

Package Manager Specification

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Chapter 1

Introduction

1.1 Aims and Motivation

This document aims to fully describe the format of an ebuild repository and the ebuilds therein, as well as certain aspects of package manager behaviour required to support such a repository.

This document is *not* designed to be an introduction to ebuild development. Prior knowledge of ebuild creation and an understanding of how the package management system works is assumed; certain less familiar terms are explained in the Glossary in chapter 15.

This document does not specify any user or package manager configuration information.

1.2 Rationale

At present the only definition of what an ebuild can assume about its environment, and the only definition of what is valid in an ebuild, is the source code of the latest Portage release and a general consensus about which features are too new to assume availability. This has several drawbacks: not only is it impossible to change any aspect of Portage behaviour without verifying that nothing in the tree relies upon it, but if a new package manager should appear it becomes impossible to fully support such an ill-defined standard.

This document aims to address both of these concerns by defining almost all aspects of what an ebuild repository looks like, and how an ebuild is allowed to behave. Thus, both Portage and other package managers can change aspects of their behaviour not defined here without worry of incompatibilities with any particular repository.

1.3 Reporting Issues

Issues (inaccuracies, wording problems, omissions etc.) in this document should be reported via Gentoo Bugzilla using product *Gentoo Hosted Projects*, component *PMS/EAPI* and the default assignee. There should be one bug per issue, and one issue per bug.

Patches (in `git format-patch` form if possible) may be submitted either via Bugzilla or to the `gentoo-pms@lists.gentoo.org` mailing list. Patches will be reviewed by the PMS team, who will do one of the following:

- Accept and apply the patch.
- Explain why the patch cannot be applied as-is. The patch may then be updated and resubmitted if appropriate.
- Reject the patch outright.
- Take special action merited by the individual circumstances.

When reporting issues, remember that this document is not the appropriate place for pushing through changes to the tree or the package manager, except where those changes are bugs.

If any issue cannot be resolved by the PMS team, it may be escalated to the Gentoo Council.

1.4 Conventions

Text in `teletype` is used for filenames or variable names. *Italic* text is used for terms with a particular technical meaning in places where there may otherwise be ambiguity.

The term *package manager* is used throughout this document in a broad sense. Although some parts of this document are only relevant to fully featured package managers, many items are equally applicable to tools or other applications that interact with ebuilds or ebuild repositories.

1.5 Acknowledgements

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Chapter 2

EAPIs

2.1 Definition

An EAPI can be thought of as a ‘version’ of this specification to which a package conforms. An EAPI value is a string as per section 3.1.8, and is part of an ebuild’s metadata.

If a package manager encounters a package version with an unrecognised EAPI, it must not attempt to perform any operations upon it. It could, for example, ignore the package version entirely (although this can lead to user confusion), or it could mark the package version as masked. A package manager must not use any metadata generated from a package with an unrecognised EAPI.

The package manager must not attempt to perform any kind of comparison test other than equality upon EAPIs.

EAPIs are also used for profile directories, as described in section 5.2.2.

2.2 Defined EAPIs

The following EAPIs are defined by this specification:

- 0** The ‘original’ base EAPI.
- 1** EAPI ‘1’ contains a number of extensions to EAPI ‘0’.
- 2** EAPI ‘2’ contains a number of extensions to EAPI ‘1’.
- 3** EAPI ‘3’ contains a number of extensions to EAPI ‘2’.
- 4** EAPI ‘4’ contains a number of extensions to EAPI ‘3’.
- 5** EAPI ‘5’ contains a number of extensions to EAPI ‘4’.
- 6** EAPI ‘6’ contains a number of extensions to EAPI ‘5’.
- 7** EAPI ‘7’ contains a number of extensions to EAPI ‘6’.

Except where explicitly noted, everything in this specification applies to all of the above EAPIs.¹

2.3 Reserved EAPIs

- EAPIs whose value consists purely of an integer are reserved for future versions of this specification.
- EAPIs whose value starts with the string `paludis-` are reserved for experimental use by the Paludis package manager.

¹Another unofficial EAPI ‘kdebuild-1’ was a series of extensions to EAPI ‘1’ formerly used by the Gentoo KDE project. Some of its features have been included in EAPI ‘2’ or later.

Chapter 3

Names and Versions

3.1 Restrictions upon Names

No name may be empty. Package managers must not impose fixed upper boundaries upon the length of any name. A package manager should indicate or reject any name that is invalid according to these rules.

3.1.1 Category names

A category name may contain any of the characters [A-Za-z0-9+_.-]. It must not begin with a hyphen, a dot or a plus sign.

Note: A hyphen is *not* required because of the `virtual` category. Usually, however, category names will contain a hyphen.

3.1.2 Package names

A package name may contain any of the characters [A-Za-z0-9+_-]. It must not begin with a hyphen or a plus sign, and must not end in a hyphen followed by anything matching the version syntax described in section 3.2.

Note: A package name does not include the category. The term *qualified package name* is used where a category/package pair is meant.

3.1.3 Slot names

A slot name may contain any of the characters [A-Za-z0-9+_.-]. It must not begin with a hyphen, a dot or a plus sign.

3.1.4 USE flag names

A USE flag name may contain any of the characters [A-Za-z0-9+@_-]. It must begin with an alphanumeric character. Underscores should be considered reserved for `USE_EXPAND`, as described in section 11.1.1.

Note: Usage of the at-sign is deprecated. It was previously required for `LINGUAS`.

3.1.5 Repository names

A repository name may contain any of the characters [A-Za-z0-9_-]. It must not begin with a hyphen. In addition, every repository name must also be a valid package name.

3.1.6 License names

A license name may contain any of the characters [A-Za-z0-9+_.-]. It must not begin with a hyphen, a dot or a plus sign.

3.1.7 Keyword names

A keyword name may contain any of the characters [A-Za-z0-9_-]. It must not begin with a hyphen. In contexts where it makes sense to do so, a keyword name may be prefixed by a tilde or a hyphen. In KEYWORDS, -* is also acceptable as a keyword.

3.1.8 EAPI names

An EAPI name may contain any of the characters [A-Za-z0-9+_.-]. It must not begin with a hyphen, a dot or a plus sign.

3.2 Version Specifications

The package manager must neither impose fixed limits upon the number of version components, nor upon the length of any component. Package managers should indicate or reject any version that is invalid according to the rules below.

A version starts with the number part, which is in the form $[0-9]+(\.[0-9]+)^*$ (an unsigned integer, followed by zero or more dot-prefixed unsigned integers).

This may optionally be followed by one of [a-z] (a lowercase letter).

This may be followed by zero or more of the suffixes `_alpha`, `_beta`, `_pre`, `_rc` or `_p`, each of which may optionally be followed by an unsigned integer. Suffix and integer count as separate version components.

This may optionally be followed by the suffix `-r` followed immediately by an unsigned integer (the “revision number”). If this suffix is not present, it is assumed to be `-r0`.

3.3 Version Comparison

Version specifications are compared component by component, moving from left to right, as detailed in algorithm 3.1 and sub-algorithms. If a sub-algorithm returns a decision, then that is the result of the whole comparison; if it terminates without returning a decision, the process continues from the point from which it was invoked.

3.4 Uniqueness of Versions

No two packages in a given repository may have the same qualified package name and equal versions. For example, a repository may not contain more than one of `foo-bar/baz-1.0.2`, `foo-bar/baz-1.0.2-r0` and `foo-bar/baz-1.000.2`.

Algorithm 3.1: Version comparison top-level logic

- 1: let A and B be the versions to be compared
 - 2: compare numeric components using algorithm 3.2
 - 3: compare letter components using algorithm 3.4
 - 4: compare suffixes using algorithm 3.5
 - 5: compare revision components using algorithm 3.7
 - 6: **return** $A = B$
-

Algorithm 3.2: Version comparison logic for numeric components

- 1: define the notations An_k and Bn_k to mean the k^{th} numeric component of A and B respectively, using 0-based indexing
 - 2: **if** $An_0 > Bn_0$ using integer comparison **then**
 - 3: **return** $A > B$
 - 4: **else if** $An_0 < Bn_0$ using integer comparison **then**
 - 5: **return** $A < B$
 - 6: **end if**
 - 7: let Ann be the number of numeric components of A
 - 8: let Bnn be the number of numeric components of B
 - 9: **for all** i such that $i \geq 1$ and $i < Ann$ and $i < Bnn$, in ascending order **do**
 - 10: compare An_i and Bn_i using algorithm 3.3
 - 11: **end for**
 - 12: **if** $Ann > Bnn$ **then**
 - 13: **return** $A > B$
 - 14: **else if** $Ann < Bnn$ **then**
 - 15: **return** $A < B$
 - 16: **end if**
-

Algorithm 3.3: Version comparison logic for each numeric component after the first

- 1: **if** either An_i or Bn_i has a leading 0 **then**
 - 2: let An'_i be An_i with any trailing 0s removed
 - 3: let Bn'_i be Bn_i with any trailing 0s removed
 - 4: **if** $An'_i > Bn'_i$ using ASCII stringwise comparison **then**
 - 5: **return** $A > B$
 - 6: **else if** $An'_i < Bn'_i$ using ASCII stringwise comparison **then**
 - 7: **return** $A < B$
 - 8: **end if**
 - 9: **else**
 - 10: **if** $An_i > Bn_i$ using integer comparison **then**
 - 11: **return** $A > B$
 - 12: **else if** $An_i < Bn_i$ using integer comparison **then**
 - 13: **return** $A < B$
 - 14: **end if**
 - 15: **end if**
-

Algorithm 3.4: Version comparison logic for letter components

- 1: let Al be the letter component of A if any, otherwise the empty string
 - 2: let Bl be the letter component of B if any, otherwise the empty string
 - 3: **if** $Al > Bl$ using ASCII stringwise comparison **then**
 - 4: **return** $A > B$
 - 5: **else if** $Al < Bl$ using ASCII stringwise comparison **then**
 - 6: **return** $A < B$
 - 7: **end if**
-

Algorithm 3.5: Version comparison logic for suffixes

```

1: define the notations  $As_k$  and  $Bs_k$  to mean the  $k^{\text{th}}$  suffix of  $A$  and  $B$  respectively, using 0-based indexing
2: let  $Asn$  be the number of suffixes of  $A$ 
3: let  $Bsn$  be the number of suffixes of  $B$ 
4: for all  $i$  such that  $i \geq 0$  and  $i < Asn$  and  $i < Bsn$ , in ascending order do
5:   compare  $As_i$  and  $Bs_i$  using algorithm 3.6
6: end for
7: if  $Asn > Bsn$  then
8:   if  $As_{Bsn}$  is of type  $\_p$  then
9:     return  $A > B$ 
10:  else
11:    return  $A < B$ 
12:  end if
13: else if  $Asn < Bsn$  then
14:   if  $Bs_{Asn}$  is of type  $\_p$  then
15:    return  $A < B$ 
16:   else
17:    return  $A > B$ 
18:   end if
19: end if

```

Algorithm 3.6: Version comparison logic for each suffix

```

1: if  $As_i$  and  $Bs_i$  are of the same type ( $\_alpha$  vs  $\_beta$  etc) then
2:   let  $As'_i$  be the integer part of  $As_i$  if any, otherwise 0
3:   let  $Bs'_i$  be the integer part of  $Bs_i$  if any, otherwise 0
4:   if  $As'_i > Bs'_i$ , using integer comparison then
5:     return  $A > B$ 
6:   else if  $As'_i < Bs'_i$ , using integer comparison then
7:     return  $A < B$ 
8:   end if
9: else if the type of  $As_i$  is greater than the type of  $Bs_i$  using the ordering  $\_alpha < \_beta < \_pre < \_rc < \_p$  then
10:  return  $A > B$ 
11: else
12:  return  $A < B$ 
13: end if

```

Algorithm 3.7: Version comparison logic for revision components

```

1: let  $Ar$  be the integer part of the revision component of  $A$  if any, otherwise 0
2: let  $Br$  be the integer part of the revision component of  $B$  if any, otherwise 0
3: if  $Ar > Br$  using integer comparison then
4:   return  $A > B$ 
5: else if  $Ar < Br$  using integer comparison then
6:   return  $A < B$ 
7: end if

```

Chapter 4

Tree Layout

This chapter defines the layout on-disk of an ebuild repository. In all cases below where a file or directory is specified, a symlink to a file or directory is also valid. In this case, the package manager must follow the operating system's semantics for symbolic links and must not behave differently from normal.

4.1 Top Level

An ebuild repository shall occupy one directory on disk, with the following subdirectories:

- One directory per category, whose name shall be the name of the category. The layout of these directories shall be as described in section 4.2.
- A `profiles` directory, described in section 4.4.
- A `licenses` directory (optional), described in section 4.5.
- An `eclass` directory (optional), described in section 4.6.
- A `metadata` directory (optional), described in section 4.7.
- Other optional support files and directories (skeleton ebuilds or `ChangeLogs`, for example) may exist but are not covered by this specification. The package manager must ignore any of these files or directories that it does not recognise.

4.2 Category Directories

Each category provided by the repository (see also: the `profiles/categories` file, section 4.4) shall be contained in one directory, whose name shall be that of the category. Each category directory shall contain:

- A `metadata.xml` file, as described in appendix A. Optional.
- Zero or more package directories, one for each package in the category, as described in section 4.3. The name of the package directory shall be the corresponding package name.

Category directories may contain additional files, whose purpose is not covered by this specification. Additional directories that are not for a package may *not* be present, to avoid conflicts with package name directories; an exception is made for filesystem components whose name starts with a dot, which the package manager must ignore, and for any directory named `CVS`.

It is not required that a directory exists for each category provided by the repository. A category directory that does not exist shall be considered equivalent to an empty category (and by extension, a package manager may treat an empty category as a category that does not exist).

4.3 Package Directories

A package directory contains the following:

- Zero or more ebuilds. These are as described in section 6 and others.
- A `metadata.xml` file, as described in appendix A. Optional only for legacy support.
- A `ChangeLog`, in a format determined by the provider of the repository. Optional.
- A `Manifest` file, whose format is described in [3]. Can be omitted if the file would be empty.
- A `files` directory, containing any support files needed by the ebuilds. Optional.

Any ebuild in a package directory must be named `name-ver.ebuild`, where `name` is the (unqualified) package name, and `ver` is the package's version. Package managers must ignore any ebuild file that does not match these rules.

A package directory that contains no correctly named ebuilds shall be considered a package with no versions. A package with no versions shall be considered equivalent to a package that does not exist (and by extension, a package manager may treat a package that does not exist as a package with no versions).

A package directory may contain other files or directories, whose purpose is not covered by this specification.

4.4 The Profiles Directory

The profiles directory shall contain zero or more profile directories as described in section 5, as well as the following files and directories. In any line-based file, lines beginning with a `#` character are treated as comments, whilst blank lines are ignored. All contents of this directory, with the exception of `repo_name`, are optional.

The profiles directory may contain an `eapi` file. This file, if it exists, must contain a single line with the name of an EAPI. This specifies the EAPI to use when handling the profiles directory; a package manager must not attempt to use any repository whose profiles directory requires an EAPI it does not support. If no `eapi` file is present, EAPI 0 shall be used.

If the repository is not intended to be stand-alone, the contents of these files are to be taken from or merged with the master repository as necessary.

Other files not described by this specification may exist, but may not be relied upon. The package manager must ignore any files in this directory that it does not recognise.

arch.list Contains a list, one entry per line, of permissible values for the ARCH variable, and hence permissible keywords for packages in this repository.

categories Contains a list, one entry per line, of categories provided by this repository.

eapi See above.

info_pkgs Contains a list, one entry per line, of qualified package names. Any package matching one of these is to be listed when a package manager displays a 'system information' listing.

info_vars Contains a list, one entry per line, of profile, configuration, and environment variables which are considered to be of interest. The value of each of these variables may be shown when the package manager displays a 'system information' listing.

package.mask Contains a list, one entry per line, of package dependency specifications (using the directory's EAPI). Any package version matching one of these is considered to be masked, and will not be installed regardless of profile unless it is unmasked by the user configuration.

For EAPIs listed in table 4.1 as supporting it, `package.mask` can be a directory instead of a regular file. Files contained in that directory, unless their name begins with a dot, will be concatenated in order of their filename in the POSIX locale and the result will be processed as if it were a single file. Any subdirectories will be ignored.

PACKAGE-MASK-DIR

Table 4.1: EAPIs supporting a directory for `package.mask`

EAPI	<code>package.mask</code> can be a directory?
0, 1, 2, 3, 4, 5, 6	No
7	Yes

profiles.desc Described below in section 4.4.1.

repo_name Contains, on a single line, the name of this repository. The repository name must conform to section 3.1.5.

thirdpartymirrors Described below in section 4.4.2.

use.desc Contains descriptions of valid global USE flags for this repository. The format is described in section 4.4.3.

use.local.desc Contains descriptions of valid local USE flags for this repository, along with the packages to which they apply. The format is as described in section 4.4.3.

desc/ This directory contains files analogous to `use.desc` for the various `USE_EXPAND` variables. Each file in it is named `<varname>.desc`, where `<varname>` is the variable name, in lowercase, whose possible values the file describes. The format of each file is as for `use.desc`, described in section 4.4.3. The `USE_EXPAND` name is *not* included as a prefix here.

updates/ This directory is described in section 4.4.4.

4.4.1 The `profiles.desc` file

`profiles.desc` is a line-based file, with the standard commenting rules from section 4.4, containing a list of profiles that are valid for use, along with their associated architecture and status. Each line has the format:

```
<keyword> <profile path> <stability>
```

Where:

- `<keyword>` is the default keyword for the profile and the ARCH for which the profile is valid.
- `<profile path>` is the (relative) path from the `profiles` directory to the profile in question.
- `<stability>` indicates the stability of the profile. This may be useful for QA tools, which may wish to display warnings with a reduced severity for some profiles. The values `stable` and `dev` are widely used, but repositories may use other values.

Fields are whitespace-delimited.

4.4.2 The `thirdpartymirrors` file

`thirdpartymirrors` is another simple line-based file, describing the valid mirrors for use with `mirror://` URIs in this repository, and the associated download locations. The format of each line is:

```
<mirror name> <mirror 1> <mirror 2> ... <mirror n>
```

Fields are whitespace-delimited. When parsing a URI of the form `mirror://name/path/filename`, where the `path/` part is optional, the `thirdpartymirrors` file is searched for a line whose first field is `name`. Then the download URIs in the subsequent fields have `path/filename` appended to them to generate the URIs from which a download is attempted.

Each mirror name may appear at most once in a file. Behaviour when a mirror name appears multiple times is undefined. Behaviour when a mirror is defined in terms of another mirror is undefined. A package manager may choose to fetch from all of or a subset of the listed mirrors, and may use an order other than the one described.

The mirror with the name equal to the repository's name (and if the repository has a master, the master's name) may be consulted for all downloads.

4.4.3 use.desc and related files

`use.desc` contains descriptions of every valid global USE flag for this repository. It is a line-based file with the standard rules for comments and blank lines. The format of each line is:

```
<flagname> - <description>
```

`use.local.desc` contains descriptions of every valid local USE flag—those that apply only to a small number of packages, or that have different meanings for different packages. Its format is:

```
<category/package>:<flagname> - <description>
```

Flags must be listed once for each package to which they apply, or if a flag is listed in both `use.desc` and `use.local.desc`, it must be listed once for each package for which its meaning differs from that described in `use.desc`.

4.4.4 The updates directory

The `updates` directory is used to inform the package manager that a package has moved categories, names, or that a version has changed SLOT. It contains one file per quarter year, named `[1-4]Q-[YYYY]` for the first to fourth quarter of a given year, for example `1Q-2004` or `3Q-2006`. The format of each file is again line-based, with each line having one of the following formats:

```
move <qpn1> <qpn2>
slotmove <spec> <slot1> <slot2>
```

The first form, where `qpn1` and `qpn2` are *qualified package names*, instructs the package manager that the package `qpn1` has changed name, category, or both, and is now called `qpn2`.

The second form instructs the package manager that any currently installed package version matching package dependency specification `spec` whose SLOT is set to `slot1` should have it updated to `slot2`.

Any name that has appeared as the origin of a move must not be reused in the future. Any slot that has appeared as the origin of a slot move may not be used by packages matching the `spec` of that slot move in the future.

4.5 The Licenses Directory

The `licenses` directory shall contain copies of the licenses used by packages in the repository. Each file will be named according to the name used in the `LICENSE` variable as described in section 7.3, and will contain the complete text of the license in human-readable form. Plain text format is strongly preferred but not required.

4.6 The Eclass Directory

The `eclass` directory shall contain copies of the eclasses provided by this repository. The format of these files is described in section 10. It may also contain, in their own directory, support files needed by these eclasses.

4.7 The Metadata Directory

The metadata directory contains various repository-level metadata that is not contained in `profiles/`. All contents are optional. In this standard only the `cache` subdirectory is described; other contents are optional but may include security advisories, DTD files for the various XML files used in the repository, and repository timestamps.

4.7.1 The metadata cache

The `metadata/cache` directory may contain a cached form of all important `ebuild` metadata variables. The contents of this directory are described in chapter 14.

Chapter 5

Profiles

5.1 General Principles

Generally, a profile defines information specific to a certain ‘type’ of system—it lies somewhere between repository-level defaults and user configuration in that the information it contains is not necessarily applicable to all machines, but is sufficiently general that it should not be left to the user to configure it. Some parts of the profile can be overridden by user configuration, some only by another profile.

The format of a profile is relatively simple. Each profile is a directory containing any number of the files described in this chapter, and possibly inheriting another profile. The files themselves follow a few basic conventions as regards inheritance and format; these are described in the next section. It may also contain any number of subdirectories containing other profiles.

