Canonical

# Ubuntu Packaging Guide

Canonical

# Contents

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# 1. Tutorial

This section contains step-by-step tutorials to help you get started with Ubuntu packaging and development. We hope the tutorials make as few assumptions as possible and are accessible to anyone with an interest in Ubuntu packaging.

This should be a great place to start learning about packaging and development.

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## 1.1. Core tutorial

This tutorial will introduce you to the basics of Ubuntu packaging, while helping to set up your computer so that you can start working with packages.

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### 1.1.1. Getting set up

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### 1.1.2. Make changes to a package

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### 1.1.3. Create a new package

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### 1.1.4. Fix a bug

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# 2. How-to guides

If you have a specific goal in mind and are already familiar with the basics of Ubuntu packaging, our how-to guides cover some of the more common operations and tasks that you may need to complete.

They will help you to achieve a particular end result, but may require you to understand and adapt the steps to fit your specific requirements.

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## 2.1. How do I...?

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### 2.1.1. Get the source of a package

Before you can work on a *source package* you need to get the *source code* of that package. This article presents four ways to achieve this: **`git-ubuntu`**, **`pull-pkg`**, and **`apt-get source`**, and **`dget`**.

#### git-ubuntu

**Note**

`git-ubuntu` is the modern way of working with *Ubuntu* source packages.

**Warning**

`git-ubuntu` is still in active development and these instructions will likely change over time. While `git-ubuntu` will become the default packaging method, for now you may encounter rough edges or unsupported edge cases. You can ask for help in the `#ubuntu-devel` channel or open a bug report[2] on *Launchpad*. Bug reports are very welcome!

[2] https://bugs.launchpad.net/git-ubuntu

### Install

The following command will install `git-ubuntu`:

```
sudo snap install --classic --edge git-ubuntu
```

### Basic usage

To clone a source package git repository to a directory:

```
git-ubuntu clone PACKAGE [DIRECTORY]
```

To generate the *orig tarballs* for a given source package:

```
git-ubuntu export-orig
```

### Example

```
git-ubuntu clone hello
cd hello
git-ubuntu export-orig
```

You can find further information in these two blog articles (note that they are from 2017):

- git-ubuntu clone[3]
- Git Ubuntu: More on the imported repositories[4]

## pull-pkg

The **`pull-pkg`** command is part of the `ubuntu-dev-tools` package and downloads a specific version of a source package, or the latest version from a specified release.

### Install

The following command will install `ubtuntu-dev-tools`, which includes **`pull-pkg`**:

```
sudo apt update && sudo apt install ubuntu-dev-tools
```

[3] https://ubuntu.com/blog/git-ubuntu-clone
[4] https://ubuntu.com/blog/git-ubuntu-more-on-the-imported-repositories

### Basic usage

```
pull-pkg [OPTIONS] PACKAGE-NAME [SERIES|VERSION]
```

You can find further information on the manual page *pull-pkg(1)*[5].

### Examples

There are convenience scripts that follow a similar syntax and set the `OPTIONS` for pull type and *Distribution* appropriately. Here are three examples (although there are others):

#### `pull-lp-source`

- To download the latest version of the `hello` source package for the *Current Release in Development* from Launchpad:

  ```
  pull-lp-source hello
  ```

- To download the latest version of the `hello` source package for the Ubuntu `mantic` release from Launchpad:

  ```
  pull-lp-source hello mantic
  ```

- To download version `2.10-3` of the `hello` source package from Launchpad:

  ```
  pull-lp-source hello 2.10-3
  ```

#### `pull-ppa-source`

- To download the latest version of the `hello` source package from the Launchpad *Personal Package Archive* (PPA), also called `hello`, of the user `dviererbe`:

  ```
  pull-ppa-source --ppa 'dviererbe/hello' 'hello'
  ```

- To download the latest version of the `hello` source package for the `mantic` release from the same Launchpad PPA:

  ```
  pull-ppa-source --ppa 'dviererbe/hello' 'hello' 'mantic'
  ```

- To download version `2.10-3` of the `hello` source package for the `mantic` release from the same Launchpad PPA:

  ```
  pull-ppa-source --ppa 'dviererbe/hello' 'hello' '2.10-3'
  ```

[5] https://manpages.ubuntu.com/manpages/en/man1/pull-pkg.1.html

#### `pull-debian-source`

- To download the latest version of the `hello` source package from *Debian*:

```
pull-debian-source 'hello'
```

- To download the latest version of the `hello` source package for the `sid` release from Debian:

```
pull-debian-source 'hello' 'sid'
```

- To download the version `2.10-3` of the `hello` source package from Debian:

```
pull-debian-source 'hello' '2.10-3'
```

#### `apt-get source`

The *APT* package manager can also fetch source packages.

