



Happy Build with  
OpenEmbedded

tick@0xlab.org

# Happy Build with OpenEmbedded

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`http://0xlab.org/~tick/oe_coscup_demo/`

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# Let's build!



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## Four steps:

- ▶ `git clone git://0xlab.org/oe_coscup_demo/oe_base.git`
- ▶ `cd oe_base`
- ▶ `./run_me_to_setup_whole_environment.sh`
- ▶ `bitbake coscup-0xlab-demo-image`

If build from scratch, for dual core 2.0G intel CPU 2G ram Ununtu 9.04 with 10M/10M network, it takes about 12 hours, and requires about 20GB hard disk space

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- ▶ The build framework for embedded Linux.
- ▶ Support for **many** hardware architectures
- ▶ Multiple releases for those architectures
- ▶ Tools for speeding up the process of recreating the base after changes have been made
- ▶ **Easy** to customize
- ▶ Runs on any Linux distribution
- ▶ Cross-compiles 1000's of packages including GTK+, the X Windows system, Mono, Java, and about anything else you might ever need

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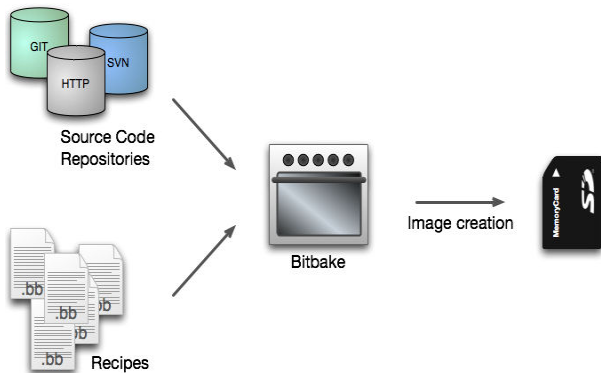
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- ▶ A tool for executing tasks and managing metadata
- ▶ Just like portage in BSD



From <http://pixhawk.ethz.ch>

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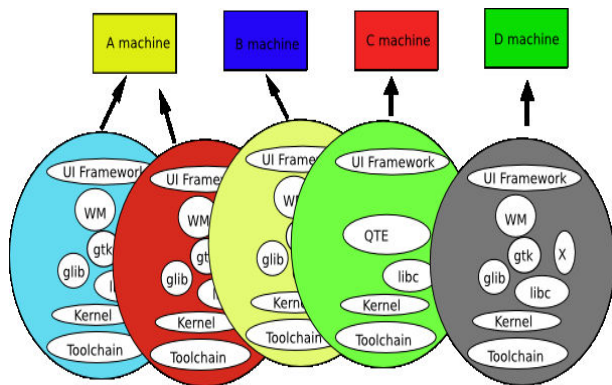
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# Why OE?



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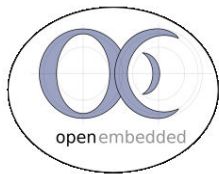
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Automatize reproducing what we/others did.

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# Why NOT OE?



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- ▶ OE is convenient – after you pass the learning curve.

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# Why NOT OE?



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- ▶ OE is convenient – after you pass the learning curve.
- ▶ If you just want one product, and just one distribution. You can live easier.

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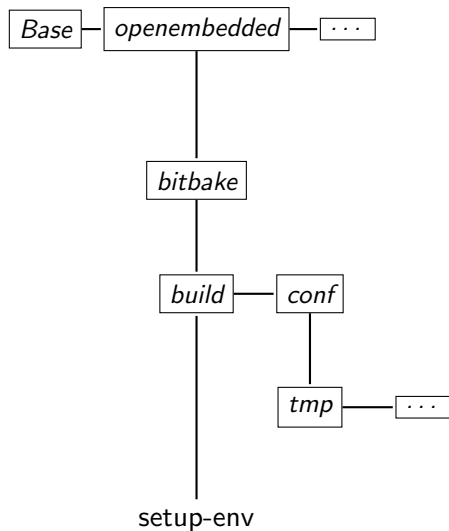
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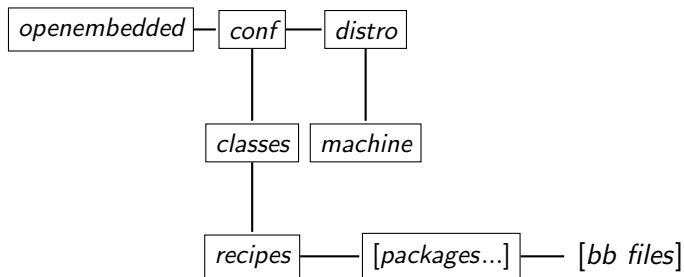
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# OE Tree structure



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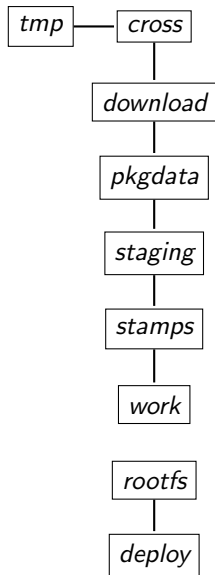
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# TMPDIR structure



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```
export OEDIR = /home/tick/work/oe_coscup
export BBPATH = "${OEDIR}/build : ${OEDIR}/openembedded"
export PYTHONPATH = "${OEDIR}/bitbake/lib"
export PATH = "${OEDIR}/bitbake/bin : ${PATH}"
if(('cat /proc/version | grepUbuntu | wc -l' == 1)); then
    if(('cat /proc/sys/vm/mmap_min_addr' > 0)); then
        echo0 | sudotee/proc/sys/vm/mmap_min_addr
    fi
fi
```

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```
MACHINE = " beagleboard"  
DISTRO = " angstrom - 2008.1"  
BUILD_ARCH = " i686"  
#INHERIT += " rm_work"  
PARALLEL_MAKE = " -j2"  
BB_NUMBER_THREADS = " 2"  
TMPDIR = " /home/tick/OE/build/tmp"  
BBFILES := " /home/tick/OE/openembedded/recipes/ * / * .bb"
```

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## ▶ Overwrite<sup>1</sup>

- ▶ :=
- ▶ +=
- ▶ =+
- ▶ .=
- ▶ =.