5.2 Files That Make up a Profile

5.2.1 The parent file

A profile may contain a `parent` file. Each line must contain a relative path to another profile which will be considered as one of this profile’s parents. Any settings from the parent are inherited by this profile, and can be overridden by it. Precise rules for how settings are combined with the parent profile vary between files, and are described below. Parents are handled depth first, left to right, with duplicate parent paths being sourced for every time they are encountered.

It is illegal for a profile’s parent tree to contain cycles. Package manager behaviour upon encountering a cycle is undefined.

This file must not contain comments, blank lines or make use of line continuations.

5.2.2 The `eapi` file

A profile directory may contain an `eapi` file. This file, if it exists, must contain a single line with the name of an EAPI. This specifies the EAPI to use when handling the directory in question; a package manager must not attempt to use any profile using a directory which requires an EAPI it does not support. If no `eapi` file is present, EAPI 0 shall be used. The EAPI is neither inherited via the `parent` file nor in subdirectories.

Table 5.1: EAPIs supporting directories for profile files

EAPI	Supports directories for profile files?
0, 1, 2, 3, 4, 5, 6	No
7	Yes

5.2.3 deprecated

If a profile contains a file named `deprecated`, it is treated as such. The first line of this file should contain the path from the `profiles` directory of the repository to a valid profile that is the recommended upgrade path from this profile. The remainder of the file can contain any text, which may be displayed to users using this profile by the package manager. This file is not inherited—profiles which inherit from a deprecated profile are *not* deprecated.

This file must not contain comments or make use of line continuations.

5.2.4 make.defaults

`make.defaults` is used to define defaults for various environment and configuration variables. This file is unusual in that it is not combined at a file level with the parent—instead, each variable is combined or overridden individually as described in section 5.3.

The file itself is a line-based key-value format. Each line contains a single `VAR="value"` entry, where the value must be double quoted. A variable name must start with one of `a-zA-Z` and may contain `a-zA-Z0-9_` only. Additional syntax, which is a small subset of bash syntax, is allowed as follows:

- Variables to the right of the equals sign in the form `${foo}` or `$foo` are recognised and expanded from variables previously set in this or earlier `make.defaults` files.
- One logical line may be continued over multiple physical lines by escaping the newline with a backslash. A quoted string may be continued over multiple physical lines by either a simple newline or a backslash-escaped newline.
- Backslashes, except for line continuations, are not allowed.

5.2.5 Simple line-based files

These files are a simple one-item-per-line list, which is inherited in the following manner: the parent profile's list is taken, and the current profile's list appended. If any line begins with a hyphen, then any lines previous to it whose contents are equal to the remainder of that line are removed from the list. Once again, blank lines and those beginning with a `#` are discarded.

In EAPIs listed in table 5.1 as supporting directories for profile files, any of the files `package.mask`, `package.use`, `use.*` and `package.use.*` mentioned below can be a directory instead of a regular file. Files contained in that directory, unless their name begins with a dot, will be concatenated in order of their filename in the POSIX locale and the result will be processed as if it were a single file. Any subdirectories will be ignored.

PROFILE-FILE-DIRS

5.2.6 packages

The `packages` file is used to define the 'system set' for this profile. After the above rules for inheritance and comments are applied, its lines must take one of two forms: a package dependency specification prefixed by `*` denotes that it forms part of the system set. A package dependency specification on its own may also appear for legacy reasons, but should be ignored when calculating the system set.

Table 5.2: EAPIs supporting `package.provided` in profiles

EAPI	Supports <code>package.provided</code> ?
0, 1, 2, 3, 4, 5, 6	Optionally
7	No

5.2.7 `packages.build`

The `packages.build` file is used by Gentoo's Catalyst tool to generate stage1 tarballs, and has no relevance to the operation of a package manager. It is thus outside the scope of this document, but is mentioned here for completeness.

5.2.8 `package.mask`

`package.mask` is used to prevent packages from being installed on a given profile. Each line contains one package dependency specification; anything matching this specification will not be installed unless unmasked by the user's configuration. In some EAPIs, `package.mask` can be a directory instead of a regular file as per section 5.2.5.

Note that the `-spec` syntax can be used to remove a mask in a parent profile, but not necessarily a global mask (from `profiles/package.mask`, section 4.4).

Note: Portage currently treats `profiles/package.mask` as being on the leftmost branch of the inherit tree when it comes to `-lines`. This behaviour may not be relied upon.

5.2.9 `package.provided`

`package.provided` is used to tell the package manager that a certain package version should be considered to be provided by the system regardless of whether it is actually installed. Because it has severe adverse effects on USE-based and slot-based dependencies, its use is strongly deprecated and package manager support must be regarded as purely optional. Supported in EAPIs as per table 5.2.

PACKAGE-PROVIDED

5.2.10 `package.use`

The `package.use` file may be used by the package manager to override the default USE flags specified by `make.defaults` on a per package basis. The format is to have a package dependency specification, and then a space delimited list of USE flags to enable. A USE flag in the form of `-flag` indicates that the package should have the USE flag disabled. The package dependency specification is limited to the forms defined by the directory's EAPI. In some EAPIs, `package.use` can be a directory instead of a regular file as per section 5.2.5.

5.2.11 USE masking and forcing

This section covers the eight files `use.mask`, `use.force`, `use.stable.mask`, `use.stable.force`, `package.use.mask`, `package.use.force`, `package.use.stable.mask`, and `package.use.stable.force`. They are described together because they interact in a non-trivial manner. In some EAPIs, these files can be directories instead of regular files as per section 5.2.5.

Simply speaking, `use.mask` and `use.force` are used to say that a given USE flag must never or always, respectively, be enabled when using this profile. `package.use.mask` and `package.use.force` do the same thing on a per-package, or per-version, basis.

In profile directories with an EAPI supporting stable masking, as listed in table 5.3, the same is true for `use.stable.mask`, `use.stable.force`, `package.use.stable.mask` and `package.use`.

STABLEMASK

Table 5.3: Profile directory support for masking/forcing use flags in stable versions only

EAPI	Supports masking/forcing use flags in stable versions?
0, 1, 2, 3, 4	No
5, 6, 7	Yes

`stable.force`. These files, however, only act on packages that are merged due to a stable keyword in the sense of subsection 7.3.2. Thus, these files can be used to restrict the feature set deemed stable in a package.

The precise manner in which the eight files interact is less simple, and is best described in terms of the algorithm used to determine whether a flag is masked for a given package version. This is described in algorithm 5.1.

Algorithm 5.1: USE masking logic

```

1: let masked = false
2: for each profile in the inheritance tree, depth first do
3:   if use.mask contains flag then
4:     let masked = true
5:   else if use.mask contains -flag then
6:     let masked = false
7:   end if
8:   if stable keyword in use then
9:     if use.stable.mask contains flag then
10:      let masked = true
11:    else if use.stable.mask contains -flag then
12:      let masked = false
13:    end if
14:   end if
15:   for each line in package.use.mask, in order, for which the spec matches package do
16:     if line contains flag then
17:       let masked = true
18:     else if line contains -flag then
19:       let masked = false
20:     end if
21:   end for
22:   if stable keyword in use then
23:     for each line in package.use.stable.mask, in order, for which the spec matches package do
24:       if line contains flag then
25:         let masked = true
26:       else if line contains -flag then
27:         let masked = false
28:       end if
29:     end for
30:   end if
31: end for

```

Stable restrictions (“stable keyword in use” in algorithm 5.1) are applied exactly if replacing in KEYWORDS all stable keywords by the corresponding tilde prefixed keywords (see subsection 7.3.2) would result in the package installation being prevented due to the KEYWORDS setting.

The logic for `use.force`, `use.stable.force`, `package.use.force`, and `package.use.stable.force` is identical. If a flag is both masked and forced, the mask is considered to take precedence.

USE_EXPAND values may be forced or masked by using `expand_name_value`.

A package manager may treat ARCH values that are not the current architecture as being masked.

Table 5.4: Profile-defined IUSE injection for EAPIs

EAPI	Supports profile-defined IUSE injection?
0, 1, 2, 3, 4	No
5, 6, 7	Yes

Table 5.5: Profile-defined unsetting of variables in EAPIs

EAPI	Supports ENV_UNSET?
0, 1, 2, 3, 4, 5, 6	No
7	Yes

5.3 Profile Variables

This section documents variables that have special meaning, or special behaviour, when defined in a profile's `make.defaults` file.

5.3.1 Incremental variables

Incremental variables must stack between parent and child profiles in the following manner: Beginning with the highest parent profile, tokenise the variable's value based on whitespace and concatenate the lists. Then, for any token *T* beginning with a hyphen, remove it and any previous tokens whose value is equal to *T* with the hyphen removed, or, if *T* is equal to `-*`, remove all previous values. Note that because of this treatment, the order of tokens in the final result is arbitrary, not necessarily related to the order of tokens in any given profile. The following variables must be treated in this fashion:

- USE
- USE_EXPAND
- USE_EXPAND_HIDDEN
- CONFIG_PROTECT
- CONFIG_PROTECT_MASK

If the package manager supports any EAPI listed in table 5.4 as using profile-defined IUSE injection, the following variables must also be treated incrementally; otherwise, the following variables may or may not be treated incrementally:

- IUSE_IMPLICIT
- USE_EXPAND_IMPLICIT
- USE_EXPAND_UNPREFIXED

If the package manager supports any EAPI listed in table 5.5 as using ENV_UNSET, the following variable must also be treated incrementally; otherwise, it may or may not be treated incrementally:

- ENV_UNSET

Other variables, except where they affect only package-manager-specific functionality (such as Portage's FEATURES variable), must not be treated incrementally—later definitions shall completely override those in parent profiles.

5.3.2 Specific variables and their meanings

The following variables have specific meanings when set in profiles.

ARCH The system's architecture. Must be a value listed in `profiles/arch.list`; see section 4.4 for more information. Must be equal to the primary KEYWORD for this profile.

CONFIG_PROTECT, CONFIG_PROTECT_MASK Contain whitespace-delimited lists used to control the configuration file protection. Described more fully in chapter 13.3.3.

USE Defines the list of default USE flags for this profile. Flags may be added or removed by the user's configuration. USE_EXPAND values must not be specified in this way.

USE_EXPAND Defines a list of variables which are to be treated incrementally and whose contents are to be expanded into the USE variable as passed to ebuilds. See section 11.1.1 for details.

USE_EXPAND_UNPREFIXED Similar to USE_EXPAND, but no prefix is used. If the repository contains any package using an EAPI supporting profile-defined IUSE injection (see table 5.4), this list must contain at least ARCH. See section 11.1.1 for details.

USE_EXPAND_HIDDEN Contains a (possibly empty) subset of names from USE_EXPAND and USE_EXPAND_UNPREFIXED. The package manager may use this set as a hint to avoid displaying uninteresting or unhelpful information to an end user.

USE_EXPAND_IMPLICIT, IUSE_IMPLICIT Used to inject implicit values into IUSE. See section 11.1.1 for details.

ENV_UNSET Contains a whitespace-delimited list of variables that the package manager shall unset. See section 11.1 for details.

In addition, for EAPIs listed in table 5.4 as supporting profile defined IUSE injection, the variables named in USE_EXPAND and USE_EXPAND_UNPREFIXED have special handling as described in section 11.1.1.

Any other variables set in `make.defaults` must be passed on into the ebuild environment as-is, and are not required to be interpreted by the package manager.

Chapter 6

Ebuild File Format

The ebuild file format is in its basic form a subset of the format of a bash script. The interpreter is assumed to be GNU bash, version as listed in table 6.1, or any later version. If possible, the package manager should set the shell's compatibility level to the exact version specified. It must ensure that any such compatibility settings (e. g. the BASH_COMPAT variable) are not exported to external programs.

BASH-VERSION

For EAPIs listed such in table 6.1, the `failglob` option of bash is set in the global scope of ebuilds. If set, failed pattern matches during filename expansion result in an error when the ebuild is being sourced.

FAILGLOB

The file encoding must be UTF-8 with Unix-style newlines. When sourced, the ebuild must define certain variables and functions (see sections 7 and 9 for specific information), and must not call any external programs, write anything to standard output or standard error, or modify the state of the system in any way.

Table 6.1: Bash version and options

EAPI	Bash version	failglob in global scope?
0, 1, 2, 3, 4, 5	3.2	No
6, 7	4.2	Yes

Chapter 7

Ebuild-defined Variables

Note: This section describes variables that may or must be defined by ebuilds. For variables that are passed from the package manager to the ebuild, see section 11.1.

If any of these variables are set to invalid values, or if any of the mandatory variables are undefined, the package manager's behaviour is undefined; ideally, an error in one ebuild should not prevent operations upon other ebuilds or packages.

7.1 Metadata Invariance

All ebuild-defined variables discussed in this chapter must be defined independently of any system, profile or tree dependent data, and must not vary depending upon the ebuild phase. In particular, ebuild metadata can and will be generated on a different system from that upon which the ebuild will be used, and the ebuild must generate identical metadata every time it is used.

Globally defined ebuild variables without a special meaning must similarly not rely upon variable data.

7.2 Mandatory Ebuild-defined Variables

All ebuilds must define at least the following variables:

DESCRIPTION A short human-readable description of the package's purpose. May be defined by an eclass. Must not be empty.

SLOT The package's slot. Must be a valid slot name, as per section 3.1.3. May be defined by an eclass. Must not be empty.

In EAPIs shown in table 8.7 as supporting sub-slots, the **SLOT** variable may contain an optional sub-slot part that follows the regular slot and is delimited by a / character. The sub-slot must be a valid slot name, as per section 3.1.3. The sub-slot is used to represent cases in which an upgrade to a new version of a package with a different sub-slot may require dependent packages to be rebuilt. When the sub-slot part is omitted from the **SLOT** definition, the package is considered to have an implicit sub-slot which is equal to the regular slot.

7.3 Optional Ebuild-defined Variables

Ebuilds may define any of the following variables:

EAPI The EAPI. See below.

Table 7.1: EAPIs supporting IUSE defaults

EAPI	Supports IUSE defaults?
0	No
1, 2, 3, 4, 5, 6, 7	Yes

Table 7.2: EAPIs supporting various ebuild-defined variables

EAPI	Supports PROPERTIES?	Supports REQUIRED_USE?
0, 1, 2, 3	Optionally	No
4, 5, 6, 7	Yes	Yes

HOMEPAGE The URI or URIs for a package’s homepage, including protocols. See section 8 for full syntax.

SRC_URI A list of source URIs for the package. Valid protocols are `http://`, `https://`, `ftp://` and `mirror://` (see section 4.4.2 for mirror behaviour). Fetch restricted packages may include URL parts consisting of just a filename. See section 8 for full syntax.

LICENSE The package’s license. Each text token must be a valid license name, as per section 3.1.6, and must correspond to a tree “licenses/” entry (see section 4.5). See section 8 for full syntax.

KEYWORDS A whitespace separated list of keywords for the ebuild. Each token must be a valid keyword name, as per section 3.1.7. See section 7.3.2 for full syntax.

IUSE The USE flags used by the ebuild. Any eclass that works with USE flags must also set IUSE, listing only the variables used by that eclass. The package manager is responsible for merging these values. See section 11.1.1 for discussion on which values must be listed in this variable.

In EAPIs shown in table 7.1 as supporting IUSE defaults, any use flag name in IUSE may be prefixed by at most one of a plus or a minus sign. If such a prefix is present, the package manager may use it as a suggestion as to the default value of the use flag if no other configuration overrides it.

IUSE-DEFAULTS

REQUIRED_USE Zero or more assertions that must be met by the configuration of USE flags to be valid for this ebuild. See section 8.2.7 for description and section 8 for full syntax. Only in EAPIs listed in table 7.2 as supporting REQUIRED_USE.

REQUIRED-USE

PROPERTIES Zero or more properties for this package. See section 8.2.9 for value meanings and section 8 for full syntax. For EAPIs listed in table 7.2 as having optional support, ebUILds must not rely upon the package manager recognising or understanding this variable in any way.

PROPERTIES

RESTRICT Zero or more behaviour restrictions for this package. See section 8.2.8 for value meanings and section 8 for full syntax.

DEPEND See section 8.

RDEPEND See section 8. For some EAPIs, RDEPEND has special behaviour for its value if unset and when used with an eclass. See section 7.3.3 for details.

PDEPEND See section 8.

BDEPEND See section 8.

7.3.1 EAPI

An empty or unset EAPI value is equivalent to 0. EbUILds must not assume that they will get a particular one of these two values if they are expecting one of these two values.

The package manager must either pre-set the EAPI variable to 0 or ensure that it is unset before sourcing the ebuild for metadata generation. When using the ebuild for other purposes, the package

Table 7.3: EAPIs with RDEPEND=DEPEND default

EAPI	RDEPEND=DEPEND?
0, 1, 2, 3	Yes
4, 5, 6, 7	No

manager must either pre-set EAPI to the value specified by the ebuild's metadata or ensure that it is unset.

If any of these variables are set to invalid values, the package manager's behaviour is undefined; ideally, an error in one ebuild should not prevent operations upon other ebuilds or packages.

If the EAPI is to be specified in an ebuild, the EAPI variable must be assigned to precisely once. The assignment must not be preceded by any lines other than blank lines or those that start with optional whitespace (spaces or tabs) followed by a # character, and the line containing the assignment statement must match the following regular expression:

```
~[ \t]*EAPI=(['"]?)([A-Za-z0-9+_.-]*)\1[ \t]*([\t]#.*)?$
```

The package manager must determine the EAPI of an ebuild by parsing its first non-blank and non-comment line, using the above regular expression. If it matches, the EAPI is the substring matched by the capturing parentheses (0 if empty), otherwise it is 0. For a recognised EAPI, the package manager must make sure that the EAPI value obtained by sourcing the ebuild with bash is identical to the EAPI obtained by parsing. The ebuild must be treated as invalid if these values are different.

7.3.2 Keywords

Keywords are used to indicate levels of stability of a package on a respective architecture arch. The following conventions are used:

- arch: Both the package version and the ebuild are widely tested, known to work and not have any serious issues on the indicated platform. This is referred to as a *stable keyword*.
- ~arch: The package version and the ebuild are believed to work and do not have any known serious bugs, but more testing is required before the package version is considered suitable for obtaining a stable keyword. This is referred to as an *unstable keyword* or a *testing keyword*.
- No keyword: It is not known whether the package will work, or insufficient testing has occurred.
- -arch: The package version will not work on the architecture.

The -* keyword is used to indicate package versions which are not worth trying to test on unlisted architectures.

An empty KEYWORDS variable indicates uncertain functionality on any architecture.

7.3.3 RDEPEND value

In EAPIs listed in table 7.3 as having RDEPEND=DEPEND, if RDEPEND is unset (but not if it is set to an empty string) in an ebuild, when generating metadata the package manager must treat its value as being equal to the value of DEPEND.

RDEPEND-DEPEND

When dealing with eclasses, only values set in the ebuild itself are considered for this behaviour; any DEPEND or RDEPEND set in an eclass does not change the implicit RDEPEND=DEPEND for the ebuild portion, and any DEPEND value set in an eclass does not get treated as being part of RDEPEND.

Table 7.4: EAPIs supporting DEFINED_PHASES

EAPI	Supports DEFINED_PHASES?
0, 1, 2, 3	Optionally
4, 5, 6, 7	Yes

7.4 Magic Ebuild-defined Variables

The following variables must be defined by `inherit` (see section 10.1), and may be considered to be part of the ebuild's metadata:

ECLASS The current eclass, or unset if there is no current eclass. This is handled magically by `inherit` and must not be modified manually.

INHERITED List of inherited eclass names. Again, this is handled magically by `inherit`.

Note: Thus, by extension of section 7.1, `inherit` may not be used conditionally, except upon constant conditions.

The following are special variables defined by the package manager for internal use and may or may not be exported to the ebuild environment:

DEFINED_PHASES A space separated arbitrarily ordered list of phase names (e. g. `configure setup unpack`) whose phase functions are defined by the ebuild or an eclass inherited by the ebuild. If no phase functions are defined, a single hyphen is used instead of an empty string. For EAPIs listed in table 7.4 as having optional `DEFINED_PHASES` support, package managers may not rely upon the metadata cache having this variable defined, and must treat an empty string as “this information is not available”.

DEFINED-PHASES

Note: Thus, by extension of section 7.1, phase functions must not be defined based upon any variant condition.

Chapter 8

Dependencies

8.1 Dependency Classes

There are three classes of dependencies supported by ebuilds:

- Build dependencies (DEPEND). These must be installed and usable before any of the ebuild `src_*` phase functions is executed. These may not be installed at all if a binary package is being merged.
- Runtime dependencies (RDEPEND). These must be installed and usable before the results of an ebuild merging are treated as usable.
- Post dependencies (PDEPEND). These must be installed at some point before the package manager finishes the batch of installs.

Additionally, in EAPIs listed in table 8.3 as supporting BDEPEND, the build dependencies are split into two subclasses:

BDEPEND

- BDEPEND build dependencies that are binary compatible with the native build system (CBUILD). The ebuild is allowed to call binary executables installed by this kind of dependency.
- DEPEND build dependencies that are binary compatible with the system being built (CHOST). The ebuild must not execute binary executables installed by this kind of dependency.

Table 8.1 lists dependencies which must be satisfied before a particular phase function is executed. Table 8.2 summarises additional interfaces related to the dependency classes.

In addition, SRC_URI, HOMEPAGE, RESTRICT, PROPERTIES, LICENSE and REQUIRED_USE use dependency-style specifications to specify their values.