> **Important**
>
> Source packages are tracked separately from *binary packages* via `deb-src` lines in the *`sources.list(5)`*[6] files. This means that you will need to add such a line for each *repository* you want to get source packages from; otherwise you will probably get either the wrong (too old/too new) source package versions – or none at all.

### Basic usage

### apt

```
apt source PACKAGE-NAME
```

You can find further information on the manual page *`apt(8)`*[7].

### apt-get

```
apt-get source PACKAGE-NAME
```

You can find further information on the manual page *`apt-get(8)`*[8].

[6] https://manpages.ubuntu.com/manpages/en/man5/sources.list.5.html
[7] https://manpages.ubuntu.com/manpages/en/man8/apt.8.html
[8] https://manpages.ubuntu.com/manpages/en/man8/apt-get.8.html

### Example

#### apt

```
apt source 'hello'
```

#### apt-get

```
apt-get source 'hello'
```

#### dget

The **dget** command is part of the devscripts package. If you call it with the URL of a .dsc or .changes file it acts as a source package aware *wget(1)*[9] and downloads all associated files that are listed in the .dsc or .changes file (debian tarball, *orig tarballs*, *upstream signatures*).

### Install

```
sudo apt update && sudo apt install devscripts
```

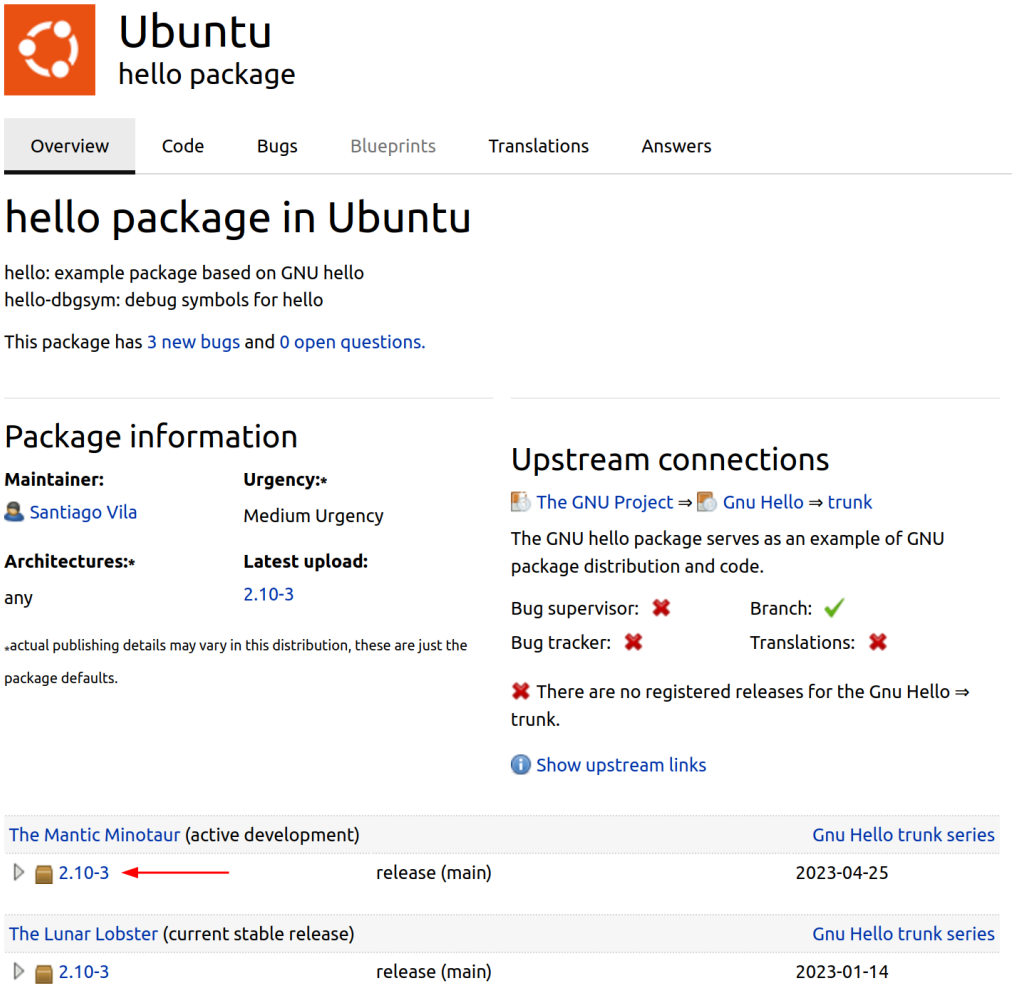
### Basic usage

```
dget URL
```

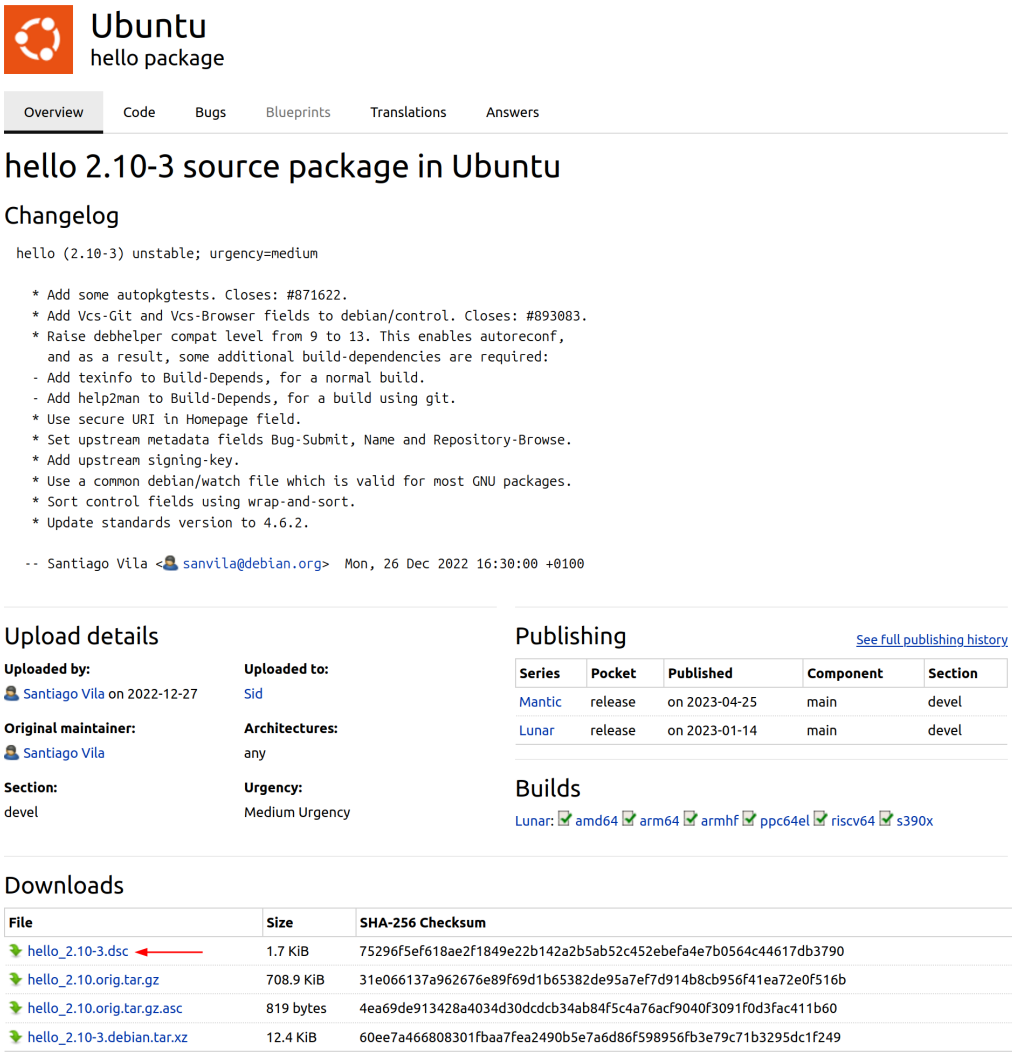
### Example

Go to Launchpad and select the package you want to download (in this example; the latest version of the hello source package):

[9] https://manpages.ubuntu.com/manpages/en/man1/wget.1.html




Next, copy the download link of the `.dsc` file:



