDOR.
-------------	--

I

ICECC_DISABLED	Disables or enables the icecc (Icecream) function. For more information on this function and best practices for using this variable, see the "icecc.bbclass" section.
----------------	---

Setting this variable to "1" in your local.conf disables the function:

```
ICECC_DISABLED ??= "1"
```

To enable the function, set the variable as follows:

```
ICECC_DISABLED = ""
```

ICECC_ENV_EXEC	<p>Points to the <code>icecc-create-env</code> script that you provide. This variable is used by the <code>icecc</code> class. You set this variable in your <code>local.conf</code> file.</p> <p>If you do not point to a script that you provide, the OpenEmbedded build system uses the default script provided by the <code>icecc-create-env.bb</code> recipe, which is a modified version and not the one that comes with <code>icecc</code>.</p>
ICECC_PARALLEL_MAKE	<p>Extra options passed to the <code>make</code> command during the <code>do_compile</code> task that specify parallel compilation. This variable usually takes the form of <code>"-j x"</code>, where <code>x</code> represents the maximum number of parallel threads <code>make</code> can run.</p> <p>Note</p> <p>The options passed affect builds on all enabled machines on the network, which are machines running the <code>iceccd</code> daemon.</p> <p>If your enabled machines support multiple cores, coming up with the maximum number of parallel threads that gives you the best performance could take some experimentation since machine speed, network lag, available memory, and existing machine loads can all affect build time. Consequently, unlike the <code>PARALLEL_MAKE</code> variable, there is no rule-of-thumb for setting <code>ICECC_PARALLEL_MAKE</code> to achieve optimal performance.</p> <p>If you do not set <code>ICECC_PARALLEL_MAKE</code>, the build system does not use it (i.e. the system does not detect and assign the number of cores as is done with <code>PARALLEL_MAKE</code>).</p>
ICECC_PATH	<p>The location of the <code>icecc</code> binary. You can set this variable in your <code>local.conf</code> file. If your <code>local.conf</code> file does not define this variable, the <code>icecc</code> class attempts to define it by locating <code>icecc</code> using <code>which</code>.</p>
ICECC_USER_CLASS_BL	<p>Identifies user classes that you do not want the Icecream distributed compile support to consider. This variable is used by the <code>icecc</code> class. You set this variable in your <code>local.conf</code> file.</p> <p>When you list classes using this variable, you are "blacklisting" them from distributed compilation across remote hosts. Any classes you list will be distributed and compiled locally.</p>
ICECC_USER_PACKAGE_BL	<p>Identifies user recipes that you do not want the Icecream distributed compile support to consider. This variable is used by the <code>icecc</code> class. You set this variable in your <code>local.conf</code> file.</p> <p>When you list packages using this variable, you are "blacklisting" them from distributed compilation across remote hosts. Any packages you list will be distributed and compiled locally.</p>
ICECC_USER_PACKAGE_WL	<p>Identifies user recipes that use an empty <code>PARALLEL_MAKE</code> variable that you want to force remote distributed compilation on using the Icecream distributed compile support. This variable is used by the <code>icecc</code> class. You set this variable in your <code>local.conf</code> file.</p>
IMAGE_BASENAME	<p>The base name of image output files. This variable defaults to the recipe name (<code>\${PN}</code>).</p>
IMAGE_BOOT_FILES	<p>A space-separated list of files installed into the boot partition when preparing an image using the <code>Wic</code> tool with the <code>bootimg-partition</code> source plugin. By default, the files are installed under the same name as the source files. To change the installed name, separate it from the original name with a semi-colon (<code>;</code>). Source files need to be located in <code>DEPLOY_DIR_IMAGE</code>. Here are two examples:</p>

```
IMAGE_BOOT_FILES = "u-boot.img uImage;kernel"
IMAGE_BOOT_FILES = "u-boot.${UBOOT_SUFFIX} ${KERNEL_IMAGETYPE}"
```

Alternatively, source files can be picked up using a glob pattern. In this case, the destination file must have the same name as the base name of the source file path. To install files into a directory within the target location, pass its name after a semi-colon (;). Here are two examples:

```
IMAGE_BOOT_FILES = "bcm2835-bootfiles/*"
IMAGE_BOOT_FILES = "bcm2835-bootfiles/*;boot/"
```

The first example installs all files from `${DEPLOY_DIR_IMAGE}/bcm2835-bootfiles` into the root of the target partition. The second example installs the same files into a boot directory within the target partition.

You can find information on how to use the Wic tool in the "Creating Partitioned Images Using Wic" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#creating-partitioned-images-using-wic>] section of the Yocto Project Development Tasks Manual. Reference material for Wic is located in the "OpenEmbedded Kickstart (.wks) Reference" [<http://www.yoctoproject.org/docs/3.0.3/ref-manual/ref-manual.html#ref-kickstart>] chapter.

IMAGE_CLASSES

A list of classes that all images should inherit. You typically use this variable to specify the list of classes that register the different types of images the OpenEmbedded build system creates.

The default value for `IMAGE_CLASSES` is `image_types`. You can set this variable in your `local.conf` or in a distribution configuration file.

For more information, see `meta/classes/image_types.bbclass` in the Source Directory.

IMAGE_CMD

Specifies the command to create the image file for a specific image type, which corresponds to the value set in `IMAGE_FSTYPES`, (e.g. `ext3`, `btrfs`, and so forth). When setting this variable, you should use an override for the associated type. Here is an example:

```
IMAGE_CMD_jffs2 = "mkfs.jffs2 --root=${IMAGE_ROOTFS} \
--faketime --output=${DEPLOY_DIR_IMAGE}/${IMAGE_NAME}.rootfs.j
${EXTRA_IMAGECMD}"
```

You typically do not need to set this variable unless you are adding support for a new image type. For more examples on how to set this variable, see the `image_types` class file, which is `meta/classes/image_types.bbclass`.

IMAGE_DEVICE_TABLES

Specifies one or more files that contain custom device tables that are passed to the `makedevs` command as part of creating an image. These files list basic device nodes that should be created under /dev within the image. If `IMAGE_DEVICE_TABLES` is not set, `files/device_table-minimal.txt` is used, which is located by `BBPATH`. For details on how you should write device table files, see `meta/files/device_table-minimal.txt` as an example.

IMAGE_FEATURES

The primary list of features to include in an image. Typically, you configure this variable in an image recipe. Although you can use this variable from your `local.conf` file, which is found in the Build Directory, best practices dictate that you do not.

Note

To enable extra features from outside the image recipe, use the `EXTRA_IMAGE_FEATURES` variable.

For a list of image features that ships with the Yocto Project, see the "Image Features" section.

For an example that shows how to customize your image by using this variable, see the "Customizing Images Using Custom `IMAGE_FEATURES` and `EXTRA_IMAGE_FEATURES` [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#usingpoky-extend-customimage-imagefeatures>]" section in the Yocto Project Development Tasks Manual.

`IMAGE_FSTYPES`

Specifies the formats the OpenEmbedded build system uses during the build when creating the root filesystem. For example, setting `IMAGE_FSTYPES` as follows causes the build system to create root filesystems using two formats: `.ext3` and `.tar.bz2`:

```
IMAGE_FSTYPES = "ext3 tar.bz2"
```

For the complete list of supported image formats from which you can choose, see `IMAGE_TYPES`.

Notes

- If an image recipe uses the "inherit image" line and you are setting `IMAGE_FSTYPES` inside the recipe, you must set `IMAGE_FSTYPES` prior to using the "inherit image" line.
- Due to the way the OpenEmbedded build system processes this variable, you cannot update its contents by using `_append` or `_prepend`. You must use the `+=` operator to add one or more options to the `IMAGE_FSTYPES` variable.

`IMAGE_INSTALL`

Used by recipes to specify the packages to install into an image through the `image` class. Use the `IMAGE_INSTALL` variable with care to avoid ordering issues.

Image recipes set `IMAGE_INSTALL` to specify the packages to install into an image through `image.bbclass`. Additionally, "helper" classes such as the `core-image` class exist that can take lists used with `IMAGE_FEATURES` and turn them into auto-generated entries in `IMAGE_INSTALL` in addition to its default contents.

When you use this variable, it is best to use it as follows:

```
IMAGE_INSTALL_append = " package-name"
```

Be sure to include the space between the quotation character and the start of the package name or names.

Caution

- When working with a `core-image-minimal-initramfs` image, do not use the `IMAGE_INSTALL` variable to specify packages for installation. Instead, use the `PACKAGE_INSTALL` variable, which allows the initial RAM filesystem (initramfs) recipe to use a

fixed set of packages and not be affected by `IMAGE_INSTALL`. For information on creating an initramfs, see the "Building an Initial RAM Filesystem (initramfs) Image" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#building-an-initramfs-image>] section in the Yocto Project Development Tasks Manual.

- Using `IMAGE_INSTALL` with the `+=` [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#appending-and-prepend>] BitBake operator within the `/conf/local.conf` file or from within an image recipe is not recommended. Use of this operator in these ways can cause ordering issues. Since `core-image.bbclass` sets `IMAGE_INSTALL` to a default value using the `?=` [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#setting-a-default-value>] operator, using a `+=` operation against `IMAGE_INSTALL` results in unexpected behavior when used within `conf/local.conf`. Furthermore, the same operation from within an image recipe may or may not succeed depending on the specific situation. In both these cases, the behavior is contrary to how most users expect the `+=` operator to work.

`IMAGE_LINGUAS`

Specifies the list of locales to install into the image during the root filesystem construction process. The OpenEmbedded build system automatically splits locale files, which are used for localization, into separate packages. Setting the `IMAGE_LINGUAS` variable ensures that any locale packages that correspond to packages already selected for installation into the image are also installed. Here is an example:

```
IMAGE_LINGUAS = "pt-br de-de"
```

In this example, the build system ensures any Brazilian Portuguese and German locale files that correspond to packages in the image are installed (i.e. `*-locale-pt-br` and `*-locale-de-de` as well as `*-locale-pt` and `*-locale-de`, since some software packages only provide locale files by language and not by country-specific language).

See the `GLIBC_GENERATE_LOCALES` variable for information on generating GLIBC locales.

`IMAGE_MANIFEST`

The manifest file for the image. This file lists all the installed packages that make up the image. The file contains package information on a line-per-package basis as follows:

```
packagename packagearch version
```

The image class defines the manifest file as follows:

```
IMAGE_MANIFEST = "${DEPLOY_DIR_IMAGE}/${IMAGE_NAME}.rootfs.manifest"
```

The location is derived using the `DEPLOY_DIR_IMAGE` and `IMAGE_NAME` variables. You can find information on how the image is created in the "Image Generation" [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#image-generation-dev-environment>] section in the Yocto Project Overview and Concepts Manual.

IMAGE_NAME The name of the output image files minus the extension. This variable is derived using the `IMAGE_BASENAME`, `MACHINE`, and `DATETIME` variables:

```
IMAGE_NAME = "${IMAGE_BASENAME}-${MACHINE}-${DATETIME}"
```

IMAGE_OVERHEAD_FACTOR Defines a multiplier that the build system applies to the initial image size for cases when the multiplier times the returned disk usage value for the image is greater than the sum of `IMAGE_ROOTFS_SIZE` and `IMAGE_ROOTFS_EXTRA_SPACE`. The result of the multiplier applied to the initial image size creates free disk space in the image as overhead. By default, the build process uses a multiplier of 1.3 for this variable. This default value results in 30% free disk space added to the image when this method is used to determine the final generated image size. You should be aware that post install scripts and the package management system uses disk space inside this overhead area. Consequently, the multiplier does not produce an image with all the theoretical free disk space. See `IMAGE_ROOTFS_SIZE` for information on how the build system determines the overall image size.

The default 30% free disk space typically gives the image enough room to boot and allows for basic post installs while still leaving a small amount of free disk space. If 30% free space is inadequate, you can increase the default value. For example, the following setting gives you 50% free space added to the image:

```
IMAGE_OVERHEAD_FACTOR = "1.5"
```

Alternatively, you can ensure a specific amount of free disk space is added to the image by using the `IMAGE_ROOTFS_EXTRA_SPACE` variable.

IMAGE_PKGTYPE Defines the package type (i.e. DEB, RPM, IPK, or TAR) used by the OpenEmbedded build system. The variable is defined appropriately by the `package_deb`, `package_rpm`, `package_ipk`, or `package_tar` class.

Warning

The `package_tar` class is broken and is not supported. It is recommended that you do not use it.

The `populate_sdk_*` and `image` classes use the `IMAGE_PKGTYPE` for packaging up images and SDKs.

You should not set the `IMAGE_PKGTYPE` manually. Rather, the variable is set indirectly through the appropriate `package_*` class using the `PACKAGE_CLASSES` variable. The OpenEmbedded build system uses the first package type (e.g. DEB, RPM, or IPK) that appears with the variable

Note

Files using the `.tar` format are never used as a substitute packaging format for DEB, RPM, and IPK formatted files for your image or SDK.

IMAGE_POSTPROCESS_COMMAND Specifies a list of functions to call once the OpenEmbedded build system creates the final image output files. You can specify functions separated by semicolons:

```
IMAGE_POSTPROCESS_COMMAND += "function; ... "
```


If you need to pass the root filesystem path to a command within the function, you can use `${IMAGE_ROOTFS}`, which points to the directory that becomes the root filesystem image. See the `IMAGE_ROOTFS` variable for more information.

IMAGE_PREPROCESS_COMMAND Specifies a list of functions to call before the OpenEmbedded build system creates the final image output files. You can specify functions separated by semicolons:

```
IMAGE_PREPROCESS_COMMAND += "function; ... "
```

If you need to pass the root filesystem path to a command within the function, you can use `${IMAGE_ROOTFS}`, which points to the directory that becomes the root filesystem image. See the `IMAGE_ROOTFS` variable for more information.

IMAGE_ROOTFS The location of the root filesystem while it is under construction (i.e. during the `do_rootfs` task). This variable is not configurable. Do not change it.

IMAGE_ROOTFS_ALIGNMENT Specifies the alignment for the output image file in Kbytes. If the size of the image is not a multiple of this value, then the size is rounded up to the nearest multiple of the value. The default value is "1". See `IMAGE_ROOTFS_SIZE` for additional information.

IMAGE_ROOTFS_EXTRA_SPACE Defines additional free disk space created in the image in Kbytes. By default, this variable is set to "0". This free disk space is added to the image after the build system determines the image size as described in `IMAGE_ROOTFS_SIZE`.

This variable is particularly useful when you want to ensure that a specific amount of free disk space is available on a device after an image is installed and running. For example, to be sure 5 Gbytes of free disk space is available, set the variable as follows:

```
IMAGE_ROOTFS_EXTRA_SPACE = "5242880"
```

For example, the Yocto Project Build Appliance specifically requests 40 Gbytes of extra space with the line:

```
IMAGE_ROOTFS_EXTRA_SPACE = "41943040"
```

IMAGE_ROOTFS_SIZE Defines the size in Kbytes for the generated image. The OpenEmbedded build system determines the final size for the generated image using an algorithm that takes into account the initial disk space used for the generated image, a requested size for the image, and requested additional free disk space to be added to the image. Programatically, the build system determines the final size of the generated image as follows:

```
if (image-du * overhead) < rootfs-size:
    internal-rootfs-size = rootfs-size + xspace
else:
    internal-rootfs-size = (image-du * overhead) + xspace
```

where:

```
image-du = Returned value of the du command on
```

the image.

```
overhead = IMAGE_OVERHEAD_FACTOR
```

```
rootfs-size = IMAGE_ROOTFS_SIZE
```

```
internal-rootfs-size = Initial root filesystem
                        size before any modifications.
```

```
xspace = IMAGE_ROOTFS_EXTRA_SPACE
```

See the `IMAGE_OVERHEAD_FACTOR` and `IMAGE_ROOTFS_EXTRA_SPACE` variables for related information.

IMAGE_TYPEDEP

Specifies a dependency from one image type on another. Here is an example from the `image-live` class:

```
IMAGE_TYPEDEP_live = "ext3"
```

In the previous example, the variable ensures that when "live" is listed with the `IMAGE_FSTYPES` variable, the OpenEmbedded build system produces an ext3 image first since one of the components of the live image is an ext3 formatted partition containing the root filesystem.

IMAGE_TYPES

Specifies the complete list of supported image types by default:

```
btrfs
container
cpio
cpio.gz
cpio.lz4
cpio.lzma
cpio.xz
cramfs
elf
ext2
ext2.bz2
ext2.gz
ext2.lzma
ext3
ext3.gz
ext4
ext4.gz
f2fs
hddimg
iso
jffs2
jffs2.sum
multiubi
squashfs
squashfs-lz4
squashfs-lzo
squashfs-xz
tar
tar.bz2
tar.gz
tar.lz4
tar.xz
ubi
ubifs
```

```
wic  
wic.bz2  
wic.gz  
wic.lzma
```

For more information about these types of images, see `meta/classes/image_types*.bbclass` in the Source Directory.

INC_PR

Helps define the recipe revision for recipes that share a common include file. You can think of this variable as part of the recipe revision as set from within an include file.

Suppose, for example, you have a set of recipes that are used across several projects. And, within each of those recipes the revision (its PR value) is set accordingly. In this case, when the revision of those recipes changes, the burden is on you to find all those recipes and be sure that they get changed to reflect the updated version of the recipe. In this scenario, it can get complicated when recipes that are used in many places and provide common functionality are upgraded to a new revision.

A more efficient way of dealing with this situation is to set the `INC_PR` variable inside the `include` files that the recipes share and then expand the `INC_PR` variable within the recipes to help define the recipe revision.

The following provides an example that shows how to use the `INC_PR` variable given a common `include` file that defines the variable. Once the variable is defined in the `include` file, you can use the variable to set the PR values in each recipe. You will notice that when you set a recipe's PR you can provide more granular revisioning by appending values to the `INC_PR` variable:

```
recipes-graphics/xorg-font/xorg-font-common.inc:INC_PR = "r2"  
recipes-graphics/xorg-font/encodings_1.0.4.bb:PR = "${INC_PR}.1"  
recipes-graphics/xorg-font/font-util_1.3.0.bb:PR = "${INC_PR}.0"  
recipes-graphics/xorg-font/font-alias_1.0.3.bb:PR = "${INC_PR}.3"
```

The first line of the example establishes the baseline revision to be used for all recipes that use the `include` file. The remaining lines in the example are from individual recipes and show how the PR value is set.

INCOMPATIBLE_LICENSE

Specifies a space-separated list of license names (as they would appear in `LICENSE`) that should be excluded from the build. Recipes that provide no alternatives to listed incompatible licenses are not built. Packages that are individually licensed with the specified incompatible licenses will be deleted.

Note

This functionality is only regularly tested using the following setting:

```
INCOMPATIBLE_LICENSE = "GPL-3.0 LGPL-3.0 AGPL-3.0"
```

Although you can use other settings, you might be required to remove dependencies on or provide alternatives to components that are required to produce a functional system image.

INHERIT	<p>Causes the named class or classes to be inherited globally. Anonymous functions in the class or classes are not executed for the base configuration and in each individual recipe. The OpenEmbedded build system ignores changes to INHERIT in individual recipes.</p> <p>For more information on INHERIT, see the "INHERIT Configuration Directive" [http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#inherit-configuration-directive] section in the Bitbake User Manual.</p>
INHERIT_DISTRO	<p>Lists classes that will be inherited at the distribution level. It is unlikely that you want to edit this variable.</p> <p>The default value of the variable is set as follows in the meta/conf/distro/defaultsetup.conf file:</p> <pre>INHERIT_DISTRO += "debian devshell sstate license"</pre>
INHIBIT_DEFAULT_DEPS	<p>Prevents the default dependencies, namely the C compiler and standard C library (libc), from being added to DEPENDS. This variable is usually used within recipes that do not require any compilation using the C compiler.</p> <p>Set the variable to "1" to prevent the default dependencies from being added.</p>
INHIBIT_PACKAGE_DEBUG_SPLIT	<p>Prevents the OpenEmbedded build system from splitting out debug information during packaging. By default, the build system splits out debugging information during the do_package task. For more information on how debug information is split out, see the PACKAGE_DEBUG_SPLIT_STYLE variable.</p> <p>To prevent the build system from splitting out debug information during packaging, set the INHIBIT_PACKAGE_DEBUG_SPLIT variable as follows:</p> <pre>INHIBIT_PACKAGE_DEBUG_SPLIT = "1"</pre>
INHIBIT_PACKAGE_STRIP	<p>If set to "1", causes the build to not strip binaries in resulting packages and prevents the -dbg package from containing the source files.</p> <p>By default, the OpenEmbedded build system strips binaries and puts the debugging symbols into \${PN}-dbg. Consequently, you should not set INHIBIT_PACKAGE_STRIP when you plan to debug in general.</p>
INHIBIT_SYSROOT_STRIP	<p>If set to "1", causes the build to not strip binaries in the resulting sysroot.</p> <p>By default, the OpenEmbedded build system strips binaries in the resulting sysroot. When you specifically set the INHIBIT_SYSROOT_STRIP variable to "1" in your recipe, you inhibit this stripping.</p> <p>If you want to use this variable, include the staging class. This class uses a sys_strip() function to test for the variable and acts accordingly.</p>

Note

Use of the INHIBIT_SYSROOT_STRIP variable occurs in rare and special circumstances. For example, suppose you are building bare-metal firmware by using an external GCC

toolchain. Furthermore, even if the toolchain's binaries are strippable, other files exist that are needed for the build that are not strippable.

INITRAMFS_FSTYPES

Defines the format for the output image of an initial RAM filesystem (initramfs), which is used during boot. Supported formats are the same as those supported by the IMAGE_FSTYPES variable.

The default value of this variable, which is set in the meta/conf/bitbake.conf configuration file in the Source Directory, is "cpio.gz". The Linux kernel's initramfs mechanism, as opposed to the initial RAM filesystem initrd [<https://en.wikipedia.org/wiki/Initrd>] mechanism, expects an optionally compressed cpio archive.

INITRAMFS_IMAGE

Specifies the PROVIDES name of an image recipe that is used to build an initial RAM filesystem (initramfs) image. In other words, the INITRAMFS_IMAGE variable causes an additional recipe to be built as a dependency to whatever root filesystem recipe you might be using (e.g. core-image-sato). The initramfs image recipe you provide should set IMAGE_FSTYPES to INITRAMFS_FSTYPES.

An initramfs image provides a temporary root filesystem used for early system initialization (e.g. loading of modules needed to locate and mount the "real" root filesystem).

Note

See the meta/recipes-core/images/core-image-minimal-initramfs.bb recipe in the Source Directory for an example initramfs recipe. To select this sample recipe as the one built to provide the initramfs image, set INITRAMFS_IMAGE to "core-image-minimal-initramfs".

You can also find more information by referencing the meta-poky/conf/local.conf.sample.extended configuration file in the Source Directory, the image class, and the kernel class to see how to use the INITRAMFS_IMAGE variable.

If INITRAMFS_IMAGE is empty, which is the default, then no initramfs image is built.

For more information, you can also see the INITRAMFS_IMAGE_BUNDLE variable, which allows the generated image to be bundled inside the kernel image. Additionally, for information on creating an initramfs image, see the "Building an Initial RAM Filesystem (initramfs) Image [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#building-an-initramfs-image>]" section in the Yocto Project Development Tasks Manual.

INITRAMFS_IMAGE_BUNDLE

Controls whether or not the image recipe specified by INITRAMFS_IMAGE is run through an extra pass (do_bundle_initramfs) during kernel compilation in order to build a single binary that contains both the kernel image and the initial RAM filesystem (initramfs) image. This makes use of the CONFIG_INITRAMFS_SOURCE kernel feature.

Note

Using an extra compilation pass to bundle the initramfs avoids a circular dependency between the kernel recipe and the initramfs recipe should the initramfs include kernel modules. Should that be the case, the initramfs recipe depends on the kernel for the kernel modules, and the kernel depends on the initramfs recipe since the initramfs is bundled inside the kernel image.

The combined binary is deposited into the tmp/deploy directory, which is part of the Build Directory.

Setting the variable to "1" in a configuration file causes the OpenEmbedded build system to generate a kernel image with the initramfs specified in INITRAMFS_IMAGE bundled within:

```
INITRAMFS_IMAGE_BUNDLE = "1"
```

By default, the kernel class sets this variable to a null string as follows:

```
INITRAMFS_IMAGE_BUNDLE ?= ""
```

Note

You must set the INITRAMFS_IMAGE_BUNDLE variable in a configuration file. You cannot set the variable in a recipe file. See the local.conf.sample.extended [<http://git.yoctoproject.org/cgit/cgit.cgi/poky/tree/meta-poky/conf/local.conf.sample.extended>] file for additional information. Also, for information on creating an initramfs, see the "Building an Initial RAM Filesystem (initramfs) Image" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#building-an-initramfs-image>] section in the Yocto Project Development Tasks Manual.

INITRAMFS_LINK_NAME

The link name of the initial RAM filesystem image. This variable is set in the meta/classes/kernel-artifact-names.bbclass file as follows:

```
INITRAMFS_LINK_NAME ?= "initramfs-${KERNEL_ARTIFACT_LINK_NAME}"
```

The value of the KERNEL_ARTIFACT_LINK_NAME variable, which is set in the same file, has the following value:

```
KERNEL_ARTIFACT_LINK_NAME ?= "${MACHINE}"
```

See the MACHINE variable for additional information.

INITRAMFS_NAME

The base name of the initial RAM filesystem image. This variable is set in the meta/classes/kernel-artifact-names.bbclass file as follows:

```
INITRAMFS_NAME ?= "initramfs-${KERNEL_ARTIFACT_NAME}"
```

The value of the KERNEL_ARTIFACT_NAME variable, which is set in the same file, has the following value:

```
KERNEL_ARTIFACT_NAME ?= "${PKGNAME}-${PKGVERSION}-${PKGRELEASE}-${MACHINE}${IMAGESUFFIX}"
```

INITRD

Indicates list of filesystem images to concatenate and use as an initial RAM disk (initrd).

The INITRD variable is an optional variable used with the image-live class.

INITRD_IMAGE When building a "live" bootable image (i.e. when `IMAGE_FSTYPES` contains "live"), `INITRD_IMAGE` specifies the image recipe that should be built to provide the initial RAM disk image. The default value is "core-image-minimal-initramfs".

See the `image-live` class for more information.

INITSCRIPT_NAME The filename of the initialization script as installed to `${sysconfdir}/init.d`.

This variable is used in recipes when using `update-rc.d.bbclass`. The variable is mandatory.

INITSCRIPT_PACKAGES A list of the packages that contain `initscripts`. If multiple packages are specified, you need to append the package name to the other `INITSCRIPT_*` as an override.

This variable is used in recipes when using `update-rc.d.bbclass`. The variable is optional and defaults to the `PN` variable.

INITSCRIPT_PARAMS Specifies the options to pass to `update-rc.d`. Here is an example:

```
INITSCRIPT_PARAMS = "start 99 5 2 . stop 20 0 1 6 ."
```

In this example, the script has a runlevel of 99, starts the script in initlevels 2 and 5, and stops the script in levels 0, 1 and 6.

