Install Gentoo

David Florness

September 12th, 2019
An OS is composed of many parts...
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...and for each part, you have many choices
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  - Linux
    - stable
    - hardened
  - *BSD kernels

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- Init system
  - systemd
  - OpenRC
  - runit
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- **Kernel**
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    - hardened
  - *BSD kernels

- **Init system**
  - systemd
  - OpenRC
  - runit

- **Userland**
  - GNU
  - Musl
  - plan9
you distro makes these decisions for you…
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...unless you use Gentoo
Decisions, decisions

With Gentoo, *you* can decide

- which kernel you use
With Gentoo, *you* can decide

- which kernel you use
- which init system you use
With Gentoo, you can decide
- which kernel you use
- which init system you use
- what specific features of a program want
How does Gentoo manage this?

Gentoo is unique in that it is one of the few source-based distros, which means that every time you request a program be installed, the program's source code is downloaded from the program author's repository and compiled on your machine.
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- This means that every time you request a program be installed, the program’s source code is downloaded from the program author’s repo and compiled on your machine.
If it moves, compile it.
Kernel options

Linux:
gentoo-sources: standard, lightly patched for security updates
ck-sources: Con Kolivas's kernel patch set that is primarily designed to improve system responsiveness and interactivity
git-sources: tracks daily snapshots of the upstream (kernel.org) development kernel tree

*BSD:
Gentoo FreeBSD was a thing and theoretically still works, but it's been mostly abandoned
Kernel options

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- systemd
- OpenRC (very similar to sysvinit, developed by Gentoo)
- runit
Comparison of init systems

This article compares and contrasts init systems. While most of the init systems compared below are available for Gentoo, some (like launchd and SMF) are not.

Available software

<table>
<thead>
<tr>
<th>Feature</th>
<th>sysvinit</th>
<th>OpenRC</th>
<th>upstart</th>
<th>systemd</th>
<th>SMF</th>
<th>launchd</th>
<th>Epoch</th>
<th>finit</th>
<th>runit</th>
<th>BSD rc.d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supported in Gentoo</td>
<td>✔ Yes (default init)</td>
<td>✔ Yes</td>
<td>❌ No</td>
<td>✔ Yes</td>
<td>❌ No</td>
<td>❌ No</td>
<td>✔ Yes</td>
<td>❌ No</td>
<td>✔ Yes</td>
<td>❌ No</td>
</tr>
<tr>
<td>Package / Bug#</td>
<td>sys-args/sysvinit</td>
<td>sys-apps/openrc</td>
<td>bug #498376</td>
<td>sys-apps/systemd</td>
<td>-</td>
<td>-</td>
<td>sys-apps/epoch</td>
<td>-</td>
<td>sys-process/runit</td>
<td>-</td>
</tr>
</tbody>
</table>

In unity-gentoo overlay.

<table>
<thead>
<tr>
<th>Supported platforms</th>
<th>Linux / BSD</th>
<th>Linux + BSD</th>
<th>Linux</th>
<th>Linux</th>
<th>Solaris</th>
<th>MacOSX</th>
<th>Linux</th>
<th>Linux</th>
<th>Linux / BSD / MacOSX</th>
<th>BSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main coding language</td>
<td>C</td>
<td>POSIX shell (+ C)</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>POSIX shell (+ C)</td>
</tr>
<tr>
<td>Main dependencies</td>
<td>-</td>
<td>init (sysv or BSD)</td>
<td>D-Bus</td>
<td>D-Bus</td>
<td>init(sysv?)</td>
<td>-</td>
<td>libc, /bin/sh</td>
<td>?</td>
<td>-</td>
<td>rcorder</td>
</tr>
<tr>
<td>Init script/service format</td>
<td>single config file</td>
<td>shell scripts</td>
<td>config files + shell fragments</td>
<td>config files (ini)</td>
<td>XML (+ shell scripts)</td>
<td>plist</td>
<td>multiple or single .conf</td>
<td>multiple or single .conf</td>
<td>shell scripts</td>
<td>shell scripts</td>
</tr>
</tbody>
</table>
Program-level features

every program has a defined set of “USE flags” that toggle certain features of the program in question.
Configuring USE flags

/etc/portage/package.use

app-editors/emacs threads zlib acl

sys-apps/util-linux static-libs

mail-mta/postfix sasl dovecot-sasl
mail-filter/spamassassin cron
mail-filter/opendkim ldap sasl
USE flags in action

edwargix@antioch ~ $ sudo emerge -a apache

* IMPORTANT: 1 news items need reading for repository 'gentoo'.
* Use eselect news read to view new items.