Table 8.1: Dependency classes required to be satisfied for a particular phase function

Phase function	Satisfied dependency classes
<code>pkg_pretend</code> , <code>pkg_setup</code> , <code>pkg_info</code> , <code>pkg_nofetch</code>	None (ebuilds can rely only on the packages in the system set)
<code>src_unpack</code> , <code>src_prepare</code> , <code>src_configure</code> , <code>src_compile</code> , <code>src_test</code> , <code>src_install</code>	DEPEND, BDEPEND
<code>pkg_preinst</code> , <code>pkg_postinst</code> , <code>pkg_prerm</code> , <code>pkg_postrm</code>	RDEPEND (unless the particular dependency results in a circular dependency, in which case it may be installed later)
<code>pkg_config</code>	RDEPEND, PDEPEND

Table 8.2: Summary of other interfaces related to dependency classes

	BDEPEND	DEPEND	RDEPEND, PDEPEND
Binary compatible with	CBUILD	CHOST	CHOST
Base unprefix path	/	\${SYSROOT}	\${ROOT}
Relevant offset-prefix	\${BROOT}	\${EPREFIX}	\${EPREFIX}
Path combined with prefix	\${BROOT}	\${ESYSROOT}	\${EROOT}
PM query command option	-b	-d	-r

Table 8.3: EAPIs supporting additional dependency types

EAPI	Supports BDEPEND?
0, 1, 2, 3, 4, 5, 6	No
7	Yes

8.2 Dependency Specification Format

The following elements are recognised in at least one class of specification. All elements must be surrounded on both sides by whitespace, except at the start and end of the string.

- A package dependency specification. Permitted in DEPEND, BDEPEND, RDEPEND, PDEPEND.
- A URI, in the form `proto://host/path`. Permitted in SRC_URI and HOMEPAGE. In EAPIs listed in table 8.4 as supporting SRC_URI arrows, may optionally be followed by whitespace, then `->`, then whitespace, then a simple filename when in SRC_URI. For SRC_URI behaviour, see section 8.2.10.
- A flat filename. Permitted in SRC_URI.
- A license name (e. g. GPL-2). Permitted in LICENSE.
- A use flag name, optionally preceded by an exclamation mark. Permitted in REQUIRED_USE.
- A simple string. Permitted in RESTRICT and PROPERTIES.
- An all-of group, which consists of an open parenthesis, followed by whitespace, followed by one or more of (a dependency item of any kind followed by whitespace), followed by a close parenthesis. More formally: `all-of ::= '(' whitespace (item whitespace)+ ')'`. Permitted in all specification style variables.
- An any-of group, which consists of the string `||`, followed by whitespace, followed by an open parenthesis, followed by whitespace, followed by one or more of (a dependency item of any kind followed by whitespace), followed by a close parenthesis. More formally: `any-of ::= '||' whitespace '(' whitespace (item whitespace)+ ')'`. Permitted in DEPEND, BDEPEND, RDEPEND, PDEPEND, LICENSE, REQUIRED_USE.
- An exactly-one-of group, which has the same format as the any-of group, but begins with the string `^^` instead. Permitted in REQUIRED_USE.
- An at-most-one-of group, which has the same format as the any-of group, but begins with the string `??` instead. Permitted in REQUIRED_USE in EAPIs listed in table 8.5 as supporting REQUIRED_USE ?? groups.
- A use-conditional group, which consists of an optional exclamation mark, followed by a use flag name, followed by a question mark, followed by whitespace, followed by an open parenthesis, followed by whitespace, followed by one or more of (a dependency item of any kind followed by whitespace), followed by a close parenthesis. More formally: `use-conditional ::= '!?' flag-name '?' whitespace '(' whitespace (item whitespace)+ ')'`. Permitted in all specification style variables.

AT-MOST-ONE-OF

In particular, note that whitespace is not optional.

8.2.1 All-of dependency specifications

In an all-of group, all of the child elements must be matched.

Table 8.4: EAPIs supporting SRC_URI arrows

EAPI	Supports SRC_URI arrows?
0, 1	No
2, 3, 4, 5, 6, 7	Yes

Table 8.5: EAPIs supporting REQUIRED_USE ?? groups

EAPI	Supports REQUIRED_USE ?? groups?
0, 1, 2, 3, 4	No
5, 6, 7	Yes

8.2.2 USE-conditional dependency specifications

In a use-conditional group, if the associated use flag is enabled (or disabled if it has an exclamation mark prefix), all of the child elements must be matched.

It is an error for a flag to be used if it is not included in IUSE_EFFECTIVE as described in section 11.1.1.

8.2.3 Any-of dependency specifications

Any use-conditional group that is an immediate child of an any-of group, if not enabled (disabled for an exclamation mark prefixed use flag name), is not considered a member of the any-of group for match purposes.

In an any-of group, at least one immediate child element must be matched. A blocker is considered to be matched if its associated package dependency specification is not matched.

In EAPIs specified in table 8.6, an empty any-of group counts as being matched.

EMPTY-DEP-GROUPS

8.2.4 Exactly-one-of dependency specifications

Any use-conditional group that is an immediate child of an exactly-one-of group, if not enabled (disabled for an exclamation mark prefixed use flag name), is not considered a member of the exactly-one-of group for match purposes.

In an exactly-one-of group, exactly one immediate child element must be matched.

In EAPIs specified in table 8.6, an empty exactly-one-of group counts as being matched.

8.2.5 At-most-one-of dependency specifications

Any use-conditional group that is an immediate child of an at-most-one-of group, if not enabled (disabled for an exclamation mark prefixed use flag name), is not considered a member of the at-most-one-of group for match purposes.

In an at-most-one-of group, at most one immediate child element must be matched.

Table 8.6: Matching of empty dependency groups in EAPIs

EAPI	Empty and ^^ groups are matched?
0, 1, 2, 3, 4, 5, 6	Yes
7	No

Table 8.7: Support for SLOT dependencies and sub-slots in EAPIs

EAPI	Supports SLOT dependencies?	Supports sub-slots?
0	No	No
1, 2, 3, 4	Named only	No
5, 6, 7	Named and operator	Yes

Table 8.8: EAPIs supporting USE dependencies

EAPI	Supports USE dependencies?
0, 1	No
2, 3	2-style
4, 5, 6, 7	4-style

8.2.6 Package dependency specifications

A package dependency can be in one of the following base formats. A package manager must warn or error on non-compliant input.

- A simple category/package name.
- An operator, as described in section 8.2.6.1, followed immediately by `category/package`, followed by a hyphen, followed by a version specification.

In EAPIs shown in table 8.7 as supporting SLOT dependencies, either of the above formats may additionally be suffixed by a `:slot` restriction, as described in section 8.2.6.3. A package manager must warn or error if slot dependencies are used with an EAPI not supporting SLOT dependencies.

In EAPIs shown in table 8.8 as supporting 2-style or 4-style USE dependencies, a specification may additionally be suffixed by at most one 2-style or 4-style `[use]` restriction, as described in section 8.2.6.4. A package manager must warn or error if this feature is used with an EAPI not supporting use dependencies.

USE-DEPS

Note: Order is important. The slot restriction must come before use dependencies.

8.2.6.1 Operators

The following operators are available:

- < Strictly less than the specified version.
- <= Less than or equal to the specified version.
- = Exactly equal to the specified version. Special exception: if the version specified has an asterisk immediately following it, then only the given number of version components is used for comparison, i. e. the asterisk acts as a wildcard for any further components. When an asterisk is used, the specification must remain valid if the asterisk were removed. (An asterisk used with any other operator is illegal.)
- ~ Equal to the specified version when revision parts are ignored.
- >= Greater than or equal to the specified version.
- > Strictly greater than the specified version.

8.2.6.2 Block operator

If the specification is prefixed with one or two exclamation marks, the named dependency is a block rather than a requirement—that is to say, the specified package must not be installed, with the following exceptions:

Table 8.9: Exclamation mark strengths for EAPIs

EAPI	!	!!
0, 1	Unspecified	Forbidden
2, 3, 4, 5, 6, 7	Weak	Strong

- Blocks on a package provided exclusively by the ebuild do not count.
- Weak blocks on the package version of the ebuild itself do not count.

There are two strengths of block: weak and strong. A weak block may be ignored by the package manager, so long as any blocked package will be uninstalled later on. A strong block must not be ignored. The mapping from one or two exclamation marks to strength is described in table 8.9.

BANG-STRENGTH

8.2.6.3 Slot dependencies

A named slot dependency consists of a colon followed by a slot name. A specification with a named slot dependency matches only if the slot of the matched package is equal to the slot specified. If the slot of the package to match cannot be determined (e. g. because it is not a supported EAPI), the match is treated as unsuccessful.

SLOT-DEPS

In EAPIs shown in table 8.7 as supporting sub-slots, a slot dependency may contain an optional sub-slot part that follows the regular slot and is delimited by a / character.

SUB-SLOT

An operator slot dependency consists of a colon followed by one of the following operators:

SLOT-OPERATOR-DEPS

* Indicates that any slot value is acceptable. In addition, for runtime dependencies, indicates that the package will not break if the matched package is uninstalled and replaced by a different matching package in a different slot.

= Indicates that any slot value is acceptable. In addition, for runtime dependencies, indicates that the package will break unless a matching package with slot and sub-slot equal to the slot and sub-slot of the best version installed as a build-time (DEPEND) dependency is available.

slot= Indicates that only a specific slot value is acceptable, and otherwise behaves identically to the plain equals slot operator.

To implement the equals slot operator, the package manager will need to store the slot/sub-slot pair of the best installed version of the matching package. This syntax is only for package manager use and must not be used by ebuilds. The package manager may do this by inserting the appropriate slot/sub-slot pair between the colon and equals sign when saving the package's dependencies. The sub-slot part must not be omitted here (when the SLOT variable omits the sub-slot part, the package is considered to have an implicit sub-slot which is equal to the regular slot).

Whenever the equals slot operator is used in an enabled dependency group, the dependencies (DEPEND) must ensure that a matching package is installed at build time. It is invalid to use the equals slot operator inside PDEPEND or inside any-of dependency specifications.

8.2.6.4 2-style and 4-style USE dependencies

A 2-style or 4-style use dependency consists of one of the following:

[opt] The flag must be enabled.

[opt=] The flag must be enabled if the flag is enabled for the package with the dependency, or disabled otherwise.

[!opt=] The flag must be disabled if the flag is enabled for the package with the dependency, or enabled otherwise.

[opt?] The flag must be enabled if the flag is enabled for the package with the dependency.

[!opt?] The flag must be disabled if the use flag is disabled for the package with the dependency.

[-opt] The flag must be disabled.

Multiple requirements may be combined using commas, e. g. `[first,-second,third?]`.

When multiple requirements are specified, all must match for a successful match.

In a 4-style use dependency, the flag name may immediately be followed by a *default* specified by either (+) or (-). The former indicates that, when applying the use dependency to a package that does not have the flag in question in `IUSE_REFERENCEABLE`, the package manager shall behave as if the flag were present and enabled; the latter, present and disabled.

USE-DEP-DEFAULTS

Unless a 4-style default is specified, it is an error for a use dependency to be applied to an ebuild which does not have the flag in question in `IUSE_REFERENCEABLE`.

Note: By extension of the above, a default that could reference an ebuild using an EAPI not supporting profile `IUSE` injections cannot rely upon any particular behaviour for flags that would not have to be part of `IUSE`.

It is an error for an ebuild to use a conditional use dependency when that ebuild does not have the flag in `IUSE_EFFECTIVE`.

8.2.7 USE state constraints

`REQUIRED_USE` contains a list of assertions that must be met by the configuration of `USE` flags to be valid for this ebuild. In order to be matched, a `USE` flag in a terminal element must be enabled (or disabled if it has an exclamation mark prefix).

If the package manager encounters a package version where `REQUIRED_USE` assertions are not met, it must treat this package version as if it was masked. No phase functions must be called.

It is an error for a flag to be used if it is not included in `IUSE_EFFECTIVE`.

8.2.8 Restrict

The following tokens are permitted inside `RESTRICT`:

mirror The package's `SRC_URI` entries may not be mirrored, and mirrors should not be checked when fetching.

fetch The package's `SRC_URI` entries may not be downloaded automatically. If entries are not available, `pkg_nofetch` is called. Implies `mirror`.

strip No stripping of debug symbols from files to be installed may be performed. In EAPIs listed in table 12.15 as supporting controllable stripping, this behaviour may be altered by the `dostrip` command.

userpriv The package manager may not drop root privileges when building the package.

test The `src_test` phase must not be run.

Package managers may recognise other tokens, but ebuilds may not rely upon them being supported.

8.2.9 Properties

The following tokens are permitted inside `PROPERTIES`:

interactive The package may require interaction with the user via the `tty`.

Ebuilds may not rely upon any token being supported.

8.2.10 SRC_URI

All filename components that are enabled (i. e. not inside a use-conditional block that is not matched) in SRC_URI must be available in the DISTDIR directory. In addition, these components are used to make the A and AA variables.

If a component contains a full URI with protocol, that download location must be used. Package managers may also consult mirrors for their files.

The special `mirror://` protocol must be supported. See section 4.4.2 for mirror details.

If a simple filename rather than a full URI is provided, the package manager can only use mirrors to download the file.

The RESTRICT metadata key can be used to impose additional restrictions upon downloading—see section 8.2.8 for details.

In EAPIs supporting arrows, if an arrow is used, the filename used when saving to DISTDIR shall instead be the name on the right of the arrow. When consulting mirrors (except for those explicitly listed on the left of the arrow, if `mirror://` is used), the filename to the right of the arrow shall be requested instead of the filename in the URI.

SRC-URI-ARROWS

Chapter 9

Ebuild-defined Functions

9.1 List of Functions

The following is a list of functions that an ebuild, or eclass, may define, and which will be called by the package manager as part of the build and/or install process. In all cases the package manager must provide a default implementation of these functions; unless otherwise stated this must be a no-op. Most functions must assume only that they have write access to the package's working directory (the `WORKDIR` environment variable; see section 11.1), and the temporary directory `T`; exceptions are noted below. All functions may assume that they have read access to all system libraries, binaries and configuration files that are accessible to normal users.

The environment for functions run outside of the build sequence (that is, `pkg_config`, `pkg_info`, `pkg_prerm` and `pkg_postrm`) must be the environment used for the build of the package, not the current configuration.

Ebuilds must not call nor assume the existence of any phase functions.

9.1.1 Initial working directories

Some functions may assume that their initial working directory is set to a particular location; these are noted below. If no initial working directory is mandated, it may be set to anything and the ebuild must not rely upon a particular location for it. The ebuild *may* assume that the initial working directory for any phase is a trusted location that may only be written to by a privileged user and group.

Some functions are described as having an initial working directory of `S` with an error or fallback to `WORKDIR`. For EAPIs listed in table 9.1 as having the fallback, this means that if `S` is not a directory before the start of the phase function, the initial working directory shall be `WORKDIR` instead. For EAPIs where it is a conditional error, if `S` is not a directory before the start of the phase function, it is a fatal error, unless all of the following conditions are true, in which case the fallback to `WORKDIR` is used:

S-WORKDIR-FALLBACK

- The `A` variable contains no items.
- The phase function in question is not in `DEFINED_PHASES`.
- None of the phase functions `unpack`, `prepare`, `configure`, `compile` or `install`, if supported by the EAPI in question and occurring prior to the phase about to be executed, are in `DEFINED_PHASES`.

9.1.2 `pkg_pretend`

The `pkg_pretend` function is only called for EAPIs listed in table 9.2 as supporting it.

PKG-PRETEND

Table 9.1: EAPIs with S to WORKDIR fallbacks

EAPI	Fallback to WORKDIR permitted?
0, 1, 2, 3	Always
4, 5, 6, 7	Conditional error

Table 9.2: EAPIs supporting pkg_pretend

EAPI	Supports pkg_pretend?
0, 1, 2, 3	No
4, 5, 6, 7	Yes

The `pkg_pretend` function may be used to carry out sanity checks early on in the install process. For example, if an ebuild requires a particular kernel configuration, it may perform that check in `pkg_pretend` and call `eerror` and then `die` with appropriate messages if the requirement is not met.

`pkg_pretend` is run separately from the main phase function sequence, and does not participate in any kind of environment saving. There is no guarantee that any of an ebuild's dependencies will be met at this stage, and no guarantee that the system state will not have changed substantially before the next phase is executed.

`pkg_pretend` must not write to the filesystem.

9.1.3 pkg_setup

The `pkg_setup` function sets up the ebuild's environment for all following functions, before the build process starts. Further, it checks whether any necessary prerequisites not covered by the package manager, e. g. that certain kernel configuration options are fulfilled.

`pkg_setup` must be run with full filesystem permissions, including the ability to add new users and/or groups to the system.

9.1.4 src_unpack

The `src_unpack` function extracts all of the package's sources. In EAPIs lacking `src_prepare`, it may also apply patches and set up the package's build system for further use.

The initial working directory must be `WORKDIR`, and the default implementation used when the ebuild lacks the `src_unpack` function shall behave as:

Listing 9.1: `src_unpack`

```
src_unpack() {
    if [[ -n ${A} ]]; then
        unpack ${A}
    fi
}
```

9.1.5 src_prepare

The `src_prepare` function is only called for EAPIs listed in table 9.3 as supporting it. The `src_prepare` function can be used for post-unpack source preparation.

SRC-PREPARE

The initial working directory is `S`, with an error or fallback to `WORKDIR` as discussed in section 9.1.1.

Table 9.3: `src_prepare` support and behaviour for EAPIs

EAPI	Supports <code>src_prepare</code> ?	Format
0, 1	No	Not applicable
2, 3, 4, 5	Yes	no-op
6, 7	Yes	6

Table 9.4: EAPIs supporting `src_configure`

EAPI	Supports <code>src_configure</code> ?
0, 1	No
2, 3, 4, 5, 6, 7	Yes

For EAPIs listed in table 9.3 as using format 6, the default implementation used when the ebuild lacks the `src_prepare` function shall behave as:

SRC-PREPARE-6

Listing 9.2: `src_prepare`, format 6

```
src_prepare() {
    if declare -p PATCHES | grep -q "^declare -a "; then
        [[ -n ${PATCHES[@]} ]] && eapply "${PATCHES[@]}"
    else
        [[ -n ${PATCHES} ]] && eapply ${PATCHES}
    fi
    eapply_user
}
```

For other EAPIs supporting `src_prepare`, the default implementation used when the ebuild lacks the `src_prepare` function is a no-op.

9.1.6 `src_configure`

The `src_configure` function is only called for EAPIs listed in table 9.4 as supporting it.

SRC-CONFIGURE

The initial working directory is `S`, with an error or fallback to `WORKDIR` as discussed in section 9.1.1.

The `src_configure` function configures the package's build environment. The default implementation used when the ebuild lacks the `src_configure` function shall behave as:

Listing 9.3: `src_configure`

```
src_configure() {
    if [[ -x ${ECONF_SOURCE:-.}/configure ]]; then
        econf
    fi
}
```

9.1.7 `src_compile`

The `src_compile` function configures the package's build environment in EAPIs lacking `src_configure`, and builds the package in all EAPIs.

SRC-COMPILE

The initial working directory is `S`, with an error or fallback to `WORKDIR` as discussed in section 9.1.1.

For EAPIs listed in table 9.5 as using format 0, the default implementation used when the ebuild lacks the `src_compile` function shall behave as:

SRC-COMPILE-0

Table 9.5: `src_compile` behaviour for EAPIs

EAPI	Format
0	0
1	1
2, 3, 4, 5, 6, 7	2

Listing 9.4: `src_compile, format 0`

```
src_compile() {
    if [[ -x ./configure ]]; then
        econf
    fi
    if [[ -f Makefile ]] || [[ -f GNUmakefile ]] || [[ -f makefile ]]; then
        emake || die "emake failed"
    fi
}
```

For EAPIs listed in table 9.5 as using format 1, the default implementation used when the ebuild lacks the `src_compile` function shall behave as:

SRC-COMPILE-1

Listing 9.5: `src_compile, format 1`

```
src_compile() {
    if [[ -x ${ECONF_SOURCE:-.}/configure ]]; then
        econf
    fi
    if [[ -f Makefile ]] || [[ -f GNUmakefile ]] || [[ -f makefile ]]; then
        emake || die "emake failed"
    fi
}
```

For EAPIs listed in table 9.5 as using format 2, the default implementation used when the ebuild lacks the `src_compile` function shall behave as:

SRC-COMPILE-2

Listing 9.6: `src_compile, format 2`

```
src_compile() {
    if [[ -f Makefile ]] || [[ -f GNUmakefile ]] || [[ -f makefile ]]; then
        emake || die "emake failed"
    fi
}
```

9.1.8 `src_test`

The `src_test` function runs unit tests for the newly built but not yet installed package as provided.

The initial working directory must be `S` if that exists, falling back to `WORKDIR` otherwise. The default implementation used when the ebuild lacks the `src_test` function must, if tests are enabled, run `emake check` if and only if such a target is available, or if not run `emake test` if and only if such a target is available. In both cases, if `emake` returns non-zero the build must be aborted.

For EAPIs listed in table 9.6 as not supporting parallel tests, the `emake` command must be called with option `-j1`.

PARALLEL-TESTS

The `src_test` function may be disabled by `RESTRICT`. See section 8.2.8. It may be disabled by user too, using a PM-specific mechanism.

Table 9.6: `src_test` behaviour for EAPIs

EAPI	Supports parallel tests?
0, 1, 2, 3, 4	No
5, 6, 7	Yes

Table 9.7: `src_install` behaviour for EAPIs

EAPI	Format
0, 1, 2, 3	no-op
4, 5	4
6, 7	6

9.1.9 `src_install`

The `src_install` function installs the package's content to a directory specified in `D`.

SRC-INSTALL

The initial working directory is `S`, with an error or fallback to `WORKDIR` as discussed in section 9.1.1.