The variable's default value is "defaults", which is set in the `update-rc.d` class.

The value in `INITSCRIPT_PARAMS` is passed through to the `update-rc.d` command. For more information on valid parameters, please see the `update-rc.d` manual page at <http://www.tin.org/bin/man.cgi?section=8&topic=update-rc.d>.

INSANE_SKIP Specifies the QA checks to skip for a specific package within a recipe. For example, to skip the check for symbolic link `.so` files in the main package of a recipe, add the following to the recipe. The package name override must be used, which in this example is `${PN}`:

```
INSANE_SKIP_${PN} += "dev-so"
```

See the "insane.bbclass" section for a list of the valid QA checks you can specify using this variable.

INSTALL_TIMEZONE_FILE By default, the `tzdata` recipe packages an `/etc/timezone` file. Set the `INSTALL_TIMEZONE_FILE` variable to "0" at the configuration level to disable this behavior.

IPK_FEED_URI When the `IPK` backend is in use and package management is enabled on the target, you can use this variable to set up `opkg` in the target image to point to package feeds on a nominated server. Once the feed is established, you can perform installations or upgrades using the package manager at runtime.

K

KARCH Defines the kernel architecture used when assembling the configuration. Architectures supported for this release are:

```
powerpc  
i386
```

```
x86_64
arm
qemu
mips
```

You define the KARCH variable in the BSP Descriptions [<http://www.yoctoproject.org/docs/3.0.3/kernel-dev/kernel-dev.html#bsp-descriptions>].

KBRANCH

A regular expression used by the build process to explicitly identify the kernel branch that is validated, patched, and configured during a build. You must set this variable to ensure the exact kernel branch you want is being used by the build process.

Values for this variable are set in the kernel's recipe file and the kernel's append file. For example, if you are using the `linux-yocto_4.12` kernel, the kernel recipe file is the `meta/recipes-kernel/linux/linux-yocto_4.12.bb` file. KBRANCH is set as follows in that kernel recipe file:

```
KBRANCH ?= "standard/base"
```

This variable is also used from the kernel's append file to identify the kernel branch specific to a particular machine or target hardware. Continuing with the previous kernel example, the kernel's append file (i.e. `linux-yocto_4.12.bbappend`) is located in the BSP layer for a given machine. For example, the append file for the Beaglebone, EdgeRouter, and generic versions of both 32 and 64-bit IA machines (`meta-yocto-bsp`) is named `meta-yocto-bsp/recipes-kernel/linux/linux-yocto_4.12.bbappend`. Here are the related statements from that append file:

```
KBRANCH_genericx86 = "standard/base"
KBRANCH_genericx86-64 = "standard/base"
KBRANCH_edgerouter = "standard/edgerouter"
KBRANCH_beaglebone = "standard/beaglebone"
KBRANCH_mpc8315e-rdb = "standard/fsl-mpc8315e-rdb"
```

The KBRANCH statements identify the kernel branch to use when building for each supported BSP.

KBUILD_DEFCONFIG

When used with the `kernel-yocto` class, specifies an "in-tree" kernel configuration file for use during a kernel build.

Typically, when using a defconfig to configure a kernel during a build, you place the file in your layer in the same manner as you would place patch files and configuration fragment files (i.e. "out-of-tree"). However, if you want to use a defconfig file that is part of the kernel tree (i.e. "in-tree"), you can use the KBUILD_DEFCONFIG variable and append the KMACHINE variable to point to the defconfig file.

To use the variable, set it in the append file for your kernel recipe using the following form:

```
KBUILD_DEFCONFIG_KMACHINE ?= defconfig_file
```

Here is an example from a "raspberrypi2" KMACHINE build that uses a defconfig file named "bcm2709_defconfig":


```
KBUILD_DEFCONFIG_raspberrypi2 = "bcm2709_defconfig"
```

As an alternative, you can use the following within your append file:

```
KBUILD_DEFCONFIG_pn-linux-yocto ?= defconfig_file
```

For more information on how to use the `KBUILD_DEFCONFIG` variable, see the "Using an "In-Tree" defconfig File [<http://www.yoctoproject.org/docs/3.0.3/kernel-dev/kernel-dev.html#using-an-in-tree-defconfig-file>]" section in the Yocto Project Linux Kernel Development Manual.

KERNEL_ALT_IMAGETYPE Specifies an alternate kernel image type for creation in addition to the kernel image type specified using the `KERNEL_IMAGETYPE` variable.

KERNEL_ARTIFACT_NAME Specifies the name of all of the build artifacts. You can change the name of the artifacts by changing the `KERNEL_ARTIFACT_NAME` variable.

The value of `KERNEL_ARTIFACT_NAME`, which is set in the `meta/classes/kernel-artifact-names.bbclass` file, has the following default value:

```
KERNEL_ARTIFACT_NAME ?= "${PKG}-${PKGVERSION}-${PKGR}-${MACHINE}${IMAGETYPE}"
```

See the `PKG`, `PKGVERSION`, `PKGR`, and `MACHINE` variables for additional information.

Note

The `IMAGE_VERSION_SUFFIX` variable is set to `DATETIME`.

KERNEL_CLASSES A list of classes defining kernel image types that the kernel class should inherit. You typically append this variable to enable extended image types. An example is the "kernel-fitimage", which enables fitImage support and resides in `meta/classes/kernel-fitimage.bbclass`. You can register custom kernel image types with the kernel class using this variable.

KERNEL_DEVICETREE Specifies the name of the generated Linux kernel device tree (i.e. the `.dtb`) file.

Note

Legacy support exists for specifying the full path to the device tree. However, providing just the `.dtb` file is preferred. In order to use this variable, the `kernel-devicetree` class must be inherited.

KERNEL_DTB_LINK_NAME The link name of the kernel device tree binary (DTB). This variable is set in the `meta/classes/kernel-artifact-names.bbclass` file as follows:

```
KERNEL_DTB_LINK_NAME ?= "${KERNEL_ARTIFACT_LINK_NAME}"
```

The value of the `KERNEL_ARTIFACT_LINK_NAME` variable, which is set in the same file, has the following value:

```
KERNEL_ARTIFACT_LINK_NAME ?= "${MACHINE}"
```

See the MACHINE variable for additional information.

KERNEL_DTB_NAME

The base name of the kernel device tree binary (DTB). This variable is set in the meta/classes/kernel-artifact-names.bbclass file as follows:

```
KERNEL_DTB_NAME ?= "${KERNEL_ARTIFACT_NAME}"
```

The value of the KERNEL_ARTIFACT_NAME variable, which is set in the same file, has the following value:

```
KERNEL_ARTIFACT_NAME ?= "${PKGNAME}-${PKGV}-${PKGR}-${MACHINE}-${IMAGESIZE}"
```

KERNEL_EXTRA_ARGS

Specifies additional make command-line arguments the OpenEmbedded build system passes on when compiling the kernel.

KERNEL_FEATURES

Includes additional kernel metadata. In the OpenEmbedded build system, the default Board Support Packages (BSPs) Metadata is provided through the KMACHINE and KBRANCH variables. You can use the KERNEL_FEATURES variable from within the kernel recipe or kernel append file to further add metadata for all BSPs or specific BSPs.

The metadata you add through this variable includes config fragments and features descriptions, which usually includes patches as well as config fragments. You typically override the KERNEL_FEATURES variable for a specific machine. In this way, you can provide validated, but optional, sets of kernel configurations and features.

For example, the following example from the linux-yocto-rt_4.12 kernel recipe adds "netfilter" and "taskstats" features to all BSPs as well as "virtio" configurations to all QEMU machines. The last two statements add specific configurations to targeted machine types:

```
KERNEL_EXTRA_FEATURES ?= "features/netfilter/netfilter.scc features/taskstats/taskstats.scc"
KERNEL_FEATURES_append = " ${KERNEL_EXTRA_FEATURES}"
KERNEL_FEATURES_append_qemuall = " cfg/virtio.scc"
KERNEL_FEATURES_append_qemux86 = " cfg/sound.scc cfg/paravirt_kvm"
KERNEL_FEATURES_append_qemux86-64 = " cfg/sound.scc"
```

KERNEL_FIT_LINK_NAME

The link name of the kernel flattened image tree (FIT) image. This variable is set in the meta/classes/kernel-artifact-names.bbclass file as follows:

```
KERNEL_FIT_LINK_NAME ?= "${KERNEL_ARTIFACT_LINK_NAME}"
```

The value of the KERNEL_ARTIFACT_LINK_NAME variable, which is set in the same file, has the following value:

```
KERNEL_ARTIFACT_LINK_NAME ?= "${MACHINE}"
```

See the MACHINE variable for additional information.

KERNEL_FIT_NAME

The base name of the kernel flattened image tree (FIT) image. This variable is set in the meta/classes/kernel-artifact-names.bbclass file as follows:

```
KERNEL_FIT_NAME ?= "${KERNEL_ARTIFACT_NAME}"
```

The value of the `KERNEL_ARTIFACT_NAME` variable, which is set in the same file, has the following value:

```
KERNEL_ARTIFACT_NAME ?= "${PKG}-${PKGVERSION}-${PKGR}-${MACHINE}${IMAG
```

`KERNEL_IMAGE_LINK_NAME`

The link name for the kernel image. This variable is set in the meta/classes/kernel-artifact-names.bbclass file as follows:

```
KERNEL_IMAGE_LINK_NAME ?= "${KERNEL_ARTIFACT_LINK_NAME}"
```

The value of the `KERNEL_ARTIFACT_LINK_NAME` variable, which is set in the same file, has the following value:

```
KERNEL_ARTIFACT_LINK_NAME ?= "${MACHINE}"
```

See the `MACHINE` variable for additional information.

`KERNEL_IMAGE_MAXSIZE`

Specifies the maximum size of the kernel image file in kilobytes. If `KERNEL_IMAGE_MAXSIZE` is set, the size of the kernel image file is checked against the set value during the `do_sizecheck` task. The task fails if the kernel image file is larger than the setting.

`KERNEL_IMAGE_MAXSIZE` is useful for target devices that have a limited amount of space in which the kernel image must be stored.

By default, this variable is not set, which means the size of the kernel image is not checked.

`KERNEL_IMAGE_NAME`

The base name of the kernel image. This variable is set in the meta/classes/kernel-artifact-names.bbclass file as follows:

```
KERNEL_IMAGE_NAME ?= "${KERNEL_ARTIFACT_NAME}"
```

The value of the `KERNEL_ARTIFACT_NAME` variable, which is set in the same file, has the following value:

```
KERNEL_ARTIFACT_NAME ?= "${PKG}-${PKGVERSION}-${PKGR}-${MACHINE}${IMAG
```

`KERNEL_IMAGETYPE`

The type of kernel to build for a device, usually set by the machine configuration files and defaults to "zImage". This variable is used when building the kernel and is passed to make as the target to build.

If you want to build an alternate kernel image type, use the `KERNEL_ALT_IMAGETYPE` variable.

`KERNEL_MODULE_AUTOLOAD`

Lists kernel modules that need to be auto-loaded during boot.

Note

This variable replaces the deprecated `module_autoload` variable.

You can use the `KERNEL_MODULE_AUTOLOAD` variable anywhere that it can be recognized by the kernel recipe or by an out-of-tree

kernel module recipe (e.g. a machine configuration file, a distribution configuration file, an append file for the recipe, or the recipe itself).

Specify it as follows:

```
KERNEL_MODULE_AUTOLOAD += "module_name1 module_name2 module_name3"
```

Including `KERNEL_MODULE_AUTOLOAD` causes the OpenEmbedded build system to populate the `/etc/modules-load.d/modname.conf` file with the list of modules to be auto-loaded on boot. The modules appear one-per-line in the file. Here is an example of the most common use case:

```
KERNEL_MODULE_AUTOLOAD += "module_name"
```

For information on how to populate the `modname.conf` file with `modprobe.d` syntax lines, see the `KERNEL_MODULE_PROBECONF` variable.

KERNEL_MODULE_PROBECONF Provides a list of modules for which the OpenEmbedded build system expects to find `module_conf_modname` values that specify configuration for each of the modules. For information on how to provide those module configurations, see the `module_conf_*` variable.

KERNEL_PATH The location of the kernel sources. This variable is set to the value of the `STAGING_KERNEL_DIR` within the module class. For information on how this variable is used, see the "Incorporating Out-of-Tree Modules [<http://www.yoctoproject.org/docs/3.0.3/kernel-dev/kernel-dev.html#incorporating-out-of-tree-modules>]" section in the Yocto Project Linux Kernel Development Manual.

To help maximize compatibility with out-of-tree drivers used to build modules, the OpenEmbedded build system also recognizes and uses the `KERNEL_SRC` variable, which is identical to the `KERNEL_PATH` variable. Both variables are common variables used by external Makefiles to point to the kernel source directory.

KERNEL_SRC The location of the kernel sources. This variable is set to the value of the `STAGING_KERNEL_DIR` within the module class. For information on how this variable is used, see the "Incorporating Out-of-Tree Modules [<http://www.yoctoproject.org/docs/3.0.3/kernel-dev/kernel-dev.html#incorporating-out-of-tree-modules>]" section in the Yocto Project Linux Kernel Development Manual.

To help maximize compatibility with out-of-tree drivers used to build modules, the OpenEmbedded build system also recognizes and uses the `KERNEL_PATH` variable, which is identical to the `KERNEL_SRC` variable. Both variables are common variables used by external Makefiles to point to the kernel source directory.

KERNEL_VERSION Specifies the version of the kernel as extracted from `version.h` or `utsrelease.h` within the kernel sources. Effects of setting this variable do not take affect until the kernel has been configured. Consequently, attempting to refer to this variable in contexts prior to configuration will not work.

KERNELDEPMODDEPEND Specifies whether the data referenced through `PKGDATA_DIR` is needed or not. The `KERNELDEPMODDEPEND` does not control whether or not that data exists, but simply whether or not it is used. If you do not need to use the data, set the `KERNELDEPMODDEPEND` variable in your `initramfs` recipe. Setting the variable there when the data is not needed avoids a potential dependency loop.

KFEATURE_DESCRIPTION Provides a short description of a configuration fragment. You use this variable in the .scc file that describes a configuration fragment file. Here is the variable used in a file named `smc.scc` to describe SMP being enabled:

```
define KFEATURE_DESCRIPTION "Enable SMP"
```

KMACHINE The machine as known by the kernel. Sometimes the machine name used by the kernel does not match the machine name used by the OpenEmbedded build system. For example, the machine name that the OpenEmbedded build system understands as `core2-32-intel-common` goes by a different name in the Linux Yocto kernel. The kernel understands that machine as `intel-core2-32`. For cases like these, the `KMACHINE` variable maps the kernel machine name to the OpenEmbedded build system machine name.

These mappings between different names occur in the Yocto Linux Kernel's meta branch. As an example take a look in the `common/recipes-kernel/linux/linux-yocto_3.19.bbappend` file:

```
LINUX_VERSION_core2-32-intel-common = "3.19.0"
COMPATIBLE_MACHINE_core2-32-intel-common = "${MACHINE}"
SRCREV_meta_core2-32-intel-common = "8897ef68b30e7426bcd39895e71"
SRCREV_machine_core2-32-intel-common = "43b9eced9ba8a57add36af077"
KMACHINE_core2-32-intel-common = "intel-core2-32"
KBRANCH_core2-32-intel-common = "standard/base"
KERNEL_FEATURES_append_core2-32-intel-common = "${KERNEL_FEATURES}
```

The `KMACHINE` statement says that the kernel understands the machine name as `intel-core2-32`. However, the OpenEmbedded build system understands the machine as `core2-32-intel-common`.

KTYPE Defines the kernel type to be used in assembling the configuration. The linux-yocto recipes define "standard", "tiny", and "preempt-rt" kernel types. See the "Kernel Types [<http://www.yoctoproject.org/docs/3.0.3/kernel-dev/kernel-dev.html#kernel-types>]" section in the Yocto Project Linux Kernel Development Manual for more information on kernel types.

You define the `KTYPE` variable in the BSP Descriptions [<http://www.yoctoproject.org/docs/3.0.3/kernel-dev/kernel-dev.html#bsp-descriptions>]. The value you use must match the value used for the `LINUX_KERNEL_TYPE` value used by the kernel recipe.

L

LABELS Provides a list of targets for automatic configuration.

See the `grub-efi` class for more information on how this variable is used.

LAYERDEPENDS Lists the layers, separated by spaces, on which this recipe depends. Optionally, you can specify a specific layer version for a dependency by adding it to the end of the layer name. Here is an example:

```
LAYERDEPENDS_mylayer = "anotherlayer (=3)"
```

In this previous example, version 3 of "anotherlayer" is compared against `LAYERVERSION_anotherlayer`.

	<p>An error is produced if any dependency is missing or the version numbers (if specified) do not match exactly. This variable is used in the <code>conf/layer.conf</code> file and must be suffixed with the name of the specific layer (e.g. <code>LAYERDEPENDS_mylayer</code>).</p>
LAYERDIR	<p>When used inside the <code>layer.conf</code> configuration file, this variable provides the path of the current layer. This variable is not available outside of <code>layer.conf</code> and references are expanded immediately when parsing of the file completes.</p>
LAYERRECOMMENDS	<p>Lists the layers, separated by spaces, recommended for use with this layer.</p> <p>Optionally, you can specify a specific layer version for a recommendation by adding the version to the end of the layer name. Here is an example:</p> <pre>LAYERRECOMMENDS_mylayer = "anotherlayer (=3)"</pre> <p>In this previous example, version 3 of "anotherlayer" is compared against <code>LAYERVERSION_anotherlayer</code>.</p> <p>This variable is used in the <code>conf/layer.conf</code> file and must be suffixed with the name of the specific layer (e.g. <code>LAYERRECOMMENDS_mylayer</code>).</p>
LAYERSERIES_COMPAT	<p>Lists the versions of the OpenEmbedded-Core for which a layer is compatible. Using the <code>LAYERSERIES_COMPAT</code> variable allows the layer maintainer to indicate which combinations of the layer and OE-Core can be expected to work. The variable gives the system a way to detect when a layer has not been tested with new releases of OE-Core (e.g. the layer is not maintained).</p> <p>To specify the OE-Core versions for which a layer is compatible, use this variable in your layer's <code>conf/layer.conf</code> configuration file. For the list, use the Yocto Project Release Name [https://wiki.yoctoproject.org/wiki/Releases] (e.g. zeus). To specify multiple OE-Core versions for the layer, use a space-separated list:</p> <pre>LAYERSERIES_COMPAT_layer_root_name = "zeus warrior"</pre>
	<h2>Note</h2> <p>Setting <code>LAYERSERIES_COMPAT</code> is required by the Yocto Project Compatible version 2 standard. The OpenEmbedded build system produces a warning if the variable is not set for any given layer.</p> <p>See the "Creating Your Own Layer" [http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#creating-your-own-layer] section in the Yocto Project Development Tasks Manual.</p>
LAYERVERSION	<p>Optionally specifies the version of a layer as a single number. You can use this within <code>LAYERDEPENDS</code> for another layer in order to depend on a specific version of the layer. This variable is used in the <code>conf/layer.conf</code> file and must be suffixed with the name of the specific layer (e.g. <code>LAYERVERSION_mylayer</code>).</p>
LD	<p>The minimal command and arguments used to run the linker.</p>
LDFLAGS	<p>Specifies the flags to pass to the linker. This variable is exported to an environment variable and thus made visible to the software being built during the compilation step.</p>

	<p>Default initialization for LDFLAGS varies depending on what is being built:</p> <ul style="list-style-type: none">• TARGET_LDFLAGS when building for the target• BUILD_LDFLAGS when building for the build host (i.e. -native)• BUILDSDK_LDFLAGS when building for an SDK (i.e. nativesdk-)
LEAD_SONAME	<p>Specifies the lead (or primary) compiled library file (i.e. .so) that the debian class applies its naming policy to given a recipe that packages multiple libraries.</p> <p>This variable works in conjunction with the debian class.</p>
LIC_FILES_CHKSUM	<p>Checksums of the license text in the recipe source code.</p> <p>This variable tracks changes in license text of the source code files. If the license text is changed, it will trigger a build failure, which gives the developer an opportunity to review any license change.</p> <p>This variable must be defined for all recipes (unless LICENSE is set to "CLOSED").</p> <p>For more information, see the "Tracking License Changes [http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#usingpoky-configuring-LIC_FILES_CHKSUM]" section in the Yocto Project Development Tasks Manual.</p>
LICENSE	<p>The list of source licenses for the recipe. Follow these rules:</p> <ul style="list-style-type: none">• Do not use spaces within individual license names.• Separate license names using (pipe) when there is a choice between licenses.• Separate license names using & (ampersand) when multiple licenses exist that cover different parts of the source.• You can use spaces between license names.• For standard licenses, use the names of the files in meta/files/common-licenses/ or the SPDXLICENSEMAP flag names defined in meta/conf/licenses.conf. <p>Here are some examples:</p> <pre>LICENSE = "LGPLv2.1 GPLv3" LICENSE = "MPL-1 & LGPLv2.1" LICENSE = "GPLv2+"</pre> <p>The first example is from the recipes for Qt, which the user may choose to distribute under either the LGPL version 2.1 or GPL version 3. The second example is from Cairo where two licenses cover different parts of the source code. The final example is from sysstat, which presents a single license.</p> <p>You can also specify licenses on a per-package basis to handle situations where components of the output have different licenses. For example, a piece of software whose code is licensed under GPLv2 but has accompanying documentation licensed under the GNU Free Documentation License 1.2 could be specified as follows:</p>

```
LICENSE = "GFDL-1.2 & GPLv2"
```

```
LICENSE_${PN} = "GPLv2"
LICENSE_${PN}-doc = "GFDL-1.2"
```

LICENSE_CREATE_PACKAGE	<p>Setting LICENSE_CREATE_PACKAGE to "1" causes the OpenEmbedded build system to create an extra package (i.e. \${PN}-lic) for each recipe and to add those packages to the RRECOMMENDS_\${PN}.</p> <p>The \${PN}-lic package installs a directory in /usr/share/licenses named \${PN}, which is the recipe's base name, and installs files in that directory that contain license and copyright information (i.e. copies of the appropriate license files from meta/common-licenses that match the licenses specified in the LICENSE variable of the recipe metadata and copies of files marked in LIC_FILES_CHKSUM as containing license text).</p> <p>For related information on providing license text, see the COPY_LIC_DIRS variable, the COPY_LIC_MANIFEST variable, and the "Providing License Text [http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#providing-license-text]" section in the Yocto Project Development Tasks Manual.</p>
LICENSE_FLAGS	<p>Specifies additional flags for a recipe you must whitelist through LICENSE_FLAGS_WHITELIST in order to allow the recipe to be built. When providing multiple flags, separate them with spaces.</p> <p>This value is independent of LICENSE and is typically used to mark recipes that might require additional licenses in order to be used in a commercial product. For more information, see the "Enabling Commercially Licensed Recipes [http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#enabling-commercially-licensed-recipes]" section in the Yocto Project Development Tasks Manual.</p>
LICENSE_FLAGS_WHITELIST	<p>Lists license flags that when specified in LICENSE_FLAGS within a recipe should not prevent that recipe from being built. This practice is otherwise known as "whitelisting" license flags. For more information, see the "Enabling Commercially Licensed Recipes [http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#enabling-commercially-licensed-recipes]" section in the Yocto Project Development Tasks Manual.</p>
LICENSE_PATH	<p>Path to additional licenses used during the build. By default, the OpenEmbedded build system uses COMMON_LICENSE_DIR to define the directory that holds common license text used during the build. The LICENSE_PATH variable allows you to extend that location to other areas that have additional licenses:</p> <pre>LICENSE_PATH += "path-to-additional-common-licenses"</pre>
LINUX_KERNEL_TYPE	<p>Defines the kernel type to be used in assembling the configuration. The linux-yocto recipes define "standard", "tiny", and "preempt-rt" kernel types. See the "Kernel Types [http://www.yoctoproject.org/docs/3.0.3/kernel-dev/kernel-dev.html#kernel-types]" section in the Yocto Project Linux Kernel Development Manual for more information on kernel types.</p> <p>If you do not specify a LINUX_KERNEL_TYPE, it defaults to "standard". Together with KMACHINE, the LINUX_KERNEL_TYPE variable defines the search arguments used by the kernel tools to find the appropriate description within the kernel Metadata with which to build out the sources and configuration.</p>
LINUX_VERSION	<p>The Linux version from kernel.org on which the Linux kernel image being built using the OpenEmbedded build system is based. You</p>

define this variable in the kernel recipe. For example, the `linux-yocto-3.4.bb` kernel recipe found in `meta/recipes-kernel/linux` defines the variables as follows:

```
LINUX_VERSION ?= "3.4.24"
```

The `LINUX_VERSION` variable is used to define `PV` for the recipe:

```
PV = "${LINUX_VERSION}+git${SRCPV}"
```

`LINUX_VERSION_EXTENSION`

A string extension compiled into the version string of the Linux kernel built with the OpenEmbedded build system. You define this variable in the kernel recipe. For example, the `linux-yocto` kernel recipes all define the variable as follows:

```
LINUX_VERSION_EXTENSION ?= "-yocto-${LINUX_KERNEL_TYPE}"
```

Defining this variable essentially sets the Linux kernel configuration item `CONFIG_LOCALVERSION`, which is visible through the `uname` command. Here is an example that shows the extension assuming it was set as previously shown:

```
$ uname -r
3.7.0-rc8-custom
```

`LOG_DIR`

Specifies the directory to which the OpenEmbedded build system writes overall log files. The default directory is `${TMPDIR}/log`.

For the directory containing logs specific to each task, see the `T` variable.

M

`MACHINE`

Specifies the target device for which the image is built. You define `MACHINE` in the `local.conf` file found in the Build Directory. By default, `MACHINE` is set to `"qemux86"`, which is an x86-based architecture machine to be emulated using QEMU:

```
MACHINE ?= "qemux86"
```

The variable corresponds to a machine configuration file of the same name, through which machine-specific configurations are set. Thus, when `MACHINE` is set to `"qemux86"` there exists the corresponding `qemux86.conf` machine configuration file, which can be found in the Source Directory in `meta/conf/machine`.

The list of machines supported by the Yocto Project as shipped include the following:

```
MACHINE ?= "qemuarm"
MACHINE ?= "qemuarm64"
MACHINE ?= "qemumips"
MACHINE ?= "qemumips64"
MACHINE ?= "qemuppc"
MACHINE ?= "qemux86"
```

```
MACHINE ?= "qemux86-64"
MACHINE ?= "genericx86"
MACHINE ?= "genericx86-64"
MACHINE ?= "beaglebone"
MACHINE ?= "mpc8315e-rdb"
MACHINE ?= "edgerouter"
```

The last five are Yocto Project reference hardware boards, which are provided in the meta-yocto-bsp layer.

Note

Adding additional Board Support Package (BSP) layers to your configuration adds new possible settings for MACHINE.

MACHINE_ARCH Specifies the name of the machine-specific architecture. This variable is set automatically from MACHINE or TUNE_PKGARCH. You should not hand-edit the MACHINE_ARCH variable.