These are the packages that would be merged, in order:

Calculating dependencies... done!
[ebuild N ] dev-libs/apr-1.6.3-r4 USE="urandom -doc -older-kernels-compatibility (-selinux) -static-libs"
[ebuild N ] app-admin/apache-tools-2.4.39 USE="ssl -libressl"

Would you like to merge these packages? [Yes/No]
Flexibility over package versions

edwargix@antioch ~ $ equery y python

Keywords for dev-lang/python:

<table>
<thead>
<tr>
<th>a</th>
<th>m</th>
<th>dx</th>
<th>68</th>
</tr>
</thead>
<tbody>
<tr>
<td>46</td>
<td>u</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lmrpihmspmpffeusr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pdamapcsxp63aibbasle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h6r66p6cp89srpsspeop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a4m44c4v6ak0hcsddidt0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[I] 2.7.15 | + + + + + + + 0 + + + + + + + ~ ~ ~ | 6 0 2.7 | gentoo
2.7.16 | ~ ~ ~ ~ ~ ~ ~ 0 ~ ~ ~ ~ ~ ~ ~ ~ ~ | 6 0 | gentoo

3.5.5 | + + + + + + + 0 + + + + + + + ~ ~ ~ | 5 0 3.5/3.5m | gentoo
3.5.7 | ~ ~ ~ ~ ~ ~ ~ 0 ~ ~ ~ ~ ~ ~ ~ ~ ~ | 5 0 | gentoo

[I] 3.6.5 | + + + + + + + 0 + + + + + + + ~ ~ ~ | 6 0 3.6/3.6m | gentoo
3.6.8 | ~ ~ ~ ~ ~ ~ ~ 0 ~ ~ ~ ~ ~ ~ ~ ~ ~ | 6 # | gentoo
3.6.9 | ~ ~ ~ ~ ~ ~ ~ 0 ~ ~ ~ ~ ~ ~ ~ ~ ~ | 6 0 | gentoo

3.7.2 | ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ | 6 # 3.7/3.7m | gentoo
3.7.3 | ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ | 7 # | gentoo
3.7.4-r1 | ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ | 7 0 | gentoo
What’s the catch?

- That everything on your Gentoo system needs to be compiled is a double-edged sword

---

1 upgrading your system can take hours to days, depending on your processor’s performance
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  - On the one hand, this gives you utter control over everything

\[1\text{upgrading your system can take hours to days, depending on your processor’s performance}\]
That everything on your Gentoo system needs to be compiled is a double-edged sword

- On the one hand, this gives you utter control over everything
- On the other hand, installing a program is no longer a simple matter. Much more thought and time \(^1\) is required

\(^1\)upgrading your system can take hours to days, depending on your processor’s performance
What’s the catch?

- That everything on your Gentoo system needs to be compiled is a double-edged sword
  - On the one hand, this gives you utter control over everything
  - On the other hand, installing a program is no longer a simple matter. Much more thought and time \(^1\) is required
- oh, and there’s the whole installing thing...

---

\(^1\)upgrading your system can take hours to days, depending on your processor’s performance
JA JA JA! I finally installed you.
Finally!
Steps from the Gentoo AMD64 handbook:

1. About the Gentoo Linux installation
2. Choosing the right installation medium
3. Configuring the network
4. Preparing the disks
5. Installing the Gentoo installation files
6. Installing the Gentoo base system
7. Configuring the Linux kernel
8. Configuring the system
9. Installing system tools
10. Configuring the bootloader
11. Finalizing the installation
Compiling your Kernel

This is without question the hardest part, and intimidates many, particularly because you need to decide what bits of the kernel you need to utilize with your hardware, which parts should be builtin and which should be modules.