For EAPIs listed in table 9.7 as using format 4, the default implementation used when the ebuild lacks the `src_install` function shall behave as:

SRC-INSTALL-4

Listing 9.7: `src_install`, format 4

```
src_install() {
    if [[ -f Makefile ]] || [[ -f GNUmakefile ]] || [[ -f makefile ]]; then
        emake DESTDIR="${D}" install
    fi

    if ! declare -p DOCS >/dev/null 2>&1 ; then
        local d
        for d in README* ChangeLog AUTHORS NEWS TODO CHANGES \
            THANKS BUGS FAQ CREDITS CHANGELOG ; do
            [[ -s "${d}" ]] && dodoc "${d}"
        done
    elif declare -p DOCS | grep -q "^declare -a " ; then
        dodoc "${DOCS[@]}"
    else
        dodoc ${DOCS}
    fi
}
```

For EAPIs listed in table 9.7 as using format 6, the default implementation used when the ebuild lacks the `src_install` function shall behave as:

SRC-INSTALL-6

Listing 9.8: `src_install`, format 6

```
src_install() {
    if [[ -f Makefile ]] || [[ -f GNUmakefile ]] || [[ -f makefile ]]; then
        emake DESTDIR="${D}" install
    fi
    einstalldocs
}
```

For other EAPIs, the default implementation used when the ebuild lacks the `src_install` function is a no-op.

9.1.10 `pkg_preinst`

The `pkg_preinst` function performs any special tasks that are required immediately before merging the package to the live filesystem. It must not write outside of the directories specified by the `ROOT` and `D` environment variables.

`pkg_preinst` must be run with full access to all files and directories below that specified by the `ROOT` and `D` environment variables.

9.1.11 `pkg_postinst`

The `pkg_postinst` function performs any special tasks that are required immediately after merging the package to the live filesystem. It must not write outside of the directory specified in the `ROOT` environment variable.

`pkg_postinst`, like, `pkg_preinst`, must be run with full access to all files and directories below that specified by the `ROOT` environment variable.

9.1.12 `pkg_prerm`

The `pkg_prerm` function performs any special tasks that are required immediately before unmerging the package from the live filesystem. It must not write outside of the directory specified by the `ROOT` environment variable.

`pkg_prerm` must be run with full access to all files and directories below that specified by the `ROOT` environment variable.

9.1.13 `pkg_postrm`

The `pkg_postrm` function performs any special tasks that are required immediately after unmerging the package from the live filesystem. It must not write outside of the directory specified by the `ROOT` environment variable.

`pkg_postrm` must be run with full access to all files and directories below that specified by the `ROOT` environment variable.

9.1.14 `pkg_config`

The `pkg_config` function performs any custom steps required to configure a package after it has been fully installed. It is the only ebuild function which may be interactive and prompt for user input.

`pkg_config` must be run with full access to all files and directories inside of `ROOT`.

9.1.15 `pkg_info`

The `pkg_info` function may be called by the package manager when displaying information about an installed package. In EAPIs listed in table 9.8 as supporting `pkg_info` on non-installed packages, it may also be called by the package manager when displaying information about a non-installed package. In this case, ebuild authors should note that dependencies may not be installed.

PKG-INFO

`pkg_info` must not write to the filesystem.

Table 9.8: EAPIs supporting `pkg_info` on non-installed packages

EAPI	Supports <code>pkg_info</code> on non-installed packages?
0, 1, 2, 3	No
4, 5, 6, 7	Yes

Table 9.9: EAPIs supporting `default_` phase functions

EAPI	Supports <code>default_</code> functions in phases
0, 1	None
2, 3	<code>pkg_nofetch</code> , <code>src_unpack</code> , <code>src_prepare</code> , <code>src_configure</code> , <code>src_compile</code> , <code>src_test</code>
4, 5, 6, 7	<code>pkg_nofetch</code> , <code>src_unpack</code> , <code>src_prepare</code> , <code>src_configure</code> , <code>src_compile</code> , <code>src_install</code> , <code>src_test</code>

9.1.16 `pkg_nofetch`

The `pkg_nofetch` function is run when the fetch phase of an fetch-restricted ebuild is run, and the relevant source files are not available. It should direct the user to download all relevant source files from their respective locations, with notes concerning licensing if applicable.

`pkg_nofetch` must require no write access to any part of the filesystem.

9.1.17 Default phase functions

In EAPIs listed in table 9.9 as supporting `default_` phase functions, a function named `default_` (phase) that behaves as the default implementation for that EAPI shall be defined when executing any ebuild phase listed in the table. Ebuilds must not call these functions except when in the phase in question.

DEFAULT-PHASE-FUNCS

9.2 Call Order

The call order for installing a package is:

- `pkg_pretend` (only for EAPIs listed in table 9.2), which is called outside of the normal call order process.
- `pkg_setup`
- `src_unpack`
- `src_prepare` (only for EAPIs listed in table 9.3)
- `src_configure` (only for EAPIs listed in table 9.4)
- `src_compile`
- `src_test` (except if `RESTRICT=test` or disabled by user)
- `src_install`
- `pkg_preinst`
- `pkg_postinst`

The call order for uninstalling a package is:

- `pkg_prerm`
- `pkg_postrm`

The call order for upgrading, downgrading or reinstalling a package is:

- `pkg_pretend` (only for EAPIs listed in table 9.2), which is called outside of the normal call order process.
- `pkg_setup`

- `src_unpack`
- `src_prepare` (only for EAPIs listed in table 9.3)
- `src_configure` (only for EAPIs listed in table 9.4)
- `src_compile`
- `src_test` (except if `RESTRICT=test`)
- `src_install`
- `pkg_preinst`
- `pkg_prerm` for the package being replaced
- `pkg_postrm` for the package being replaced
- `pkg_postinst`

Note: When up- or downgrading a package in EAPI 0 or 1, the last four phase functions can alternatively be called in the order `pkg_preinst`, `pkg_postinst`, `pkg_prerm`, `pkg_postrm`. This behaviour is deprecated.

The `pkg_config`, `pkg_info` and `pkg_nofetch` functions are not called in a normal sequence. The `pkg_pretend` function is called some unspecified time before a (possibly hypothetical) normal sequence.

For installing binary packages, the `src` phases are not called.

When building binary packages that are not to be installed locally, the `pkg_preinst` and `pkg_postinst` functions are not called.

Chapter 10

Eclasses

Eclasses serve to store common code that is used by more than one ebuild, which greatly aids maintainability and reduces the tree size. However, due to metadata cache issues, care must be taken in their use. In format they are similar to an ebuild, and indeed are sourced as part of any ebuild using them. The interpreter is therefore the same, and the same requirements for being parseable hold.

Eclasses must be located in the `eclass` directory in the top level of the repository—see section 4.6. Each eclass is a single file named `<name>.eclass`, where `<name>` is the name of this eclass, used by `inherit` and `EXPORT_FUNCTIONS` among other places.

10.1 The `inherit` Command

An ebuild wishing to make use of an eclass does so by using the `inherit` command in global scope. This will cause the eclass to be sourced as part of the ebuild—any function or variable definitions in the eclass will appear as part of the ebuild, with exceptions for certain metadata variables, as described below.

The `inherit` command takes one or more parameters, which must be the names of eclasses (excluding the `.eclass` suffix and the path). For each parameter, in order, the named eclass is sourced.

Eclasses may end up being sourced multiple times.

The `inherit` command must also ensure that:

- The `ECLASS` variable is set to the name of the current eclass, when sourcing that eclass.
- Once all inheriting has been done, the `INHERITED` metadata variable contains the name of every eclass used, separated by whitespace.

10.2 Eclass-defined Metadata Keys

The `IUSE`, `REQUIRED_USE`, `DEPEND`, `BDEPEND`, `RDEPEND` and `PDEPEND` variables are handled specially when set by an eclass. They must be accumulated across eclasses, appending the value set by each eclass to the resulting value after the previous one is loaded. Then the eclass-defined value is appended to that defined by the ebuild. In the case of `RDEPEND`, this is done after the implicit `RDEPEND` rules in section 7.3.3 are applied.

10.3 `EXPORT_FUNCTIONS`

There is one command available in the eclass environment that is neither available nor meaningful in ebuilds—`EXPORT_FUNCTIONS`. This can be used to alias ebuild phase functions from the eclass so

Listing 10.1: EXPORT_FUNCTIONS example: foo.eclass

```
foo_src_compile()
{
    econf --enable-gerbil \
        $(use_enable fnord)
    emake gerbil || die "Couldn't make a gerbil"
    emake || die "emake failed"
}

EXPORT_FUNCTIONS src_compile
```

that an ebuild inherits a default definition whilst retaining the ability to override and call the eclass-defined version from it. The use of it is best illustrated by an example; this is given in listing 10.1 and is a snippet from a hypothetical `foo.eclass`.

This example defines an eclass `src_compile` function and uses `EXPORT_FUNCTIONS` to alias it. Then any ebuild that inherits `foo.eclass` will have a default `src_compile` defined, but should the author wish to override it he can access the function in `foo.eclass` by calling `foo_src_compile`.

`EXPORT_FUNCTIONS` must only be used on ebuild phase functions. The function that is aliased must be named `eclassname_phasefunctionname`, where `eclassname` is the name of the eclass.

Chapter 11

The Ebuild Environment

11.1 Defined Variables

The package manager must define the following environment variables. Not all variables are meaningful in all phases; variables that are not meaningful in a given phase may be unset or set to any value. Ebuilds must not attempt to modify any of these variables, unless otherwise specified.

Because of their special meanings, these variables may not be preserved consistently across all phases as would normally happen due to environment saving (see 11.2). For example, `EBUILD_PHASE` is different for every phase, and `ROOT` may have changed between the various different `pkg_*` phases. Ebuilds must recalculate any variable they derive from an inconsistent variable.

Table 11.1: Defined variables

Variable	Legal in	Consistent?	Description
P	All	No ²	Package name and version, without the revision part. For example, vim-7.0.174.
PF	All	Ditto	Package name, version, and revision (if any), for example vim-7.0.174-r1.
PN	All	Ditto	Package name, for example vim.
CATEGORY	All	Ditto	The package's category, for example app-editors.
PV	All	Yes	Package version, with no revision. For example 7.0.174.
PR	All	Yes	Package revision, or r0 if none exists.
PVR	All	Yes	Package version and revision (if any), for example 7.0.174 or 7.0.174-r1.
A	src_*, pkg_nofetch	Yes	All source files available for the package, whitespace separated with no leading or trailing whitespace, and in the order in which the item first appears in a matched component of SRC_URI. Does not include any that are disabled because of USE conditionals. The value is calculated from the base names of each element of the SRC_URI ebuild metadata variable.
AA ³	Ditto	Yes	All source files that could be available for the package, including any that are disabled in A because of USE conditionals. The value is calculated from the base names of each element of the SRC_URI ebuild metadata variable. Only for EAPIs listed in table 11.3 as supporting AA.
FILESDIR	src_*, global scope ⁴	Yes	The full path to a directory where the files from the package's files directory (used for small support files or patches) are available. See section 4.3. May or may not exist; if a repository provides no support files for the package in question then an ebuild must be prepared for the situation where FILESDIR points to a non-existent directory.
DISTDIR	Ditto	Yes	The full path to the directory in which the files in the A variable are stored.
WORKDIR	Ditto	Yes	The full path to the ebuild's working directory, where all build data should be contained.
S	src_*	Yes	The full path to the temporary build directory, used by src_compile, src_install etc. Defaults to \${WORKDIR}/\${P}. May be modified by ebuilds. If S is assigned in the global scope of an ebuild, then the restrictions of section 11.2 for global variables apply.

²May change if a package has been updated (see 4.4.4).³This variable is generally considered deprecated. However, ebuilds must still assume that the package manager sets it in the EAPIs supporting it. For example, a few configure scripts use this variable to find the aalib package; ebuilds calling such configure scripts must thus work around this.⁴Not necessarily present when installing from a binary package. Ebuilds must not access the directory in global scope.

Variable	Legal in	Consistent?	Description
<code>PORTDIR</code>	<code>src_*</code>	No	The full path to the master repository's base directory. Only for EAPIs listed in table 11.3 as supporting <code>PORTDIR</code> .
<code>ECLASSDIR</code>	<code>src_*</code>	No	The full path to the master repository's eclass directory. Only for EAPIs listed in table 11.3 as supporting <code>ECLASSDIR</code> .
<code>ROOT</code>	<code>pkg_*</code>	No	The absolute path to the root directory into which the package is to be merged. Phases which run with full filesystem access must not touch any files outside of the directory given in <code>ROOT</code> . Also of note is that in a cross-compiling environment, binaries inside of <code>ROOT</code> will not be executable on the build machine, so ebuilds must not call them. The presence of a trailing slash is EAPI dependent as listed in table 11.7.
<code>EROOT</code>	<code>pkg_*</code>	No	Contains the concatenation of the paths in the <code>ROOT</code> and <code>EPREFIX</code> variables, for convenience. See also the <code>EPREFIX</code> variable. Only for EAPIs listed in table 11.4 as supporting <code>EROOT</code> . The presence of a trailing slash is EAPI dependent as listed in table 11.7.
<code>SYSROOT</code>	<code>src_*</code>	No	The absolute path to the root directory containing build dependencies satisfied by <code>DEPEND</code> . Only for EAPIs listed in table 11.2 as supporting <code>SYSROOT</code> .
<code>ESYSROOT</code>	<code>src_*</code>	No	Contains the concatenation of the paths in the <code>SYSROOT</code> and <code>EPREFIX</code> variables, for convenience. See also the <code>EPREFIX</code> variable. Only for EAPIs listed in table 11.4 as supporting <code>ESYSROOT</code> .
<code>BROOT</code>	<code>src_*</code>	No	The absolute path to the root directory containing build dependencies satisfied by <code>BDEPEND</code> , typically executable build tools. This includes any applicable offset prefix. Only for EAPIs listed in table 11.4 as supporting <code>BROOT</code> .
<code>T</code>	All	Partially ⁵	The full path to a temporary directory for use by the ebuild.
<code>TMPDIR</code>	All	Ditto	Must be set to the location of a usable temporary directory, for any applications called by an ebuild. Must not be used by ebuilds directly; see T above.
<code>HOME</code>	All	Ditto	The full path to an appropriate temporary directory for use by any programs invoked by the ebuild that may read or modify the home directory.

⁵Consistent and preserved across a single connected sequence of `install` or `uninstall` phases, but not between `install` and `uninstall`. When reinstalling a package, this variable must have different values for the `install` and the replacement.

Variable	Legal in	Consistent?	Description
EPREFIX	All	Yes	The normalised offset-prefix path of an offset installation. When EPREFIX is not set in the calling environment, EPREFIX defaults to the built-in offset-prefix that was set during installation of the package manager. When a different EPREFIX value than the built-in value is set in the calling environment, a cross-prefix build is performed where using the existing utilities, a package is built for the given EPREFIX, akin to ROOT. See also 11.1.3. Only for EAPIs listed in table 11.4 as supporting EPREFIX.
D	src_install	No	Contains the full path to the image directory into which the package should be installed.
D (continued)	pkg_preinst, pkg_postinst	Yes	The presence of a trailing slash is EAPI dependent as listed in table 11.7.
ED	src_install, pkg_preinst, pkg_postinst	See D	Contains the full path to the image that is about to be or has just been merged. The presence of a trailing slash is EAPI dependent as listed in table 11.7.
DESTTREE	src_install	No	Contains the concatenation of the paths in the D and EPREFIX variables, for convenience. See also the EPREFIX variable. Only for EAPIs listed in table 11.4 as supporting ED. The presence of a trailing slash is EAPI dependent as listed in table 11.7.
DESTTREE			Controls the location where dobin, do1ib, domo, and dosbin install things. Only for EAPIs listed in table 11.3 as supporting DESTTREE. In all other EAPIs, this is retained as a conceptual variable not exported to the ebuild environment.
INSDESTTREE	src_install	No	Controls the location where doins installs things. Only for EAPIs listed in table 11.3 as supporting INSDESTTREE. In all other EAPIs, this is retained as a conceptual variable not exported to the ebuild environment.
USE	All	Yes	A whitespace-delimited list of all active USE flags for this ebuild. See section 11.1.1 for details.
EBUILD_PHASE	All	No	Takes one of the values config, setup, nofetch, unpack, prepare, configure, compile, test, install, preinst, postinst, preem, postrm, info, pretend according to the top level ebuild function that was executed by the package manager. May be unset or any single word that is not any of the above when the ebuild is being sourced for other (e.g. metadata or QA) purposes.

Variable	Legal in	Consistent?	Description
<code>EBUILD_PHASE_FUNC</code>	All	No	Takes one of the values <code>pkg_config</code> , <code>pkg_setup</code> , <code>pkg_nofetch</code> , <code>src_unpack</code> , <code>src_prepare</code> , <code>src_configure</code> , <code>src_compile</code> , <code>src_test</code> , <code>src_install</code> , <code>pkg_preinst</code> , <code>pkg_postinst</code> , <code>pkg_prerm</code> , <code>pkg_postrm</code> , <code>pkg_info</code> , <code>pkg_prepend</code> according to the top level ebuild function that was executed by the package manager. May be unset or any single word that is not any of the above when the ebuild is being sourced for other (e.g. metadata or QA) purposes. Only for EAPIs listed in table 11.2 as supporting <code>EBUILD_PHASE_FUNC</code> .
<code>KV</code>	All	Yes	The version of the running kernel at the time the ebuild was first executed, as returned by the <code>uname -r</code> command or equivalent. May be modified by ebuilds. Only for EAPIs listed in table 11.3 as supporting <code>KV</code> .
<code>MERGE_TYPE</code>	<code>pkg_*</code>	No	The type of package that is being merged. Possible values are: <code>source</code> if building and installing a package from source, <code>binary</code> if installing a binary package, and <code>buildonly</code> if building a binary package without installing it. Only for EAPIs listed in table 11.2 as supporting <code>MERGE_TYPE</code> .
<code>REPLACING_VERSIONS</code>	<code>pkg_*</code> (see text)	Yes	A list of all versions of this package (including revision, if specified), whitespace separated with no leading or trailing whitespace, that are being replaced (uninstalled or overwritten) as a result of this install. See section 11.1.2. Only for EAPIs listed in table 11.2 as supporting <code>REPLACING_VERSIONS</code> .
<code>REPLACED_BY_VERSION</code>	<code>pkg_prerm</code> , <code>pkg_postrm</code>	Yes	The single version of this package (including revision, if specified) that is replacing us, if we are being uninstalled as part of an install, or an empty string otherwise. See section 11.1.2. Only for EAPIs listed in table 11.2 as supporting <code>REPLACED_BY_VERSION</code> .

`EBUILD_PHASE_FUNC``KV``MERGE_TYPE`

Table 11.2: EAPIs supporting various added env variables

EAPI	MERGE_TYPE?	REPLACING_VERSIONS?	REPLACED_BY_VERSION?	EBUILD_PHASE_FUNC?	SYSROOT?	BROOT?
0, 1, 2, 3	No	No	No	No	No	No
4	Yes	Yes	Yes	No	No	No
5, 6	Yes	Yes	Yes	Yes	No	No
7	Yes	Yes	Yes	Yes	Yes	Yes

Table 11.3: EAPIs supporting various removed env variables

EAPI	AA?	KV?	PORTDIR?	ECLASSDIR?	DESTTREE?	INSDESTTREE?
0, 1, 2, 3	Yes	Yes	Yes	Yes	Yes	Yes
4, 5, 6	No	No	Yes	Yes	Yes	Yes
7	No	No	No	No	No	No

Except where otherwise noted, all variables set in the active profiles' `make.defaults` files must be exported to the ebuild environment. `CHOST`, `CBUILD` and `CTARGET`, if not set by profiles, must contain either an appropriate machine tuple (the definition of appropriate is beyond the scope of this specification) or be unset.

`PATH` must be initialized by the package manager to a “usable” default. The exact value here is left up to interpretation, but it should include the equivalent “`sbin`” and “`bin`” and any package manager specific directories.

`GZIP`, `BZIP`, `BZIP2`, `CDPATH`, `GREP_OPTIONS`, `GREP_COLOR` and `GLOBIGNORE` must not be set. In addition, any variable whose name appears in the `ENV_UNSET` variable must be unset, for EAPIs listed in table 5.5 as supporting `ENV_UNSET`.

ENV-UNSET

The package manager must ensure that the `LC_CTYPE` and `LC_COLLATE` locale categories are equivalent to the POSIX locale, as far as characters in the ASCII range (U+0000 to U+007F) are concerned. Only for EAPIs listed in such a manner in table 11.5.

LOCALE-SETTINGS

11.1.1 USE and IUSE handling

This section discusses the handling of four variables:

IUSE is the variable calculated from the `IUSE` values defined in ebuilds and eclasses.

IUSE_REFERENCEABLE is a variable calculated from `IUSE` and a variety of other sources described below. It is purely a conceptual variable; it is not exported to the ebuild environment. Values in `IUSE_REFERENCEABLE` may legally be used in queries from other packages about an ebuild's state (for example, for use dependencies).

IUSE_EFFECTIVE is another conceptual, unexported variable. Values in `IUSE_EFFECTIVE` are those which an ebuild may legally use in queries about itself (for example, for the `use` function, and for use in dependency specification conditional blocks).

USE is a variable calculated by the package manager and exported to the ebuild environment.

Table 11.4: EAPIs supporting offset-prefix env variables

EAPI	EPREFIX?	EROOT?	ED?	ESYSROOT?
0, 1, 2	No	No	No	No
3, 4, 5, 6	Yes	Yes	Yes	No
7	Yes	Yes	Yes	Yes

Table 11.5: Locale settings for EAPIs

EAPI	Sane LC_CTYPE and LC_COLLATE?
0, 1, 2, 3, 4, 5	Undefined
6, 7	Yes

In all cases, the values of `IUSE_REFERENCEABLE` and `IUSE_EFFECTIVE` are undefined during meta-data generation.

For EAPIs listed in table 5.4 as not supporting profile defined IUSE injection, `IUSE_REFERENCEABLE` is equal to the calculated IUSE value. For EAPIs where profile defined IUSE injection is supported, `IUSE_REFERENCEABLE` is equal to `IUSE_EFFECTIVE`.

For EAPIs listed in table 5.4 as not supporting profile defined IUSE injection, `IUSE_EFFECTIVE` contains the following values:

- All values in the calculated IUSE value.
- All possible values for the `ARCH` variable.
- All legal use flag names whose name starts with the lowercase equivalent of any value in the profile `USE_EXPAND` variable followed by an underscore.