MACHINE_ESSENTIAL_EXTRA_RDEPENDS Required machine-specific packages to install as part of the image being built. The build process depends on these packages being present. Furthermore, because this is a "machine-essential" variable, the list of packages are essential for the machine to boot. The impact of this variable affects images based on packagegroup-core-boot, including the core-image-minimal image.

This variable is similar to the MACHINE_ESSENTIAL_EXTRA_RRECOMMENDS variable with the exception that the image being built has a build dependency on the variable's list of packages. In other words, the image will not build if a file in this list is not found.

As an example, suppose the machine for which you are building requires example-init to be run during boot to initialize the hardware. In this case, you would use the following in the machine's .conf configuration file:

```
MACHINE_ESSENTIAL_EXTRA_RDEPENDS += "example-init"
```

MACHINE_ESSENTIAL_EXTRA_RRECOMMENDS Recommended machine-specific packages to install as part of the image being built. The build process does not depend on these packages being present. However, because this is a "machine-essential" variable, the list of packages are essential for the machine to boot. The impact of this variable affects images based on packagegroup-core-boot, including the core-image-minimal image.

This variable is similar to the MACHINE_ESSENTIAL_EXTRA_RDEPENDS variable with the exception that the image being built does not have a build dependency on the variable's list of packages. In other words, the image will still build if a package in this list is not found. Typically, this variable is used to handle essential kernel modules, whose functionality may be selected to be built into the kernel rather than as a module, in which case a package will not be produced.

Consider an example where you have a custom kernel where a specific touchscreen driver is required for the machine to be usable. However, the driver can be built as a module or into the kernel depending on the kernel configuration. If the driver is built as a module, you want it to be installed. But, when the driver is built into the kernel, you still want the build to succeed. This variable sets up a "recommends" relationship so that in the latter case, the build will not fail due to the missing package. To accomplish this, assuming

the package for the module was called `kernel-module-ab123`, you would use the following in the machine's `.conf` configuration file:

```
MACHINE_ESSENTIAL_EXTRA_RRECOMMENDS += "kernel-module-ab123"
```

Note

In this example, the `kernel-module-ab123` recipe needs to explicitly set its `PACKAGES` variable to ensure that BitBake does not use the kernel recipe's `PACKAGES_DYNAMIC` variable to satisfy the dependency.

Some examples of these machine essentials are flash, screen, keyboard, mouse, or touchscreen drivers (depending on the machine).

MACHINE_EXTRA_RDEPENDS

A list of machine-specific packages to install as part of the image being built that are not essential for the machine to boot. However, the build process for more fully-featured images depends on the packages being present.

This variable affects all images based on `packagegroup-base`, which does not include the `core-image-minimal` or `core-image-full-cmdline` images.

The variable is similar to the `MACHINE_EXTRA_RRECOMMENDS` variable with the exception that the image being built has a build dependency on the variable's list of packages. In other words, the image will not build if a file in this list is not found.

An example is a machine that has WiFi capability but is not essential for the machine to boot the image. However, if you are building a more fully-featured image, you want to enable the WiFi. The package containing the firmware for the WiFi hardware is always expected to exist, so it is acceptable for the build process to depend upon finding the package. In this case, assuming the package for the firmware was called `wifidriver-firmware`, you would use the following in the `.conf` file for the machine:

```
MACHINE_EXTRA_RDEPENDS += "wifidriver-firmware"
```

MACHINE_EXTRA_RRECOMMENDS

A list of machine-specific packages to install as part of the image being built that are not essential for booting the machine. The image being built has no build dependency on this list of packages.

This variable affects only images based on `packagegroup-base`, which does not include the `core-image-minimal` or `core-image-full-cmdline` images.

This variable is similar to the `MACHINE_EXTRA_RDEPENDS` variable with the exception that the image being built does not have a build dependency on the variable's list of packages. In other words, the image will build if a file in this list is not found.

An example is a machine that has WiFi capability but is not essential for the machine to boot the image. However, if you are building a more fully-featured image, you want to enable WiFi. In this case, the package containing the WiFi kernel module will not be produced if the WiFi driver is built into the kernel, in which case you still want the build to succeed instead of failing as a result of the package not being found. To accomplish this, assuming the package for the module was called `kernel-module-examplewifi`, you would use the following in the `.conf` file for the machine:

```
MACHINE_EXTRA_RRECOMMENDS += "kernel-module-examplewifi"
```

MACHINE_FEATURES Specifies the list of hardware features the MACHINE is capable of supporting. For related information on enabling features, see the DISTRO_FEATURES, COMBINED_FEATURES, and IMAGE_FEATURES variables.

For a list of hardware features supported by the Yocto Project as shipped, see the "Machine Features" section.

MACHINE_FEATURES_BACKFILL_CONSIDERED Features to be added to MACHINE_FEATURES if not also present in MACHINE_FEATURES_BACKFILL_CONSIDERED.

This variable is set in the meta/conf/bitbake.conf file. It is not intended to be user-configurable. It is best to just reference the variable to see which machine features are being backfilled for all machine configurations. See the "Feature Backfilling" section for more information.

MACHINE_FEATURES_BACKFILL_CONSIDERED Features from MACHINE_FEATURES_BACKFILL that should not be backfilled (i.e. added to MACHINE_FEATURES) during the build. See the "Feature Backfilling" section for more information.

MACHINEOVERRIDES A colon-separated list of overrides that apply to the current machine. By default, this list includes the value of MACHINE.

You can extend MACHINEOVERRIDES to add extra overrides that should apply to a machine. For example, all machines emulated in QEMU (e.g. qemuarm, qemux86, and so forth) include a file named meta/conf/machine/include/qemu.inc that prepends the following override to MACHINEOVERRIDES:

```
MACHINEOVERRIDES =. "qemuall:"
```

This override allows variables to be overridden for all machines emulated in QEMU, like in the following example from the connman-conf recipe:

```
SRC_URI_append_qemuall = "file://wired.config \
                           file://wired-setup \
                           "
```

The underlying mechanism behind MACHINEOVERRIDES is simply that it is included in the default value of OVERRIDES.

MAINTAINER The email address of the distribution maintainer.

MIRRORS Specifies additional paths from which the OpenEmbedded build system gets source code. When the build system searches for source code, it first tries the local download directory. If that location fails, the build system tries locations defined by PREMIRRORS, the upstream source, and then locations specified by MIRRORS in that order.

Assuming your distribution (DISTRO) is "poky", the default value for MIRRORS is defined in the conf/distro/poky.conf file in the meta-poky Git repository.

MLPREFIX Specifies a prefix has been added to PN to create a special version of a recipe or package (i.e. a Multilib version). The variable is used in places where the prefix needs to be added to or removed from a

the name (e.g. the BPN variable). MLPREFIX gets set when a prefix has been added to PN.

Note

The "ML" in MLPREFIX stands for "MultiLib". This representation is historical and comes from a time when nativesdk was a suffix rather than a prefix on the recipe name. When nativesdk was turned into a prefix, it made sense to set MLPREFIX for it as well.

To help understand when MLPREFIX might be needed, consider when BBCLASSEXTEND is used to provide a nativesdk version of a recipe in addition to the target version. If that recipe declares build-time dependencies on tasks in other recipes by using DEPENDS, then a dependency on "foo" will automatically get rewritten to a dependency on "nativesdk-foo". However, dependencies like the following will not get rewritten automatically:

```
do_foo[depends] += "recipe:do_foo"
```

If you want such a dependency to also get transformed, you can do the following:

```
do_foo[depends] += "${MLPREFIX}recipe:do_foo"
```

module_autoload

This variable has been replaced by the KERNEL_MODULE_AUTOLOAD variable. You should replace all occurrences of module_autoload with additions to KERNEL_MODULE_AUTOLOAD, for example:

```
module_autoload_rfcomm = "rfcomm"
```

should now be replaced with:

```
KERNEL_MODULE_AUTOLOAD += "rfcomm"
```

See the KERNEL_MODULE_AUTOLOAD variable for more information.

module_conf

Specifies `modprobe.d` [http://linux.die.net/man/5/modprobe.d] syntax lines for inclusion in the `/etc/modprobe.d/modname.conf` file.

You can use this variable anywhere that it can be recognized by the kernel recipe or out-of-tree kernel module recipe (e.g. a machine configuration file, a distribution configuration file, an append file for the recipe, or the recipe itself). If you use this variable, you must also be sure to list the module name in the KERNEL_MODULE_AUTOLOAD variable.

Here is the general syntax:

```
module_conf_module_name = "modprobe.d-syntax"
```

You must use the kernel module name override.

Run `man modprobe.d` in the shell to find out more information on the exact syntax you want to provide with module_conf.

Including `module_conf` causes the OpenEmbedded build system to populate the `/etc/modprobe.d/modname.conf` file with `modprobe.d` syntax lines. Here is an example that adds the options `arg1` and `arg2` to a module named `mymodule`:

```
module_conf_mymodule = "options mymodule arg1=val1 arg2=val2"
```

For information on how to specify kernel modules to auto-load on boot, see the `KERNEL_MODULE_AUTOLOAD` variable.

MODULE_TARBALL_DEPLOY Controls creation of the `modules-*.tgz` file. Set this variable to "0" to disable creation of this file, which contains all of the kernel modules resulting from a kernel build.

MODULE_TARBALL_LINK_NAME The link name of the kernel module tarball. This variable is set in the `meta/classes/kernel-artifact-names.bbclass` file as follows:

```
MODULE_TARBALL_LINK_NAME ?= "${KERNEL_ARTIFACT_LINK_NAME}"
```

The value of the `KERNEL_ARTIFACT_LINK_NAME` variable, which is set in the same file, has the following value:

```
KERNEL_ARTIFACT_LINK_NAME ?= "${MACHINE}"
```

See the `MACHINE` variable for additional information.

MODULE_TARBALL_NAME The base name of the kernel module tarball. This variable is set in the `meta/classes/kernel-artifact-names.bbclass` file as follows:

```
MODULE_TARBALL_NAME ?= "${KERNEL_ARTIFACT_NAME}"
```

The value of the `KERNEL_ARTIFACT_NAME` variable, which is set in the same file, has the following value:

```
KERNEL_ARTIFACT_NAME ?= "${PKGGE}-${PKGCV}-${PKGR}-${MACHINE}${IMAG
```

MULTIMACH_TARGET_SYS Uniquely identifies the type of the target system for which packages are being built. This variable allows output for different types of target systems to be put into different subdirectories of the same output directory.

The default value of this variable is:

```
${PACKAGE_ARCH}${TARGET_VENDOR}-${TARGET_OS}
```

Some classes (e.g. `cross-canadian`) modify the `MULTIMACH_TARGET_SYS` value.

See the `STAMP` variable for an example. See the `STAGING_DIR_TARGET` variable for more information.

N

NATIVESBSTRING

A string identifying the host distribution. Strings consist of the host distributor ID followed by the release, as reported by the `lsb_release` tool or as read from `/etc/lsb-release`. For example, when running a build on Ubuntu 12.10, the value is "Ubuntu-12.10". If this information is unable to be determined, the value resolves to "Unknown".

This variable is used by default to isolate native shared state packages for different distributions (e.g. to avoid problems with `glibc` version incompatibilities). Additionally, the variable is checked against `SANITY_TESTED_DISTROS` if that variable is set.

NM

The minimal command and arguments to run `nm`.

NO_GENERIC_LICENSE

Avoids QA errors when you use a non-common, non-CLOSED license in a recipe. Packages exist, such as the `linux-firmware` package, with many licenses that are not in any way common. Also, new licenses are added occasionally to avoid introducing a lot of common license files, which are only applicable to a specific package. `NO_GENERIC_LICENSE` is used to allow copying a license that does not exist in common licenses.

The following example shows how to add `NO_GENERIC_LICENSE` to a recipe:

```
NO_GENERIC_LICENSE[license_name] = "license_file_in_fetched_source"
```

The following is an example that uses the `LICENSE.Abilis.txt` file as the license from the fetched source:

```
NO_GENERIC_LICENSE[Firmware-Abilis] = "LICENSE.Abilis.txt"
```

NO_RECOMMENDATIONS

Prevents installation of all "recommended-only" packages. Recommended-only packages are packages installed only through the `RRECOMMENDS` variable). Setting the `NO_RECOMMENDATIONS` variable to "1" turns this feature on:

```
NO_RECOMMENDATIONS = "1"
```

You can set this variable globally in your `local.conf` file or you can attach it to a specific image recipe by using the recipe name override:

```
NO_RECOMMENDATIONS_pn-target_image = "1"
```

It is important to realize that if you choose to not install packages using this variable and some other packages are dependent on them (i.e. listed in a recipe's `RDEPENDS` variable), the OpenEmbedded build system ignores your request and will install the packages to avoid dependency errors.

Note

Some recommended packages might be required for certain system functionality, such as kernel modules. It is up to you to add packages with the `IMAGE_INSTALL` variable.

Support for this variable exists only when using the IPK and RPM packaging backend. Support does not exist for DEB.

See the `BAD_RECOMMENDATIONS` and the `PACKAGE_EXCLUDE` variables for related information.

`NOAUTOPACKAGEDEBUG`

Disables auto package from splitting `.debug` files. If a recipe requires `FILES_${PN}-dbg` to be set manually, the `NOAUTOPACKAGEDEBUG` can be defined allowing you to define the content of the debug package. For example:

```
NOAUTOPACKAGEDEBUG = "1"
FILES_${PN}-dev = "${includedir}/${QT_DIR_NAME}/Qt/*"
FILES_${PN}-dbg = "/usr/src/debug/"
FILES_${QT_BASE_NAME}-demos-doc = "${docdir}/${QT_DIR_NAME}/qch/q
```

O

`OBJCOPY`

The minimal command and arguments to run `objcopy`.

`OBJDUMP`

The minimal command and arguments to run `objdump`.

`OE_BINCONFIG_EXTRA_MANGLE`

When inheriting the `binconfig` class, this variable specifies additional arguments passed to the `"sed"` command. The `sed` command alters any paths in configuration scripts that have been set up during compilation. Inheriting this class results in all paths in these scripts being changed to point into the `sysroots/` directory so that all builds that use the script will use the correct directories for the cross compiling layout.

See the `meta/classes/binconfig.bbclass` in the Source Directory for details on how this class applies these additional `sed` command arguments. For general information on the `binconfig` class, see the `"binconfig.bbclass"` section.

`OE_IMPORTS`

An internal variable used to tell the OpenEmbedded build system what Python modules to import for every Python function run by the system.

Note

Do not set this variable. It is for internal use only.

`OE_INIT_ENV_SCRIPT`

The name of the build environment setup script for the purposes of setting up the environment within the extensible SDK. The default value is `"oe-init-build-env"`.

If you use a custom script to set up your build environment, set the `OE_INIT_ENV_SCRIPT` variable to its name.

`OE_TERMINAL`

Controls how the OpenEmbedded build system spawns interactive terminals on the host development system (e.g. using the `BitBake` command with the `-c devshell` command-line option). For more information, see the `"Using a Development Shell [http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#platdev-appdev-devshell]"` section in the Yocto Project Development Tasks Manual.

You can use the following values for the `OE_TERMINAL` variable:

```
auto
gnome
xfce
```


rxvt
screen
konsole
none

OEROOT The directory from which the top-level build environment setup script is sourced. The Yocto Project provides a top-level build environment setup script: `oe-init-build-env`. When you run this script, the `OEROOT` variable resolves to the directory that contains the script.

For additional information on how this variable is used, see the initialization script.

OLDEST_KERNEL Declares the oldest version of the Linux kernel that the produced binaries must support. This variable is passed into the build of the Embedded GNU C Library (glibc).

The default for this variable comes from the `meta/conf/bitbake.conf` configuration file. You can override this default by setting the variable in a custom distribution configuration file.

OVERRIDES A colon-separated list of overrides that currently apply. Overrides are a BitBake mechanism that allows variables to be selectively overridden at the end of parsing. The set of overrides in `OVERRIDES` represents the "state" during building, which includes the current recipe being built, the machine for which it is being built, and so forth.

As an example, if the string "an-override" appears as an element in the colon-separated list in `OVERRIDES`, then the following assignment will override `F00` with the value "overridden" at the end of parsing:

```
F00_an-override = "overridden"
```

See the "Conditional Syntax (Overrides)" [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#conditional-syntax-overrides>] section in the BitBake User Manual for more information on the overrides mechanism.

The default value of `OVERRIDES` includes the values of the `CLASSOVERRIDE`, `MACHINEOVERRIDES`, and `DISTROOVERRIDES` variables. Another important override included by default is `pn-${PN}`. This override allows variables to be set for a single recipe within configuration (`.conf`) files. Here is an example:

```
F00_pn-myrecipe = "myrecipe-specific value"
```

Tip

An easy way to see what overrides apply is to search for `OVERRIDES` in the output of the `bitbake -e` command. See the "Viewing Variable Values" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#dev-debugging-viewing-variable-values>] section in the Yocto Project Development Tasks Manual for more information.

P

P The recipe name and version. `P` is comprised of the following:

`${PN} - ${PV}`

`PACKAGE_ARCH`

The architecture of the resulting package or packages.

By default, the value of this variable is set to `TUNE_PKGARCH` when building for the target, `BUILD_ARCH` when building for the build host, and `"${SDK_ARCH}-${SDKPKGSUFFIX}"` when building for the SDK.

Note

See `SDK_ARCH` for more information.

However, if your recipe's output packages are built specific to the target machine rather than generally for the architecture of the machine, you should set `PACKAGE_ARCH` to the value of `MACHINE_ARCH` in the recipe as follows:

```
PACKAGE_ARCH = "${MACHINE_ARCH}"
```

`PACKAGE_ARCHS`

Specifies a list of architectures compatible with the target machine. This variable is set automatically and should not normally be hand-edited. Entries are separated using spaces and listed in order of priority. The default value for `PACKAGE_ARCHS` is `"all any noarch ${PACKAGE_EXTRA_ARCHS} ${MACHINE_ARCH}"`.

`PACKAGE_BEFORE_PN`

Enables easily adding packages to `PACKAGES` before `${PN}` so that those added packages can pick up files that would normally be included in the default package.

`PACKAGE_CLASSES`

This variable, which is set in the `local.conf` configuration file found in the `conf` folder of the Build Directory, specifies the package manager the OpenEmbedded build system uses when packaging data.

You can provide one or more of the following arguments for the variable:

```
PACKAGE_CLASSES ?= "package_rpm package_deb package_ipk package_t"
```

Warning

While it is a legal option, the `package_tar` class has limited functionality due to no support for package dependencies by that backend. Therefore, it is recommended that you do not use it.

The build system uses only the first argument in the list as the package manager when creating your image or SDK. However, packages will be created using any additional packaging classes you specify. For example, if you use the following in your `local.conf` file:

```
PACKAGE_CLASSES ?= "package_ipk"
```

The OpenEmbedded build system uses the IPK package manager to create your image or SDK.

For information on packaging and build performance effects as a result of the package manager in use, see the `"package.bbclass"` section.

`PACKAGE_DEBUG_SPLIT_STYLE`

Determines how to split up the binary and debug information when creating `*-dbg` packages to be used with the GNU Project Debugger (GDB).

With the `PACKAGE_DEBUG_SPLIT_STYLE` variable, you can control where debug information, which can include or exclude source files, is stored:

- `".debug"`: Debug symbol files are placed next to the binary in a `.debug` directory on the target. For example, if a binary is installed into `/bin`, the corresponding debug symbol files are installed in `/bin/.debug`. Source files are placed in `/usr/src/debug`.
- `"debug-file-directory"`: Debug symbol files are placed under `/usr/lib/debug` on the target, and separated by the path from where the binary is installed. For example, if a binary is installed in `/bin`, the corresponding debug symbols are installed in `/usr/lib/debug/bin`. Source files are placed in `/usr/src/debug`.
- `"debug-without-src"`: The same behavior as `".debug"` previously described with the exception that no source files are installed.
- `"debug-with-srcpkg"`: The same behavior as `".debug"` previously described with the exception that all source files are placed in a separate `*-src` pkg. This is the default behavior.

You can find out more about debugging using GDB by reading the "Debugging With the GNU Project Debugger (GDB) Remotely [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#platdev-gdb-remotedebug>]" section in the Yocto Project Development Tasks Manual.

PACKAGE_EXCLUDE_COMPLEMENTARY Prevents specific packages from being installed when you are installing complementary packages.

You might find that you want to prevent installing certain packages when you are installing complementary packages. For example, if you are using `IMAGE_FEATURES` to install `dev-pkgs`, you might not want to install all packages from a particular multilib. If you find yourself in this situation, you can use the `PACKAGE_EXCLUDE_COMPLEMENTARY` variable to specify regular expressions to match the packages you want to exclude.

PACKAGE_EXCLUDE Lists packages that should not be installed into an image. For example:

```
PACKAGE_EXCLUDE = "package_name package_name package_name ..."
```

You can set this variable globally in your `local.conf` file or you can attach it to a specific image recipe by using the recipe name override:

```
PACKAGE_EXCLUDE_pn-target_image = "package_name"
```

If you choose to not install a package using this variable and some other package is dependent on it (i.e. listed in a recipe's `RDEPENDS` variable), the OpenEmbedded build system generates a fatal installation error. Because the build system halts the process with a fatal error, you can use the variable with an iterative development process to remove specific components from a system.

Support for this variable exists only when using the IPK and RPM packaging backend. Support does not exist for DEB.

See the `NO_RECOMMENDATIONS` and the `BAD_RECOMMENDATIONS` variables for related information.

PACKAGE_EXTRA_ARCHS Specifies the list of architectures compatible with the device CPU. This variable is useful when you build for several different devices that use miscellaneous processors such as XScale and ARM926-EJS.

PACKAGE_FEED_ARCHS Optionally specifies the package architectures used as part of the package feed URIs during the build. When used, the `PACKAGE_FEED_ARCHS` variable is appended to the final package feed URI, which is constructed using the `PACKAGE_FEED_URI` and `PACKAGE_FEED_BASE_PATHS` variables.

Tip

You can use the `PACKAGE_FEEDS_ARCHS` variable to whitelist specific package architectures. If you do not need to whitelist specific architectures, which is a common case, you can omit this variable. Omitting the variable results in all available architectures for the current machine being included into remote package feeds.

Consider the following example where the `PACKAGE_FEED_URI`, `PACKAGE_FEED_BASE_PATHS`, and `PACKAGE_FEED_ARCHS` variables are defined in your `local.conf` file:

```
PACKAGE_FEED_URI = "https://example.com/packagerepos/release \
                    https://example.com/packagerepos/updates"
PACKAGE_FEED_BASE_PATHS = "rpm rpm-dev"
PACKAGE_FEED_ARCHS = "all core2-64"
```

Given these settings, the resulting package feeds are as follows:

```
https://example.com/packagerepos/release/rpm/all
https://example.com/packagerepos/release/rpm/core2-64
https://example.com/packagerepos/release/rpm-dev/all
https://example.com/packagerepos/release/rpm-dev/core2-64
https://example.com/packagerepos/updates/rpm/all
https://example.com/packagerepos/updates/rpm/core2-64
https://example.com/packagerepos/updates/rpm-dev/all
https://example.com/packagerepos/updates/rpm-dev/core2-64
```

PACKAGE_FEED_BASE_PATHS Specifies the base path used when constructing package feed URIs. The `PACKAGE_FEED_BASE_PATHS` variable makes up the middle portion of a package feed URI used by the OpenEmbedded build system. The base path lies between the `PACKAGE_FEED_URI` and `PACKAGE_FEED_ARCHS` variables.

Consider the following example where the `PACKAGE_FEED_URI`, `PACKAGE_FEED_BASE_PATHS`, and `PACKAGE_FEED_ARCHS` variables are defined in your `local.conf` file:

```
PACKAGE_FEED_URI = "https://example.com/packagerepos/release \
                    https://example.com/packagerepos/updates"
PACKAGE_FEED_BASE_PATHS = "rpm rpm-dev"
PACKAGE_FEED_ARCHS = "all core2-64"
```

Given these settings, the resulting package feeds are as follows:

```
https://example.com/packagerepos/release/rpm/all
https://example.com/packagerepos/release/rpm/core2-64
https://example.com/packagerepos/release/rpm-dev/all
https://example.com/packagerepos/release/rpm-dev/core2-64
```

```
https://example.com/packagerepos/updates/rpm/all
https://example.com/packagerepos/updates/rpm/core2-64
https://example.com/packagerepos/updates/rpm-dev/all
https://example.com/packagerepos/updates/rpm-dev/core2-64
```

PACKAGE_FEED_URI

Specifies the front portion of the package feed URI used by the OpenEmbedded build system. Each final package feed URI is comprised of PACKAGE_FEED_URI, PACKAGE_FEED_BASE_PATHS, and PACKAGE_FEED_ARCHS variables.

Consider the following example where the PACKAGE_FEED_URI, PACKAGE_FEED_BASE_PATHS, and PACKAGE_FEED_ARCHS variables are defined in your local.conf file:

```
PACKAGE_FEED_URI = "https://example.com/packagerepos/release \
                    https://example.com/packagerepos/updates"
PACKAGE_FEED_BASE_PATHS = "rpm rpm-dev"
PACKAGE_FEED_ARCHS = "all core2-64"
```

Given these settings, the resulting package feeds are as follows:

```
https://example.com/packagerepos/release/rpm/all
https://example.com/packagerepos/release/rpm/core2-64
https://example.com/packagerepos/release/rpm-dev/all
https://example.com/packagerepos/release/rpm-dev/core2-64
https://example.com/packagerepos/updates/rpm/all
https://example.com/packagerepos/updates/rpm/core2-64
https://example.com/packagerepos/updates/rpm-dev/all
https://example.com/packagerepos/updates/rpm-dev/core2-64
```

PACKAGE_GROUP

The PACKAGE_GROUP variable has been renamed to FEATURE_PACKAGES. See the variable description for FEATURE_PACKAGES for information.

If if you use the PACKAGE_GROUP variable, the OpenEmbedded build system issues a warning message.

PACKAGE_INSTALL

The final list of packages passed to the package manager for installation into the image.

Because the package manager controls actual installation of all packages, the list of packages passed using PACKAGE_INSTALL is not the final list of packages that are actually installed. This variable is internal to the image construction code. Consequently, in general, you should use the IMAGE_INSTALL variable to specify packages for installation. The exception to this is when working with the core-image-minimal-initramfs image. When working with an initial RAM filesystem (initramfs) image, use the PACKAGE_INSTALL variable. For information on creating an initramfs, see the "Building an Initial RAM Filesystem (initramfs) Image [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#building-an-initramfs-image>]" section in the Yocto Project Development Tasks Manual.

PACKAGE_INSTALL_ATTEMPTONLY

Specifies a list of packages the OpenEmbedded build system attempts to install when creating an image. If a listed package fails to install, the build system does not generate an error. This variable is generally not user-defined.

PACKAGE_PREPROCESS_FUNCS

Specifies a list of functions run to pre-process the PKGD directory prior to splitting the files out to individual packages.

PACKAGE_WRITE_DEPS Specifies a list of dependencies for post-installation and pre-installation scripts on native/cross tools. If your post-installation or pre-installation script can execute at rootfs creation time rather than on the target but depends on a native tool in order to execute, you need to list the tools in `PACKAGE_WRITE_DEPS`.