## ▶ Tasks do\_xxx

## ▶ File download, supports: local file, CVS, Subversion (SVN), http, https, git

- ▶ SRC\_URI = "file://relativefile.patch"
- ▶ SRC\_URI =  
"cvs://CVSROOT;module=mymodule;tag=some-version;method=ext"
- ▶ SRC\_URI = "http://oe.handhelds.org/not\_there.aac;md5sum=12343"
- ▶ SRC\_URI = "svn://svn.oe.handhelds.org/svn;module=vip;proto=http;rev=667"
- ▶ SRC\_URI = "git://git.oe.handhelds.org/git/vip.git;protocol=http"

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<sup>1</sup><http://bitbake.berlios.de/manual/>

- ▶ include
- ▶ inherit

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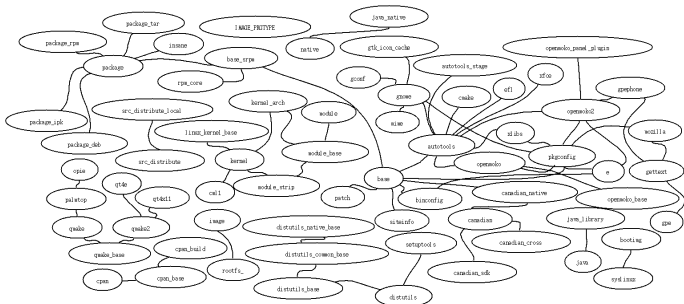
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- ▶ A class for what target type of the bb file is.



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*[PROJECT NAME]\_[VERSION|SCM].bb*

For example:

firefox\_3.0.8.bb

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- ▶ **DESCRIPTION** : the description of target package project
- ▶ **LICENSE** : License of target package project
- ▶ **SECTION** : which category of this project
- ▶ **HOMEPAGE** : The web site of target project
- ▶ **RDEPENDS** : The dependency of target project on target device (runtime dependency)
- ▶ **DEPENDS** : The compile time dependency of target project on build host
- ▶ **EXTRA\_OECONF** : The configure flag for target project
- ▶ **S** : The source directory of this project after downloade
- ▶ **D** : The destination directory of this project when packaging
- ▶ **PV** : Package Version (from source) <sup>2</sup>
- ▶ **PN** : Package name (for package manager)
- ▶ **PR** : Package release number (for build system, and package manager)
- ▶ **PE** : Package emergency (for downgrade, or serious bug fix)
- ▶ **FILE\_XXXX** : Packaging the following file into package PROJECT-XXXX
- ▶ **WORDIR** : The directory where the project been built

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<sup>2</sup>[http://wiki.openembedded.net/index.php/Versioning\\_Policy](http://wiki.openembedded.net/index.php/Versioning_Policy)

Grouping packages into tasks for particular purpose.

- ▶ PACKAGES
- ▶ DEPENDS on other projects when build
- ▶ RDEPENDS on other projects when running

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Creating rootfs for partical purpose.  
Images install tasks and packages included, and package  
the whole directory into rootfs image.

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- ▶ OE will follow the depends of project and build whatever depended
- ▶ Deepest first
- ▶ Dependency will be checked iteratively
- ▶ What OE will build for a normal distribution?
  - ▶ Utils for building system
  - ▶ Native toolchain for building stuff
  - ▶ Cross compiler toolchain
  - ▶ packages depended. . .
  - ▶ target package

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- ▶ Adding PR after modifying bb file.
- ▶ Editing conf/distro/include/sane-srcrevs.inc and select preferred version
- ▶ Adding conf/checksums.ini after you trying to download files from internet
- ▶ local.conf will overwrite original conf
- ▶ Remember source the environment before bitbake
- ▶ 'bitbake -c clean xxxx\_package;bitbake xxxx\_package' can make sure the package will be rebuilt

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- ▶ git: <http://cgit.openembedded.org/>
- ▶ irc: [#oe](irc://irc.freenode.net)
- ▶ mailing list: [openembedded-devel@lists.openembedded.org](mailto:openembedded-devel@lists.openembedded.org)

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# How to join?



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- ▶ **Subscribe the mailing list:**  
[http://wiki.openembedded.net/index.php/Mailing\\_lists](http://wiki.openembedded.net/index.php/Mailing_lists)
- ▶ **Reading the policies:**  
<http://wiki.openembedded.net/index.php/Category:Policy>

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- ▶ OE helps us reproduce the procedure of building distributions
- ▶ OE does not simplify development phase, it make the procedure reproducible and automatically
- ▶ Help us integrate packages, distributions, architectures, and machines
- ▶ OE trace the package dependency tree, and build code in sequence from deepest one
- ▶ You can overwrite variables and customize your own package/image
- ▶ It's flexible, and therefore you need to know how to use it more elegantly
- ▶ OE is a powerful resource to creating a new product

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Thank you.

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