For EAPIs listed in table 5.4 as supporting profile defined IUSE injection, `IUSE_EFFECTIVE` contains the following values:

PROFILE-IUSE-INJECT

- All values in the calculated IUSE value.
- All values in the profile `IUSE_IMPLICIT` variable.
- All values in the profile variable named `USE_EXPAND_VALUES_{v}`, where `{v}` is any value in the intersection of the profile `USE_EXPAND_UNPREFIXED` and `USE_EXPAND_IMPLICIT` variables.
- All values for `{lower_v}_{x}`, where `{x}` is all values in the profile variable named `USE_EXPAND_VALUES_{v}`, where `{v}` is any value in the intersection of the profile `USE_EXPAND` and `USE_EXPAND_IMPLICIT` variables and `{lower_v}` is the lowercase equivalent of `{v}`.

The `USE` variable is set by the package manager. For each value in `IUSE_EFFECTIVE`, `USE` shall contain that value if the flag is to be enabled for the ebuild in question, and shall not contain that value if it is to be disabled. In EAPIs listed in table 5.4 as not supporting profile defined IUSE injection, `USE` may contain other flag names that are not relevant for the ebuild.

For EAPIs listed in table 5.4 as supporting profile defined IUSE injection, the variables named in `USE_EXPAND` and `USE_EXPAND_UNPREFIXED` shall have their profile-provided values reduced to contain only those values that are present in `IUSE_EFFECTIVE`.

For EAPIs listed in table 5.4 as supporting profile defined IUSE injection, the package manager must save the calculated value of `IUSE_EFFECTIVE` when installing a package. Details are beyond the scope of this specification.

11.1.2 REPLACING_VERSIONS and REPLACED_BY_VERSION

In EAPIs listed in table 11.2 as supporting it, the `REPLACING_VERSIONS` variable shall be defined in `pkg_preinst` and `pkg_postinst`. In addition, it *may* be defined in `pkg_prepend` and `pkg_setup`, although ebuild authors should take care to handle binary package creation and installation correctly when using it in these phases.

REPLACE-VERSION-VARS

`REPLACING_VERSIONS` is a list, not a single optional value, to handle pathological cases such as installing `foo-2:2` to replace `foo-2:1` and `foo-3:2`.

In EAPIs listed in table 11.2 as supporting it, the `REPLACED_BY_VERSION` variable shall be defined in `pkg_prerm` and `pkg_postrm`. It shall contain at most one value.

Table 11.6: EAPIs supporting offset-prefix

EAPI	Supports offset-prefix?
0, 1, 2	No
3, 4, 5, 6, 7	Yes

Table 11.7: Variables that always or never end with a trailing slash

EAPI	Ends with a trailing slash?	
	ROOT, EROOT	D, ED
0, 1, 2, 3, 4, 5, 6	always	always
7	never	never

11.1.3 Offset-prefix variables

Table 11.6 lists the EAPIs which support offset-prefix installations. This support was initially added in EAPI 3, in the form of three extra variables. Two of these, EROOT and ED, are convenience variables using the variable EPREFIX. In EAPIs that do not support an offset-prefix, the installation offset is hardwired to `/usr`. In offset-prefix supporting EAPIs the installation offset is set as `${EPREFIX}/usr` and hence can be adjusted using the variable EPREFIX. Note that the behaviour of offset-prefix aware and agnostic is the same when EPREFIX is set to the empty string in offset-prefix aware EAPIs. The latter do have the variables ED and EROOT properly set, though.

OFFSET-PREFIX-VARS

11.1.4 Path variables and trailing slash

Unless specified otherwise, the paths provided through package manager variables do not end with a trailing slash and cannot be empty. A few exceptions to that rule are listed in table 11.7 along with applicable EAPIs.

For EAPIs where those variables are defined to always end with a trailing slash, the package manager guarantees that a trailing slash will always be appended to the path in question. If the path specifies the system root directory, it will consist of a single slash (`/`).

For EAPIs where those variables are defined to never end with a trailing slash, the package manager guarantees that a trailing slash will never be present. If the path specifies the system root directory, it will be empty.

TRAILING-SLASH

11.2 The State of Variables Between Functions

Exported and default scope variables are saved between functions. A non-local variable set in a function earlier in the call sequence must have its value preserved for later functions, including functions executed as part of a later uninstall.

Note: `pkg_pretend` is *not* part of the normal call sequence, and does not take part in environment saving.

Variables that were exported must remain exported in later functions; variables with default visibility may retain default visibility or be exported. Variables with special meanings to the package manager are excluded from this rule.

Global variables must only contain invariant values (see 7.1). If a global variable's value is invariant, it may have the value that would be generated at any given point in the build sequence.

This is demonstrated by code listing 11.1.

Listing 11.1: Environment state between functions

```

GLOBAL_VARIABLE="a"

src_compile()
{
    GLOBAL_VARIABLE="b"
    DEFAULT_VARIABLE="c"
    export EXPORTED_VARIABLE="d"
    local LOCAL_VARIABLE="e"
}

src_install(){
    [[ ${GLOBAL_VARIABLE} == "a" ]] \
        || [[ ${GLOBAL_VARIABLE} == "b" ]] \
        || die "broken env saving for globals"

    [[ ${DEFAULT_VARIABLE} == "c" ]] \
        || die "broken env saving for default"

    [[ ${EXPORTED_VARIABLE} == "d" ]] \
        || die "broken env saving for exported"

    [[ $(printenv EXPORTED_VARIABLE) == "d" ]] \
        || die "broken env saving for exported"

    [[ -z ${LOCAL_VARIABLE} ]] \
        || die "broken env saving for locals"
}

```

11.3 The State of the System Between Functions

For the sake of this section:

- Variancy is any package manager action that modifies either `ROOT` or `/` in any way that isn't merely a simple addition of something that doesn't alter other packages. This includes any non-default call to any `pkg` phase function except `pkg_setup`, a merge of any package or an unmerge of any package.
- As an exception, changes to `DISTDIR` do not count as variancy.
- The `pkg_setup` function may be assumed not to introduce variancy. Thus, ebuilds must not perform variant actions in this phase.

The following exclusivity and invariancy requirements are mandated:

- No variancy shall be introduced at any point between a package's `pkg_setup` being started up to the point that that package is merged, except for any variancy introduced by that package.
- There must be no variancy between a package's `pkg_setup` and a package's `pkg_postinst`, except for any variancy introduced by that package.
- Any non-default `pkg` phase function must be run exclusively.
- Each phase function must be called at most once during the build process for any given package.

Chapter 12

Available Commands

This chapter documents the commands available to an ebuild. Unless otherwise specified, they may be aliases, shell functions, or executables in the ebuild's PATH.

When an ebuild is being sourced for metadata querying rather than for a build (that is to say, when none of the `src_` or `pkg_` functions are to be called), no external command may be executed. The package manager may take steps to enforce this.

12.1 System Commands

Any ebuild not listed in the system set for the active profile(s) may assume the presence of every command that is always provided by the system set for that profile. However, it must target the lowest common denominator of all systems on which it might be installed—in most cases this means that the only packages that can be assumed to be present are those listed in the `base` profile or equivalent, which is inherited by all available profiles. If an ebuild requires any applications not provided by the system profile, or that are provided conditionally based on USE flags, appropriate dependencies must be used to ensure their presence.

12.1.1 Guaranteed system commands

The following commands must always be available in the ebuild environment:

- All builtin commands in GNU bash, version as listed in table 6.1 on page 29.
- `sed` must be available, and must support all forms of invocations valid for GNU sed version 4 or later.
- `patch` must be available, and must support all inputs valid for GNU patch, version as listed in table 12.1. GNU-PATCH
- `find` and `xargs` must be available, and must support all forms of invocations valid for GNU findutils version 4.4 or later. Only for EAPIs listed in table 12.1 as requiring GNU find. GNU-FIND

Table 12.1: System commands for EAPIs

EAPI	GNU find?	GNU patch version
0, 1, 2, 3, 4	Undefined	Any
5, 6	Yes	Any
7	Yes	2.7

Table 12.2: EAPI command failure behaviour

EAPI	Command failure behaviour	Supports nonfatal?	nonfatal is both a function and an external command?
0, 1, 2, 3	Non-zero exit	No	n/a
4, 5, 6	Aborts	Yes	No
7	Aborts	Yes	Yes

12.2 Commands Provided by Package Dependencies

In some cases a package's build process will require the availability of executables not provided by the core system, a common example being autotools. The availability of commands provided by the particular types of dependencies is explained in section 8.1.

12.3 Ebuild-specific Commands

The following commands will always be available in the ebuild environment, provided by the package manager. Except where otherwise noted, they may be internal (shell functions or aliases) or external commands available in PATH; where this is not specified, ebuids may not rely upon either behaviour.

Unless otherwise noted, any output of these commands ends with a newline.

12.3.1 Failure behaviour and related commands

Where a command is listed as having EAPI dependent failure behaviour, a failure shall either result in a non-zero exit status or abort the build process, as determined by table 12.2.

DIE-ON-FAILURE

The following commands affect this behaviour:

nonfatal Executes the remainder of its arguments as a command, preserving the exit status. If this results in a command being called that would normally abort the build process due to a failure, instead a non-zero exit status shall be returned. Only in EAPIs listed in table 12.2 as supporting `nonfatal`.

NONFATAL

In EAPIs listed in table 12.2 as having `nonfatal` defined both as a shell function and as an external command, the package manager must provide both implementations to account for calling directly in ebuild scope or through `xargs`.

Explicit `die` or `assert` commands only respect `nonfatal` when called with the `-n` option and in EAPIs supporting this option, see table 12.6.

12.3.2 Banned commands

Some commands are banned in some EAPIs. If a banned command is called, the package manager must abort the build process indicating an error.

BANNED-COMMANDS

12.3.3 Sandbox commands

These commands affect the behaviour of the sandbox. Each command takes a single directory as argument. Ebuids must not run any of these commands once the current phase function has returned.

addread Add a directory to the permitted read list.

addwrite Add a directory to the permitted write list.

Table 12.3: Banned commands

EAPI	Command banned?					
	dohard	dosed	einstall	dohtml	dolib	libopts
0, 1, 2, 3	No	No	No	No	No	No
4, 5	Yes	Yes	No	No	No	No
6	Yes	Yes	Yes	No	No	No
7	Yes	Yes	Yes	Yes	Yes	Yes

Table 12.4: Package manager query command options supported by EAPIs

EAPI	--host-root?	-b?	-d?	-r?
0, 1, 2, 3, 4	No	No	No	No
5, 6	Yes	No	No	No
7	No	Yes	Yes	Yes

addpredict Add a directory to the predict list. Any write to a location in this list will be denied, but will not trigger access violation messages or abort the build process.

adddeny Add a directory to the deny list.

12.3.4 Package manager query commands

These commands are used to extract information about the system. Ebuilds must not run any of these commands in parallel with any other package manager command. Ebuilds must not run any of these commands once the current phase function has returned.

In EAPIs listed in table 12.4 as supporting option `--host-root`, this flag as the first argument will cause the query to apply to the host root. Otherwise, it applies to `ROOT`.

PM-QUERY-OPTIONS

In EAPIs listed in table 12.4 as supporting options `-b`, `-d` and `-r`, these mutually exclusive flags as the first argument will cause the query to apply to locations targetted by `BDEPEND`, `DEPEND` and `RDEPEND`, respectively. When none of these options are given, `-r` is assumed.

has_version Takes exactly one package dependency specification as an argument. Returns true if a package matching the specification is installed, and false otherwise.

best_version Takes exactly one package dependency specification as an argument. If a matching package is installed, prints the category, package name and version of the highest matching version; otherwise, prints an empty string. The exit code is unspecified.

12.3.5 Output commands

These commands display messages to the user. Unless otherwise stated, the entire argument list is used as a message, with backslash-escaped characters interpreted as for the `echo -e` command of bash, notably `\t` for a horizontal tab, `\n` for a new line, and `\\` for a literal backslash. Ebuilds must not run any of these commands once the current phase function has returned.

Unless otherwise noted, output may be sent to `stderr` or some other appropriate facility. In EAPIs listed in table 12.5 as not allowing `stdout` output, using `stdout` as an output facility is forbidden.

OUTPUT-NO-STDOUT

einfo Displays an informational message.

einfoN Displays an informational message without a trailing newline.

eelog Displays an informational message of slightly higher importance. The package manager may choose to log `eelog` messages by default where `einfo` messages are not, for example.

ewarn Displays a warning message. Must not go to `stdout`.

Table 12.5: Output commands for EAPIs

EAPI	Commands can output to stdout?	Supports eqawarn?
0, 1, 2, 3, 4, 5, 6	Yes	No
7	No	Yes

Table 12.6: Properties of die and assert commands in EAPIs

EAPI	die and assert	
	support -n?	work in subshell?
0, 1, 2, 3, 4, 5	No	No
6	Yes	No
7	Yes	Yes

eqawarn Display a QA warning message intended for ebuild developers. The package manager may provide appropriate mechanisms to skip those messages for normal users. Must not go to stdout. Only available in EAPIs listed in table 12.5 as supporting eqawarn.

EQAWARN

error Displays an error message. Must not go to stdout.

ebegin Displays an informational message. Should be used when beginning a possibly lengthy process, and followed by a call to `epend`.

end Indicates that the process begun with an `ebegin` message has completed. Takes one fixed argument, which is a numeric return code, and an optional message in all subsequent arguments. If the first argument is 0, prints a success indicator; otherwise, prints the message followed by a failure indicator. Returns its first argument as exit status.

12.3.6 Error commands

These commands are used when an error is detected that will prevent the build process from completing. Ebuilds must not run any of these commands once the current phase function has returned.

die If called under the `nonfatal` command (as per section 12.3.1) and with `-n` as its first parameter, displays a failure message provided in its following argument and then returns a non-zero exit status. Only in EAPIs listed in table 12.6 as supporting option `-n`. Otherwise, displays a failure message provided in its first and only argument, and then aborts the build process.

NONFATAL-DIE

In EAPIs listed in table 12.6 as not providing subshell support, `die` is *not* guaranteed to work correctly if called from a subshell environment.

SUBSHELL-DIE

assert Checks the value of the shell's pipe status variable, and if any component is non-zero (indicating failure), calls `die`, passing any parameters to it.

12.3.7 Patch commands

These commands are used during the `src_prepare` phase to apply patches to the package's sources. Ebuilds must not run any of these commands once the current phase function has returned.

eapply Takes zero or more GNU patch options, followed by one or more file or directory paths. Processes options and applies all patches found in specified locations according to algorithm 12.1. If applying the patches fails, it aborts the build using `die`, unless run using `nonfatal`, in which case it returns non-zero exit status. Only available in EAPIs listed in table 12.7 as supporting `eapply`.

EAPPLY

eapply_user Takes no arguments. Package managers supporting it apply user-provided patches to the source tree in the current working directory. Exact behaviour is implementation defined and beyond the scope of this specification. Package managers not supporting it must implement

EAPPLY-USER

Algorithm 12.1: eapply logic

```

1: if any parameter is equal to "--" then
2:   collect all parameters before the first "--" in the options array
3:   collect all parameters after the first "--" in the files array
4: else if any parameter that begins with a hyphen follows one that does not then
5:   abort the build process with an error
6: else
7:   collect all parameters beginning with a hyphen in the options array
8:   collect all remaining parameters in the files array
9: end if
10: if the files array is empty then
11:   abort the build process with an error
12: end if
13: for all x in the files array do
14:   if $x is a directory then
15:     if not any files match $x/*.diff or $x/*.patch then
16:       abort the build process with an error
17:     end if
18:     for all files f matching $x/*.diff or $x/*.patch, sorted in POSIX locale do
19:       call patch -p1 -f -g0 --no-backup-if-mismatch "${options[@]}" < "$f"
20:       if child process returned with non-zero exit status then
21:         return immediately with that status
22:       end if
23:     end for
24:   else
25:     call patch -p1 -f -g0 --no-backup-if-mismatch "${options[@]}" < "$x"
26:     if child process returned with non-zero exit status then
27:       return immediately with that status
28:     end if
29:   end if
30: end for
31: return shell true (0)

```

Table 12.7: Patch commands for EAPIs

EAPI	eapply?	eapply_user?
0, 1, 2, 3, 4, 5	No	No
6, 7	Yes	Yes

the command as a no-op. Returns shell true (0) if patches applied successfully, or if no patches were provided. Otherwise, aborts the build process, unless run using `nonfatal`, in which case it returns non-zero exit status. Only available in EAPIs listed in table 12.7 as supporting `eapply_user`. In EAPIs where it is supported, `eapply_user` must be called once in the `src_prepare` phase. For any subsequent calls, the command will do nothing and return 0.

12.3.8 Build commands

These commands are used during the `src_configure`, `src_compile`, and `src_install` phases to run the package's build commands. Ebuilds must not run any of these commands once the current phase function has returned.

econf Calls the program's `./configure` script. This is designed to work with GNU Autoconf-generated scripts. Any additional parameters passed to `econf` are passed directly to `./configure`, after the default options below. `econf` will look in the current working directory for a configure script unless the `ECONF_SOURCE` environment variable is set, in which case it is taken to be the directory containing it.

`econf` must pass the following options to the configure script:

ECONF-OPTIONS

- `--prefix` must default to `${EPREFIX}/usr` unless overridden by `econf`'s caller.
- `--mandir` must be `${EPREFIX}/usr/share/man`
- `--infodir` must be `${EPREFIX}/usr/share/info`
- `--datadir` must be `${EPREFIX}/usr/share`
- `--sysconfdir` must be `${EPREFIX}/etc`
- `--localstatedir` must be `${EPREFIX}/var/lib`
- `--docdir` must be `${EPREFIX}/usr/share/doc/${PF}`, if the EAPI is listed in table 12.8 as using it. This option will only be passed if the string `--docdir` occurs in the output of `configure --help`.
- `--htmldir` must be `${EPREFIX}/usr/share/doc/${PF}/html`, if the EAPI is listed in table 12.8 as using it. This option will only be passed if the string `--htmldir` occurs in the output of `configure --help`.
- `--with-sysroot` must be `${ESYSROOT}`, if the EAPI is listed in table 12.8 as using it. This option will only be passed if the string `--with-sysroot` occurs in the output of `configure --help`.
- `--build` must be the value of the `CBUILD` environment variable. This option will only be passed if `CBUILD` is non-empty.
- `--host` must be the value of the `CHOST` environment variable.
- `--target` must be the value of the `CTARGET` environment variable. This option will only be passed if `CTARGET` is non-empty.
- `--libdir` must be set according to algorithm 12.2.
- `--disable-dependency-tracking`, if the EAPI is listed in table 12.8 as using it. This option will only be passed if the string `--disable-dependency-tracking` occurs in the output of `configure --help`.

Table 12.8: Extra `econf` arguments for EAPIs

EAPI	<code>--disable-dependency-tracking</code>	<code>--disable-silent-rules</code>	<code>--docdir</code>	<code>--htmldir</code>	<code>--with-sysroot</code>
0, 1, 2, 3	No	No	No	No	No
4	Yes	No	No	No	No
5	Yes	Yes	No	No	No
6	Yes	Yes	Yes	Yes	No
7	Yes	Yes	Yes	Yes	Yes

- `--disable-silent-rules`, if the EAPI is listed in table 12.8 as using it. This option will only be passed if the string `--disable-silent-rules` occurs in the output of `configure --help`.

Note that the `${EPREFIX}` component represents the same offset-prefix as described in table 11.1. It facilitates offset-prefix installations which is supported by EAPIs listed in table 11.4. When no offset-prefix installation is in effect, `EPREFIX` becomes the empty string, making the behaviour of `econf` equal for both offset-prefix supporting and agnostic EAPIs.

`econf` must be implemented internally—that is, as a bash function and not an external script. Should any portion of it fail, it must abort the build using `die`, unless run using `nonfatal`, in which case it must return non-zero exit status.

Algorithm 12.2: `econf --libdir` logic

```

1: let prefix=${EPREFIX}/usr
2: if the caller specified --prefix=$p then
3:   let prefix=$p
4: end if
5: let libdir=
6: if the ABI environment variable is set then
7:   let libvar=LIBDIR_${ABI}
8:   if the environment variable named by libvar is set then
9:     let libdir=the value of the variable named by libvar
10:  end if
11: end if
12: if libdir is non-empty then
13:   pass --libdir=$prefix/$libdir to configure
14: end if

```

emake Calls the `$MAKE` program, or GNU `make` if the `MAKE` variable is unset. Any arguments given are passed directly to the `make` command, as are the user's chosen `MAKEOPTS`. Arguments given to `emake` override user configuration. See also section 12.1.1. `emake` must be an external program and cannot be a function or alias—it must be callable from e.g. `xargs`. Failure behaviour is EAPI dependent as per section 12.3.1.

einstall A shortcut for the command given in listing 12.1. Any arguments given to `einstall` are passed verbatim to `emake`, as shown. Failure behaviour is EAPI dependent as per section 12.3.1. In EAPIs listed in table 12.3, this command is banned as per section 12.3.2.

The variable `ED` is defined as in table 11.1 and depends on the use of an offset-prefix. When such offset-prefix is absent, `ED` is equivalent to `D`. `ED` is always available in EAPIs that support offset-prefix installations as listed in table 11.4, hence EAPIs lacking offset-prefix support should use `D` instead of `ED` in the command given in listing 12.1. Variable `libdir` is an auxiliary local variable whose value is determined by algorithm 12.3.