For information on running post-installation scripts, see the "Post-Installation Scripts [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#new-recipe-post-installation-scripts>]" section in the Yocto Project Development Tasks Manual.

PACKAGECONFIG This variable provides a means of enabling or disabling features of a recipe on a per-recipe basis. `PACKAGECONFIG` blocks are defined in recipes when you specify features and then arguments that define feature behaviors. Here is the basic block structure:

```
PACKAGECONFIG ??= "f1 f2 f3 ..."
PACKAGECONFIG[f1] = "--with-f1,--without-f1,build-deps-f1,rt-deps
PACKAGECONFIG[f2] = "--with-f2,--without-f2,build-deps-f2,rt-deps
PACKAGECONFIG[f3] = "--with-f3,--without-f3,build-deps-f3,rt-deps"
```

The `PACKAGECONFIG` variable itself specifies a space-separated list of the features to enable. Following the features, you can determine the behavior of each feature by providing up to five order-dependent arguments, which are separated by commas. You can omit any argument you like but must retain the separating commas. The order is important and specifies the following:

1. Extra arguments that should be added to the configure script argument list (`EXTRA_OECONF` or `PACKAGECONFIG_CONFARGS`) if the feature is enabled.
2. Extra arguments that should be added to `EXTRA_OECONF` or `PACKAGECONFIG_CONFARGS` if the feature is disabled.
3. Additional build dependencies (`DEPENDS`) that should be added if the feature is enabled.
4. Additional runtime dependencies (`RDEPENDS`) that should be added if the feature is enabled.
5. Additional runtime recommendations (`RRECOMMENDS`) that should be added if the feature is enabled.

Consider the following `PACKAGECONFIG` block taken from the `librsvg` recipe. In this example the feature is `croco`, which has three arguments that determine the feature's behavior.

```
PACKAGECONFIG ??= "croco"
PACKAGECONFIG[croco] = "--with-croco,--without-croco,libcroco"
```

The `--with-croco` and `libcroco` arguments apply only if the feature is enabled. In this case, `--with-croco` is added to the configure script argument list and `libcroco` is added to `DEPENDS`. On the other hand, if the feature is disabled say through a `.bbappend` file in another layer, then the second argument `--without-croco` is added to the configure script rather than `--with-croco`.

The basic `PACKAGECONFIG` structure previously described holds true regardless of whether you are creating a block or changing a block. When creating a block, use the structure inside your recipe.

If you want to change an existing `PACKAGECONFIG` block, you can do so one of two ways:

- Append file: Create an append file named `recipename.bbappend` in your layer and override the value of `PACKAGECONFIG`. You can either completely override the variable:

```
PACKAGECONFIG = "f4 f5"
```

Or, you can just append the variable:

```
PACKAGECONFIG_append = " f4"
```

- Configuration file: This method is identical to changing the block through an append file except you edit your `local.conf` or `mydistro.conf` file. As with append files previously described, you can either completely override the variable:

```
PACKAGECONFIG_pn-recipe = "f4 f5"
```

Or, you can just amend the variable:

```
PACKAGECONFIG_append_pn-recipe = " f4"
```

PACKAGECONFIG_CONFARGS A space-separated list of configuration options generated from the `PACKAGECONFIG` setting.

Classes such as `autotools` and `cmake` use `PACKAGECONFIG_CONFARGS` to pass `PACKAGECONFIG` options to configure and `cmake`, respectively. If you are using `PACKAGECONFIG` but not a class that handles the `do_configure` task, then you need to use `PACKAGECONFIG_CONFARGS` appropriately.

PACKAGEGROUP_DISABLE_COMPLEMENTARY If you are inheriting the `packagegroup` class, setting `PACKAGEGROUP_DISABLE_COMPLEMENTARY` to "1" specifies that the normal complementary packages (i.e. `-dev`, `-dbg`, and so forth) should not be automatically created by the `packagegroup` recipe, which is the default behavior.

PACKAGES The list of packages the recipe creates. The default value is the following:

```
${PN}-dbg ${PN}-staticdev ${PN}-dev ${PN}-doc ${PN}-locale ${PACKAGES}
```

During packaging, the `do_package` task goes through `PACKAGES` and uses the `FILES` variable corresponding to each package to assign files to the package. If a file matches the `FILES` variable for more than one package in `PACKAGES`, it will be assigned to the earliest (leftmost) package.

Packages in the variable's list that are empty (i.e. where none of the patterns in `FILES_pkg` match any files installed by the `do_install` task) are not generated, unless generation is forced through the `ALLOW_EMPTY` variable.

PACKAGES_DYNAMIC A promise that your recipe satisfies runtime dependencies for optional modules that are found in other recipes. `PACKAGES_DYNAMIC`

does not actually satisfy the dependencies, it only states that they should be satisfied. For example, if a hard, runtime dependency (RDEPENDS) of another package is satisfied at build time through the PACKAGES_DYNAMIC variable, but a package with the module name is never actually produced, then the other package will be broken. Thus, if you attempt to include that package in an image, you will get a dependency failure from the packaging system during the `do_rootfs` task.

Typically, if there is a chance that such a situation can occur and the package that is not created is valid without the dependency being satisfied, then you should use RRECOMMENDS (a soft runtime dependency) instead of RDEPENDS.

For an example of how to use the PACKAGES_DYNAMIC variable when you are splitting packages, see the "Handling Optional Module Packaging [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#handling-optional-module-packaging>]" section in the Yocto Project Development Tasks Manual.

PACKAGESPLITFUNCS

Specifies a list of functions run to perform additional splitting of files into individual packages. Recipes can either prepend to this variable or prepend to the `populate_packages` function in order to perform additional package splitting. In either case, the function should set PACKAGES, FILES, RDEPENDS and other packaging variables appropriately in order to perform the desired splitting.

PARALLEL_MAKE

Extra options passed to the `make` command during the `do_compile` task in order to specify parallel compilation on the local build host. This variable is usually in the form "`-j x`", where `x` represents the maximum number of parallel threads `make` can run.

Caution

In order for PARALLEL_MAKE to be effective, `make` must be called with `${EXTRA_OEMAKE}`. An easy way to ensure this is to use the `oe_runmake` function.

By default, the OpenEmbedded build system automatically sets this variable to be equal to the number of cores the build system uses.

Note

If the software being built experiences dependency issues during the `do_compile` task that result in race conditions, you can clear the PARALLEL_MAKE variable within the recipe as a workaround. For information on addressing race conditions, see the "Debugging Parallel Make Races [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#debugging-parallel-make-races>]" section in the Yocto Project Development Tasks Manual.

For single socket systems (i.e. one CPU), you should not have to override this variable to gain optimal parallelism during builds. However, if you have very large systems that employ multiple physical CPUs, you might want to make sure the PARALLEL_MAKE variable is not set higher than "`-j 20`".

For more information on speeding up builds, see the "Speeding Up a Build [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#speeding-up-a-build>]" section in the Yocto Project Development Tasks Manual.

PARALLEL_MAKEINST

Extra options passed to the `make install` command during the `do_install` task in order to specify parallel installation. This variable defaults to the value of PARALLEL_MAKE.

Notes and Cautions

In order for `PARALLEL_MAKEINST` to be effective, `make` must be called with `${EXTRA_OEMAKE}`. An easy way to ensure this is to use the `oe_runmake` function.

If the software being built experiences dependency issues during the `do_install` task that result in race conditions, you can clear the `PARALLEL_MAKEINST` variable within the recipe as a workaround. For information on addressing race conditions, see the "Debugging Parallel Make Races [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#debugging-parallel-make-races>]" section in the Yocto Project Development Tasks Manual.

PATCHRESOLVE Determines the action to take when a patch fails. You can set this variable to one of two values: "noop" and "user".

The default value of "noop" causes the build to simply fail when the OpenEmbedded build system cannot successfully apply a patch. Setting the value to "user" causes the build system to launch a shell and places you in the right location so that you can manually resolve the conflicts.

Set this variable in your `local.conf` file.

PATCHTOOL Specifies the utility used to apply patches for a recipe during the `do_patch` task. You can specify one of three utilities: "patch", "quilt", or "git". The default utility used is "quilt" except for the quilt-native recipe itself. Because the quilt tool is not available at the time quilt-native is being patched, it uses "patch".

If you wish to use an alternative patching tool, set the variable in the recipe using one of the following:

```
PATCHTOOL = "patch"
PATCHTOOL = "quilt"
PATCHTOOL = "git"
```

PE The epoch of the recipe. By default, this variable is unset. The variable is used to make upgrades possible when the versioning scheme changes in some backwards incompatible way.

PE is the default value of the `PKG` variable.

PF Specifies the recipe or package name and includes all version and revision numbers (i.e. `glibc-2.13-r20+svnr15508/` and `bash-4.2-r1/`). This variable is comprised of the following:

```
${PN}-${EXTENDPE}${PV}-${PR}
```

PIXBUF_PACKAGES When inheriting the `pixbufcache` class, this variable identifies packages that contain the `pixbuf` loaders used with `gdk-pixbuf`. By default, the `pixbufcache` class assumes that the loaders are in the recipe's main package (i.e. `${PN}`). Use this variable if the loaders you need are in a package other than that main package.

PKG The name of the resulting package created by the OpenEmbedded build system.

Note

When using the PKG variable, you must use a package name override.

For example, when the debian class renames the output package, it does so by setting PKG_packageName.

PKG_CONFIG_PATH

The path to pkg-config files for the current build context. pkg-config reads this variable from the environment.

PKGDIR

Points to the destination directory for files to be packaged before they are split into individual packages. This directory defaults to the following:

`${WORKDIR}/package`

Do not change this default.

PKGDATA_DIR

Points to a shared, global-state directory that holds data generated during the packaging process. During the packaging process, the do_packagedata task packages data for each recipe and installs it into this temporary, shared area. This directory defaults to the following, which you should not change:

`${STAGING_DIR_HOST}/pkgdata`

For examples of how this data is used, see the "Automatically Added Runtime Dependencies" [http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#automatically-added-runtime-dependencies] section in the Yocto Project Overview and Concepts Manual and the "Viewing Package Information with oe-pkgdata-util" [http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#viewing-package-information-with-oe-pkgdata-util] section in the Yocto Project Development Tasks Manual. For more information on the shared, global-state directory, see STAGING_DIR_HOST.

PKGDEST

Points to the parent directory for files to be packaged after they have been split into individual packages. This directory defaults to the following:

`${WORKDIR}/packages-split`

Under this directory, the build system creates directories for each package specified in PACKAGES. Do not change this default.

PKGDESTWORK

Points to a temporary work area where the do_package task saves package metadata. The PKGDESTWORK location defaults to the following:

`${WORKDIR}/pkgdata`

Do not change this default.

The do_packagedata task copies the package metadata from PKGDESTWORK to PKGDATA_DIR to make it available globally.

PKGE	The epoch of the package(s) built by the recipe. By default, PKGE is set to PE.
PKGR	The revision of the package(s) built by the recipe. By default, PKGR is set to PR.
PKGVS	The version of the package(s) built by the recipe. By default, PKGV is set to PV.
PN	<p>This variable can have two separate functions depending on the context: a recipe name or a resulting package name.</p> <p>PN refers to a recipe name in the context of a file used by the OpenEmbedded build system as input to create a package. The name is normally extracted from the recipe file name. For example, if the recipe is named <code>expat_2.0.1.bb</code>, then the default value of PN will be "expat".</p> <p>The variable refers to a package name in the context of a file created or produced by the OpenEmbedded build system.</p> <p>If applicable, the PN variable also contains any special suffix or prefix. For example, using bash to build packages for the native machine, PN is bash-native. Using bash to build packages for the target and for Multilib, PN would be bash and lib64-bash, respectively.</p>
PNBLACKLIST	<p>Lists recipes you do not want the OpenEmbedded build system to build. This variable works in conjunction with the <code>blacklist</code> class, which is inherited globally.</p> <p>To prevent a recipe from being built, use the PNBLACKLIST variable in your <code>local.conf</code> file. Here is an example that prevents myrecipe from being built:</p> <pre>PNBLACKLIST[myrecipe] = "Not supported by our organization."</pre>
POPULATE_SDK_POST_HOST_COMMAND	<p>Specifies a list of functions to call once the OpenEmbedded build system has created the host part of the SDK. You can specify functions separated by semicolons:</p> <pre>POPULATE_SDK_POST_HOST_COMMAND += "function; ... "</pre> <p>If you need to pass the SDK path to a command within a function, you can use <code>\${SDK_DIR}</code>, which points to the parent directory used by the OpenEmbedded build system when creating SDK output. See the <code>SDK_DIR</code> variable for more information.</p>
POPULATE_SDK_POST_TARGET_COMMAND	<p>Specifies a list of functions to call once the OpenEmbedded build system has created the target part of the SDK. You can specify functions separated by semicolons:</p> <pre>POPULATE_SDK_POST_TARGET_COMMAND += "function; ... "</pre> <p>If you need to pass the SDK path to a command within a function, you can use <code>\${SDK_DIR}</code>, which points to the parent directory used by the OpenEmbedded build system when creating SDK output. See the <code>SDK_DIR</code> variable for more information.</p>
PR	The revision of the recipe. The default value for this variable is "r0". Subsequent revisions of the recipe conventionally have the values "r1", "r2", and so forth. When PV increases, PR is conventionally reset to "r0".

Note

The OpenEmbedded build system does not need the aid of PR to know when to rebuild a recipe. The build system uses the task input checksums [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#overview-checksums>] along with the stamp and shared state cache [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#shared-state-cache>] mechanisms.

The PR variable primarily becomes significant when a package manager dynamically installs packages on an already built image. In this case, PR, which is the default value of PKGR, helps the package manager distinguish which package is the most recent one in cases where many packages have the same PV (i.e. PKGV). A component having many packages with the same PV usually means that the packages all install the same upstream version, but with later (PR) version packages including packaging fixes.

Note

PR does not need to be increased for changes that do not change the package contents or metadata.

Because manually managing PR can be cumbersome and error-prone, an automated solution exists. See the "Working With a PR Service" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#working-with-a-pr-service>] section in the Yocto Project Development Tasks Manual for more information.

PREFERRED_PROVIDER

If multiple recipes provide the same item, this variable determines which recipe is preferred and thus provides the item (i.e. the preferred provider). You should always suffix this variable with the name of the provided item. And, you should define the variable using the preferred recipe's name (PN). Here is a common example:

```
PREFERRED_PROVIDER_virtual/kernel ?= "linux-yocto"
```

In the previous example, multiple recipes are providing "virtual/kernel". The PREFERRED_PROVIDER variable is set with the name (PN) of the recipe you prefer to provide "virtual/kernel".

Following are more examples:

```
PREFERRED_PROVIDER_virtual/xserver = "xserver-xf86"  
PREFERRED_PROVIDER_virtual/libgl ?= "mesa"
```

For more information, see the "Using Virtual Providers" [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#metadata-virtual-providers>] section in the Yocto Project Development Tasks Manual.

Note

If you use a virtual/* item with PREFERRED_PROVIDER, then any recipe that PROVIDES that item but is not selected (defined) by PREFERRED_PROVIDER is prevented from building, which is usually desirable since this mechanism is designed to select between mutually exclusive alternative providers.

PREFERRED_VERSION

If multiple versions of recipes exist, this variable determines which version is given preference. You must always suffix the variable with the PN you want to select, and you should set the PV accordingly for precedence.

The `PREFERRED_VERSION` variable supports limited wildcard use through the `"%"` character. You can use the character to match any number of characters, which can be useful when specifying versions that contain long revision numbers that potentially change. Here are two examples:

```
PREFERRED_VERSION_python = "3.4.0"  
PREFERRED_VERSION_linux-yocto = "5.0%"
```

Important

The use of the `"%"` character is limited in that it only works at the end of the string. You cannot use the wildcard character in any other location of the string.

The specified version is matched against PV, which does not necessarily match the version part of the recipe's filename. For example, consider two recipes `foo_1.2.bb` and `foo_git.bb` where `foo_git.bb` contains the following assignment:

```
PV = "1.1+git${SRCPV}"
```

In this case, the correct way to select `foo_git.bb` is by using an assignment such as the following:

```
PREFERRED_VERSION_foo = "1.1+git%"
```

Compare that previous example against the following incorrect example, which does not work:

```
PREFERRED_VERSION_foo = "git"
```

Sometimes the `PREFERRED_VERSION` variable can be set by configuration files in a way that is hard to change. You can use `OVERRIDES` to set a machine-specific override. Here is an example:

```
PREFERRED_VERSION_linux-yocto_qemux86 = "5.0%"
```

Although not recommended, worst case, you can also use the `"forcevariable"` override, which is the strongest override possible. Here is an example:

```
PREFERRED_VERSION_linux-yocto_forcevariable = "5.0%"
```

Note

The `_forcevariable` override is not handled specially. This override only works because the default value of `OVERRIDES` includes `"forcevariable"`.

PREMIRRORS

Specifies additional paths from which the OpenEmbedded build system gets source code. When the build system searches for source code, it first tries the local download directory. If that location fails, the build system tries locations defined by PREMIRRORS, the upstream source, and then locations specified by MIRRORS in that order.

Assuming your distribution (DISTR0) is "poky", the default value for PREMIRRORS is defined in the `conf/distro/poky.conf` file in the meta-poky Git repository.

Typically, you could add a specific server for the build system to attempt before any others by adding something like the following to the `local.conf` configuration file in the Build Directory:

```
PREMIRRORS_prepend = "\
git://.*/* http://www.yoctoproject.org/sources/ \n \
ftp://.*/* http://www.yoctoproject.org/sources/ \n \
http://.*/* http://www.yoctoproject.org/sources/ \n \
https://.*/* http://www.yoctoproject.org/sources/ \n"
```

These changes cause the build system to intercept Git, FTP, HTTP, and HTTPS requests and direct them to the `http://` sources mirror. You can use `file://` URLs to point to local directories or network shares as well.

PRIORITY

Indicates the importance of a package.

PRIORITY is considered to be part of the distribution policy because the importance of any given recipe depends on the purpose for which the distribution is being produced. Thus, PRIORITY is not normally set within recipes.

You can set PRIORITY to "required", "standard", "extra", and "optional", which is the default.

PRIVATE_LIBS

Specifies libraries installed within a recipe that should be ignored by the OpenEmbedded build system's shared library resolver. This variable is typically used when software being built by a recipe has its own private versions of a library normally provided by another recipe. In this case, you would not want the package containing the private libraries to be set as a dependency on other unrelated packages that should instead depend on the package providing the standard version of the library.

Libraries specified in this variable should be specified by their file name. For example, from the Firefox recipe in meta-browser:

```
PRIVATE_LIBS = "libmozjs.so \
                libxpcom.so \
                libnspr4.so \
                libxul.so \
                libmozalloc.so \
                libplc4.so \
                libplds4.so"
```

For more information, see the "Automatically Added Runtime Dependencies [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#automatically-added-runtime-dependencies>]" section in the Yocto Project Overview and Concepts Manual.

PROVIDES

A list of aliases by which a particular recipe can be known. By default, a recipe's own PN is implicitly already in its PROVIDES list. If a recipe

uses PROVIDES, the additional aliases are synonyms for the recipe and can be useful satisfying dependencies of other recipes during the build as specified by DEPENDS.

Consider the following example PROVIDES statement from a recipe file `libav_0.8.11.bb`:

```
PROVIDES += "libpostproc"
```

The PROVIDES statement results in the "libav" recipe also being known as "libpostproc".

In addition to providing recipes under alternate names, the PROVIDES mechanism is also used to implement virtual targets. A virtual target is a name that corresponds to some particular functionality (e.g. a Linux kernel). Recipes that provide the functionality in question list the virtual target in PROVIDES. Recipes that depend on the functionality in question can include the virtual target in DEPENDS to leave the choice of provider open.

Conventionally, virtual targets have names on the form "virtual/function" (e.g. "virtual/kernel"). The slash is simply part of the name and has no syntactical significance.

The PREFERRED_PROVIDER variable is used to select which particular recipe provides a virtual target.

Note

A corresponding mechanism for virtual runtime dependencies (packages) exists. However, the mechanism does not depend on any special functionality beyond ordinary variable assignments. For example, VIRTUAL-RUNTIME_dev_manager refers to the package of the component that manages the /dev directory.

Setting the "preferred provider" for runtime dependencies is as simple as using the following assignment in a configuration file:

```
VIRTUAL-RUNTIME_dev_manager = "udev"
```

PRSERV_HOST

The network based PR service host and port.

The `conf/local.conf.sample.extended` configuration file in the Source Directory shows how the PRSERV_HOST variable is set:

```
PRSERV_HOST = "localhost:0"
```

You must set the variable if you want to automatically start a local PR service [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#working-with-a-pr-service>]. You can set PRSERV_HOST to other values to use a remote PR service.

PTEST_ENABLED

Specifies whether or not Package Test [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#testing-packages-with-ptest>] (ptest) functionality is enabled when building a recipe. You should not set this variable directly. Enabling and disabling building Package Tests at build time should be done by adding "ptest" to (or removing it from) DISTRO_FEATURES.

PV The version of the recipe. The version is normally extracted from the recipe filename. For example, if the recipe is named `expat_2.0.1.bb`, then the default value of `PV` will be `"2.0.1"`. `PV` is generally not overridden within a recipe unless it is building an unstable (i.e. development) version from a source code repository (e.g. Git or Subversion).

`PV` is the default value of the `PKGVS` variable.

PYTHON_ABI When used by recipes that inherit the `distutils3`, `setuptools3`, `distutils`, or `setuptools` classes, denotes the Application Binary Interface (ABI) currently in use for Python. By default, the ABI is `"m"`. You do not have to set this variable as the OpenEmbedded build system sets it for you.

The OpenEmbedded build system uses the ABI to construct directory names used when installing the Python headers and libraries in `sysroot` (e.g. `.../python3.3m/...`).

Recipes that inherit the `distutils` class during cross-builds also use this variable to locate the headers and libraries of the appropriate Python that the extension is targeting.

PYTHON_PN When used by recipes that inherit the `distutils3`, `setuptools3`, `distutils`, or `setuptools` classes, specifies the major Python version being built. For Python 3.x, `PYTHON_PN` would be `"python3"`. You do not have to set this variable as the OpenEmbedded build system automatically sets it for you.

The variable allows recipes to use common infrastructure such as the following:

```
DEPENDS += "${PYTHON_PN}-native"
```

In the previous example, the version of the dependency is `PYTHON_PN`.

R

RANLIB The minimal command and arguments to run `ranlib`.

RCONFLICTS The list of packages that conflict with packages. Note that packages will not be installed if conflicting packages are not first removed.

Like all package-controlling variables, you must always use them in conjunction with a package name override. Here is an example:

```
RCONFLICTS_${PN} = "another_conflicting_package_name"
```

BitBake, which the OpenEmbedded build system uses, supports specifying versioned dependencies. Although the syntax varies depending on the packaging format, BitBake hides these differences from you. Here is the general syntax to specify versions with the `RCONFLICTS` variable:

```
RCONFLICTS_${PN} = "package (operator version)"
```

For operator, you can specify the following:

=
<
>
<=
>=

For example, the following sets up a dependency on version 1.2 or greater of the package foo:

```
RCONFLICTS_${PN} = "foo (>= 1.2)"
```

RDEPENDS

Lists runtime dependencies of a package. These dependencies are other packages that must be installed in order for the package to function correctly. As an example, the following assignment declares that the package foo needs the packages bar and baz to be installed:

```
RDEPENDS_foo = "bar baz"
```

The most common types of package runtime dependencies are automatically detected and added. Therefore, most recipes do not need to set RDEPENDS. For more information, see the "Automatically Added Runtime Dependencies [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#automatically-added-runtime-dependencies>]" section in the Yocto Project Overview and Concepts Manual.

The practical effect of the above RDEPENDS assignment is that bar and baz will be declared as dependencies inside the package foo when it is written out by one of the `do_package_write_*` tasks. Exactly how this is done depends on which package format is used, which is determined by `PACKAGE_CLASSES`. When the corresponding package manager installs the package, it will know to also install the packages on which it depends.

To ensure that the packages bar and baz get built, the previous RDEPENDS assignment also causes a task dependency to be added. This dependency is from the recipe's `do_build` (not to be confused with `do_compile`) task to the `do_package_write_*` task of the recipes that build bar and baz.

The names of the packages you list within RDEPENDS must be the names of other packages - they cannot be recipe names. Although package names and recipe names usually match, the important point here is that you are providing package names within the RDEPENDS variable. For an example of the default list of packages created from a recipe, see the `PACKAGES` variable.

Because the RDEPENDS variable applies to packages being built, you should always use the variable in a form with an attached package name (remember that a single recipe can build multiple packages). For example, suppose you are building a development package that depends on the perl package. In this case, you would use the following RDEPENDS statement:

```
RDEPENDS_${PN}-dev += "perl"
```

In the example, the development package depends on the perl package. Thus, the RDEPENDS variable has the \${PN}-dev package name as part of the variable.

Caution

RDEPENDS_\${PN}-dev includes \${PN} by default. This default is set in the BitBake configuration file (meta/conf/bitbake.conf). Be careful not to accidentally remove \${PN} when modifying RDEPENDS_\${PN}-dev. Use the "+=" operator rather than the "=" operator.

The package names you use with RDEPENDS must appear as they would in the PACKAGES variable. The PKG variable allows a different name to be used for the final package (e.g. the debian class uses this to rename packages), but this final package name cannot be used with RDEPENDS, which makes sense as RDEPENDS is meant to be independent of the package format used.

BitBake, which the OpenEmbedded build system uses, supports specifying versioned dependencies. Although the syntax varies depending on the packaging format, BitBake hides these differences from you. Here is the general syntax to specify versions with the RDEPENDS variable:

```
RDEPENDS_${PN} = "package (operator version)"
```

For operator, you can specify the following:

```
=  
<  
>  
<=  
>=
```

For version, provide the version number.

Tip

You can use EXTENDPKG to provide a full package version specification.

For example, the following sets up a dependency on version 1.2 or greater of the package foo:

```
RDEPENDS_${PN} = "foo (>= 1.2)"
```

For information on build-time dependencies, see the DEPENDS variable. You can also see the "Tasks [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#tasks>]" and "Dependencies [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#dependencies>]" sections in the BitBake User Manual for additional information on tasks and dependencies.

REQUIRED_DISTRO_FEATURES When inheriting the distro_features_check class, this variable identifies distribution features that must exist in the current configuration in order for the OpenEmbedded build system to build the recipe. In other words, if the REQUIRED_DISTRO_FEATURES variable lists a feature that does not appear in DISTRO_FEATURES within the current configuration, an error occurs and the build stops.

RM_WORK_EXCLUDE With `rm_work` enabled, this variable specifies a list of recipes whose work directories should not be removed. See the "`rm_work.bbclass`" section for more details.

ROOT_HOME Defines the root home directory. By default, this directory is set as follows in the BitBake configuration file:

```
ROOT_HOME ??= "/home/root"
```

Note

This default value is likely used because some embedded solutions prefer to have a read-only root filesystem and prefer to keep writeable data in one place.