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Enabling Kernel features

-.config - Linux/x86 4.19.52-gentoo Kernel Configuration
- Networking support - Networking options

Networking options

Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < > module capable

[ ] PF_KEY MIGRATE
[*] SMC socket protocol family
[ ] XDP sockets
[ ] TCP/IP networking
[*] IP: multicasting
[*] IP: advanced router
[*] FIB TRIE statistics
[*] IP: policy routing
[*] IP: equal cost multipath

<select> < Exit > < Help > < Save > < Load >
ebuilds and eclasses

- used by portage to know how to build packages
- reside in /usr/portage/
ebuilds and eclasses

/usr/portage/net-mail/mu/mu-1.0.ebuild

# Copyright 1999-2018 Gentoo Foundation
# Distributed under the terms of the GNU General Public License v2

EAPI=6

inherit autotools elisp-common

DESCRIPTION="Set of tools to deal with Maildirs, in particular, searching and indexing"
HOMEPAGE="http://www.djcbsoftware.nl/code/mu/
SRC_URI="https://github.com/djcb/mu/archive/v$\{PV\}.tar.gz -> \$\{P\}.tar.gz"

LICENSE="GPL-3"
SLOT="0"
KEYWORDS="-amd64 ~x86"
IUSE="emacs"

# net-mail/mailutils also installes /usr/bin/mu. Block it until somebody
# really wants both installed at the same time.
DEPEND="dev-libs/gmime:2.6
dev-libs/xapian
dev-libs/glib:2
emacs? ( >=virtual/emacs-23 )
!net-mail/mailutils"
RDEPEND="\{DEPEND\}"

SITEFILE="70mu-gentoo.el"
ebuilds and eclasses

/src/ports/net-mail/mu/mu-1.0.ebuild

src_prepare() {
    default
    eautoreconf
}

src_configure() {
    # Todo: Make a guile USE-flag as soon as >=guile-2 is available
    # Note: --disable-silent-rules is included in EAPI-5
    econf --disable-guile \
         --disable-gtk \
         --disable-webkit \
         $(use_enable emacs mu4e)
}

src_install() {
    dobin mu/mu
    dodoc AUTHORS HACKING NEWS NEWS.org TODO README README.org ChangeLog
    if use emacs; then
        elisp-install ${PN} mu4e/*.el mu4e/*.elc
        elisp-site-file-install "${FILES_DIR}/${SITEFILE}"
        doinfo mu4e/mu4e.info
    fi
    # TODO: Add guile man page when guile-2 is available.
    doman man/mu-add.1 man/mu-bookmarks.5 man/mu-cfind.1 man/mu-easy.1 \
        man/mu-extract.1 man/mu-find.1 man/mu-help.1 man/mu-index.1 \
        man/mu-mkdir.1 man/mu-remove.1 man/mu-server.1 man/mu-verify.1 \
        man/mu-view.1 man/mu.1
}
ebuilds and ecclasses

/usr/portage/net-mail/mu/mu-1.0.ebuild

```plaintext
src_test () {
    # Note: Fails with parallel make
    emake -j1 check
}

pkg_postinst() {
    if use emacs; then
        einfo "To use mu4e you need to configure it in your .emacs file"
        einfo "See the manual for more information:"
        einfo "http://www.djcbsoftware.nl/code/mu/mu4e/"
    fi

    elog "If you upgrade from an older major version,"
    elog "then you need to rebuild your mail index."

    use emacs && elisp-site-regen
}

pkg_postrm() {
    use emacs && elisp-site-regen
}
```
I want to show you...

- the Gentoo wiki
- the PulseAudio wiki page
- the Gentoo handbook
- layovers
- Hardened Gentoo
Why tho?

you learn a ton while installing and using Gentoo. Technically your programs run faster and occupy less space on your machine, but...

the real reason is it's FUN.

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- the real reason is it’s *FUN*