Listing 12.1: `einstall` command

```

emake \
  prefix="${ED}"/usr \
  datadir="${ED}"/usr/share \
  mandir="${ED}"/usr/share/man \
  infodir="${ED}"/usr/share/info \
  libdir="${ED}"/usr/${libdir} \
  localstatedir="${ED}"/var/lib \
  sysconfdir="${ED}"/etc \
  -j1 \
  "$@" \
install

```

12.3.9 Installation commands

These commands are used to install files into the staging area, in cases where the package's `make install` target cannot be used or does not install all needed files. Except where otherwise stated, all filenames created or modified are relative to the staging directory including the offset-prefix `ED` in offset-prefix aware EAPIs, or just the staging directory `D` in offset-prefix agnostic EAPIs. Existing destination files are overwritten. These commands must all be external programs and not bash functions or aliases—that is, they must be callable from `xargs`. Calling any of these commands without a filename parameter is an error. `Ebuilds` must not run any of these commands once the current phase function has returned.

dobin Installs the given files into `DESTTREE/bin`, where `DESTTREE` defaults to `/usr`. Gives the files mode `0755` and transfers file ownership to the superuser or its equivalent on the system or installation at hand. For instance on Gentoo Linux in a non-offset-prefix installation this ownership is `root:root`, while on an offset-prefix aware installation this may be `joe:users`. Failure behaviour is EAPI dependent as per section 12.3.1.

doconfd Installs the given config files into `/etc/conf.d/`, by default with file mode `0644`, or with the `install` options set by the most recent `insopts` call. Failure behaviour is EAPI dependent as per section 12.3.1.

dodir Creates the given directories, by default with file mode `0755`, or with the `install` options set by the most recent `diropts` call. Failure behaviour is EAPI dependent as per section 12.3.1.

dodoc Installs the given files into a subdirectory under `/usr/share/doc/${PF}/` with file mode `0644`. The subdirectory is set by the most recent call to `docinto`. If `docinto` has not yet been called, instead installs to the directory `/usr/share/doc/${PF}/`. For EAPIs listed in table 12.9 as supporting `-r`, if the first argument is `-r`, any subsequent arguments that are directories are installed recursively to the appropriate location; in any other case, it is an error for a directory to be specified. Failure behaviour is EAPI dependent as per section 12.3.1.

DODOC

doenvd Installs the given environment files into `/etc/env.d/`, by default with file mode `0644`, or with the `install` options set by the most recent `insopts` call. Failure behaviour is EAPI dependent as per section 12.3.1.

doexe Installs the given files into the directory specified by the most recent `exeinto` call. If `exeinto` has not yet been called, behaviour is undefined. Files are installed by default with file mode `0755`, or with the `install` options set by the most recent `exeopts` call. Failure behaviour is EAPI dependent as per section 12.3.1.

dohard Takes two parameters. Creates a hardlink from the second to the first. Both paths are relative to the staging directory including the offset-prefix `ED` in offset-prefix aware EAPIs, or just the staging directory `D` in offset-prefix agnostic EAPIs. In EAPIs listed in table 12.3, this command is banned as per section 12.3.2.

doheader Installs the given header files into `/usr/include/`, by default with file mode `0644`, or with the `install` options set by the most recent `insopts` call. If the first argument is `-r`, then operates recursively, descending into any directories given. Only available in EAPIs

DOHEADER

listed in table 12.10 as supporting `doheader`. Failure behaviour is EAPI dependent as per section 12.3.1.

dohtml Installs the given HTML files into a subdirectory under `/usr/share/doc/$PF/`. The subdirectory is `html` by default, but this can be overridden with the `docinto` function. Files to be installed automatically are determined by extension and the default extensions are `css`, `gif`, `htm`, `html`, `jpeg`, `jpg`, `js` and `png`. These default extensions can be extended or reduced (see below). The options that can be passed to `dohtml` are as follows:

- `-r` enables recursion into directories.
- `-V` enables verbosity.
- `-A` adds file type extensions to the default list.
- `-a` sets file type extensions to only those specified.
- `-f` list of files that are able to be installed.
- `-x` list of directories that files will not be installed from (only used in conjunction with `-r`).
- `-p` sets a document prefix for installed files, not to be confused with the global offset-prefix.

In EAPIs listed in table 12.3, this command is banned as per section 12.3.2. Failure behaviour is EAPI dependent as per section 12.3.1.

It is undefined whether a failure shall occur if `-r` is not specified and a directory is encountered. Ebuilds must not rely upon any particular behaviour.

doinfo Installs the given GNU Info files into the `/usr/share/info` area with file mode 0644. Failure behaviour is EAPI dependent as per section 12.3.1.

doinitd Installs the given initscript files into `/etc/init.d`, by default with file mode 0755, or with the `install` options set by the most recent `exeopts` call. Failure behaviour is EAPI dependent as per section 12.3.1.

doins Takes one or more files as arguments and installs them into `INSDESTTREE`, by default with file mode 0644, or with the `install` options set by the most recent `insopts` call. If the first argument is `-r`, then operates recursively, descending into any directories given. For EAPIs listed in table 12.11, `doins` must install symlinks as symlinks; for other EAPIs, behaviour is undefined if any symlink is encountered. Failure behaviour is EAPI dependent as per section 12.3.1.

DOINS

dolib.a For each argument, installs it into the appropriate library subdirectory under `DESTTREE`, as determined by algorithm 12.3. Files are installed with file mode 0644. Any symlinks are installed into the same directory as relative links to their original target. Failure behaviour is EAPI dependent as per section 12.3.1.

dolib.so As for `dolib.a` except each file is installed with mode 0755.

dolib As for `dolib.a` except that the default install mode can be overridden with the `install` options set by the most recent `libopts` call. In EAPIs listed in table 12.3, this command is banned as per section 12.3.2.

doman Installs the given man pages into the appropriate subdirectory of `/usr/share/man` depending upon its apparent section suffix (e. g. `foo.1` goes to `/usr/share/man/man1/foo.1`) with file mode 0644.

In EAPIs listed in table 12.12 as supporting language detection by filename, a man page with name of the form `foo.lang.1` shall go to `/usr/share/man/lang/man1/foo.1`, where `lang` refers to a pair of lower-case ASCII letters optionally followed by an underscore and a pair of upper-case ASCII letters. Failure behaviour is EAPI dependent as per section 12.3.1.

DOMAN-LANGS

With option `-i18n=lang`, a man page shall be installed into an appropriate subdirectory of `/usr/share/man/lang` (e. g. `/usr/share/man/lang/man1/foo.pl.1` would be the destination for `foo.pl.1`). The `lang` subdirectory level is skipped if `lang` is the empty string. In EAPIs specified by table 12.12, the `-i18n` option takes precedence over the language code in the filename.

domo Installs the given `.mo` files with file mode 0644 into the appropriate subdirectory of the locale tree, generated by taking the basename of the file, removing the `.*` suffix, and appending `/LC_`

DOMO-PATH

Algorithm 12.3: Determining the library directory

```

1: if CONF_LIBDIR_OVERRIDE is set in the environment then
2:   return CONF_LIBDIR_OVERRIDE
3: end if
4: if CONF_LIBDIR is set in the environment then
5:   let LIBDIR_default=CONF_LIBDIR
6: else
7:   let LIBDIR_default="lib"
8: end if
9: if ABI is set in the environment then
10:  let abi=ABI
11: else if DEFAULT_ABI is set in the environment then
12:  let abi=DEFAULT_ABI
13: else
14:  let abi="default"
15: end if
16: return the value of LIBDIR_$abi

```

MESSAGES. The name of the installed files is the package name with `.mo` appended. Failure behaviour is EAPI dependent as per section 12.3.1. The locale tree location is EAPI dependent as per table 12.14.

dosbin As `dobin`, but installs to `DESTTREE/sbin`.

dosym Creates a symbolic link named as for its second parameter, pointing to the first. If the directory containing the new link does not exist, creates it. Failure behaviour is EAPI dependent as per section 12.3.1.

fowners Acts as for `chown`, but takes paths relative to the image directory. Failure behaviour is EAPI dependent as per section 12.3.1.

fperms Acts as for `chmod`, but takes paths relative to the image directory. Failure behaviour is EAPI dependent as per section 12.3.1.

keepdir For each argument, creates a directory as for `dodir`, and an empty file whose name starts with `.keep` in that directory to ensure that the directory does not get removed by the package manager should it be empty at any point. Failure behaviour is EAPI dependent as per section 12.3.1.

newbin As for `dobin`, but takes two parameters. The first is the file to install; the second is the new filename under which it will be installed. In EAPIs specified by table 12.13, standard input is read when the first parameter is `-` (a hyphen). In this case, it is an error if standard input is a terminal.

NEWFOO-STDIN

newconfd As for `doconfd`, but takes two parameters as for `newbin`.

newdoc As above, for `dodoc`.

newenvd As above, for `doenvd`.

newexe As above, for `doexe`.

newheader As above, for `doheader`.

newinitd As above, for `doinitd`.

newins As above, for `doins`.

newlib.a As above, for `dolib.a`.

newlib.so As above, for `dolib.so`.

newman As above, for `doman`.

newsbin As above, for `dosbin`.

Table 12.9: EAPIs supporting `dodoc -r`

EAPI	Supports <code>dodoc -r</code> ?
0, 1, 2, 3	No
4, 5, 6, 7	Yes

Table 12.10: EAPIs supporting `doheader` and `newheader`

EAPI	Supports <code>doheader</code> and <code>newheader</code> ?
0, 1, 2, 3, 4	No
5, 6, 7	Yes

Table 12.11: EAPIs supporting symlinks for `doins`

EAPI	<code>doins</code> supports symlinks?
0, 1, 2, 3	No
4, 5, 6, 7	Yes

Table 12.12: domain language support options for EAPIs

EAPI	Language detection by filename?	Option <code>-i18n</code> takes precedence?
0, 1	No	Not applicable
2, 3	Yes	No
4, 5, 6, 7	Yes	Yes

Table 12.13: EAPIs supporting `stdin` for `new*` commands

EAPI	<code>new*</code> can read from <code>stdin</code> ?
0, 1, 2, 3, 4	No
5, 6, 7	Yes

Table 12.14: domain destination path in EAPIs

EAPI	Destination path
0, 1, 2, 3, 4, 5, 6	<code>\${DESTTREE}/share/locale</code>
7	<code>/usr/share/locale</code>

12.3.10 Commands affecting install destinations

The following commands are used to set the various destination trees, all relative to $\${ED}$ in offset-prefix aware EAPIs and relative to $\${D}$ in offset-prefix agnostic EAPIs, used by the above installation commands. They must be shell functions or aliases, due to the need to set variables read by the above commands. Ebuilds must not run any of these commands once the current phase function has returned.

into Sets the value of `DESTTREE` for future invocations of the above utilities. Creates the directory under $\${ED}$ in offset-prefix aware EAPIs or under $\${D}$ in offset-prefix agnostic EAPIs, using `install -d` with no additional options, if it does not already exist. Failure behaviour is EAPI dependent as per section 12.3.1.

insinto Sets the value of `INSDESTTREE` for future invocations of the above utilities. May create the directory, as specified for `into`.

exeinto Sets the install path for `doexe` and `newexe`. May create the directory, as specified for `into`.

docinto Sets the install subdirectory for `dodoc` et al. May create the directory, as specified for `into`.

insopts Sets the options passed by `doins` et al. to the `install` command.

diropts Sets the options passed by `dodir` et al. to the `install` command.

exeopts Sets the options passed by `doexe` et al. to the `install` command.

libopts Sets the options passed by `dolib` et al. to the `install` command. In EAPIs listed in table 12.3, this command is banned as per section 12.3.2.

12.3.11 Commands controlling manipulation of files in the staging area

These commands are used to control optional manipulations that the package manager may perform on files in the staging directory `ED`, like compressing files or stripping symbols from object files.

For each of the operations mentioned below, the package manager shall maintain an inclusion list and an exclusion list, in order to control which directories and files the operation may or may not be performed upon. The initial contents of the two lists is specified below for each of the commands, respectively.

Any of these operations shall be carried out after `src_install` has completed, and before the execution of any subsequent phase function. For each item in the inclusion list, pretend it has the value of the `ED` variable prepended, then:

- If it is a directory, act as if every file or directory immediately under this directory were in the inclusion list.
- If the item is a file, the operation may be performed on it, unless it has been excluded as described below.
- If the item does not exist, it is ignored.

Whether an item is to be excluded is determined as follows: For each item in the exclusion list, pretend it has the value of the `ED` variable prepended, then:

- If it is a directory, act as if every file or directory immediately under this directory were in the exclusion list.
- If the item is a file, the operation shall not be performed on it.
- If the item does not exist, it is ignored.

The package manager shall take appropriate steps to ensure that any operations that it performs on files in the staging area behave sensibly even if an item is listed in the inclusion list multiple times or if an item is a symlink.

In EAPIs listed in table 12.15 as supporting controllable compression, the package manager may optionally compress a subset of the files under the `ED` directory. The package manager shall ensure that its compression mechanisms behave sensibly even if a file is already compressed. For compression, the initial values of the two lists are as follows:

DOCOMPRESS

Table 12.15: Commands controlling manipulation of files in the staging area in EAPIs

EAPI	Supports controllable compression and <code>docompress</code> ?	Supports controllable stripping and <code>dostrip</code> ?
0, 1, 2, 3	No	No
4, 5, 6	Yes	No
7	Yes	Yes

- The inclusion list contains `/usr/share/doc`, `/usr/share/info` and `/usr/share/man`.
- The exclusion list contains `/usr/share/doc/${PF}/html`.

In EAPIs listed in table 12.15 as supporting controllable stripping of symbols, the package manager may strip a subset of the files under the `ED` directory. For stripping of symbols, the initial values of the two lists are as follows:

DOSTRIP

- If the `RESTRICT` variable described in section 8.2.8 enables a `strip` token, the inclusion list is empty; otherwise it contains `/` (the root path).
- The exclusion list is empty.

The following commands may be used in `src_install` to alter these lists. It is an error to call any of these functions from any other phase.

docompress If the first argument is `-x`, add each of its subsequent arguments to the exclusion list for compression. Otherwise, add each argument to the respective inclusion list. Only available in EAPIs listed in table 12.15 as supporting `docompress`.

dostrip If the first argument is `-x`, add each of its subsequent arguments to the exclusion list for stripping of symbols. Otherwise, add each argument to the respective inclusion list. Only available in EAPIs listed in table 12.15 as supporting `dostrip`.

12.3.12 USE list functions

These functions provide behaviour based upon set or unset use flags. `Ebuilds` must not run any of these commands once the current phase function has returned. It is an error if an `ebuild` calls any of these functions in global scope.

Unless otherwise noted, if any of these functions is called with a flag value that is not included in `IUSE_EFFECTIVE`, either behaviour is undefined or it is an error as decided by table 12.16.

use Returns shell true (0) if the first argument (a USE flag name) is enabled, false otherwise. If the flag name is prefixed with `!`, returns true if the flag is disabled, and false if it is enabled. It is guaranteed that this command is quiet.

usev The same as `use`, but also prints the flag name if the condition is met.

useq Deprecated synonym for `use`.

use_with Has one-, two-, and three-argument forms. The first argument is a USE flag name, the second a `configure` option name (`${opt}`), defaulting to the same as the first argument if not provided, and the third is a string value (`${value}`). For EAPIs listed in table 12.17 as not supporting it, an empty third argument is treated as if it weren't provided. If the USE flag is set, outputs `--with-${opt}=${value}` if the third argument was provided, and `--with-${opt}` otherwise. If the flag is not set, then it outputs `--without-${opt}`.

USE-WITH

use_enable Works the same as `use_with()`, but outputs `--enable-` or `--disable-` instead of `--with-` or `--without-`.

usex Accepts at least one and at most five arguments. The first argument is a USE flag name, any subsequent arguments (`${arg2}` to `${arg5}`) are string values. If not provided, `${arg2}` and `${arg3}` default to `yes` and `no`, respectively; `${arg4}` and `${arg5}` default to the empty string. If the USE flag is set, outputs `${arg2}${arg4}`. Otherwise, outputs

USEX

Table 12.16: EAPI behaviour for use queries not in IUSE_EFFECTIVE

EAPI	Behaviour
0, 1, 2, 3	Undefined
4, 5, 6, 7	Error

Table 12.17: EAPIs supporting empty third argument in use_with and use_enable

EAPI	Supports empty third argument?
0, 1, 2, 3	No
4, 5, 6, 7	Yes

`${arg3}${arg5}`. The condition is inverted if the flag name is prefixed with `!`. Only available in EAPIs listed in table 12.18 as supporting usex.

in_iuse Returns shell true (0) if the first argument (a USE flag name) is included in IUSE_EFFECTIVE, false otherwise. Only available in EAPIs listed in table 12.18 as supporting in_iuse.

IN-IUSE

12.3.13 Text list functions

These functions check whitespace-separated lists for a particular value.

has Returns shell true (0) if the first argument (a word) is found in the list of subsequent arguments, false otherwise. Guaranteed quiet.

hasv The same as has, but also prints the first argument if found.

hasq Deprecated synonym for has.

12.3.14 Version manipulation and comparison commands

These commands provide utilities for working with version strings. Their availability per EAPI is listed in table 12.19.

VER-COMMANDS

For the purpose of version manipulation commands, the specification provides a method for splitting an arbitrary version string (not necessarily conforming to section 3.2) into a series of version components and version separators.

A version component consists either purely of digits (`[0-9]+`) or purely of uppercase and lowercase ASCII letters (`[A-Za-z]+`). A version separator is either a string of any other characters (`[^A-Za-z0-9]`) or it occurs at the transition between a sequence of digits and a sequence of letters, or vice versa. In the latter case, the version separator is an empty string.

The version string is processed left-to-right, with the successive version components being assigned successive indices starting with 1. The separator following a version component is assigned the index of the preceding version component. If the first version component is preceded by a non-empty string of version separator characters, this separator is assigned the index 0.

Table 12.18: EAPIs supporting usex and in_iuse

EAPI	usex?	in_iuse?
0, 1, 2, 3, 4	No	No
5	Yes	No
6, 7	Yes	Yes

Table 12.19: EAPIs supporting version manipulation commands

EAPI	ver_cut?	ver_rs?	ver_test?
0, 1, 2, 3, 4, 5, 6	No	No	No
7	Yes	Yes	Yes

The version components are presumed present if not empty. The version separators between version components are always presumed present, even if they are empty. The version separators preceding the first version component and following the last are only presumed present if they are not empty.

Whenever the commands support ranges, the range is specified as an unsigned integer, optionally followed by a hyphen (-), which in turn is optionally followed by another unsigned integer.

A single integer specifies a single component or separator index. An integer followed by a hyphen specifies all components or separators starting with the one at the specified index. Two integers separated by a hyphen specify a range of versions starting at the index specified by the first and ending at the second, inclusively.

ver_cut Takes a range as the first argument, and optionally a version string as the second. Prints a substring of the version string starting at the version component specified as start of the range and ending at the version component specified as end of the range. If the version string is not specified, `#{PVR}` is used.

If the range spans outside the present version components, the missing components and separators are presumed empty. In particular, the range starting at zero includes the zeroth version separator if present, and the range spanning past the last version component includes the suffix following it if present. A range that does not intersect with any present version components yields an empty string.

ver_rs Takes one or more pairs of arguments, optionally followed by a version string. Every argument pair specifies a range and a replacement string. Prints a version string after performing the specified separator substitutions. If the version string is not specified, `#{PVR}` is used.

For every argument pair specified, each of the version separators present at indices specified by the range is replaced with the replacement string, in order. If the range spans outside the range of present version separators, it is silently truncated.

ver_test Takes two or three arguments. In the 3-argument form, takes an LHS version string, followed by an operator, followed by an RHS version string. In the 2-argument form, the first version string is omitted and `#{PVR}` is used as LHS version string. The operator can be `-eq` (equal to), `-ne` (not equal to), `-gt` (greater than), `-ge` (greater than or equal to), `-lt` (less than) or `-le` (less than or equal to). Returns shell true (0) if the specified relation between the LHS and RHS version strings is fulfilled.

Both version strings must conform to the version specification in section 3.2. Comparison is done using algorithm 3.1.

12.3.15 Misc commands

The following commands are always available in the ebuild environment, but don't really fit in any of the above categories. Ebuilds must not run any of these commands once the current phase function has returned.

dosed Takes any number of arguments, which can be files or sed expressions. For each argument, if it names, relative to ED (offset-prefix aware EAPIs) or D (offset-prefix agnostic EAPIs) a file which exists, then sed is run with the current expression on that file. Otherwise, the current expression is set to the text of the argument. The initial value of the expression is `s:#{ED}: :g` in offset-prefix aware EAPIs and `s:#{D}: :g` in offset-prefix agnostic EAPIs. In EAPIs listed in table 12.3, this command is banned as per section 12.3.2.

unpack Unpacks one or more source archives, in order, into the current directory. For compressed files, creates the target file in the current directory, with the compression suffix removed from its name. After unpacking, must ensure that all filesystem objects inside the current working directory (but not the current working directory itself) have permissions `a+r,u+w,go-w` and that all directories under the current working directory additionally have permissions `a+x`.

Arguments to `unpack` are interpreted as follows:

- A filename without path (i. e., not containing any slash) is looked up in `DISTDIR`.
- An argument starting with the string `./` is a path relative to the working directory.
- Otherwise, for EAPIs listed in table 12.20 as supporting absolute and relative paths, the argument is interpreted as a literal path (absolute, or relative to the working directory); for EAPIs listed as *not* supporting such paths, `unpack` shall abort the build process.

UNPACK-ABSOLUTE

Any unrecognised file format shall be skipped silently. If unpacking a supported file format fails, `unpack` shall abort the build process.