You can override the default by setting the variable in any layer or in the `local.conf` file. Because the default is set using a "weak" assignment (i.e. "`??=`"), you can use either of the following forms to define your override:

```
ROOT_HOME = "/root"
ROOT_HOME ?= "/root"
```

These override examples use `/root`, which is probably the most commonly used override.

ROOTFS Indicates a filesystem image to include as the root filesystem.

The `ROOTFS` variable is an optional variable used with the `image-live` class.

ROOTFS_POSTINSTALL_COMMAND Specifies a list of functions to call after the OpenEmbedded build system has installed packages. You can specify functions separated by semicolons:

```
ROOTFS_POSTINSTALL_COMMAND += "function; ... "
```

If you need to pass the root filesystem path to a command within a function, you can use `${IMAGE_ROOTFS}`, which points to the directory that becomes the root filesystem image. See the `IMAGE_ROOTFS` variable for more information.

ROOTFS_POSTPROCESS_COMMAND Specifies a list of functions to call once the OpenEmbedded build system has created the root filesystem. You can specify functions separated by semicolons:

```
ROOTFS_POSTPROCESS_COMMAND += "function; ... "
```

If you need to pass the root filesystem path to a command within a function, you can use `${IMAGE_ROOTFS}`, which points to the directory that becomes the root filesystem image. See the `IMAGE_ROOTFS` variable for more information.

ROOTFS_POSTUNINSTALL_COMMAND Specifies a list of functions to call after the OpenEmbedded build system has removed unnecessary packages. When runtime package management is disabled in the image, several packages are removed including `base-passwd`, `shadow`, and `update-alternatives`. You can specify functions separated by semicolons:

```
ROOTFS_POSTUNINSTALL_COMMAND += "function; ... "
```

If you need to pass the root filesystem path to a command within a function, you can use `${IMAGE_ROOTFS}`, which points to the directory that becomes the root filesystem image. See the `IMAGE_ROOTFS` variable for more information.

ROOTFS_PREPROCESS_COMMAND Specifies a list of functions to call before the OpenEmbedded build system has created the root filesystem. You can specify functions separated by semicolons:

```
ROOTFS_PREPROCESS_COMMAND += "function; ... "
```

If you need to pass the root filesystem path to a command within a function, you can use `${IMAGE_ROOTFS}`, which points to the directory that becomes the root filesystem image. See the `IMAGE_ROOTFS` variable for more information.

RPROVIDES

A list of package name aliases that a package also provides. These aliases are useful for satisfying runtime dependencies of other packages both during the build and on the target (as specified by `RDEPENDS`).

Note

A package's own name is implicitly already in its `RPROVIDES` list.

As with all package-controlling variables, you must always use the variable in conjunction with a package name override. Here is an example:

```
RPROVIDES_${PN} = "widget-abi-2"
```

RRECOMMENDS

A list of packages that extends the usability of a package being built. The package being built does not depend on this list of packages in order to successfully build, but rather uses them for extended usability. To specify runtime dependencies for packages, see the `RDEPENDS` variable.

The package manager will automatically install the `RRECOMMENDS` list of packages when installing the built package. However, you can prevent listed packages from being installed by using the `BAD_RECOMMENDATIONS`, `NO_RECOMMENDATIONS`, and `PACKAGE_EXCLUDE` variables.

Packages specified in `RRECOMMENDS` need not actually be produced. However, a recipe must exist that provides each package, either through the `PACKAGES` or `PACKAGES_DYNAMIC` variables or the `RPROVIDES` variable, or an error will occur during the build. If such a recipe does exist and the package is not produced, the build continues without error.

Because the `RRECOMMENDS` variable applies to packages being built, you should always attach an override to the variable to specify the particular package whose usability is being extended. For example, suppose you are building a development package that is extended to support wireless functionality. In this case, you would use the following:

```
RRECOMMENDS_${PN}-dev += "wireless_package_name"
```

In the example, the package name (`${PN}-dev`) must appear as it would in the `PACKAGES` namespace before any renaming of the output package by classes such as `debian.bbclass`.

BitBake, which the OpenEmbedded build system uses, supports specifying versioned recommends. Although the syntax varies depending on the packaging format, BitBake hides these differences from you. Here is the general syntax to specify versions with the `RRECOMMENDS` variable:

```
RRECOMMENDS_${PN} = "package (operator version)"
```

For operator, you can specify the following:

```
=  
<  
>  
<=  
>=
```

For example, the following sets up a recommend on version 1.2 or greater of the package `foo`:

```
RRECOMMENDS_${PN} = "foo (>= 1.2)"
```

RREPLACES

A list of packages replaced by a package. The package manager uses this variable to determine which package should be installed to replace other package(s) during an upgrade. In order to also have the other package(s) removed at the same time, you must add the name of the other package to the `RCONFLICTS` variable.

As with all package-controlling variables, you must use this variable in conjunction with a package name override. Here is an example:

```
RREPLACES_${PN} = "other_package_being_replaced"
```

BitBake, which the OpenEmbedded build system uses, supports specifying versioned replacements. Although the syntax varies depending on the packaging format, BitBake hides these differences from you. Here is the general syntax to specify versions with the `RREPLACES` variable:

```
RREPLACES_${PN} = "package (operator version)"
```

For operator, you can specify the following:

```
=  
<  
>  
<=  
>=
```

For example, the following sets up a replacement using version 1.2 or greater of the package foo:

```
RREPLACES_${PN} = "foo (>= 1.2)"
```

RSUGGESTS

A list of additional packages that you can suggest for installation by the package manager at the time a package is installed. Not all package managers support this functionality.

As with all package-controlling variables, you must always use this variable in conjunction with a package name override. Here is an example:

```
RSUGGESTS_${PN} = "useful_package another_package"
```

S

S

The location in the Build Directory where unpacked recipe source code resides. By default, this directory is `${WORKDIR}/${BPN}-${PV}`, where `${BPN}` is the base recipe name and `${PV}` is the recipe version. If the source tarball extracts the code to a directory named anything other than `${BPN}-${PV}`, or if the source code is fetched from an SCM such as Git or Subversion, then you must set `S` in the recipe so that the OpenEmbedded build system knows where to find the unpacked source.

As an example, assume a Source Directory top-level folder named `poky` and a default Build Directory at `poky/build`. In this case, the work directory the build system uses to keep the unpacked recipe for `db` is the following:

```
poky/build/tmp/work/qemux86-poky-linux/db/5.1.19-r3/db-5.1.19
```

The unpacked source code resides in the `db-5.1.19` folder.

This next example assumes a Git repository. By default, Git repositories are cloned to `${WORKDIR}/git` during `do_fetch`. Since this path is different from the default value of `S`, you must set it specifically so the source can be located:

```
SRC_URI = "git://path/to/repo.git"
S = "${WORKDIR}/git"
```

SANITY_REQUIRED_UTILITIES

Specifies a list of command-line utilities that should be checked for during the initial sanity checking process when running BitBake. If any of the utilities are not installed on the build host, then BitBake immediately exits with an error.

SANITY_TESTED_DISTROS

A list of the host distribution identifiers that the build system has been tested against. Identifiers consist of the host distributor ID followed by the release, as reported by the `lsb_release` tool or as read from `/etc/lsb-release`. Separate the list items with explicit newline characters (`\n`). If `SANITY_TESTED_DISTROS` is not empty and the current value of `NATIVELSBSTRING` does not appear in the list, then the build system reports a warning that indicates the current host distribution has not been tested as a build host.

SDK_ARCH The target architecture for the SDK. Typically, you do not directly set this variable. Instead, use SDKMACHINE.

SDK_DEPLOY The directory set up and used by the `populate_sdk_base` class to which the SDK is deployed. The `populate_sdk_base` class defines SDK_DEPLOY as follows:

```
SDK_DEPLOY = "${TMPDIR}/deploy/sdk"
```

SDK_DIR The parent directory used by the OpenEmbedded build system when creating SDK output. The `populate_sdk_base` class defines the variable as follows:

```
SDK_DIR = "${WORKDIR}/sdk"
```

Note

The SDK_DIR directory is a temporary directory as it is part of WORKDIR. The final output directory is SDK_DEPLOY.

SDK_EXT_TYPE Controls whether or not shared state artifacts are copied into the extensible SDK. The default value of "full" copies all of the required shared state artifacts into the extensible SDK. The value "minimal" leaves these artifacts out of the SDK.

Note

If you set the variable to "minimal", you need to ensure SSTATE_MIRRORS is set in the SDK's configuration to enable the artifacts to be fetched as needed.

SDK_HOST_MANIFEST The manifest file for the host part of the SDK. This file lists all the installed packages that make up the host part of the SDK. The file contains package information on a line-per-package basis as follows:

```
packagename packagearch version
```

The `populate_sdk_base` class defines the manifest file as follows:

```
SDK_HOST_MANIFEST = "${SDK_DEPLOY}/${TOOLCHAIN_OUTPUTNAME}.host.m
```

The location is derived using the SDK_DEPLOY and TOOLCHAIN_OUTPUTNAME variables.

SDK_INCLUDE_PKGDATA When set to "1", specifies to include the packagedata for all recipes in the "world" target in the extensible SDK. Including this data allows the `devtool search` command to find these recipes in search results, as well as allows the `devtool add` command to map dependencies more effectively.

Note

Enabling the SDK_INCLUDE_PKGDATA variable significantly increases build time because all of world needs to be built. Enabling the variable also slightly increases the size of the extensible SDK.

SDK_INCLUDE_TOOLCHAIN When set to "1", specifies to include the toolchain in the extensible SDK. Including the toolchain is useful particularly when SDK_EXT_TYPE is set to "minimal" to keep the SDK reasonably small

but you still want to provide a usable toolchain. For example, suppose you want to use the toolchain from an IDE or from other tools and you do not want to perform additional steps to install the toolchain.

The `SDK_INCLUDE_TOOLCHAIN` variable defaults to "0" if `SDK_EXT_TYPE` is set to "minimal", and defaults to "1" if `SDK_EXT_TYPE` is set to "full".

`SDK_INHERIT_BLACKLIST`

A list of classes to remove from the `INHERIT` value globally within the extensible SDK configuration. The `populate-sdk-ext` class sets the default value:

```
SDK_INHERIT_BLACKLIST ?= "buildhistory icecc"
```

Some classes are not generally applicable within the extensible SDK context. You can use this variable to disable those classes.

For additional information on how to customize the extensible SDK's configuration, see the "Configuring the Extensible SDK [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-configuring-the-extensible-sdk>]" section in the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) manual.

`SDK_LOCAL_CONF_BLACKLIST`

A list of variables not allowed through from the OpenEmbedded build system configuration into the extensible SDK configuration. Usually, these are variables that are specific to the machine on which the build system is running and thus would be potentially problematic within the extensible SDK.

By default, `SDK_LOCAL_CONF_BLACKLIST` is set in the `populate-sdk-ext` class and excludes the following variables:

```
CONF_VERSION
BB_NUMBER_THREADS
BB_NUMBER_PARSE_THREADS [http://www.yoctoproject.org/docs/3.0.3/b
PARALLEL_MAKE
PRSERV_HOST
SSTATE_MIRRORS
DL_DIR
SSTATE_DIR
TMPDIR
BB_SERVER_TIMEOUT
```

For additional information on how to customize the extensible SDK's configuration, see the "Configuring the Extensible SDK [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-configuring-the-extensible-sdk>]" section in the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) manual.

`SDK_LOCAL_CONF_WHITELIST`

A list of variables allowed through from the OpenEmbedded build system configuration into the extensible SDK configuration. By default, the list of variables is empty and is set in the `populate-sdk-ext` class.

This list overrides the variables specified using the `SDK_LOCAL_CONF_BLACKLIST` variable as well as any variables identified by automatic blacklisting due to the "/" character being found at the start of the value, which is usually indicative of being a path and thus might not be valid on the system where the SDK is installed.

For additional information on how to customize the extensible SDK's configuration, see the "Configuring the Extensible SDK [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-configuring-the-extensible-sdk>]" section in the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) manual.

SDK_NAME The base name for SDK output files. The name is derived from the DISTRO, TCLIBC, SDK_ARCH, IMAGE_BASENAME, and TUNE_PKGARCH variables:

```
SDK_NAME = "${DISTRO}-${TCLIBC}-${SDK_ARCH}-${IMAGE_BASENAME}-${T
```

SDK_OS Specifies the operating system for which the SDK will be built. The default value is the value of BUILD_OS.

SDK_OUTPUT The location used by the OpenEmbedded build system when creating SDK output. The populate_sdk_base class defines the variable as follows:

```
SDK_DIR = "${WORKDIR}/sdk"
SDK_OUTPUT = "${SDK_DIR}/image"
SDK_DEPLOY = "${DEPLOY_DIR}/sdk"
```

Note

The SDK_OUTPUT directory is a temporary directory as it is part of WORKDIR by way of SDK_DIR. The final output directory is SDK_DEPLOY.

SDK_PACKAGE_ARCHS Specifies a list of architectures compatible with the SDK machine. This variable is set automatically and should not normally be hand-edited. Entries are separated using spaces and listed in order of priority. The default value for SDK_PACKAGE_ARCHS is "all any noarch \${SDK_ARCH}-\${SDKPKGSUFFIX}".

SDK_POSTPROCESS_COMMAND Specifies a list of functions to call once the OpenEmbedded build system creates the SDK. You can specify functions separated by semicolons:

```
SDK_POSTPROCESS_COMMAND += "function; ... "
```

If you need to pass an SDK path to a command within a function, you can use \${SDK_DIR}, which points to the parent directory used by the OpenEmbedded build system when creating SDK output. See the SDK_DIR variable for more information.

SDK_PREFIX The toolchain binary prefix used for nativesdk recipes. The OpenEmbedded build system uses the SDK_PREFIX value to set the TARGET_PREFIX when building nativesdk recipes. The default value is "\${SDK_SYS}-".

SDK_RECRDEP_TASKS A list of shared state tasks added to the extensible SDK. By default, the following tasks are added:

```
do_populate_lic
do_package_qa
do_populate_sysroot
do_deploy
```

	<p>Despite the default value of "" for the <code>SDK_RECRDEP_TASKS</code> variable, the above four tasks are always added to the SDK. To specify tasks beyond these four, you need to use the <code>SDK_RECRDEP_TASKS</code> variable (e.g. you are defining additional tasks that are needed in order to build <code>SDK_TARGETS</code>).</p>
<code>SDK_SYS</code>	<p>Specifies the system, including the architecture and the operating system, for which the SDK will be built.</p> <p>The OpenEmbedded build system automatically sets this variable based on <code>SDK_ARCH</code>, <code>SDK_VENDOR</code>, and <code>SDK_OS</code>. You do not need to set the <code>SDK_SYS</code> variable yourself.</p>
<code>SDK_TARGET_MANIFEST</code>	<p>The manifest file for the target part of the SDK. This file lists all the installed packages that make up the target part of the SDK. The file contains package information on a line-per-package basis as follows:</p> <pre>packagename packagearch version</pre> <p>The <code>populate_sdk_base</code> class defines the manifest file as follows:</p> <pre>SDK_TARGET_MANIFEST = "\${SDK_DEPLOY}/\${TOOLCHAIN_OUTPUTNAME}.target-manifest</pre> <p>The location is derived using the <code>SDK_DEPLOY</code> and <code>TOOLCHAIN_OUTPUTNAME</code> variables.</p>
<code>SDK_TARGETS</code>	<p>A list of targets to install from shared state as part of the standard or extensible SDK installation. The default value is <code>"\${PN}"</code> (i.e. the image from which the SDK is built).</p> <p>The <code>SDK_TARGETS</code> variable is an internal variable and typically would not be changed.</p>
<code>SDK_TITLE</code>	<p>The title to be printed when running the SDK installer. By default, this title is based on the <code>DISTRO_NAME</code> or <code>DISTRO</code> variable and is set in the <code>populate_sdk_base</code> class as follows:</p> <pre>SDK_TITLE ??= "\${@d.getVar('DISTRO_NAME') or d.getVar('DISTRO')}</pre> <p>For the default distribution "poky", <code>SDK_TITLE</code> is set to "Poky (Yocto Project Reference Distro)".</p> <p>For information on how to change this default title, see the "Changing the Extensible SDK Installer Title" [http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-changing-the-sdk-installer-title] section in the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) manual.</p>
<code>SDK_UPDATE_URL</code>	<p>An optional URL for an update server for the extensible SDK. If set, the value is used as the default update server when running <code>devtool sdk-update</code> within the extensible SDK.</p>
<code>SDK_VENDOR</code>	<p>Specifies the name of the SDK vendor.</p>
<code>SDK_VERSION</code>	<p>Specifies the version of the SDK. The distribution configuration file (e.g. <code>/meta-poky/conf/distro/poky.conf</code>) defines the <code>SDK_VERSION</code> as follows:</p> <pre>SDK_VERSION = "\${@d.getVar('DISTRO_VERSION')}.replace('snapshot-\${@</pre>

	<p>For additional information, see the <code>DISTRO_VERSION</code> and <code>DATE</code> variables.</p>
<code>SDKEXTPATH</code>	<p>The default installation directory for the Extensible SDK. By default, this directory is based on the <code>DISTRO</code> variable and is set in the <code>populate_sdk_base</code> class as follows:</p> <pre>SDKEXTPATH ??= "~/\${@d.getVar('DISTRO')}_sdk"</pre> <p>For the default distribution "poky", the <code>SDKEXTPATH</code> is set to "poky_sdk".</p> <p>For information on how to change this default directory, see the "Changing the Default SDK Installation Directory [http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-changing-the-default-sdk-installation-directory]" section in the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) manual.</p>
<code>SDKIMAGE_FEATURES</code>	<p>Equivalent to <code>IMAGE_FEATURES</code>. However, this variable applies to the SDK generated from an image using the following command:</p> <pre>\$ bitbake -c populate_sdk imagename</pre>
<code>SDKMACHINE</code>	<p>The machine for which the SDK is built. In other words, the SDK is built such that it runs on the target you specify with the <code>SDKMACHINE</code> value. The value points to a corresponding <code>.conf</code> file under <code>conf/machine-sdk/</code>.</p> <p>You can use "i686" and "x86_64" as possible values for this variable. The variable defaults to "i686" and is set in the <code>local.conf</code> file in the Build Directory.</p> <pre>SDKMACHINE ??= "i686"</pre> <p>Note</p> <p>You cannot set the <code>SDKMACHINE</code> variable in your distribution configuration file. If you do, the configuration will not take affect.</p>
<code>SDKPATH</code>	<p>Defines the path offered to the user for installation of the SDK that is generated by the OpenEmbedded build system. The path appears as the default location for installing the SDK when you run the SDK's installation script. You can override the offered path when you run the script.</p>
<code>SDKTARGETSYSROOT</code>	<p>The full path to the sysroot used for cross-compilation within an SDK as it will be when installed into the default <code>SDKPATH</code>.</p>
<code>SECTION</code>	<p>The section in which packages should be categorized. Package management utilities can make use of this variable.</p>
<code>SELECTED_OPTIMIZATION</code>	<p>Specifies the optimization flags passed to the C compiler when building for the target. The flags are passed through the default value of the <code>TARGET_CFLAGS</code> variable.</p> <p>The <code>SELECTED_OPTIMIZATION</code> variable takes the value of <code>FULL_OPTIMIZATION</code> unless <code>DEBUG_BUILD</code> = "1". If that is the case, the value of <code>DEBUG_OPTIMIZATION</code> is used.</p>

SERIAL_CONSOLE Defines a serial console (TTY) to enable using getty [[https://en.wikipedia.org/wiki/Getty_\(Unix\)](https://en.wikipedia.org/wiki/Getty_(Unix))]. Provide a value that specifies the baud rate followed by the TTY device name separated by a space. You cannot specify more than one TTY device:

```
SERIAL_CONSOLE = "115200 ttyS0"
```

Note

The `SERIAL_CONSOLE` variable is deprecated. Please use the `SERIAL_CONSOLES` variable.

SERIAL_CONSOLES Defines a serial console (TTY) to enable using getty [[https://en.wikipedia.org/wiki/Getty_\(Unix\)](https://en.wikipedia.org/wiki/Getty_(Unix))]. Provide a value that specifies the baud rate followed by the TTY device name separated by a semicolon. Use spaces to separate multiple devices:

```
SERIAL_CONSOLES = "115200;ttyS0 115200;ttyS1"
```

SERIAL_CONSOLES_CHECK Specifies serial consoles, which must be listed in `SERIAL_CONSOLES`, to check against `/proc/console` before enabling them using getty. This variable allows aliasing in the format: `<device>:<alias>`. If a device was listed as `"sclp_line0"` in `/dev/` and `"ttyS0"` was listed in `/proc/console`, you would do the following:

```
SERIAL_CONSOLES_CHECK = "sclp_line0:ttyS0"
```

This variable is currently only supported with SysVinit (i.e. not with systemd).

SIGGEN_EXCLUDE_SAFE_RECIPE_DEPS List of recipe dependencies that should not be used to determine signatures of tasks from one recipe when they depend on tasks from another recipe. For example:

```
SIGGEN_EXCLUDE_SAFE_RECIPE_DEPS += "intone->mplayer2"
```

In the previous example, `intone` depends on `mplayer2`.

You can use the special token `"*"` on the left-hand side of the dependency to match all recipes except the one on the right-hand side. Here is an example:

```
SIGGEN_EXCLUDE_SAFE_RECIPE_DEPS += "*->quilt-native"
```

In the previous example, all recipes except `quilt-native` ignore task signatures from the `quilt-native` recipe when determining their task signatures.

Use of this variable is one mechanism to remove dependencies that affect task signatures and thus force rebuilds when a recipe changes.

Caution

If you add an inappropriate dependency for a recipe relationship, the software might break during runtime if the interface of the second recipe was changed after the first recipe had been built.

SIGGEN_EXCLUDERECIPIES_ABIS List of recipes that are completely stable and will never change. The ABI for the recipes in the list are presented by output from the tasks run to build the recipe. Use of this variable is one way to remove dependencies from one recipe on another that affect task signatures and thus force rebuilds when the recipe changes.

Caution

If you add an inappropriate variable to this list, the software might break at runtime if the interface of the recipe was changed after the other had been built.

SITEINFO_BITS Specifies the number of bits for the target system CPU. The value should be either "32" or "64".

SITEINFO_ENDIANNES Specifies the endian byte order of the target system. The value should be either "le" for little-endian or "be" for big-endian.

SKIP_FILEDEPS Enables removal of all files from the "Provides" section of an RPM package. Removal of these files is required for packages containing prebuilt binaries and libraries such as libstdc++ and glibc.

To enable file removal, set the variable to "1" in your `conf/local.conf` configuration file in your: Build Directory.

```
SKIP_FILEDEPS = "1"
```

SOC_FAMILY Groups together machines based upon the same family of SOC (System On Chip). You typically set this variable in a common `.inc` file that you include in the configuration files of all the machines.

Note

You must include `conf/machine/include/soc-family.inc` for this variable to appear in `MACHINEOVERRIDES`.

SOLIBS Defines the suffix for shared libraries used on the target platform. By default, this suffix is ".so.*" for all Linux-based systems and is defined in the `meta/conf/bitbake.conf` configuration file.

You will see this variable referenced in the default values of `FILES_${PN}`.

SOLIBSDEV Defines the suffix for the development symbolic link (symlink) for shared libraries on the target platform. By default, this suffix is ".so" for Linux-based systems and is defined in the `meta/conf/bitbake.conf` configuration file.

You will see this variable referenced in the default values of `FILES_${PN}-dev`.

SOURCE_MIRROR_FETCH When you are fetching files to create a mirror of sources (i.e. creating a source mirror), setting `SOURCE_MIRROR_FETCH` to "1" in your `local.conf` configuration file ensures the source for all recipes are fetched regardless of whether or not a recipe is compatible with the configuration. A recipe is considered incompatible with the currently configured machine when either or both the `COMPATIBLE_MACHINE` variable and `COMPATIBLE_HOST` variables specify compatibility with a machine other than that of the current machine or host.

Warning

Do not set the `SOURCE_MIRROR_FETCH` variable unless you are creating a source mirror. In other words, do not set the variable during a normal build.

SOURCE_MIRROR_URL Defines your own PREMIRRORS from which to first fetch source before attempting to fetch from the upstream specified in SRC_URI.

To use this variable, you must globally inherit the own-mirrors class and then provide the URL to your mirrors. Here is the general syntax:

```
INHERIT += "own-mirrors"
SOURCE_MIRROR_URL = "http://example.com/my_source_mirror"
```

Note

You can specify only a single URL in SOURCE_MIRROR_URL.

SPDXLICENSEMAP Maps commonly used license names to their SPDX counterparts found in meta/files/common-licenses/. For the default SPDXLICENSEMAP mappings, see the meta/conf/licenses.conf file.

For additional information, see the LICENSE variable.

SPECIAL_PKGSUFFIX A list of prefixes for PN used by the OpenEmbedded build system to create variants of recipes or packages. The list specifies the prefixes to strip off during certain circumstances such as the generation of the BPN variable.

SPL_BINARY The file type for the Secondary Program Loader (SPL). Some devices use an SPL from which to boot (e.g. the BeagleBone development board). For such cases, you can declare the file type of the SPL binary in the u-boot.inc include file, which is used in the U-Boot recipe.

The SPL file type is set to "null" by default in the u-boot.inc file as follows:

```
# Some versions of u-boot build an SPL (Second Program Loader) im
# should be packaged along with the u-boot binary as well as plac
# deploy directory. For those versions they can set the followin
# to allow packaging the SPL.
SPL_BINARY ?= ""
SPL_BINARYNAME ?= "${@os.path.basename(d.getVar("SPL_BINARY"))}"
SPL_IMAGE ?= "${SPL_BINARYNAME}-${MACHINE}-${PV}-${PR}"
SPL_SYMLINK ?= "${SPL_BINARYNAME}-${MACHINE}"
```

The SPL_BINARY variable helps form various SPL_* variables used by the OpenEmbedded build system.

See the BeagleBone machine configuration example in the "Creating a new BSP Layer Using the bitbake-layers Script [<http://www.yoctoproject.org/docs/3.0.3/bsp-guide/bsp-guide.html#creating-a-new-bsp-layer-using-the-bitbake-layers-script>]" section in the Yocto Project Board Support Package Developer's Guide for additional information.

SRC_URI The list of source files - local or remote. This variable tells the OpenEmbedded build system which bits to pull in for the build and how to pull them in. For example, if the recipe or append file only needs to fetch a tarball from the Internet, the recipe or append file uses a single SRC_URI entry. On the other hand, if the recipe or append file needs to fetch a tarball, apply two patches, and include a custom file, the recipe or append file would include four instances of the variable.

The following list explains the available URI protocols. URI protocols are highly dependent on particular BitBake Fetcher submodules. Depending on the fetcher BitBake uses, various URL

parameters are employed. For specifics on the supported Fetchers, see the "Fetchers [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html#bb-fetchers>]" section in the BitBake User Manual.

- `file://` - Fetches files, which are usually files shipped with the Metadata, from the local machine (e.g. patch [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#patching-dev-environment>] files). The path is relative to the `FILESPATH` variable. Thus, the build system searches, in order, from the following directories, which are assumed to be subdirectories of the directory in which the recipe file (`.bb`) or append file (`.bbappend`) resides:
- `${BPN}` - The base recipe name without any special suffix or version numbers.
- `${BP}` - `${BPN}-${PV}`. The base recipe name and version but without any special package name suffix.
- `files` - Files within a directory, which is named `files` and is also alongside the recipe or append file.

Note

If you want the build system to pick up files specified through a `SRC_URI` statement from your append file, you need to be sure to extend the `FILESPATH` variable by

also using the `FILESEXTRAPATHS` variable from within your append file.

- `bzr://` - Fetches files from a Bazaar revision control repository.
- `git://` - Fetches files from a Git revision control repository.
- `osc://` - Fetches files from an OSC (OpenSUSE Build service) revision control repository.
- `repo://` - Fetches files from a repo (Git) repository.
- `ccrc://` - Fetches files from a ClearCase repository.
- `http://` - Fetches files from the Internet using http.
- `https://` - Fetches files from the Internet using https.
- `ftp://` - Fetches files from the Internet using ftp.
- `cvs://` - Fetches files from a CVS revision control repository.
- `hg://` - Fetches files from a Mercurial (hg) revision control repository.
- `p4://` - Fetches files from a Perforce (p4) revision control repository.
- `ssh://` - Fetches files from a secure shell.
- `svn://` - Fetches files from a Subversion (svn) revision control repository.
- `npm://` - Fetches JavaScript modules from a registry.

Standard and recipe-specific options for `SRC_URI` exist. Here are standard options:

- `apply` - Whether to apply the patch or not. The default action is to apply the patch.
- `striplevel` - Which striplevel to use when applying the patch. The default level is 1.
- `patchdir` - Specifies the directory in which the patch should be applied. The default is `${S}`.

Here are options specific to recipes building code from a revision control system:

- `mindate` - Apply the patch only if `SRCDATE` is equal to or greater than `mindate`.
- `maxdate` - Apply the patch only if `SRCDATE` is not later than `maxdate`.
- `minrev` - Apply the patch only if `SRCREV` is equal to or greater than `minrev`.
- `maxrev` - Apply the patch only if `SRCREV` is not later than `maxrev`.
- `rev` - Apply the patch only if `SRCREV` is equal to `rev`.
- `not rev` - Apply the patch only if `SRCREV` is not equal to `rev`.

Here are some additional options worth mentioning:

- `unpack` - Controls whether or not to unpack the file if it is an archive. The default action is to unpack the file.

- `destsuffix` - Places the file (or extracts its contents) into the specified subdirectory of `WORKDIR` when the Git fetcher is used.
- `subdir` - Places the file (or extracts its contents) into the specified subdirectory of `WORKDIR` when the local (`file://`) fetcher is used.
- `localdir` - Places the file (or extracts its contents) into the specified subdirectory of `WORKDIR` when the CVS fetcher is used.
- `subpath` - Limits the checkout to a specific subpath of the tree when using the Git fetcher is used.
- `name` - Specifies a name to be used for association with `SRC_URI` checksums when you have more than one file specified in `SRC_URI`.
- `downloadfilename` - Specifies the filename used when storing the downloaded file.

`SRC_URI_OVERRIDES_PACKAGE_ARCH` - By default, the OpenEmbedded build system automatically detects whether `SRC_URI` contains files that are machine-specific. If so, the build system automatically changes `PACKAGE_ARCH`. Setting this variable to "0" disables this behavior.

`SRCDATE` - The date of the source code used to build the package. This variable applies only if the source was fetched from a Source Code Manager (SCM).

`SRCPV` - Returns the version string of the current package. This string is used to help define the value of `PV`.

The `SRCPV` variable is defined in the `meta/conf/bitbake.conf` configuration file in the Source Directory as follows:

```
SRCPV = "${@bb.fetch2.get_srcrev(d)}"
```

Recipes that need to define `PV` do so with the help of the `SRCPV`. For example, the `ofono` recipe (`ofono_git.bb`) located in `meta/recipes-connectivity` in the Source Directory defines `PV` as follows:

```
PV = "0.12-git${SRCPV}"
```

`SRCREV` - The revision of the source code used to build the package. This variable applies to Subversion, Git, Mercurial, and Bazaar only. Note that if you want to build a fixed revision and you want to avoid performing a query on the remote repository every time BitBake parses your recipe, you should specify a `SRCREV` that is a full revision identifier and not just a tag.

Note

For information on limitations when inheriting the latest revision of software using `SRCREV`, see the `AUTOREV` variable description and the "Automatically Incrementing a Binary Package Revision Number [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#automatically-incrementing-a-binary-package-revision-number>]" section, which is in the Yocto Project Development Tasks Manual.

`SSTATE_DIR` - The directory for the shared state cache.

`SSTATE_MIRROR_ALLOW_NETWORK` - Set to "1", allows fetches from mirrors that are specified in `SSTATE_MIRRORS` to work even when fetching from the

	<p>network is disabled by setting <code>BB_NO_NETWORK</code> to "1". Using the <code>SSTATE_MIRROR_ALLOW_NETWORK</code> variable is useful if you have set <code>SSTATE_MIRRORS</code> to point to an internal server for your shared state cache, but you want to disable any other fetching from the network.</p>
<code>SSTATE_MIRRORS</code>	<p>Configures the OpenEmbedded build system to search other mirror locations for prebuilt cache data objects before building out the data. This variable works like <code>fetcher MIRRORS</code> and <code>PREMIRRORS</code> and points to the cache locations to check for the shared state (sstate) objects.</p> <p>You can specify a filesystem directory or a remote URL such as HTTP or FTP. The locations you specify need to contain the shared state cache (sstate-cache) results from previous builds. The sstate-cache you point to can also be from builds on other machines.</p> <p>When pointing to sstate build artifacts on another machine that uses a different GCC version for native builds, you must configure <code>SSTATE_MIRROR</code> with a regular expression that maps local search paths to server paths. The paths need to take into account <code>NATIVELSBSTRING</code> set by the <code>uninative</code> class. For example, the following maps the local search path <code>universal-4.9</code> to the server-provided path <code>server_url_sstate_path</code>:</p> <pre>SSTATE_MIRRORS ?= file://universal-4.9/(.*) http://server_url_sst</pre> <p>If a mirror uses the same structure as <code>SSTATE_DIR</code>, you need to add "PATH" at the end as shown in the examples below. The build system substitutes the correct path within the directory structure.</p> <pre>SSTATE_MIRRORS ?= "\ file://.* http://someserver.tld/share/sstate/PATH;downloadfilenam file://.* file:///some-local-dir/sstate/PATH"</pre>
<code>SSTATE_SCAN_FILES</code>	<p>Controls the list of files the OpenEmbedded build system scans for hardcoded installation paths. The variable uses a space-separated list of filenames (not paths) with standard wildcard characters allowed.</p> <p>During a build, the OpenEmbedded build system creates a shared state (sstate) object during the first stage of preparing the sysroots. That object is scanned for hardcoded paths for original installation locations. The list of files that are scanned for paths is controlled by the <code>SSTATE_SCAN_FILES</code> variable. Typically, recipes add files they want to be scanned to the value of <code>SSTATE_SCAN_FILES</code> rather than the variable being comprehensively set. The <code>sstate</code> class specifies the default list of files.</p> <p>For details on the process, see the <code>staging</code> class.</p>
<code>STAGING_BASE_LIBDIR_NATIVE</code>	<p>Specifies the path to the <code>/lib</code> subdirectory of the sysroot directory for the build host.</p>
<code>STAGING_BASELIBDIR</code>	<p>Specifies the path to the <code>/lib</code> subdirectory of the sysroot directory for the target for which the current recipe is being built (<code>STAGING_DIR_HOST</code>).</p>
<code>STAGING_BINDIR</code>	<p>Specifies the path to the <code>/usr/bin</code> subdirectory of the sysroot directory for the target for which the current recipe is being built (<code>STAGING_DIR_HOST</code>).</p>
<code>STAGING_BINDIR_CROSS</code>	<p>Specifies the path to the directory containing binary configuration scripts. These scripts provide configuration information for other</p>

software that wants to make use of libraries or include files provided by the software associated with the script.

Note

This style of build configuration has been largely replaced by `pkg-config`. Consequently, if `pkg-config` is supported by the library to which you are linking, it is recommended you use `pkg-config` instead of a provided configuration script.

STAGING_BINDIR_NATIVE	Specifies the path to the <code>/usr/bin</code> subdirectory of the sysroot directory for the build host.
STAGING_DATADIR	Specifies the path to the <code>/usr/share</code> subdirectory of the sysroot directory for the target for which the current recipe is being built (<code>STAGING_DIR_HOST</code>).
STAGING_DATADIR_NATIVE	Specifies the path to the <code>/usr/share</code> subdirectory of the sysroot directory for the build host.
STAGING_DIR	Helps construct the <code>recipe-sysroots</code> directory, which is used during packaging.

For information on how staging for recipe-specific sysroots occurs, see the `do_populate_sysroot` task, the "Sharing Files Between Recipes [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#new-sharing-files-between-recipes>]" section in the Yocto Project Development Tasks Manual, the "Configuration, Compilation, and Staging [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#configuration-compilation-and-staging-dev-environment>]" section in the Yocto Project Overview and Concepts Manual, and the `SYSROOT_DIRS` variable.

Note

Recipes should never write files directly under the `STAGING_DIR` directory because the OpenEmbedded build system manages the directory automatically. Instead, files should be installed to `${D}` within your recipe's `do_install` task and then the OpenEmbedded build system will stage a subset of those files into the sysroot.

STAGING_DIR_HOST	<p>Specifies the path to the sysroot directory for the system on which the component is built to run (the system that hosts the component). For most recipes, this sysroot is the one in which that recipe's <code>do_populate_sysroot</code> task copies files. Exceptions include <code>-native</code> recipes, where the <code>do_populate_sysroot</code> task instead uses <code>STAGING_DIR_NATIVE</code>. Depending on the type of recipe and the build target, <code>STAGING_DIR_HOST</code> can have the following values:</p> <ul style="list-style-type: none">• For recipes building for the target machine, the value is <code>"\${STAGING_DIR}/\${MACHINE}"</code>.• For native recipes building for the build host, the value is empty given the assumption that when building for the build host, the build host's own directories should be used.
------------------	--

Note

`-native` recipes are not installed into host paths like such as `/usr`. Rather, these recipes are installed into `STAGING_DIR_NATIVE`. When compiling `-native` recipes, standard build environment variables such as `CPPFLAGS` and `CFLAGS` are set up so that both host paths and `STAGING_DIR_NATIVE` are searched for libraries and headers using, for example, GCC's `-isystem` option.

Thus, the emphasis is that the STAGING_DIR* variables should be viewed as input variables by tasks such as do_configure, do_compile, and do_install. Having the real system root correspond to STAGING_DIR_HOST makes conceptual sense for -native recipes, as they make use of host headers and libraries.

STAGING_DIR_NATIVE	Specifies the path to the sysroot directory used when building components that run on the build host itself.
STAGING_DIR_TARGET	<p>Specifies the path to the sysroot used for the system for which the component generates code. For components that do not generate code, which is the majority, STAGING_DIR_TARGET is set to match STAGING_DIR_HOST.</p> <p>Some recipes build binaries that can run on the target system but those binaries in turn generate code for another different system (e.g. cross-canadian recipes). Using terminology from GNU, the primary system is referred to as the "HOST" and the secondary, or different, system is referred to as the "TARGET". Thus, the binaries run on the "HOST" system and generate binaries for the "TARGET" system. The STAGING_DIR_HOST variable points to the sysroot used for the "HOST" system, while STAGING_DIR_TARGET points to the sysroot used for the "TARGET" system.</p>
STAGING_ETCDIR_NATIVE	Specifies the path to the /etc subdirectory of the sysroot directory for the build host.
STAGING_EXECPREFIXDIR	Specifies the path to the /usr subdirectory of the sysroot directory for the target for which the current recipe is being built (STAGING_DIR_HOST).
STAGING_INCDIR	Specifies the path to the /usr/include subdirectory of the sysroot directory for the target for which the current recipe being built (STAGING_DIR_HOST).
STAGING_INCDIR_NATIVE	Specifies the path to the /usr/include subdirectory of the sysroot directory for the build host.
STAGING_KERNEL_BUILDDIR	Points to the directory containing the kernel build artifacts. Recipes building software that needs to access kernel build artifacts (e.g. systemtap-uprobes) can look in the directory specified with the STAGING_KERNEL_BUILDDIR variable to find these artifacts after the kernel has been built.
STAGING_KERNEL_DIR	The directory with kernel headers that are required to build out-of-tree modules.
STAGING_LIBDIR	Specifies the path to the /usr/lib subdirectory of the sysroot directory for the target for which the current recipe is being built (STAGING_DIR_HOST).
STAGING_LIBDIR_NATIVE	Specifies the path to the /usr/lib subdirectory of the sysroot directory for the build host.
STAMP	Specifies the base path used to create recipe stamp files. The path to an actual stamp file is constructed by evaluating this string and then appending additional information. Currently, the default assignment for STAMP as set in the meta/conf/bitbake.conf file is:

```
STAMP = "${STAMPS_DIR}/${MULTIMACH_TARGET_SYS}/${PN}/${EXTENDPE}$
```

For information on how BitBake uses stamp files to determine if a task should be rerun, see the "Stamp Files and the Rerunning of Tasks" [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/>]

overview-manual.html#stamp-files-and-the-rerunning-of-tasks]" section in the Yocto Project Overview and Concepts Manual.

See STAMPS_DIR, MULTIMACH_TARGET_SYS, PN, EXTENDPE, PV, and PR for related variable information.

STAMPS_DIR	Specifies the base directory in which the OpenEmbedded build system places stamps. The default directory is <code>\${TMPDIR}/stamps</code> .
STRIP	The minimal command and arguments to run <code>strip</code> , which is used to strip symbols.
SUMMARY	The short (72 characters or less) summary of the binary package for packaging systems such as <code>opkg</code> , <code>rpm</code> , or <code>dpkg</code> . By default, <code>SUMMARY</code> is used to define the <code>DESCRIPTION</code> variable if <code>DESCRIPTION</code> is not set in the recipe.
SVNDIR	The directory in which files checked out of a Subversion system are stored.
SYSLINUX_DEFAULT_CONSOLE	Specifies the kernel boot default console. If you want to use a console other than the default, set this variable in your recipe as follows where "X" is the console number you want to use:

```
SYSLINUX_DEFAULT_CONSOLE = "console=ttyX"
```

The `syslinux` class initially sets this variable to null but then checks for a value later.

SYSLINUX_OPTS	Lists additional options to add to the <code>syslinux</code> file. You need to set this variable in your recipe. If you want to list multiple options, separate the options with a semicolon character (;).
	The <code>syslinux</code> class uses this variable to create a set of options.
SYSLINUX_SERIAL	Specifies the alternate serial port or turns it off. To turn off serial, set this variable to an empty string in your recipe. The variable's default value is set in the <code>syslinux</code> class as follows:

```
SYSLINUX_SERIAL ?= "0 115200"
```

The class checks for and uses the variable as needed.

SYSLINUX_SPLASH	An <code>.LSS</code> file used as the background for the VGA boot menu when you use the boot menu. You need to set this variable in your recipe.
	The <code>syslinux</code> class checks for this variable and if found, the OpenEmbedded build system installs the splash screen.
SYSLINUX_SERIAL_TTY	Specifies the alternate <code>console=tty...</code> kernel boot argument. The variable's default value is set in the <code>syslinux</code> class as follows:

```
SYSLINUX_SERIAL_TTY ?= "console=ttyS0,115200"
```

The class checks for and uses the variable as needed.

SYSROOT_DESTDIR	Points to the temporary directory under the work directory (default <code>"\${WORKDIR}/sysroot-destdir"</code>) where the files populated into the <code>sysroot</code> are assembled during the <code>do_populate_sysroot</code> task.
SYSROOT_DIRS	Directories that are staged into the <code>sysroot</code> by the <code>do_populate_sysroot</code> task. By default, the following directories are staged:

```
SYSROOT_DIRS = " \
    ${includedir} \
    ${libdir} \
    ${base_libdir} \
    ${nonarch_base_libdir} \
    ${datadir} \
"
```

SYSROOT_DIRS_BLACKLIST Directories that are not staged into the sysroot by the `do_populate_sysroot` task. You can use this variable to exclude certain subdirectories of directories listed in `SYSROOT_DIRS` from staging. By default, the following directories are not staged:

```
SYSROOT_DIRS_BLACKLIST = " \
    ${mandir} \
    ${docdir} \
    ${infodir} \
    ${datadir}/locale \
    ${datadir}/applications \
    ${datadir}/fonts \
    ${datadir}/pixmap \
"
```

SYSROOT_DIRS_NATIVE Extra directories staged into the sysroot by the `do_populate_sysroot` task for `-native` recipes, in addition to those specified in `SYSROOT_DIRS`. By default, the following extra directories are staged:

```
SYSROOT_DIRS_NATIVE = " \
    ${bindir} \
    ${sbindir} \
    ${base_bindir} \
    ${base_sbindir} \
    ${libexecdir} \
    ${sysconfdir} \
    ${localstatedir} \
"
```

Note

Programs built by `-native` recipes run directly from the sysroot (`STAGING_DIR_NATIVE`), which is why additional directories containing program executables and supporting files need to be staged.

SYSROOT_PREPROCESS_FUNCS A list of functions to execute after files are staged into the sysroot. These functions are usually used to apply additional processing on the staged files, or to stage additional files.

SYSTEMD_AUTO_ENABLE When inheriting the `systemd` class, this variable specifies whether the specified service in `SYSTEMD_SERVICE` should start automatically or not. By default, the service is enabled to automatically start at boot time. The default setting is in the `systemd` class as follows:

```
SYSTEMD_AUTO_ENABLE ??= "enable"
```

You can disable the service by setting the variable to `"disable"`.

SYSTEMD_BOOT_CFG When `EFI_PROVIDER` is set to "systemd-boot", the `SYSTEMD_BOOT_CFG` variable specifies the configuration file that should be used. By default, the `systemd-boot` class sets the `SYSTEMD_BOOT_CFG` as follows:

```
SYSTEMD_BOOT_CFG ?= "${S}/loader.conf"
```

For information on Systemd-boot, see the Systemd-boot documentation [<http://www.freedesktop.org/wiki/Software/systemd/systemd-boot/>].

SYSTEMD_BOOT_ENTRIES When `EFI_PROVIDER` is set to "systemd-boot", the `SYSTEMD_BOOT_ENTRIES` variable specifies a list of entry files (*.conf) to install that contain one boot entry per file. By default, the `systemd-boot` class sets the `SYSTEMD_BOOT_ENTRIES` as follows:

```
SYSTEMD_BOOT_ENTRIES ?= ""
```

For information on Systemd-boot, see the Systemd-boot documentation [<http://www.freedesktop.org/wiki/Software/systemd/systemd-boot/>].

SYSTEMD_BOOT_TIMEOUT When `EFI_PROVIDER` is set to "systemd-boot", the `SYSTEMD_BOOT_TIMEOUT` variable specifies the boot menu timeout in seconds. By default, the `systemd-boot` class sets the `SYSTEMD_BOOT_TIMEOUT` as follows:

```
SYSTEMD_BOOT_TIMEOUT ?= "10"
```

For information on Systemd-boot, see the Systemd-boot documentation [<http://www.freedesktop.org/wiki/Software/systemd/systemd-boot/>].

SYSTEMD_PACKAGES When inheriting the `systemd` class, this variable locates the `systemd` unit files when they are not found in the main recipe's package. By default, the `SYSTEMD_PACKAGES` variable is set such that the `systemd` unit files are assumed to reside in the recipes main package:

```
SYSTEMD_PACKAGES ?= "${PN}"
```

If these unit files are not in this recipe's main package, you need to use `SYSTEMD_PACKAGES` to list the package or packages in which the build system can find the `systemd` unit files.

SYSTEMD_SERVICE When inheriting the `systemd` class, this variable specifies the `systemd` service name for a package.

When you specify this file in your recipe, use a package name override to indicate the package to which the value applies. Here is an example from the `connman` recipe:

```
SYSTEMD_SERVICE_${PN} = "connman.service"
```

SYSVINIT_ENABLED_GETTYS When using `SysVinit` [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#new-recipe-enabling-system-services>], specifies a space-separated list of the virtual terminals that

should run a getty [http://en.wikipedia.org/wiki/Getty_%28Unix%29] (allowing login), assuming USE_VT is not set to "0".

The default value for SYSVINIT_ENABLED_GETTYS is "1" (i.e. only run a getty on the first virtual terminal).

T

T This variable points to a directory where BitBake places temporary files, which consist mostly of task logs and scripts, when building a particular recipe. The variable is typically set as follows:

```
T = "${WORKDIR}/temp"
```

The WORKDIR is the directory into which BitBake unpacks and builds the recipe. The default bitbake.conf file sets this variable.

The T variable is not to be confused with the TMPDIR variable, which points to the root of the directory tree where BitBake places the output of an entire build.

TARGET_ARCH The target machine's architecture. The OpenEmbedded build system supports many architectures. Here is an example list of architectures supported. This list is by no means complete as the architecture is configurable:

```
arm
i586
x86_64
powerpc
powerpc64
mips
mipsel
```

For additional information on machine architectures, see the TUNE_ARCH variable.

TARGET_AS_ARCH Specifies architecture-specific assembler flags for the target system. TARGET_AS_ARCH is initialized from TUNE_ASARGS by default in the BitBake configuration file (meta/conf/bitbake.conf):

```
TARGET_AS_ARCH = "${TUNE_ASARGS}"
```

TARGET_CC_ARCH Specifies architecture-specific C compiler flags for the target system. TARGET_CC_ARCH is initialized from TUNE_CCARGS by default.

Note

It is a common workaround to append LDFLAGS to TARGET_CC_ARCH in recipes that build software for the target that would not otherwise respect the exported LDFLAGS variable.

TARGET_CC_KERNEL_ARCH This is a specific kernel compiler flag for a CPU or Application Binary Interface (ABI) tune. The flag is used rarely and only for cases where a userspace TUNE_CCARGS is not compatible with the kernel compilation. The TARGET_CC_KERNEL_ARCH variable allows the kernel (and associated modules) to use a different configuration. See the meta/conf/machine/include/arm/feature-arm-thumb.inc file in the Source Directory for an example.

TARGET_CFLAGS	<p>Specifies the flags to pass to the C compiler when building for the target. When building in the target context, CFLAGS is set to the value of this variable by default.</p> <p>Additionally, the SDK's environment setup script sets the CFLAGS variable in the environment to the TARGET_CFLAGS value so that executables built using the SDK also have the flags applied.</p>
TARGET_CPPFLAGS	<p>Specifies the flags to pass to the C pre-processor (i.e. to both the C and the C++ compilers) when building for the target. When building in the target context, CPPFLAGS is set to the value of this variable by default.</p> <p>Additionally, the SDK's environment setup script sets the CPPFLAGS variable in the environment to the TARGET_CPPFLAGS value so that executables built using the SDK also have the flags applied.</p>
TARGET_CXXFLAGS	<p>Specifies the flags to pass to the C++ compiler when building for the target. When building in the target context, CXXFLAGS is set to the value of this variable by default.</p> <p>Additionally, the SDK's environment setup script sets the CXXFLAGS variable in the environment to the TARGET_CXXFLAGS value so that executables built using the SDK also have the flags applied.</p>
TARGET_FPU	<p>Specifies the method for handling FPU code. For FPU-less targets, which include most ARM CPUs, the variable must be set to "soft". If not, the kernel emulation gets used, which results in a performance penalty.</p>
TARGET_LD_ARCH	<p>Specifies architecture-specific linker flags for the target system. TARGET_LD_ARCH is initialized from TUNE_LDARGS by default in the BitBake configuration file (meta/conf/bitbake.conf):</p> <pre>TARGET_LD_ARCH = "\${TUNE_LDARGS}"</pre>
TARGET_LDFLAGS	<p>Specifies the flags to pass to the linker when building for the target. When building in the target context, LDFLAGS is set to the value of this variable by default.</p> <p>Additionally, the SDK's environment setup script sets the LDFLAGS variable in the environment to the TARGET_LDFLAGS value so that executables built using the SDK also have the flags applied.</p>
TARGET_OS	<p>Specifies the target's operating system. The variable can be set to "linux" for glibc-based systems (GNU C Library) and to "linux-musl" for musl libc. For ARM/EABI targets, "linux-gnueabi" and "linux-musleabi" possible values exist.</p>
TARGET_PREFIX	<p>Specifies the prefix used for the toolchain binary target tools.</p> <p>Depending on the type of recipe and the build target, TARGET_PREFIX is set as follows:</p> <ul style="list-style-type: none">• For recipes building for the target machine, the value is "\${TARGET_SYS}-".• For native recipes, the build system sets the variable to the value of BUILD_PREFIX.• For native SDK recipes (nativesdk), the build system sets the variable to the value of SDK_PREFIX.
TARGET_SYS	<p>Specifies the system, including the architecture and the operating system, for which the build is occurring in the context of the current recipe.</p>

The OpenEmbedded build system automatically sets this variable based on `TARGET_ARCH`, `TARGET_VENDOR`, and `TARGET_OS` variables.

Note

You do not need to set the `TARGET_SYS` variable yourself.

Consider these two examples:

- Given a native recipe on a 32-bit, x86 machine running Linux, the value is "i686-linux".
- Given a recipe being built for a little-endian, MIPS target running Linux, the value might be "mipsel-linux".

`TARGET_VENDOR`

Specifies the name of the target vendor.

`TCLIBC`

Specifies the GNU standard C library (`libc`) variant to use during the build process. This variable replaces `POKYLIBC`, which is no longer supported.

You can select "glibc", "musl", "newlib", or "baremetal"

`TCLIBCAPPEND`

Specifies a suffix to be appended onto the `TMPDIR` value. The suffix identifies the `libc` variant for building. When you are building for multiple variants with the same Build Directory, this mechanism ensures that output for different `libc` variants is kept separate to avoid potential conflicts.

In the `defaultsetup.conf` file, the default value of `TCLIBCAPPEND` is `"-${TCLIBC}"`. However, distros such as poky, which normally only support one `libc` variant, set `TCLIBCAPPEND` to `"` in their distro configuration file resulting in no suffix being applied.

`TCMODE`

Specifies the toolchain selector. `TCMODE` controls the characteristics of the generated packages and images by telling the OpenEmbedded build system which toolchain profile to use. By default, the OpenEmbedded build system builds its own internal toolchain. The variable's default value is "default", which uses that internal toolchain.

Note

If `TCMODE` is set to a value other than "default", then it is your responsibility to ensure that the toolchain is compatible with the default toolchain. Using older or newer versions of these components might cause build problems. See the Release Notes for the Yocto Project release for the specific components with which the toolchain must be compatible. To access the Release Notes, go to the Downloads [<http://www.yoctoproject.org/software-overview/downloads/>] page on the Yocto Project website and click on the "RELEASE INFORMATION" link for the appropriate release.