Must be able to unpack the following file formats, if the relevant binaries are available:

UNPACK-EXTENSIONS

- tar files (`*.tar`). Ebuilds must ensure that GNU tar is installed.
- gzip-compressed files (`*.gz`, `*.Z`). Ebuilds must ensure that GNU gzip is installed.
- gzip-compressed tar files (`*.tar.gz`, `*.tgz`, `*.tar.Z`). Ebuilds must ensure that GNU gzip and GNU tar are installed.
- bzip2-compressed files (`*.bz2`, `*.bz`). Ebuilds must ensure that bzip2 is installed.
- bzip2-compressed tar files (`*.tar.bz2`, `*.tbz2`, `*.tar.bz`, `*.tbz`). Ebuilds must ensure that bzip2 and GNU tar are installed.
- zip files (`*.zip`, `*.ZIP`, `*.jar`). Ebuilds must ensure that Info-ZIP Unzip is installed.
- 7zip files (`*.7z`, `*.7Z`). Ebuilds must ensure that P7ZIP is installed.
- rar files (`*.rar`, `*.RAR`). Ebuilds must ensure that RARLAB's unrar is installed.
- LHA archives (`*.LHA`, `*.LHa`, `*.lha`, `*.lzh`). Ebuilds must ensure that the lha program is installed.
- ar archives (`*.a`). Ebuilds must ensure that GNU binutils is installed.
- deb packages (`*.deb`). Ebuilds must ensure that the `deb2targz` program is installed on those platforms where the GNU binutils `ar` program is not available and the installed `ar` program is incompatible with GNU archives. Otherwise, ebuilds must ensure that GNU binutils is installed.
- lzma-compressed files (`*.lzma`). Ebuilds must ensure that XZ Utils is installed.
- lzma-compressed tar files (`*.tar.lzma`). Ebuilds must ensure that XZ Utils and GNU tar are installed.
- xz-compressed files (`*.xz`). Ebuilds must ensure that XZ Utils is installed. Only for EAPIs listed in table 12.21 as supporting `.xz`.
- xz-compressed tar files (`*.tar.xz`, `*.txz`). Ebuilds must ensure that XZ Utils and GNU tar are installed. Only for EAPIs listed in table 12.21 as supporting `.tar.xz` or `.txz`.

It is up to the ebuild to ensure that the relevant external utilities are available, whether by being in the system set or via dependencies.

`unpack` matches filename extensions in a case-insensitive manner, for EAPIs listed such in table 12.20.

UNPACK-IGNORE-CASE

inherit See section 10.1.

default Calls the `default_` function for the current phase (see section 9.1.17). Must not be called if the `default_` function does not exist for the current phase in the current EAPI. Only available in EAPIs listed in table 12.22 as supporting `default`.

DEFAULT-FUNC

Table 12.20: unpack behaviour for EAPIs

EAPI	Supports absolute and relative paths?	Case-insensitive matching?
0, 1, 2, 3, 4, 5	No	No
6, 7	Yes	Yes

Table 12.21: unpack extensions for EAPIs

EAPI	.xz?	.tar.xz?	.txz?
0, 1, 2	No	No	No
3, 4, 5	Yes	Yes	No
6, 7	Yes	Yes	Yes

einstalldocs Takes no arguments. Installs the files specified by the DOCS and HTML_DOCS variables or a default set of files, according to algorithm 12.4. If called using `nonfatal` and any of the called commands returns a non-zero exit status, returns immediately with the same exit status. Only available in EAPIs listed in table 12.22 as supporting `einstalldocs`.

EINSTALDOCS

Algorithm 12.4: `einstalldocs` logic

- 1: save the value of the install directory for `dodoc`
 - 2: set the install directory for `dodoc` to `/usr/share/doc/${PF}`
 - 3: **if** the DOCS variable is a non-empty array **then**
 - 4: call `dodoc -r "${DOCS[@]}"`
 - 5: **else if** the DOCS variable is a non-empty scalar **then**
 - 6: call `dodoc -r ${DOCS}`
 - 7: **else if** the DOCS variable is unset **then**
 - 8: **for all** *d* matching the filename expansion of `README* ChangeLog AUTHORS NEWS TODO CHANGES THANKS BUGS FAQ CREDITS CHANGELOG do`
 - 9: **if** file *d* exists and has a size greater than zero **then**
 - 10: call `dodoc` with *d* as argument
 - 11: **end if**
 - 12: **end for**
 - 13: **end if**
 - 14: set the install directory for `dodoc` to `/usr/share/doc/${PF}/html`
 - 15: **if** the HTML_DOCS variable is a non-empty array **then**
 - 16: call `dodoc -r "${HTML_DOCS[@]}"`
 - 17: **else if** the HTML_DOCS variable is a non-empty scalar **then**
 - 18: call `dodoc -r ${HTML_DOCS}`
 - 19: **end if**
 - 20: restore the value of the install directory for `dodoc`
 - 21: **return** shell true (0)
-

get_libdir Prints the `libdir` name obtained according to algorithm 12.5. Only available in EAPIs listed in table 12.22 as supporting `get_libdir`.

GET-LIBDIR

12.3.16 Debug commands

The following commands are available for debugging. Normally all of these commands should be no ops; a package manager may provide a special debug mode where these commands instead do something. Ebuilds must not run any of these commands once the current phase function has returned.

debug-print If in a special debug mode, the arguments should be outputted or recorded using some kind of debug logging.

Algorithm 12.5: `get_libdir` logic

```

1: let libdir=lib
2: if the ABI environment variable is set then
3:   let libvar=LIBDIR_${ABI}
4:   if the environment variable named by libvar is set then
5:     let libdir=the value of the variable named by libvar
6:   end if
7: end if
8: print the value of libdir

```

Table 12.22: Misc commands for EAPIs

EAPI	default?	einstalldocs?	get_libdir?
0, 1	No	No	No
2, 3, 4, 5	Yes	No	No
6, 7	Yes	Yes	Yes

debug-print-function Calls `debug-print` with `$1`: `entering function` as the first argument and the remaining arguments as additional arguments.

debug-print-section Calls `debug-print` with `now in section $*`.

12.3.17 Reserved commands and variables

Except where documented otherwise, all functions and variables that contain any of the following strings (ignoring case) are reserved for package manager use and may not be used or relied upon by `ebuilds`:

- `__` (two underscores) at beginning of string
- `abort`
- `dyn`
- `ebuild`
- `hook`
- `paludis`
- `portage`
- `prep`

Chapter 13

Merging and Unmerging

Note: In this chapter, *file* and *regular file* have their Unix meanings.

13.1 Overview

The merge process merges the contents of the D directory onto the filesystem under ROOT. This is not a straight copy; there are various subtleties which must be addressed.

The unmerge process removes an installed package's files. It is not covered in detail in this specification.

13.2 Directories

Directories are merged recursively onto the filesystem. The method used to perform the merge is not specified, so long as the end result is correct. In particular, merging a directory may alter or remove the source directory under D.

Ebuilds must not attempt to merge a directory on top of any existing file that is not either a directory or a symlink to a directory.

13.2.1 Permissions

The owner, group and mode (including set*id and sticky bits) of the directory must be preserved, except as follows:

- Any directory owned by the user used to perform the build must become owned by the root user.
- Any directory whose group is the primary group of the user used to perform the build must have its group be that of the root user.

On SELinux systems, the SELinux context must also be preserved. Other directory attributes, including modification time, may be discarded.

13.2.2 Empty directories

Behaviour upon encountering an empty directory is undefined. Ebuilds must not attempt to install an empty directory.

Table 13.1: Preservation of file modification times (mtimes)

EAPI	mtimes preserved?
0, 1, 2	Undefined
3, 4, 5, 6, 7	Yes

13.3 Regular Files

Regular files are merged onto the filesystem (but see the notes on configuration file protection, below). The method used to perform the merge is not specified, so long as the end result is correct. In particular, merging a regular file may alter or remove the source file under D.

Ebuilds must not attempt to merge a regular file on top of any existing file that is not either a regular file or a symlink to a regular file.

13.3.1 Permissions

The owner, group and mode (including set*id and sticky bits) of the file must be preserved, except as follows:

- Any file owned by the user used to perform the build must become owned by the root user.
- Any file whose group is the primary group of the user used to perform the build must have its group be that of the root user.
- The package manager may reduce read and write permissions on executable files that have a set*id bit set.

On SELinux systems, the SELinux context must also be preserved. Other file attributes may be discarded.

13.3.2 File modification times

In EAPIs listed in table 13.1, the package manager must preserve modification times of regular files. This includes files being compressed before merging. Exceptions to this are files newly created by the package manager and binary object files being stripped of symbols.

MTIME-PRESERVE

When preserving, the seconds part of every regular file's mtime must be preserved exactly. The sub-second part must either be set to zero, or set to the greatest value supported by the operating system and filesystem that is not greater than the sub-second part of the original time.

For any given destination filesystem, the package manager must ensure that for any two preserved files a, b in that filesystem the relation $\text{mtime}(a) \leq \text{mtime}(b)$ still holds, if it held under the original image directory.

In other EAPIs, the behaviour with respect to file modification times is undefined.

13.3.3 Configuration file protection

The package manager must provide a means to prevent user configuration files from being overwritten by any package updates. The profile variables `CONFIG_PROTECT` and `CONFIG_PROTECT_MASK` (section 5.3) control the paths for which this must be enforced.

In order to ensure interoperability with configuration update tools, the following scheme must be used by all package managers when merging any regular file:

1. If the directory containing the file to be merged is not listed in `CONFIG_PROTECT`, and is not a subdirectory of any such directory, and if the file is not listed in `CONFIG_PROTECT`, the file is merged normally.

2. If the directory containing the file to be merged is listed in `CONFIG_PROTECT_MASK`, or is a subdirectory of such a directory, or if the file is listed in `CONFIG_PROTECT_MASK`, the file is merged normally.
3. If no existing file with the intended filename exists, or the existing file has identical content to the one being merged, the file is installed normally.
4. Otherwise, prepend the filename with `._cfg0000_`. If no file with the new name exists, then the file is merged with this name.
5. Otherwise, increment the number portion (to form `._cfg0001_<name>`) and repeat step 4. Continue this process until a usable filename is found.
6. If 9999 is reached in this way, behaviour is undefined.

13.4 Symlinks

Symlinks are merged as symlinks onto the filesystem. The link destination for a merged link shall be the same as the link destination for the link under `D`, except as noted below. The method used to perform the merge is not specified, so long as the end result is correct; in particular, merging a symlink may alter or remove the symlink under `D`.

Ebuilds must not attempt to merge a symlink on top of a directory.

13.4.1 Rewriting

Any absolute symlink whose link starts with `D` must be rewritten with the leading `D` removed. The package manager should issue a notice when doing this.

13.5 Hard Links

A hard link may be merged either as a single file with links or as multiple independent files.

13.6 Other Files

Ebuilds must not attempt to install any other type of file (FIFOs, device nodes etc).

Chapter 14

Metadata Cache

14.1 Directory Contents

The `metadata/cache` directory, if it exists, contains directories whose names are the same as categories in the repository. Each subdirectory may optionally contain one file per package version in that category, named `<package>-<version>`, in the format described below.

The metadata cache may be incomplete or non-existent, and may contain additional bogus entries.

14.2 Cache File Format

Each cache file contains the textual values of various metadata keys, one per line, in the following order. Other lines may be present following these; their meanings are not defined here.

1. Build-time dependencies (DEPEND)
2. Run-time dependencies (RDEPEND)
3. Slot (SLOT)
4. Source tarball URIs (SRC_URI)
5. RESTRICT
6. Package homepage (HOMEPAGE)
7. Package license (LICENSE)
8. Package description (DESCRIPTION)
9. Package keywords (KEYWORDS)
10. Inherited eclasses (INHERITED)
11. Use flags that this package respects (IUSE)
12. Use flags that this package requires (REQUIRED_USE). Blank in some EAPIs; see table 7.2.
13. Post dependencies (PDEPEND)
14. Build-time dependencies for CBUILD host (BDEPEND). Blank in some EAPIs; see table 8.3.
15. The ebuild API version to which this package conforms (EAPI)
16. Properties (PROPERTIES). In some EAPIs, may optionally be blank, regardless of ebuild metadata; see table 7.2.
17. Defined phases (DEFINED_PHASEES). In some EAPIs, may optionally be blank, regardless of ebuild metadata; see table 7.4.
18. Blank lines to pad the file to 22 lines long

Future EAPIs may define new variables, remove existing variables, change the line number or format used for a particular variable, add or reduce the total length of the file and so on. Any future EAPI that uses this cache format will continue to place the EAPI value on line 15 if such a concept makes sense for that EAPI, and will place a value that is clearly not a supported EAPI on line 15 if it does not.

Chapter 15

Glossary

This section contains explanations of some of the terms used in this document whose meaning may not be immediately obvious.

qualified package name A package name along with its associated category. For example, `app-editors/vim` is a qualified package name.

new-style virtual A new-style virtual is a normal package in the `virtual` category which installs no files and uses its dependency requirements to pull in a ‘provider’. Historically, old-style virtuals required special handling from the package manager; new-style virtuals do not.

stand-alone repository An (ebuild) repository which is intended to function on its own as the only, or primary, repository on a system. Contrast with *slave repository* below.

slave repository, non-stand-alone repository An (ebuild) repository which is not complete enough to function on its own, but needs one or more *master repositories* to satisfy dependencies and provide repository-level support files. Known in Portage as an overlay.

master repository See above.

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Appendix A

metadata.xml

The `metadata.xml` file is used to contain extra package- or category-level information beyond what is stored in ebuild metadata. Its exact format is strictly beyond the scope of this document, and is described in GLEP 68 [1].

Appendix B

Unspecified Items

The following items are not specified by this document, and must not be relied upon by ebuilds. This is, of course, an incomplete list—it covers only the things that the authors know have been abused in the past.

- The FEATURES variable. This is Portage specific.
- Similarly, any EMERGE_ variable and any PORTAGE_ variable.
- Any Portage configuration file.
- The VDB (/var/db/pkg). Ebuilds must not access this or rely upon it existing or being in any particular format.
- The portageq command. The has_version and best_version commands are available as functions.
- The emerge command.
- Binary packages.
- The PORTDIR_OVERLAY variable, and overlay behaviour in general.

Appendix C

Historical Curiosities

Long-obsolete Features

The items described in this section are included for information only. Unless otherwise noted, they were deprecated or abandoned long before EAPI was introduced. Ebuilds must not use these features, and package managers should not be changed to support them.

If-else USE blocks

Historically, Portage supported if-else use conditionals, as shown by listing C.1. The block before the colon would be taken if the condition was met, and the block after the colon would be taken if the condition was not met.

CVS versions

Portage has very crude support for CVS packages. The package `foo` could contain a file named `foo-cvs.1.2.3.ebuild`. This version would order *higher* than any non-CVS version (including `foo-2.ebuild`). This feature has not seen real world use and breaks versioned dependencies, so it must not be used.

use.defaults

The `use.defaults` file in the profile directory was used to implement ‘autouse’—switching USE flags on or off depending upon which packages are installed. It was deprecated long ago and finally removed in 2009.

Listing C.1: If-else use blocks

```
DEPEND="
    flag? (
        taken/if-true
    ) : (
        taken/if-false
    )
"
```

Retroactive Changes

In some exceptional cases, changes to the specification have been approved by the Gentoo Council without introducing a new EAPI. This section lists such retroactive changes.

Bash version

EAPIs 0, 1 and 2 originally specified GNU Bash version 3.0. This was retroactively updated to version 3.2 (see table 6.1) in November 2009.

Old-style virtuals

Historically, virtuals were special packages rather than regular ebuilds. An ebuild could specify in the `PROVIDE` metadata that it supplied certain virtuals, and the package manager had to bear this in mind when handling dependencies.

Old-style virtuals were supported by EAPIs 0, 1, 2, 3 and 4. They were phased out via GLEP 37 [4] and finally removed in 2011.

EAPI parsing

The method to specify the EAPI of an ebuild used to be a shell variable assignment, and the package manager had to source the ebuild in order to determine the EAPI. Therefore any ebuild using a future EAPI would still have to be sourceable by old package managers, which imposed restrictions e. g. on updating the Bash version or on possible changes of global scope functions. Several approaches to overcome this limitation were discussed, notably GLEP 55 [2], which was rejected though.

The current syntax of the EAPI assignment statement (see section 7.3.1), allowing the package manager to obtain the EAPI from the ebuild by a regular expression match and without sourcing it, was introduced in May 2012.

Package names

Previously, package names were only required not to end in a hyphen followed by one or more digits. In October 2012 this was tightened to the specification in section 3.1.2, namely that they must not end in a hyphen followed by anything resembling a package version.

Asterisk in dependency specification

In the `=` dependency operator specified in section 8.2.6.1, an asterisk used to induce string prefix comparison instead of the normal version comparison logic. That could lead to surprising results, e. g. `=dev-lang/perl-5.2*` matching `dev-lang/perl-5.22.0`. Moreover, implementation in package managers deviated from what was specified.

String prefix matching was effective in EAPIs 0, 1, 2, 3, 4 and 5. It was retroactively dropped in favour of the current behaviour in October 2015.

Empty dependency groups

The dependency specification format (see section 8.2) originally permitted all-of, any-of, exactly-one-of, at-most-one-of and use-conditional groups with zero sub-elements. However, such empty groups were neither supported by all package managers nor used in ebuilds. They were dropped from the specification in October 2017.

Appendix D

Feature Availability by EAPI

Note: This chapter is informative and for convenience only. Refer to the main text for specifics. For lack of space, EAPIs 0, 1, 2, and 3 have been consolidated into a single column in the table below; entries marked with an asterisk differ between these EAPIs. See the 2012-09-20 edition of this document for a complete table of previous EAPIs.

Table D.1: Features in EAPIs

Feature	Reference	EAPIs				
		0, 1, 2, 3	4	5	6	7
package .mask directory	package-mask-dir p19	No	No	No	No	Yes
Profile files as directories	profile-file-dirs p24	No	No	No	No	Yes
package .provided	package-provided p25	Optional	Optional	Optional	Optional	No
Stable use masking/forcing	stablemask p25	No	No	Yes	Yes	Yes
Bash version	bash-version p29	3.2	3.2	3.2	4.2	4.2
failglob in global scope	failglob p29	No	No	No	Yes	Yes
IUSE defaults	iuse-defaults p31	*	Yes	Yes	Yes	Yes
REQUIRED_USE	required-use p31	No	Yes	Yes	Yes	Yes
PROPERTIES	properties p31	Optionally	Yes	Yes	Yes	Yes
RDEPEND=DEPEND	rdepend-depend p32	Yes	No	No	No	No
DEFINED_PHASES	defined-phases p33	Optionally	Yes	Yes	Yes	Yes
BDEPEND	bdepend p34	No	No	No	No	Yes
?? () groups	at-most-one-of p35	No	No	Yes	Yes	Yes
Empty !, ~ groups match	empty-dep-groups p36	Yes	Yes	Yes	Yes	No
SRC_URI arrows	src-uri-arrows p40	*	Yes	Yes	Yes	Yes
Slot dependencies	slot-deps p38	*	Named	Named and Operator	Named and Operator	Named and Operator
Sub-slots	sub-slot p38	No	No	Yes	Yes	Operator
Use dependencies	use-deps p37	*	4-style	4-style	4-style	4-style
! blockers	bang-strength p38	*	Weak	Weak	Weak	Weak
!! blockers	bang-strength p38	*	Strong	Strong	Strong	Strong
S to WORKDIR fallback	s-workdir-fallback p41	Always	Conditional	Conditional	Conditional	Conditional
pkg-pretend	pkg-pretend p41	No	Yes	Yes	Yes	Yes
src_prepare	src_prepare p42	*	Yes	Yes	Yes	Yes
src_prepare style	src_prepare p42	*	no-op	no-op	6	6
src_configure	src_configure p43	*	Yes	Yes	Yes	Yes
src_compile style	src_compile p43	*	2	2	2	2
Parallel tests	parallel-tests p44	No	No	Yes	Yes	Yes

Feature	Reference	EAPIs						
		0, 1, 2, 3	4	4	5	6	6	7
src_install style	src_install p45	no-op	Both	Both	Both	Both	Both	Both
pkg_info	pkg_info p46	Installed	pkg_nofetch,	pkg_nofetch,	pkg_nofetch,	pkg_nofetch,	pkg_nofetch,	pkg_nofetch,
default_t_phase functions	default-phase-funcs p47	*	src_unpack,	src_unpack,	src_unpack,	src_unpack,	src_unpack,	src_unpack,
			src_prepare,	src_prepare,	src_prepare,	src_prepare,	src_prepare,	src_prepare,
			src_configure,	src_configure,	src_configure,	src_configure,	src_configure,	src_configure,
			src_compile,	src_compile,	src_compile,	src_compile,	src_compile,	src_compile,
			src_install,	src_install,	src_install,	src_install,	src_install,	src_install,
			src_test	src_test	src_test	src_test	src_test	src_test
AA	aa p52	Yes	No	No	No	No	No	No
PORTDIR	portdir p53	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ECLASSDIR	eclassdir p53	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SYSROOT, ESYSROOT	sysroot p53	No	No	No	No	No	No	Yes
BROOT	broot p53	No	No	No	No	No	No	Yes
DESTTREE	destree p54	Yes	Yes	Yes	Yes	Yes	Yes	No
INSDSTREE	insdestree p54	Yes	Yes	Yes	Yes	Yes	Yes	No
KV	kv p55	Yes	No	No	No	No	No	No
EBUILD_PHASE_FUNC	ebuild-phase-func p55	No	No	No	Yes	Yes	Yes	Yes
MERGE_TYPE	merge-type p55	No	Yes	Yes	Yes	Yes	Yes	Yes
ENV_UNSET	env-unset p56	No	No	No	No	No	No	Yes
Sane locale settings	locale-settings p56	Undefined	Undefined	Undefined	Undefined	Undefined	Undefined	Yes
Profile IUSE injection	profile-iuse-inject p57	No	No	No	Yes	Yes	Yes	Yes
REPLACING_VERSIONS	replace-version-vars p57	No	Yes	Yes	Yes	Yes	Yes	Yes
REPLACED_BY_VERSION	replace-version-vars p57	No	Yes	Yes	Yes	Yes	Yes	Yes
EPREFIX, ED, EROOT	offset-prefix-vars p58	*	Yes	Yes	Yes	Yes	Yes	Yes
Trailing slash in D etc.	trailing-slash p58	Yes	Yes	Yes	Yes	Yes	Yes	No
GNU patch version	gnu-patch p60	Any	Any	Any	Any	Any	Any	2.7
find is GNU?	gnu-find p60	Undefined	Undefined	Undefined	Yes	Yes	Yes	Yes
Most utilities die	die-on-failure p61	No	Yes	Yes	Yes	Yes	Yes	Yes
nonfatal	nonfatal p61	No	Yes	Yes	Yes	Yes	Yes	Function / external