The `TCMODE` variable is similar to `TCLIBC`, which controls the variant of the GNU standard C library (`libc`) used during the build process: `glibc` or `musl`.

With additional layers, it is possible to use a pre-compiled external toolchain. One example is the Sourcery G++ Toolchain. The support for this toolchain resides in the separate Mentor Graphics® meta-sourcery layer at <http://github.com/MentorEmbedded/meta-sourcery/>.

The layer's README file contains information on how to use the Sourcery G++ Toolchain as an external toolchain. In summary, you must be sure to add the layer to your `bbayers.conf` file in front of

the meta layer and then set the `EXTERNAL_TOOLCHAIN` variable in your `local.conf` file to the location in which you installed the toolchain.

The fundamentals used for this example apply to any external toolchain. You can use meta-sourcery as a template for adding support for other external toolchains.

TEST_EXPORT_DIR The location the OpenEmbedded build system uses to export tests when the `TEST_EXPORT_ONLY` variable is set to "1".

The `TEST_EXPORT_DIR` variable defaults to "`${TMPDIR}/testimage/${PN}`".

TEST_EXPORT_ONLY Specifies to export the tests only. Set this variable to "1" if you do not want to run the tests but you want them to be exported in a manner that you to run them outside of the build system.

TEST_LOG_DIR Holds the SSH log and the boot log for QEMU machines. The `TEST_LOG_DIR` variable defaults to "`${WORKDIR}/testimage`".

Note

Actual test results reside in the task log (`log.do_testimage`), which is in the `${WORKDIR}/temp/` directory.

TEST_POWERCONTROL_CMD For automated hardware testing, specifies the command to use to control the power of the target machine under test. Typically, this command would point to a script that performs the appropriate action (e.g. interacting with a web-enabled power strip). The specified command should expect to receive as the last argument "off", "on" or "cycle" specifying to power off, on, or cycle (power off and then power on) the device, respectively.

TEST_POWERCONTROL_EXTRA_ARGS For automated hardware testing, specifies additional arguments to pass through to the command specified in `TEST_POWERCONTROL_CMD`. Setting `TEST_POWERCONTROL_EXTRA_ARGS` is optional. You can use it if you wish, for example, to separate the machine-specific and non-machine-specific parts of the arguments.

TEST_QEMUBOOT_TIMEOUT The time in seconds allowed for an image to boot before automated runtime tests begin to run against an image. The default timeout period to allow the boot process to reach the login prompt is 500 seconds. You can specify a different value in the `local.conf` file.

For more information on testing images, see the "Performing Automated Runtime Testing [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#performing-automated-runtime-testing>]" section in the Yocto Project Development Tasks Manual.

TEST_SERIALCONTROL_CMD For automated hardware testing, specifies the command to use to connect to the serial console of the target machine under test. This command simply needs to connect to the serial console and forward that connection to standard input and output as any normal terminal program does.

For example, to use the Picocom terminal program on serial device `/dev/ttyUSB0` at 115200bps, you would set the variable as follows:

```
TEST_SERIALCONTROL_CMD = "picocom /dev/ttyUSB0 -b 115200"
```

TEST_SERIALCONTROL_EXTRA_ARGS For automated hardware testing, specifies additional arguments to pass through to the command specified in `TEST_SERIALCONTROL_CMD`. Setting `TEST_SERIALCONTROL_EXTRA_ARGS` is optional. You can use it if you wish, for example, to separate the machine-specific and non-machine-specific parts of the command.

TEST_SERVER_IP The IP address of the build machine (host machine). This IP address is usually automatically detected. However, if detection fails, this variable needs to be set to the IP address of the build machine (i.e. where the build is taking place).

Note

The TEST_SERVER_IP variable is only used for a small number of tests such as the "dnf" test suite, which needs to download packages from WORKDIR/oe-rootfs-repo.

TEST_TARGET Specifies the target controller to use when running tests against a test image. The default controller to use is "QemuTarget":

```
TEST_TARGET = "QemuTarget"
```

A target controller is a class that defines how an image gets deployed on a target and how a target is started. A layer can extend the controllers by adding a module in the layer's /lib/oeqa/controllers directory and by inheriting the BaseTarget class, which is an abstract class that cannot be used as a value of TEST_TARGET.

You can provide the following arguments with TEST_TARGET:

- "QemuTarget": Boots a QEMU image and runs the tests. See the "Enabling Runtime Tests on QEMU [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#qemu-image-enabling-tests>]" section in the Yocto Project Development Tasks Manual for more information.
- "SimpleRemoteTarget": Runs the tests on target hardware that is already up and running. The hardware can be on the network or it can be a device running an image on QEMU. You must also set TEST_TARGET_IP when you use "SimpleRemoteTarget".

Note

This argument is defined in meta/lib/oeqa/controllers/simpleremote.py.

For information on running tests on hardware, see the "Enabling Runtime Tests on Hardware [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#hardware-image-enabling-tests>]" section in the Yocto Project Development Tasks Manual.

TEST_TARGET_IP The IP address of your hardware under test. The TEST_TARGET_IP variable has no effect when TEST_TARGET is set to "qemu".

When you specify the IP address, you can also include a port. Here is an example:

```
TEST_TARGET_IP = "192.168.1.4:2201"
```

Specifying a port is useful when SSH is started on a non-standard port or in cases when your hardware under test is behind a firewall or network that is not directly accessible from your host and you need to do port address translation.

TEST_SUITES An ordered list of tests (modules) to run against an image when performing automated runtime testing.

The OpenEmbedded build system provides a core set of tests that can be used against images.

Note

Currently, there is only support for running these tests under QEMU.

Tests include ping, ssh, df among others. You can add your own tests to the list of tests by appending TEST_SUITES as follows:

```
TEST_SUITES_append = " mytest"
```

Alternatively, you can provide the "auto" option to have all applicable tests run against the image.

```
TEST_SUITES_append = " auto"
```

Using this option causes the build system to automatically run tests that are applicable to the image. Tests that are not applicable are skipped.

The order in which tests are run is important. Tests that depend on another test must appear later in the list than the test on which they depend. For example, if you append the list of tests with two tests (test_A and test_B) where test_B is dependent on test_A, then you must order the tests as follows:

```
TEST_SUITES = " test_A test_B"
```

For more information on testing images, see the "Performing Automated Runtime Testing [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#performing-automated-runtime-testing>]" section in the Yocto Project Development Tasks Manual.

TESTIMAGE_AUTO

Automatically runs the series of automated tests for images when an image is successfully built. Setting TESTIMAGE_AUTO to "1" causes any image that successfully builds to automatically boot under QEMU. Using the variable also adds in dependencies so that any SDK for which testing is requested is automatically built first.

These tests are written in Python making use of the unittest module, and the majority of them run commands on the target system over ssh. You can set this variable to "1" in your local.conf file in the Build Directory to have the OpenEmbedded build system automatically run these tests after an image successfully builds:

```
TESTIMAGE_AUTO = "1"
```

For more information on enabling, running, and writing these tests, see the "Performing Automated Runtime Testing [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#performing-automated-runtime-testing>]" section in the Yocto Project Development Tasks Manual and the "testimage*.bbclass" section.

THISDIR

The directory in which the file BitBake is currently parsing is located. Do not manually set this variable.

TIME

The time the build was started. Times appear using the hour, minute, and second (HMS) format (e.g. "140159" for one minute and fifty-nine seconds past 1400 hours).

TMPDIR This variable is the base directory the OpenEmbedded build system uses for all build output and intermediate files (other than the shared state cache). By default, the TMPDIR variable points to tmp within the Build Directory.

If you want to establish this directory in a location other than the default, you can uncomment and edit the following statement in the `conf/local.conf` file in the Source Directory:

```
#TMPDIR = "${TOPDIR}/tmp"
```

An example use for this scenario is to set TMPDIR to a local disk, which does not use NFS, while having the Build Directory use NFS.

The filesystem used by TMPDIR must have standard filesystem semantics (i.e. mixed-case files are unique, POSIX file locking, and persistent inodes). Due to various issues with NFS and bugs in some implementations, NFS does not meet this minimum requirement. Consequently, TMPDIR cannot be on NFS.

TOOLCHAIN_HOST_TASK This variable lists packages the OpenEmbedded build system uses when building an SDK, which contains a cross-development environment. The packages specified by this variable are part of the toolchain set that runs on the SDKMACHINE, and each package should usually have the prefix `nativesdk-`. For example, consider the following command when building an SDK:

```
$ bitbake -c populate_sdk imagename
```

In this case, a default list of packages is set in this variable, but you can add additional packages to the list. See the "Adding Individual Packages to the Standard SDK [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-adding-individual-packages>]" section in the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) manual for more information.

For background information on cross-development toolchains in the Yocto Project development environment, see the "Cross-Development Toolchain Generation [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#cross-development-toolchain-generation>]" section in the Yocto Project Overview and Concepts Manual. For information on setting up a cross-development environment, see the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html>] manual.

TOOLCHAIN_OUTPUTNAME This variable defines the name used for the toolchain output. The `populate_sdk_base` class sets the TOOLCHAIN_OUTPUTNAME variable as follows:

```
TOOLCHAIN_OUTPUTNAME ?= "${SDK_NAME}-toolchain-${SDK_VERSION}"
```

See the `SDK_NAME` and `SDK_VERSION` variables for additional information.

TOOLCHAIN_TARGET_TASK This variable lists packages the OpenEmbedded build system uses when it creates the target part of an SDK (i.e. the part built for the target hardware), which includes libraries and headers. Use this variable to add individual packages to the part of the SDK that

runs on the target. See the "Adding Individual Packages to the Standard SDK [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html#sdk-adding-individual-packages>]" section in the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) manual for more information.

For background information on cross-development toolchains in the Yocto Project development environment, see the "Cross-Development Toolchain Generation [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#cross-development-toolchain-generation>]" section in the Yocto Project Overview and Concepts Manual. For information on setting up a cross-development environment, see the Yocto Project Application Development and the Extensible Software Development Kit (eSDK) [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html>] manual.

TOPDIR The top-level Build Directory. BitBake automatically sets this variable when you initialize your build environment using `oe-init-build-env`.

TRANSLATED_TARGET_ARCH A sanitized version of `TARGET_ARCH`. This variable is used where the architecture is needed in a value where underscores are not allowed, for example within package filenames. In this case, dash characters replace any underscore characters used in `TARGET_ARCH`.

Do not edit this variable.

TUNE_ARCH The GNU canonical architecture for a specific architecture (i.e. `arm`, `armeb`, `mips`, `mips64`, and so forth). BitBake uses this value to setup configuration.

`TUNE_ARCH` definitions are specific to a given architecture. The definitions can be a single static definition, or can be dynamically adjusted. You can see details for a given CPU family by looking at the architecture's `README` file. For example, the `meta/conf/machine/include/mips/README` file in the Source Directory provides information for `TUNE_ARCH` specific to the `mips` architecture.

`TUNE_ARCH` is tied closely to `TARGET_ARCH`, which defines the target machine's architecture. The BitBake configuration file (`meta/conf/bitbake.conf`) sets `TARGET_ARCH` as follows:

```
TARGET_ARCH = "${TUNE_ARCH}"
```

The following list, which is by no means complete since architectures are configurable, shows supported machine architectures:

```
arm
i586
x86_64
powerpc
powerpc64
mips
mipsel
```

TUNE_ASARGS Specifies architecture-specific assembler flags for the target system. The set of flags is based on the selected tune features. `TUNE_ASARGS` is set using the tune include files, which are typically under `meta/conf/machine/include/` and are influenced through `TUNE_FEATURES`. For example, the `meta/conf/machine/include/x86/arch-x86.inc` file defines the flags for the `x86` architecture as follows:

```
TUNE_ASARGS += "${@bb.utils.contains("TUNE_FEATURES", "mx32", "-x
```

Note

Board Support Packages (BSPs) select the tune. The selected tune, in turn, affects the tune variables themselves (i.e. the tune can supply its own set of flags).

TUNE_CCARGS

Specifies architecture-specific C compiler flags for the target system. The set of flags is based on the selected tune features. TUNE_CCARGS is set using the tune include files, which are typically under meta/conf/machine/include/ and are influenced through TUNE_FEATURES.

Note

Board Support Packages (BSPs) select the tune. The selected tune, in turn, affects the tune variables themselves (i.e. the tune can supply its own set of flags).

TUNE_LDARGS

Specifies architecture-specific linker flags for the target system. The set of flags is based on the selected tune features. TUNE_LDARGS is set using the tune include files, which are typically under meta/conf/machine/include/ and are influenced through TUNE_FEATURES. For example, the meta/conf/machine/include/x86/arch-x86.inc file defines the flags for the x86 architecture as follows:

```
TUNE_LDARGS += "${@bb.utils.contains("TUNE_FEATURES", "mx32", "-m
```

Note

Board Support Packages (BSPs) select the tune. The selected tune, in turn, affects the tune variables themselves (i.e. the tune can supply its own set of flags).

TUNE_FEATURES

Features used to "tune" a compiler for optimal use given a specific processor. The features are defined within the tune files and allow arguments (i.e. TUNE_*ARGS) to be dynamically generated based on the features.

The OpenEmbedded build system verifies the features to be sure they are not conflicting and that they are supported.

The BitBake configuration file (meta/conf/bitbake.conf) defines TUNE_FEATURES as follows:

```
TUNE_FEATURES ??= "${TUNE_FEATURES_tune-${DEFAULTTUNE}}"
```

See the DEFAULTTUNE variable for more information.

TUNE_PKGARCH

The package architecture understood by the packaging system to define the architecture, ABI, and tuning of output packages. The specific tune is defined using the "_tune" override as follows:

```
TUNE_PKGARCH_tune-tune = "tune"
```

These tune-specific package architectures are defined in the machine include files. Here is an example of the "core2-32" tuning as used in the meta/conf/machine/include/tune-core2.inc file:


```
TUNE_PKGARCH_tune-core2-32 = "core2-32"
```

TUNEABI

An underlying Application Binary Interface (ABI) used by a particular tuning in a given toolchain layer. Providers that use prebuilt libraries can use the TUNEABI, TUNEABI_OVERRIDE, and TUNEABI_WHITELIST variables to check compatibility of tunings against their selection of libraries.

If TUNEABI is undefined, then every tuning is allowed. See the sanity class to see how the variable is used.

TUNEABI_OVERRIDE

If set, the OpenEmbedded system ignores the TUNEABI_WHITELIST variable. Providers that use prebuilt libraries can use the TUNEABI_OVERRIDE, TUNEABI_WHITELIST, and TUNEABI variables to check compatibility of a tuning against their selection of libraries.

See the sanity class to see how the variable is used.

TUNEABI_WHITELIST

A whitelist of permissible TUNEABI values. If TUNEABI_WHITELIST is not set, all tunes are allowed. Providers that use prebuilt libraries can use the TUNEABI_WHITELIST, TUNEABI_OVERRIDE, and TUNEABI variables to check compatibility of a tuning against their selection of libraries.

See the sanity class to see how the variable is used.

TUNECONFLICTS[feature]

Specifies CPU or Application Binary Interface (ABI) tuning features that conflict with feature.

Known tuning conflicts are specified in the machine include files in the Source Directory. Here is an example from the meta/conf/machine/include/mips/arch-mips.inc include file that lists the "o32" and "n64" features as conflicting with the "n32" feature:

```
TUNECONFLICTS[n32] = "o32 n64"
```

TUNEVALID[feature]

Specifies a valid CPU or Application Binary Interface (ABI) tuning feature. The specified feature is stored as a flag. Valid features are specified in the machine include files (e.g. meta/conf/machine/include/arm/arch-arm.inc). Here is an example from that file:

```
TUNEVALID[bigendian] = "Enable big-endian mode."
```

See the machine include files in the Source Directory for these features.

U

UBOOT_CONFIG

Configures the UBOOT_MACHINE and can also define IMAGE_FSTYPES for individual cases.

Following is an example from the meta-fsl-arm layer.

```
UBOOT_CONFIG ??= "sd"
UBOOT_CONFIG[sd] = "mx6qsabreauto_config,sdcard"
UBOOT_CONFIG[eimnor] = "mx6qsabreauto_eimnor_config"
UBOOT_CONFIG[nand] = "mx6qsabreauto_nand_config,ubifs"
UBOOT_CONFIG[spinor] = "mx6qsabreauto_spinor_config"
```

	<p>In this example, "sd" is selected as the configuration of the possible four for the UBOOT_MACHINE. The "sd" configuration defines "mx6qsabreauto_config" as the value for UBOOT_MACHINE, while the "sdcard" specifies the IMAGE_FSTYPES to use for the U-boot image.</p> <p>For more information on how the UBOOT_CONFIG is handled, see the uboot-config [http://git.yoctoproject.org/cgit/cgit.cgi/poky/tree/meta/classes/uboot-config.bbclass] class.</p>
UBOOT_ENTRYPOINT	Specifies the entry point for the U-Boot image. During U-Boot image creation, the UBOOT_ENTRYPOINT variable is passed as a command-line parameter to the uboot-mkimage utility.
UBOOT_LOADADDRESS	Specifies the load address for the U-Boot image. During U-Boot image creation, the UBOOT_LOADADDRESS variable is passed as a command-line parameter to the uboot-mkimage utility.
UBOOT_LOCALVERSION	<p>Appends a string to the name of the local version of the U-Boot image. For example, assuming the version of the U-Boot image built was "2013.10, the full version string reported by U-Boot would be "2013.10-yocto" given the following statement:</p> <pre>UBOOT_LOCALVERSION = "-yocto"</pre>
UBOOT_MACHINE	<p>Specifies the value passed on the make command line when building a U-Boot image. The value indicates the target platform configuration. You typically set this variable from the machine configuration file (i.e. conf/machine/machine_name.conf).</p> <p>Please see the "Selection of Processor Architecture and Board Type" section in the U-Boot README for valid values for this variable.</p>
UBOOT_MAKE_TARGET	Specifies the target called in the Makefile. The default target is "all".
UBOOT_SUFFIX	<p>Points to the generated U-Boot extension. For example, u-boot.sb has a .sb extension.</p> <p>The default U-Boot extension is .bin</p>
UBOOT_TARGET	Specifies the target used for building U-Boot. The target is passed directly as part of the "make" command (e.g. SPL and AIS). If you do not specifically set this variable, the OpenEmbedded build process passes and uses "all" for the target during the U-Boot building process.
UNKNOWN_CONFIGURE_WHITELIST	<p>Specifies a list of options that, if reported by the configure script as being invalid, should not generate a warning during the do_configure task. Normally, invalid configure options are simply not passed to the configure script (e.g. should be removed from EXTRA_OECONF or PACKAGECONFIG_CONFARGS). However, common options, for example, exist that are passed to all configure scripts at a class level that might not be valid for some configure scripts. It follows that no benefit exists in seeing a warning about these options. For these cases, the options are added to UNKNOWN_CONFIGURE_WHITELIST.</p> <p>The configure arguments check that uses UNKNOWN_CONFIGURE_WHITELIST is part of the insane class and is only enabled if the recipe inherits the autotools class.</p>
UPDATERCPN	For recipes inheriting the update-rc.d class, UPDATERCPN specifies the package that contains the initscript that is enabled.

The default value is "\${PN}". Given that almost all recipes that install initscripts package them in the main package for the recipe, you rarely need to set this variable in individual recipes.

UPSTREAM_CHECK_GITTAGREGEX You can perform a per-recipe check for what the latest upstream source code version is by calling `bitbake -c checkpkg recipe`. If the recipe source code is provided from Git repositories, the OpenEmbedded build system determines the latest upstream version by picking the latest tag from the list of all repository tags.

You can use the `UPSTREAM_CHECK_GITTAGREGEX` variable to provide a regular expression to filter only the relevant tags should the default filter not work correctly.

```
UPSTREAM_CHECK_GITTAGREGEX = "git_tag_regex"
```

UPSTREAM_CHECK_REGEX Use the `UPSTREAM_CHECK_REGEX` variable to specify a different regular expression instead of the default one when the package checking system is parsing the page found using `UPSTREAM_CHECK_URI`.

```
UPSTREAM_CHECK_REGEX = "package_regex"
```

UPSTREAM_CHECK_URI You can perform a per-recipe check for what the latest upstream source code version is by calling `bitbake -c checkpkg recipe`. If the source code is provided from tarballs, the latest version is determined by fetching the directory listing where the tarball is and attempting to find a later tarball. When this approach does not work, you can use `UPSTREAM_CHECK_URI` to provide a different URI that contains the link to the latest tarball.

```
UPSTREAM_CHECK_URI = "recipe_url"
```

USE_DEVFS Determines if `devtmpfs` is used for `/dev` population. The default value used for `USE_DEVFS` is "1" when no value is specifically set. Typically, you would set `USE_DEVFS` to "0" for a statically populated `/dev` directory.

See the "Selecting a Device Manager [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#selecting-dev-manager>]" section in the Yocto Project Development Tasks Manual for information on how to use this variable.

USE_VT When using `SysVinit` [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#new-recipe-enabling-system-services>], determines whether or not to run a `getty` [http://en.wikipedia.org/wiki/Getty_%28Unix%29] on any virtual terminals in order to enable logging in through those terminals.

The default value used for `USE_VT` is "1" when no default value is specifically set. Typically, you would set `USE_VT` to "0" in the machine configuration file for machines that do not have a graphical display attached and therefore do not need virtual terminal functionality.

USER_CLASSES A list of classes to globally inherit. These classes are used by the OpenEmbedded build system to enable extra features (e.g. `buildstats`, `image-mklibs`, and so forth).

The default list is set in your `local.conf` file:

```
USER_CLASSES ?= "buildstats image-mklibs image-prelink"
```

For more information, see `meta-poky/conf/local.conf.sample` in the Source Directory.

USERADD_ERROR_DYNAMIC If set to "error", forces the OpenEmbedded build system to produce an error if the user identification (uid) and group identification (gid) values are not defined in `files/passwd` and `files/group` files. If set to "warn", a warning will be issued instead.

The default behavior for the build system is to dynamically apply uid and gid values. Consequently, the `USERADD_ERROR_DYNAMIC` variable is by default not set. If you plan on using statically assigned gid and uid values, you should set the `USERADD_ERROR_DYNAMIC` variable in your `local.conf` file as follows:

```
USERADD_ERROR_DYNAMIC = "error"
```

Overriding the default behavior implies you are going to also take steps to set static uid and gid values through use of the `USERADDEXTENSION`, `USERADD_UID_TABLES`, and `USERADD_GID_TABLES` variables.

USERADD_GID_TABLES Specifies a password file to use for obtaining static group identification (gid) values when the OpenEmbedded build system adds a group to the system during package installation.

When applying static group identification (gid) values, the OpenEmbedded build system looks in `BBPATH` for a `files/group` file and then applies those uid values. Set the variable as follows in your `local.conf` file:

```
USERADD_GID_TABLES = "files/group"
```

Note

Setting the `USERADDEXTENSION` variable to "useradd-staticids" causes the build system to use static gid values.

USERADD_PACKAGES When inheriting the `useradd` class, this variable specifies the individual packages within the recipe that require users and/or groups to be added.

You must set this variable if the recipe inherits the class. For example, the following enables adding a user for the main package in a recipe:

```
USERADD_PACKAGES = "${PN}"
```

Note

It follows that if you are going to use the `USERADD_PACKAGES` variable, you need to set one or more of the `USERADD_PARAM`, `GROUPADD_PARAM`, or `GROUPMEMS_PARAM` variables.

USERADD_PARAM When inheriting the `useradd` class, this variable specifies for a package what parameters should pass to the `useradd` command if you add a user to the system when the package is installed.

Here is an example from the `dbus` recipe:

```
USERADD_PARAM_${PN} = "--system --home ${localstatedir}/lib/dbus  
--no-create-home --shell /bin/false \  
--user-group messagebus"
```

For information on the standard Linux shell command `useradd`, see <http://linux.die.net/man/8/useradd>.

USERADD_UID_TABLES

Specifies a password file to use for obtaining static user identification (uid) values when the OpenEmbedded build system adds a user to the system during package installation.

When applying static user identification (uid) values, the OpenEmbedded build system looks in `BBPATH` for a `files/passwd` file and then applies those uid values. Set the variable as follows in your `local.conf` file:

```
USERADD_UID_TABLES = "files/passwd"
```

Note

Setting the `USERADDEXTENSION` variable to `"useradd-staticids"` causes the build system to use static uid values.

USERADDEXTENSION

When set to `"useradd-staticids"`, causes the OpenEmbedded build system to base all user and group additions on a static `passwd` and group files found in `BBPATH`.

To use static user identification (uid) and group identification (gid) values, set the variable as follows in your `local.conf` file:

```
USERADDEXTENSION = "useradd-staticids"
```

Note

Setting this variable to use static uid and gid values causes the OpenEmbedded build system to employ the `useradd-staticids` class.

If you use static uid and gid information, you must also specify the `files/passwd` and `files/group` files by setting the `USERADD_UID_TABLES` and `USERADD_GID_TABLES` variables. Additionally, you should also set the `USERADD_ERROR_DYNAMIC` variable.

V

VOLATILE_LOG_DIR

Specifies the persistence of the target's `/var/log` directory, which is used to house postinstall target log files.

By default, `VOLATILE_LOG_DIR` is set to `"yes"`, which means the file is not persistent. You can override this setting by setting the variable to `"no"` to make the log directory persistent.

W

WARN_QA

Specifies the quality assurance checks whose failures are reported as warnings by the OpenEmbedded build system. You set this variable in your distribution configuration file. For a list of the checks you can control with this variable, see the `"insane.bbclass"` section.

WKS_FILE_DEPENDS

When placed in the recipe that builds your image, this variable lists build-time dependencies. The `WKS_FILE_DEPENDS` variable is only applicable when Wic images are active (i.e. when `IMAGE_FSTYPES` contains entries related to Wic). If your recipe does not create Wic images, the variable has no effect.

The `WKS_FILE_DEPENDS` variable is similar to the `DEPENDS` variable. When you use the variable in your recipe that builds the Wic image, dependencies you list in the `WKS_FILE_DEPENDS` variable are added to the `DEPENDS` variable.

With the `WKS_FILE_DEPENDS` variable, you have the possibility to specify a list of additional dependencies (e.g. native tools, bootloaders, and so forth), that are required to build Wic images. Following is an example:

```
WKS_FILE_DEPENDS = "some-native-tool"
```

In the previous example, `some-native-tool` would be replaced with an actual native tool on which the build would depend.

WKS_FILE

Specifies the location of the Wic kickstart file that is used by the OpenEmbedded build system to create a partitioned image (`image.wic`). For information on how to create a partitioned image, see the "Creating Partitioned Images Using Wic [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#creating-partitioned-images-using-wic>]" section in the Yocto Project Development Tasks Manual. For details on the kickstart file format, see the "OpenEmbedded Kickstart (.wks) Reference Chapter.

WORKDIR

The pathname of the work directory in which the OpenEmbedded build system builds a recipe. This directory is located within the `TMPDIR` directory structure and is specific to the recipe being built and the system for which it is being built.

The `WORKDIR` directory is defined as follows:

```
${TMPDIR}/work/${MULTIMACH_TARGET_SYS}/${PN}/${EXTENDPE}${PV}-${P
```

The actual directory depends on several things:

- `TMPDIR`: The top-level build output directory
- `MULTIMACH_TARGET_SYS`: The target system identifier
- `PN`: The recipe name
- `EXTENDPE`: The epoch - (if PE is not specified, which is usually the case for most recipes, then `EXTENDPE` is blank)
- `PV`: The recipe version
- `PR`: The recipe revision

As an example, assume a Source Directory top-level folder name `poky`, a default Build Directory at `poky/build`, and a `qemux86-poky-linux` machine target system. Furthermore, suppose your recipe is named `foo_1.3.0-r0.bb`. In this case, the work directory the build system uses to build the package would be as follows:

```
poky/build/tmp/work/qemux86-poky-linux/foo/1.3.0-r0
```

X

XSERVER

Specifies the packages that should be installed to provide an X server and drivers for the current machine, assuming your image directly includes `packagegroup-core-x11-xserver` or, perhaps indirectly, includes "x11-base" in `IMAGE_FEATURES`.

The default value of XSERVER, if not specified in the machine configuration, is "xserver-xorg xf86-video-fbdev xf86-input-evdev".

Chapter 14. Variable Context

While you can use most variables in almost any context such as `.conf`, `.bbclass`, `.inc`, and `.bb` files, some variables are often associated with a particular locality or context. This chapter describes some common associations.

14.1. Configuration

The following subsections provide lists of variables whose context is configuration: distribution, machine, and local.

14.1.1. Distribution (Distro)

This section lists variables whose configuration context is the distribution, or distro.

- `DISTRO`
- `DISTRO_NAME`
- `DISTRO_VERSION`
- `MAINTAINER`
- `PACKAGE_CLASSES`
- `TARGET_OS`
- `TARGET_FPU`
- `TCMODE`
- `TCLIBC`

14.1.2. Machine

This section lists variables whose configuration context is the machine.

- `TARGET_ARCH`
- `SERIAL_CONSOLES`
- `PACKAGE_EXTRA_ARCHS`
- `IMAGE_FSTYPES`
- `MACHINE_FEATURES`
- `MACHINE_EXTRA_RDEPENDS`
- `MACHINE_EXTRA_RRECOMMENDS`
- `MACHINE_ESSENTIAL_EXTRA_RDEPENDS`
- `MACHINE_ESSENTIAL_EXTRA_RRECOMMENDS`

14.1.3. Local

This section lists variables whose configuration context is the local configuration through the `local.conf` file.

- `DISTRO`
- `MACHINE`
- `DL_DIR`

- BBFILES
- EXTRA_IMAGE_FEATURES
- PACKAGE_CLASSES
- BB_NUMBER_THREADS
- BBINCLUDELOGS
- ENABLE_BINARY_LOCALE_GENERATION

14.2. Recipes

The following subsections provide lists of variables whose context is recipes: required, dependencies, path, and extra build information.

14.2.1. Required

This section lists variables that are required for recipes.

- LICENSE
- LIC_FILES_CHKSUM
- SRC_URI - used in recipes that fetch local or remote files.

14.2.2. Dependencies

This section lists variables that define recipe dependencies.

- DEPENDS
- RDEPENDS
- RRECOMMENDS
- RCONFLICTS
- RREPLACES

14.2.3. Paths

This section lists variables that define recipe paths.

- WORKDIR
- S
- FILES

14.2.4. Extra Build Information

This section lists variables that define extra build information for recipes.

- DEFAULT_PREFERENCE
- EXTRA_OECMAKE
- EXTRA_OECONF
- EXTRA_OEMAKE
- PACKAGECONFIG_CONFARGS
- PACKAGES

Chapter 15. FAQ

15.1. How does Poky differ from OpenEmbedded [<http://www.openembedded.org>]?

The term "Poky" refers to the specific reference build system that the Yocto Project provides. Poky is based on OE-Core and BitBake. Thus, the generic term used here for the build system is the "OpenEmbedded build system." Development in the Yocto Project using Poky is closely tied to OpenEmbedded, with changes always being merged to OE-Core or BitBake first before being pulled back into Poky. This practice benefits both projects immediately.

15.2. My development system does not meet the required Git, tar, and Python versions. In particular, I do not have Python 3.4.0 or greater. Can I still use the Yocto Project?

You can get the required tools on your host development system a couple different ways (i.e. building a tarball or downloading a tarball). See the "Required Git, tar, and Python Versions" section for steps on how to update your build tools.

15.3. How can you claim Poky / OpenEmbedded-Core is stable?

There are three areas that help with stability;

- The Yocto Project team keeps OE-Core small and focused, containing around 830 recipes as opposed to the thousands available in other OpenEmbedded community layers. Keeping it small makes it easy to test and maintain.
- The Yocto Project team runs manual and automated tests using a small, fixed set of reference hardware as well as emulated targets.
- The Yocto Project uses an autobuilder, which provides continuous build and integration tests.

15.4. How do I get support for my board added to the Yocto Project?

Support for an additional board is added by creating a Board Support Package (BSP) layer for it. For more information on how to create a BSP layer, see the "Understanding and Creating Layers [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#understanding-and-creating-layers>]" section in the Yocto Project Development Tasks Manual and the Yocto Project Board Support Package (BSP) Developer's Guide [<http://www.yoctoproject.org/docs/3.0.3/bsp-guide/bsp-guide.html>].

Usually, if the board is not completely exotic, adding support in the Yocto Project is fairly straightforward.

15.5. Are there any products built using the OpenEmbedded build system?

The software running on the Vernier LabQuest [<http://vernier.com/labquest/>] is built using the OpenEmbedded build system. See the Vernier LabQuest [<http://www.vernier.com/products/interfaces/labq/>] website for more information. There are a number of pre-production devices using the OpenEmbedded build system and the Yocto Project team announces them as soon as they are released.

15.6. What does the OpenEmbedded build system produce as output?

Because you can use the same set of recipes to create output of various formats, the output of an OpenEmbedded build depends on how you start it. Usually, the output is a flashable image ready for the target device.

15.7. How do I add my package to the Yocto Project?

To add a package, you need to create a BitBake recipe. For information on how to create a BitBake recipe, see the "Writing a New Recipe [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#new-recipe-writing-a-new-recipe>]" section in the Yocto Project Development Tasks Manual.

15.8. Do I have to reflash my entire board with a new Yocto Project image when recompiling a package?

The OpenEmbedded build system can build packages in various formats such as IPK for OPKG, Debian package (.deb), or RPM. You can then upgrade the packages using the package tools on

the device, much like on a desktop distribution such as Ubuntu or Fedora. However, package management on the target is entirely optional.

- 15.9. I see the error 'chmod: XXXXX new permissions are r-xrwxrwx, not r-xr-xr-x'. What is wrong?

You are probably running the build on an NTFS filesystem. Use ext2, ext3, or ext4 instead.

- 15.10. I see lots of 404 responses for files when the OpenEmbedded build system is trying to download sources. Is something wrong?

Nothing is wrong. The OpenEmbedded build system checks any configured source mirrors before downloading from the upstream sources. The build system does this searching for both source archives and pre-checked out versions of SCM-managed software. These checks help in large installations because it can reduce load on the SCM servers themselves. The address above is one of the default mirrors configured into the build system. Consequently, if an upstream source disappears, the team can place sources there so builds continue to work.

- 15.11. I have machine-specific data in a package for one machine only but the package is being marked as machine-specific in all cases, how do I prevent this?

Set `SRC_URI_OVERRIDES_PACKAGE_ARCH = "0"` in the `.bb` file but make sure the package is manually marked as machine-specific for the case that needs it. The code that handles `SRC_URI_OVERRIDES_PACKAGE_ARCH` is in the `meta/classes/base.bbclass` file.

- 15.12. I'm behind a firewall and need to use a proxy server. How do I do that?

Most source fetching by the OpenEmbedded build system is done by `wget` and you therefore need to specify the proxy settings in a `.wgetrc` file, which can be in your home directory if you are a single user or can be in `/usr/local/etc/wgetrc` as a global user file.

Following is the applicable code for setting various proxy types in the `.wgetrc` file. By default, these settings are disabled with comments. To use them, remove the comments:

```
# You can set the default proxies for Wget to use for http, https, and ftp.
# They will override the value in the environment.
#https_proxy = http://proxy.yoyodyne.com:18023/
#http_proxy = http://proxy.yoyodyne.com:18023/
#ftp_proxy = http://proxy.yoyodyne.com:18023/

# If you do not want to use proxy at all, set this to off.
#use_proxy = on
```

The Yocto Project also includes a `meta-poky/conf/site.conf.sample` file that shows how to configure CVS and Git proxy servers if needed. For more information on setting up various proxy types and configuring proxy servers, see the "Working Behind a Network Proxy [https://wiki.yoctoproject.org/wiki/Working_Behind_a_Network_Proxy]" Wiki page.

- 15.13. What's the difference between `target` and `target-native`?

The `*-native` targets are designed to run on the system being used for the build. These are usually tools that are needed to assist the build in some way such as `quilt-native`, which is used to apply patches. The non-native version is the one that runs on the target device.

- 15.14. I'm seeing random build failures. Help?!

If the same build is failing in totally different and random ways, the most likely explanation is:

- The hardware you are running the build on has some problem.
- You are running the build under virtualization, in which case the virtualization probably has bugs.

The OpenEmbedded build system processes a massive amount of data that causes lots of network, disk and CPU activity and is sensitive to even single-bit failures in any of these areas. True random failures have always been traced back to hardware or virtualization issues.

15.15. When I try to build a native recipe, the build fails with `iconv.h` problems.

If you get an error message that indicates GNU libiconv is not in use but `iconv.h` has been included from libiconv, you need to check to see if you have a previously installed version of the header file in `/usr/local/include`.

```
#error GNU libiconv not in use but included iconv.h is from libiconv
```

If you find a previously installed file, you should either uninstall it or temporarily rename it and try the build again.

This issue is just a single manifestation of "system leakage" issues caused when the OpenEmbedded build system finds and uses previously installed files during a native build. This type of issue might not be limited to `iconv.h`. Be sure that leakage cannot occur from `/usr/local/include` and `/opt` locations.

15.16. What do we need to ship for license compliance?

This is a difficult question and you need to consult your lawyer for the answer for your specific case. It is worth bearing in mind that for GPL compliance, there needs to be enough information shipped to allow someone else to rebuild and produce the same end result you are shipping. This means sharing the source code, any patches applied to it, and also any configuration information about how that package was configured and built.

You can find more information on licensing in the "Licensing [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html#licensing>]" section in the Yocto Project Overview and Concepts Manual and also in the "Maintaining Open Source License Compliance During Your Product's Lifecycle [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#maintaining-open-source-license-compliance-during-your-products-lifecycle>]" section in the Yocto Project Development Tasks Manual.

15.17. How do I disable the cursor on my touchscreen device?

You need to create a form factor file as described in the "Miscellaneous BSP-Specific Recipe Files [<http://www.yoctoproject.org/docs/3.0.3/bsp-guide/bsp-guide.html#bsp-filelayout-misc-recipes>]" section in the Yocto Project Board Support Packages (BSP) Developer's Guide. Set the `HAVE_TOUCHSCREEN` variable equal to one as follows:

```
HAVE_TOUCHSCREEN=1
```

15.18. How do I make sure connected network interfaces are brought up by default?

The default interfaces file provided by the netbase recipe does not automatically bring up network interfaces. Therefore, you will need to add a BSP-specific netbase that includes an interfaces file. See the "Miscellaneous BSP-Specific Recipe Files [<http://www.yoctoproject.org/docs/3.0.3/bsp-guide/bsp-guide.html#bsp-filelayout-misc-recipes>]" section in the Yocto Project Board Support Packages (BSP) Developer's Guide for information on creating these types of miscellaneous recipe files.

For example, add the following files to your layer:

```
meta-MACHINE/recipes-bsp/netbase/netbase/MACHINE/interfaces
meta-MACHINE/recipes-bsp/netbase/netbase_5.0.bbappend
```

15.19. How do I create images with more free space?

By default, the OpenEmbedded build system creates images that are 1.3 times the size of the populated root filesystem. To affect the image size, you need to set various configurations:

- **Image Size:** The OpenEmbedded build system uses the `IMAGE_R00TFS_SIZE` variable to define the size of the image in Kbytes. The build system determines the size by taking into account

the initial root filesystem size before any modifications such as requested size for the image and any requested additional free disk space to be added to the image.

- **Overhead:** Use the `IMAGE_OVERHEAD_FACTOR` variable to define the multiplier that the build system applies to the initial image size, which is 1.3 by default.
- **Additional Free Space:** Use the `IMAGE_ROOTFS_EXTRA_SPACE` variable to add additional free space to the image. The build system adds this space to the image after it determines its `IMAGE_ROOTFS_SIZE`.

15.20. Why don't you support directories with spaces in the pathnames?

The Yocto Project team has tried to do this before but too many of the tools the OpenEmbedded build system depends on, such as `autoconf`, break when they find spaces in pathnames. Until that situation changes, the team will not support spaces in pathnames.

15.21. How do I use an external toolchain?

The toolchain configuration is very flexible and customizable. It is primarily controlled with the `TCMODE` variable. This variable controls which `tcmode-*.inc` file to include from the `meta/conf/distro/include` directory within the Source Directory.

The default value of `TCMODE` is "default", which tells the OpenEmbedded build system to use its internally built toolchain (i.e. `tcmode-default.inc`). However, other patterns are accepted. In particular, "external-*" refers to external toolchains. One example is the Sourcery G++ Toolchain. The support for this toolchain resides in the separate meta-sourcery layer at <http://github.com/MentorEmbedded/meta-sourcery/>.

In addition to the toolchain configuration, you also need a corresponding toolchain recipe file. This recipe file needs to package up any pre-built objects in the toolchain such as `libgcc`, `libstdc++`, any locales, and `libc`.

15.22. How does the OpenEmbedded build system obtain source code and will it work behind my firewall or proxy server?

The way the build system obtains source code is highly configurable. You can setup the build system to get source code in most environments if HTTP transport is available.

When the build system searches for source code, it first tries the local download directory. If that location fails, Poky tries `PREMIRRORS`, the upstream source, and then `MIRRORS` in that order.

Assuming your distribution is "poky", the OpenEmbedded build system uses the Yocto Project source `PREMIRRORS` by default for SCM-based sources, upstreams for normal tarballs, and then falls back to a number of other mirrors including the Yocto Project source mirror if those fail.

As an example, you could add a specific server for the build system to attempt before any others by adding something like the following to the `local.conf` configuration file:

```
PREMIRRORS_prepend = "\
git://.*/* http://www.yoctoproject.org/sources/ \n \
ftp://.*/* http://www.yoctoproject.org/sources/ \n \
http://.*/* http://www.yoctoproject.org/sources/ \n \
https://.*/* http://www.yoctoproject.org/sources/ \n"
```

These changes cause the build system to intercept Git, FTP, HTTP, and HTTPS requests and direct them to the `http://sources` mirror. You can use `file://` URLs to point to local directories or network shares as well.

Aside from the previous technique, these options also exist:

```
BB_NO_NETWORK = "1"
```

This statement tells BitBake to issue an error instead of trying to access the Internet. This technique is useful if you want to ensure code builds only from local sources.

Here is another technique:

```
BB_FETCH_PREMIRRORONLY = "1"
```

This statement limits the build system to pulling source from the PREMIRRORS only. Again, this technique is useful for reproducing builds.

Here is another technique:

```
BB_GENERATE_MIRROR_TARBALLS = "1"
```

This statement tells the build system to generate mirror tarballs. This technique is useful if you want to create a mirror server. If not, however, the technique can simply waste time during the build.

Finally, consider an example where you are behind an HTTP-only firewall. You could make the following changes to the `local.conf` configuration file as long as the PREMIRRORS server is current:

```
PREMIRRORS_prepend = "\
ftp://.*/* http://www.yoctoproject.org/sources/ \n \
http://.*/* http://www.yoctoproject.org/sources/ \n \
https://.*/* http://www.yoctoproject.org/sources/ \n"
BB_FETCH_PREMIRRORONLY = "1"
```

These changes would cause the build system to successfully fetch source over HTTP and any network accesses to anything other than the PREMIRRORS would fail.

The build system also honors the standard shell environment variables `http_proxy`, `ftp_proxy`, `https_proxy`, and `all_proxy` to redirect requests through proxy servers.

Note

You can find more information on the "Working Behind a Network Proxy [https://wiki.yoctoproject.org/wiki/Working_Behind_a_Network_Proxy]" Wiki page.

15.23.Can I get rid of build output so I can start over?

Yes - you can easily do this. When you use BitBake to build an image, all the build output goes into the directory created when you run the build environment setup script (i.e. `oe-init-build-env`). By default, this Build Directory is named `build` but can be named anything you want.

Within the Build Directory, is the `tmp` directory. To remove all the build output yet preserve any source code or downloaded files from previous builds, simply remove the `tmp` directory.

15.24.Why do `${bindir}` and `${libdir}` have strange values for -native recipes?

Executables and libraries might need to be used from a directory other than the directory into which they were initially installed. Complicating this situation is the fact that sometimes these executables and libraries are compiled with the expectation of being run from that initial installation target directory. If this is the case, moving them causes problems.

This scenario is a fundamental problem for package maintainers of mainstream Linux distributions as well as for the OpenEmbedded build system. As such, a well-established solution exists. Makefiles, Autotools configuration scripts, and other build systems are expected to respect environment variables such as `bindir`, `libdir`, and `sysconfdir` that indicate where executables, libraries, and data reside when a program is actually run. They are also expected to respect a `DESTDIR` environment variable, which is prepended to all the other variables when the build system actually installs the files. It is understood that the program does not actually run from within `DESTDIR`.

When the OpenEmbedded build system uses a recipe to build a target-architecture program (i.e. one that is intended for inclusion on the image being built), that program eventually runs from the root file system of that image. Thus, the build system provides a value of `"/usr/bin"` for `bindir`, a value of `"/usr/lib"` for `libdir`, and so forth.

Meanwhile, `DESTDIR` is a path within the Build Directory. However, when the recipe builds a native program (i.e. one that is intended to run on the build machine), that program is never installed directly to the build machine's root file system. Consequently, the build system uses paths within the Build Directory for `DESTDIR`, `bindir` and related variables. To better understand this, consider the following two paths where the first is relatively normal and the second is not:

Note

Due to these lengthy examples, the paths are artificially broken across lines for readability.

```
/home/maxtothemax/poky-bootchart2/build/tmp/work/i586-poky-linux/zlib/  
1.2.8-r0/sysroot-destdir/usr/bin
```

```
/home/maxtothemax/poky-bootchart2/build/tmp/work/x86_64-linux/  
zlib-native/1.2.8-r0/sysroot-destdir/home/maxtothemax/poky-bootchart2/  
build/tmp/sysroots/x86_64-linux/usr/bin
```

Even if the paths look unusual, they both are correct - the first for a target and the second for a native recipe. These paths are a consequence of the `DESTDIR` mechanism and while they appear strange, they are correct and in practice very effective.

- 15.25. The files provided by my `*-native` recipe do not appear to be available to other recipes. Files are missing from the native `sysroot`, my recipe is installing to the wrong place, or I am getting permissions errors during the `do_install` task in my recipe! What is wrong?

This situation results when a build system does not recognize the environment variables supplied to it by BitBake. The incident that prompted this FAQ entry involved a Makefile that used an environment variable named `BINDIR` instead of the more standard variable `bindir`. The makefile's hardcoded default value of `"/usr/bin"` worked most of the time, but not for the recipe's `-native` variant. For another example, permissions errors might be caused by a Makefile that ignores `DESTDIR` or uses a different name for that environment variable. Check the the build system to see if these kinds of issues exist.

Chapter 16. Contributions and Additional Information

16.1. Introduction

The Yocto Project team is happy for people to experiment with the Yocto Project. A number of places exist to find help if you run into difficulties or find bugs. This presents information about contributing and participating in the Yocto Project.

16.2. Contributions

The Yocto Project gladly accepts contributions. You can submit changes to the project either by creating and sending pull requests, or by submitting patches through email. For information on how to do both as well as information on how to identify the maintainer for each area of code, see the "Submitting a Change to the Yocto Project [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#how-to-submit-a-change>]" section in the Yocto Project Development Tasks Manual.

16.3. Yocto Project Bugzilla

The Yocto Project uses its own implementation of Bugzilla [<http://bugzilla.yoctoproject.org>] to track defects (bugs). Implementations of Bugzilla work well for group development because they track bugs and code changes, can be used to communicate changes and problems with developers, can be used to submit and review patches, and can be used to manage quality assurance.

Sometimes it is helpful to submit, investigate, or track a bug against the Yocto Project itself (e.g. when discovering an issue with some component of the build system that acts contrary to the documentation or your expectations).

A general procedure and guidelines exist for when you use Bugzilla to submit a bug. For information on how to use Bugzilla to submit a bug against the Yocto Project, see the following:

- The "Submitting a Defect Against the Yocto Project [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html#submitting-a-defect-against-the-yocto-project>]" section in the Yocto Project Development Tasks Manual.
- The Yocto Project Bugzilla wiki page [https://wiki.yoctoproject.org/wiki/Bugzilla_Configuration_and_Bug_Tracking]

For information on Bugzilla in general, see <http://www.bugzilla.org/about/>.

16.4. Mailing lists

A number of mailing lists maintained by the Yocto Project exist as well as related OpenEmbedded mailing lists for discussion, patch submission and announcements. To subscribe to one of the following mailing lists, click on the appropriate URL in the following list and follow the instructions:

- <http://lists.yoctoproject.org/listinfo/yocto> - General Yocto Project discussion mailing list.
- <http://lists.openembedded.org/mailman/listinfo/openembedded-core> - Discussion mailing list about OpenEmbedded-Core (the core metadata).
- <http://lists.openembedded.org/mailman/listinfo/openembedded-devel> - Discussion mailing list about OpenEmbedded.
- <http://lists.openembedded.org/mailman/listinfo/bitbake-devel> - Discussion mailing list about the BitBake build tool.
- <http://lists.yoctoproject.org/listinfo/poky> - Discussion mailing list about Poky.
- <http://lists.yoctoproject.org/listinfo/yocto-announce> - Mailing list to receive official Yocto Project release and milestone announcements.

For more Yocto Project-related mailing lists, see the Yocto Project Website [<http://www.yoctoproject.org>].

16.5. Internet Relay Chat (IRC)

Two IRC channels on freenode are available for the Yocto Project and Poky discussions:

- #yocto
- #poky

16.6. Links and Related Documentation

Here is a list of resources you might find helpful:

- The Yocto Project website [<http://www.yoctoproject.org>]: The home site for the Yocto Project.
- The Yocto Project Main Wiki Page [https://wiki.yoctoproject.org/wiki/Main_Page]: The main wiki page for the Yocto Project. This page contains information about project planning, release engineering, QA & automation, a reference site map, and other resources related to the Yocto Project.
- OpenEmbedded [<http://www.openembedded.org>]: The build system used by the Yocto Project. This project is the upstream, generic, embedded distribution from which the Yocto Project derives its build system (Poky) and to which it contributes.
- BitBake [<http://www.openembedded.org/wiki/BitBake>]: The tool used to process metadata.
- BitBake User Manual [<http://www.yoctoproject.org/docs/3.0.3/bitbake-user-manual/bitbake-user-manual.html>]: A comprehensive guide to the BitBake tool. If you want information on BitBake, see this manual.
- Yocto Project Quick Build [<http://www.yoctoproject.org/docs/3.0.3/brief-yoctoprojectqs/brief-yoctoprojectqs.html>]: This short document lets you experience building an image using the Yocto Project without having to understand any concepts or details.
- Yocto Project Overview and Concepts Manual [<http://www.yoctoproject.org/docs/3.0.3/overview-manual/overview-manual.html>]: This manual provides overview and conceptual information about the Yocto Project.
- Yocto Project Development Tasks Manual [<http://www.yoctoproject.org/docs/3.0.3/dev-manual/dev-manual.html>]: This manual is a "how-to" guide that presents procedures useful to both application and system developers who use the Yocto Project.
- Yocto Project Application Development and the Extensible Software Development Kit (eSDK) [<http://www.yoctoproject.org/docs/3.0.3/sdk-manual/sdk-manual.html>] manual: This guide provides information that lets you get going with the standard or extensible SDK. An SDK, with its cross-development toolchains, allows you to develop projects inside or outside of the Yocto Project environment.
- Yocto Project Board Support Package (BSP) Developer's Guide [<http://www.yoctoproject.org/docs/3.0.3/bsp-guide/bsp-guide.html>]: This guide defines the structure for BSP components. Having a commonly understood structure encourages standardization.
- Yocto Project Linux Kernel Development Manual [<http://www.yoctoproject.org/docs/3.0.3/kernel-dev/kernel-dev.html>]: This manual describes how to work with Linux Yocto kernels as well as provides a bit of conceptual information on the construction of the Yocto Linux kernel tree.
- Yocto Project Reference Manual [<http://www.yoctoproject.org/docs/3.0.3/ref-manual/ref-manual.html>]: This manual provides reference material such as variable, task, and class descriptions.
- Yocto Project Mega-Manual [<http://www.yoctoproject.org/docs/3.0.3/mega-manual/mega-manual.html>]: This manual is simply a single HTML file comprised of the bulk of the Yocto Project manuals. The Mega-Manual primarily exists as a vehicle by which you can easily search for phrases and terms used in the Yocto Project documentation set.

- Yocto Project Profiling and Tracing Manual [<http://www.yoctoproject.org/docs/3.0.3/profile-manual/profile-manual.html>]: This manual presents a set of common and generally useful tracing and profiling schemes along with their applications (as appropriate) to each tool.
- Toaster User Manual [<http://www.yoctoproject.org/docs/3.0.3/toaster-manual/toaster-manual.html>]: This manual introduces and describes how to set up and use Toaster. Toaster is an Application Programming Interface (API) and web-based interface to the OpenEmbedded Build System, which uses BitBake, that reports build information.
- FAQ [<https://wiki.yoctoproject.org/wiki/FAQ>]: A list of commonly asked questions and their answers.
- Release Notes: Features, updates and known issues for the current release of the Yocto Project. To access the Release Notes, go to the Downloads [<http://www.yoctoproject.org/software-overview/downloads/>] page on the Yocto Project website and click on the "RELEASE INFORMATION" link for the appropriate release.
- Bugzilla [<http://bugzilla.yoctoproject.org>]: The bug tracking application the Yocto Project uses. If you find problems with the Yocto Project, you should report them using this application.
- Bugzilla Configuration and Bug Tracking Wiki Page [https://wiki.yoctoproject.org/wiki/Bugzilla_Configuration_and_Bug_Tracking]: Information on how to get set up and use the Yocto Project implementation of Bugzilla for logging and tracking Yocto Project defects.
- Internet Relay Chat (IRC): Two IRC channels on freenode are available for Yocto Project and Poky discussions: #yocto and #poky, respectively.
- Quick EMUlator (QEMU) [<http://wiki.qemu.org/Index.html>]: An open-source machine emulator and virtualizer.