Feature	Reference	EAPIs						
		0, 1, 2, 3	4	5	6	7		
dohard	banned-commands p61	Yes	Banned	Banned	Banned	Banned	Banned	
dosed	banned-commands p61	Yes	Banned	Banned	Banned	Banned	Banned	
einstall	banned-commands p61	Yes	Yes	Yes	Yes	Yes	Banned	
dohtml	banned-commands p61	Yes	Yes	Yes	Yes	Yes	Banned	
dolib	banned-commands p61	Yes	Yes	Yes	Yes	Yes	Banned	
libopts	banned-commands p61	Yes	Yes	Yes	Yes	Yes	Banned	
Query command options	pm-query-options p62	None	None	--host-root	--host-root	--host-root	-b, -d, -r	
Output commands use stdout	output-no-stdout p62	Yes	Yes	Yes	Yes	Yes	No	
eqawarn	eqawarn p63	No	No	No	No	No	Yes	
die -n	nonfatal-die p63	No	No	No	No	No	Yes	
die in subshell	subshell-die p63	No	No	No	No	No	Yes	
eapply	eapply p63	No	No	No	No	No	Yes	
eapply_user	eapply-user p63	No	No	No	No	No	Yes	
econf arguments	econf-options p65	None	disable	disable	disable	disable	disable	
			dependency	dependency	dependency	dependency	dependency	
			tracking	tracking, disable	tracking, disable	tracking, disable	tracking, disable	
				silent rules	silent rules	silent rules,	silent rules,	
					docdir, htmdir	docdir, htmdir	docdir, htmdir,	
							with sysroot	
dodoc -r	dodoc p67	No	Yes	Yes	Yes	Yes	Yes	
doheader	doheader p67	No	No	Yes	Yes	Yes	Yes	
doins handles symlinks	doins p68	No	Yes	Yes	Yes	Yes	Yes	
doman languages	doman-langs p68	*	Yes	Yes	Yes	Yes	Yes	
doman -i18n precedence	doman-langs p68	*	Yes	Yes	Yes	Yes	Yes	
domo destination path	domo-path p68	#{DESTTREE}	#{DESTTREE}	#{DESTTREE}	#{DESTTREE}	#{DESTTREE}	#{DESTTREE}	
new* support stdin	newfoo-stdin p69	No	No	Yes	Yes	Yes	/usr	
Controllable compression	docompress p71	No	Yes	Yes	Yes	Yes	Yes	
docompress	docompress p71	No	Yes	Yes	Yes	Yes	Yes	
Controllable stripping	dostrip p72	No	No	No	No	No	Yes	
dostrip	dostrip p72	No	No	No	No	No	Yes	

Feature	Reference	EAPIs						
		0, 1, 2, 3	4	5	6	7		
use_with empty third arg	use-with p72	No	Yes	Yes	Yes	Yes	Yes	
usex	usex p72	No	No	Yes	Yes	Yes	Yes	
in_iuse	in-iuse p73	No	No	No	Yes	Yes	Yes	
ver_* commands	ver-commands p73	No	No	No	No	Yes	Yes	
unpack absolute paths	unpack-absolute p75	No	No	No	Yes	Yes	Yes	
unpack support for xz	unpack-extensions p75	*	Yes	Yes	Yes	Yes	Yes	
unpack support for txz	unpack-extensions p75	No	No	No	Yes	Yes	Yes	
unpack case-insensitive	unpack-ignore-case p75	No	No	No	Yes	Yes	Yes	
default function	default-func p75	*	Yes	Yes	Yes	Yes	Yes	
einstalldocs	einstalldocs p76	No	No	No	Yes	Yes	Yes	
get_libdir	get-libdir p76	No	No	No	Yes	Yes	Yes	
File mtimes preserved	mtime-preserve p79	*	Yes	Yes	Yes	Yes	Yes	

Appendix E

Differences Between EAPIs

Note: This chapter is informative and for convenience only. Refer to the main text for specifics.

EAPI 0

EAPI 0 is the base EAPI.

EAPI 1

EAPI 1 is EAPI 0 with the following changes:

- IUSE defaults, IUSE-DEFAULTS on page 31.
- Slot dependencies, SLOT-DEPS on page 38.
- Different `src_compile` implementation, SRC-COMPILE-1 on page 44.

EAPI 2

EAPI 2 is EAPI 1 with the following changes:

- Use dependencies, USE-DEPS on page 37.
- `!` and `!!` blockers, BANG-STRENGTH on page 38.
- `SRC_URI` arrows, SRC-URI-ARROWS on page 40.
- `src_prepare`, SRC-PREPARE on page 42.
- `src_configure`, SRC-CONFIGURE on page 43.
- Different `src_compile` implementation, SRC-COMPILE-2 on page 44.
- `default_phase` functions for phases `pkg_nofetch`, `src_unpack`, `src_prepare`, `src_configure`, `src_compile` and `src_test`; DEFAULT-PHASE-FUNCS on page 47.
- domain language detection by filename, DOMAN-LANGS on page 68.
- `default` function, DEFAULT-FUNC on page 75.

EAPI 3

EAPI 3 is EAPI 2 with the following changes:

- Offset-prefix support by definition of `EPREFIX`, `ED` and `EROOT`, OFFSET-PREFIX-VARS on page 58.
- `unpack` supports `.xz` and `.tar.xz`, UNPACK-EXTENSIONS on page 75.
- File modification times are preserved, MTIME-PRESERVE on page 79.

EAPI 4

EAPI 4 is EAPI 3 with the following changes:

- PROPERTIES support is mandatory, PROPERTIES on page 31.
- REQUIRED_USE, REQUIRED-USE on page 31.
- RDEPEND=DEPEND no longer done, RDEPEND-DEPEND on page 32.
- DEFINED_PHASES support is mandatory, DEFINED-PHASES on page 33.
- Use dependency defaults, USE-DEP-DEFAULTS on page 39.
- S to WORKDIR fallback restricted, S-WORKDIR-FALLBACK on page 41.
- pkg_pretend, PKG-PRETEND on page 41.
- Default src_install no longer a no-op, SRC-INSTALL-4 on page 45.
- pkg_info can run on non-installed packages, PKG-INFO on page 46.
- AA is gone, AA on page 52.
- KV is gone, KV on page 55.
- MERGE_TYPE, MERGE-TYPE on page 55.
- REPLACING_VERSIONS and REPLACED_BY_VERSION, REPLACE-VERSION-VARS on page 57.
- Utilities now die on failure, DIE-ON-FAILURE on page 61, unless called under nonfatal, NONFATAL on page 61
- dohard, dosed banned, BANNED-COMMANDS on page 61.
- econf adds --disable-dependency-tracking, ECONF-OPTIONS on page 65.
- dodoc -r support, DODOC on page 67.
- doins supports symlinks, DOINS on page 68.
- doman -i18n option takes precedence, DOMAN-LANGS on page 68.
- Controllable compression and docompress, DOCOMPRESS on page 71.
- use_with and use_enable support empty third argument, USE-WITH on page 72.

EAPI 5

EAPI 5 is EAPI 4 with the following changes:

- Stable use masking and forcing, STABLEMASK on page 25.
- REQUIRED_USE now supports ?? groups, AT-MOST-ONE-OF on page 35.
- Slot operator dependencies, SLOT-OPERATOR-DEPS on page 38.
- SLOT now supports an optional sub-slot part, SUB-SLOT on page 38.
- src_test supports parallel tests, PARALLEL-TESTS on page 44.
- EBUILD_PHASE_FUNC, EBUILD-PHASE-FUNC on page 55.
- USE is calculated differently, PROFILE-IUSE-INJECT on page 57.
- find is guaranteed to be GNU, GNU-FIND on page 60.
- best_version and has_version support the --host-root option, PM-QUERY-OPTIONS on page 62.
- econf adds --disable-silent-rules, ECONF-OPTIONS on page 65.
- doheader and newheader support, DOHEADER on page 67.
- new* can read from standard input, NEWFOO-STDIN on page 69.
- usex support, USEX on page 72.

EAPI 6

EAPI 6 is EAPI 5 with the following changes:

- Bash version is 4.2, BASH-VERSION on page 29.
- failglob is enabled in global scope, FAILGLOB on page 29.
- Default src_prepare no longer a no-op, SRC-PREPARE-6 on page 43.
- Different src_install implementation, SRC-INSTALL-6 on page 45.
- LC_CTYPE and LC_COLLATE compatible with POSIX locale, LOCALE-SETTINGS on page 56.
- einstall banned, BANNED-COMMANDS on page 61.

- `die` and `assert` called with `-n` respect `nonfatal`, `NONFATAL-DIE` on page 63.
- `eapply` support, `EAPPLY` on page 63.
- `eapply_user` support, `EAPPLY-USER` on page 63.
- `econf` adds `--docdir` and `--htmldir`, `ECONF-OPTIONS` on page 65.
- `in_iuse` support, `IN-IUSE` on page 73.
- `unpack` supports absolute and relative paths, `UNPACK-ABSOLUTE` on page 75.
- `unpack` supports `.txz`, `UNPACK-EXTENSIONS` on page 75.
- `unpack` matches filename extensions case-insensitively, `UNPACK-IGNORE-CASE` on page 75.
- `installdocs` support, `EINSTALLDOCS` on page 76.
- `get_libdir` support, `GET-LIBDIR` on page 76.

EAPI 7

EAPI 7 is EAPI 6 with the following changes:

- `profiles/package.mask` can be a directory, `PACKAGE-MASK-DIR` on page 19.
- `package.mask`, `package.use`, `use.*` and `package.use.*` in a profile can be directories, `PROFILE-FILE-DIRS` on page 24.
- `package.provided` in profiles banned, `PACKAGE-PROVIDED` on page 25.
- Empty `||` and `^^` dependency groups no longer count as being matched, `EMPTY-DEP-GROUPS` on page 36.
- `PORTDIR` is gone, `PORTDIR` on page 53.
- `ECLASSDIR` is gone, `ECLASSDIR` on page 53.
- `DESTTREE` is gone, `DESTTREE` on page 54.
- `INSDESTTREE` is gone, `INSDESTTREE` on page 54.
- `ROOT`, `EROOT`, `D`, `ED` no longer end with a trailing slash, `TRAILING-SLASH` on page 58.
- `SYSROOT` and `ESYSROOT`, `SYSROOT` on page 53.
- `econf` adds `--with-sysroot`, `ECONF-OPTIONS` on page 65.
- `BDEPEND`, `BDEPEND` on page 34.
- `BROOT`, `BROOT` on page 53.
- `best_version` and `has_version` support `-b`, `-d` and `-r` options instead of `--host-root`, `PM-QUERY-OPTIONS` on page 62.
- `ENV_UNSET`, `ENV-UNSET` on page 56.
- `patch` is compatible with GNU patch 2.7, `GNU-PATCH` on page 60.
- `nonfatal` is both a shell function and an external command, `NONFATAL` on page 61.
- `dohtml` banned, `BANNED-COMMANDS` on page 61.
- `dolib` and `libopts` banned, `BANNED-COMMANDS` on page 61.
- Output commands no longer use `stdout`, `OUTPUT-NO-STDOUT` on page 62.
- `eqawarn`, `EQAWARN` on page 63.
- `die` is guaranteed to work in a subshell, `SUBSHELL-DIE` on page 63.
- `domo` installs to `/usr`, `DOMO-PATH` on page 68.
- Controllable stripping and `dostrip`, `DOSTRIP` on page 72.
- Version manipulation and comparison commands, `VER-COMMANDS` on page 73.

Cross compilation support Several variables have been added and some commands have been extended for better cross compilation support:

BDEPEND Build dependencies are divided into two classes: `BDEPEND` for native build tools (`CBUILD`); `DEPEND` for dependencies compatible with the system being built (`CHOST`). See `BDEPEND` on page 34.

SYSROOT The path to the root directory for `DEPEND` type dependencies. See `SYSROOT` on page 53.

ESYSROOT The concatenation of the `SYSROOT` and `EPREFIX` paths, for convenience.

BROOT The prefixed root directory path for `BDEPEND` type dependencies, typically executable build tools. See `BROOT` on page 53.

econf Option `--with-sysroot=${ESYSROOT}` is passed to configure, if this option is supported. See `ECONF-OPTIONS` on page 65.

has_version and best_version These helpers support `-b`, `-d` or `-r` options, causing the query to apply to `BDEPEND`, `DEPEND` or `RDEPEND` (the default). This replaces the `--host-root` option. See `PM-QUERY-OPTIONS` on page 62.

Environment blacklist Any environment variable listed in the profile-defined `ENV_UNSET` variable will be unset by the package manager. See `ENV_UNSET` on page 56.

patch All inputs valid for GNU patch version 2.7 are supported. Especially, this includes support for git-formatted patches. See `GNU-PATCH` on page 60.

nonfatal In addition to its definition as a shell function, the `nonfatal` wrapper has now a fallback implementation as an external command. Thus, it can be called from other commands. See `NONFATAL` on page 61.

Output commands `info` and `friends` no longer use `stdout`, so inside of command substitution their output won't be caught. See `OUTPUT-NO-STDOUT` on page 62.

egwarn The `egwarn` output command is supported in the package manager itself. See `EQAWARN` on page 63.

die in subshell The `die` command is guaranteed to work in a subshell context. See `SUBSHELL-DIE` on page 63.

domo destination `domo` installs the specified files under `/usr/share/locale` instead of `$(DESTTREE)/share/locale`. See `DOMO-PATH` on page 68.

Controllable stripping The `dostrip -x` command can be used to add paths to an exclusion list for stripping of debug symbols, to allow more fine-grained control than with `RESTRICT="strip"`. See `DOSTRIP` on page 72.

Version manipulation and comparison commands

ver_cut range [version] Print the version substring specified by `range`. `version` defaults to `PV`.

ver_rs range repl ... [version] Replace all version separators in `range` by string `repl`. Multiple `range repl` pairs are allowed. `version` defaults to `PV`.

ver_test [v1] op v2 Check if the relation `v1 op v2` is true. `v1` defaults to `PVR`; `op` can be `-eq`, `-ne`, `-gt`, `-ge`, `-lt` or `-le`.

See `VER-COMMANDS` on page 73.

Removals/Bans

package.provided Deprecated since a long time and finally dropped. See `PACKAGE-PROVIDED` on page 25.

PORTDIR and ECLASSDIR No longer defined, because ebuilds should not directly access files in the repository. See `PORTDIR` on page 53 and `ECLASSDIR` on page 53.

DESTTREE and INSDESTTREE Not defined any more. Use the `into` and `insinto` commands instead. See `DESTTREE` on page 54 and `INSDESTTREE` on page 54.

dohtml No longer allowed. `doins -r` can be used as a replacement. See `BANNED-COMMANDS` on page 61.

dolib and libopts No longer allowed. The specific `dolib.a` or `dolib.so` commands should be used as replacement. See `BANNED-COMMANDS` on page 61.

EAPI Cheat Sheet

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Version 7.0

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Abstract

An overview of the main EAPI changes in Gentoo, for ebuild authors. For full details, consult the Package Manager Specification found on the project page;¹ this is an incomplete summary only.

Official Gentoo EAPIs are consecutively numbered integers (0, 1, 2, ...). Except where otherwise noted, an EAPI is the same as the previous EAPI. All labels refer to the PMS document itself, built from the same checkout as this overview.

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EAPIs 0, 1, 2, 3, and 4

Omitted for lack of space. See version 5.0 of this document for differences between these previous EAPIs.

EAPI 5 (2012-09-20)

Additions/Changes

Sub-slots The `SLOT` variable and slot dependencies may contain an optional sub-slot part that follows the regular slot, delimited by a `/` character; for example `2/2.30`. The sub-slot is used to represent cases in which an upgrade to a new version of a package with a different sub-slot may require dependent packages to be rebuilt. If the

¹https://wiki.gentoo.org/wiki/Project:Package_Manager_Specification

²<http://creativecommons.org/licenses/by-sa/3.0/>

sub-slot is not specified in `SLOT`, it defaults to the regular slot. See `SUB-SLOT` on page 38.

Slot operator dependencies Package dependencies can specify one of the following operators as a suffix, which will affect updates of runtime dependencies:

- `*` Any slot value is acceptable. The package will not break when its dependency is updated.

- `=` Any slot value is acceptable, but the package can break when its dependency is updated to a different slot (or sub-slot).

See `SLOT-OPERATOR-DEPS` on page 38.

Profile `USE` injection Apart from the `USE` flags explicitly listed in `USE`, additional flags can be implicitly provided by profiles. See `PROFILE-USE-INJECT` on page 57.

At-most-one-of groups In `REQUIRED_USE` you can use `"?? (flag1 flag2 ...)"` to allow zero or one `USE` flag out of many. See `AT-MOST-ONE-OF` on page 35.

Parallel tests The default for `src_test` runs `emake` without `-j1` now. See `PARALLEL-TESTS` on page 44.

`econfg` changes The `econfg` function now always passes `--disable-silent-rules` to `configure`. See `ECONF-OPTIONS` on page 65.

`has_version` and `best_version` changes The two helpers support a `--host-root` option that causes the query to apply to the host root instead of `ROOT`. See `PM-QUERY-OPTIONS` on page 62.

`usex` Usage for this helper function is `usex <USE flag> [true1][false1] [true2][false2]`. If the `USE` flag is set, outputs `[true1][true2]` (defaults to `yes`), otherwise outputs `[false1][false2]` (defaults to `no`). See `USEX` on page 72.

`doheader` and `newheader` These new helper functions install the given header file(s) into `/usr/include`. The `-r` option enables recursion for `doheader`, similar to `doins`. See `DOHEADER` on page 67.

`new*` standard input The `newins` etc. commands read from standard input if the first argument is `-` (a hyphen). See `NEWFOO-STDIN` on page 69.

`EBUILD_PHASE_FUNC` This variable is very similar to `EBUILD_PHASE`, but contains the name of the current `ebuild` function. See `EBUILD-PHASE-FUNC` on page 55.

Stable use masking/forcing New files `use.stable`.

`{mask, force}` and `package.use.stable`. `{mask, force}` are supported in profile directories. They are similar to their non-stable counterparts, but act only on packages that would be merged due to a stable keyword. See `STABLEMASK` on page 25.

EAPI 6 (2015-11-13)

Additions/Changes

Bash version `Ebuilds` can use features of Bash version 4.2 (was 3.2 before). See `BASH-VERSION` on page 29.

`failglob` The `failglob` option of Bash is set in global scope, so that unintentional pattern expansion will be caught as an error. See `FAILGLOB` on page 29.

Locale settings It is ensured that the behaviour of case modification and collation order for ASCII characters (`LC_TYPE` and `LC_COLLATE`) are the same as in the POSIX locale. See `LOCALE-SETTINGS` on page 56.

`src_prepare` This phase function has a default now, which applies patches from the `PATCHES` variable with the new `eapply` command, and user-provided patches with `eapply_user`. See `SRC-PREPARE-6` on page 43.

`src_install` The default implementation uses the new `installdocs` function for installing documentation. See `SRC-INSTALL-6` on page 45.

`nonfatal die` When `die` or `assert` are called under the `nonfatal` command and with the `-n` option, they will not abort the build process but return with an error. See `NONFATAL-DIE` on page 63.

`unpack changes` `unpack` has been extended:

Pathnames Both absolute paths and paths relative to the working directory are accepted as arguments. See `UNPACK-ABSOLUTE` on page 75.

`.txz` files Suffix `.txz` for `xz` compressed tarballs is recognised. See `UNPACK-EXTENSIONS` on page 75.

Filename case Character case of filename extensions is ignored. See `UNPACK-IGNORE-CASE` on page 75.

`econfg` changes Options `--docdir` and `--htmldir` are passed to `configure`, in addition to the existing options. See `ECONF-OPTIONS` on page 65.

`eapply` The `eapply` command is a simplified substitute for `epatch`, implemented in the package manager. The patches from its file or directory arguments are applied using `patch -p1`. See `EAPPLY` on page 63.

`eapply_user` The `eapply_user` command permits the package manager to apply user-provided patches. It must be called from every `src_prepare` function. See `EAPPLY-USER` on page 63.

`installdocs` The `installdocs` function will install the files specified by the `DOCS` variable (or a default set of files if `DOCS` is unset) and by the `HTML_DOCS` variable. See `INSTALLDOCS` on page 76.

`in_use` The `in_use` function returns true if the `USE` flag given as its argument is available in the `ebuild` for `USE` queries. See `IN-USE` on page 73.

`get_libdir` The `get_libdir` command outputs the `lib*` directory basename suitable for the current ABI. See `GET-LIBDIR` on page 76.

Removals/Bans

`install` No longer allowed. Use `emake install` as replacement. See `BANNED-COMMANDS` on page 61.

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Additions/Changes

`package.*` and `use.*` These profile files can be directories instead of regular files. This is intended to be used in overlays only. See `PACKAGE-MASK-DIR` on page 19 and `PROFILE-FILE-DIRS` on page 24.

`||` and `^^` dependency groups These groups now evaluate to false when they are empty (for example, if there are only unmatched use dependencies inside of them). See `EMPTY-DEP-GROUPS` on page 36.

No trailing slash The paths specified by `ROOT`, `ERROR`, `D`, and `ED` no longer end with a slash. Thus, default `ROOT` is empty now. See `TRAILING-SLASH` on page 58.