Ubuntu
hello package

Overview Code Bugs Blueprints Translations Answers

hello 2.10-3 source package in Ubuntu

Changelog

```
hello (2.10-3) unstable; urgency=medium

  * Add some autopkgtests. Closes: #871622.
  * Add Vcs-Git and Vcs-Browser fields to debian/control. Closes: #893083.
  * Raise debhelper compat level from 9 to 13. This enables autoreconf,
    and as a result, some additional build-dependencies are required:
  - Add texinfo to Build-Depends, for a normal build.
  - Add help2man to Build-Depends, for a build using git.
  * Use secure URI in Homepage field.
  * Set upstream metadata fields Bug-Submit, Name and Repository-Browse.
  * Add upstream signing-key.
  * Use a common debian/watch file which is valid for most GNU packages.
  * Sort control fields using wrap-and-sort.
  * Update standards version to 4.6.2.

 -- Santiago Vila <sanvila@debian.org>  Mon, 26 Dec 2022 16:30:00 +0100
```

Upload details

Uploaded by: Santiago Vila on 2022-12-27
Uploaded to: Sid
Original maintainer: Santiago Vila
Architectures: any
Section: devel
Urgency: Medium Urgency

Publishing

See full publishing history

| Series | Pocket | Published | Component | Section |
|---|---|---|---|---|
| Mantic | release | on 2023-04-25 | main | devel |
| Lunar | release | on 2023-01-14 | main | devel |

Builds

Lunar: amd64 arm64 armhf ppc64el riscv64 s390x

Downloads

| File | Size | SHA-256 Checksum |
|---|---|---|
| hello_2.10-3.dsc | 1.7 KiB | 75296f5ef618ae2f1849e22b142a2b5ab52c452ebefa4e7b0564c44617db3790 |
| hello_2.10.orig.tar.gz | 708.9 KiB | 31e066137a962676e89f69d1b65382de95a7ef7d914b8cb956f41ea72e0f516b |
| hello_2.10.orig.tar.gz.asc | 819 bytes | 4ea69de913428a4034d30dcdcb34ab84f5c4a76acf9040f3091f0d3fac411b60 |
| hello_2.10-3.debian.tar.xz | 12.4 KiB | 60ee7a466808301fbaa7fea2490b5e7a6d86f598956fb3e79c71b3295dc1f249 |

**Finally, call `dget` with the copied URL:**

```
dget https://launchpad.net/ubuntu/+archive/primary/+sourcefiles/hello/2.10-3/hello_2.10-3.dsc
```

Note that this works for links from Debian and Launchpad Personal Package Archives too.

You can find further information on the manual page *dget(1)*[10].

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[10] https://manpages.ubuntu.com/manpages/en/man1/dget.1.html

### 2.1.2. Download a new upstream version

Once in a while you may need to download a new *upstream* release or check if a newer upstream release exists; for example:

- When fixing a bug, to rule out that a more recent version may have already fixed the bug.
- As a *source package maintainer*, to check for, download, and package a newer upstream release.

Most of the source packages contain a `watch` file in the `debian` folder. This is a configuration file for the *uscan(1)*[11] utility which allows you to automatically search HTTP or FTP sites or *git(1)*[12] repositories for newly available updates of the upstream project.

> **Note**
>
> If the source package does not contain a `debian/watch` file, there may be an explanation and instructions in the `debain/README.source` or `debian/README.debian` file (if available) that tell you how to proceed.

#### Best practices

You should download upstream file(s) manually only if there is no automatic download mechanism and you can't find any download instructions.

Remember that a package may get distributed to hundreds of thousands of users. Humans are the weakest link in this distribution chain, because we may accidentally miss or skip a verification step, misspell a *URL*, copy the wrong URL or copy a URL only partially, etc.

If you still have to download upstream file(s) manually make sure to verify *Cryptographic Signatures* (if available). The *Signing Key* of the upstream project should be stored in the source package as `debian/upstream/signing-key.asc` (if the upstream project has a signing key).

*uscan(1)*[13] verifies downloads against this signing key automatically (if available).

#### Download new upstream version (if available)

Running *uscan(1)*[14] from the *Root* of the *Source Tree* will check if a newer upstream version exists and downloads it:

```
uscan
```

If *uscan(1)*[15] could not find a newer upstream version it will return with the exit code *1* and print nothing to the *Standard Output*.

*uscan(1)*[16] reads the first entry in `debian/changelog` to determine the name and version of the source package.

[11] https://manpages.ubuntu.com/manpages/en/man1/uscan.1.html
[12] https://manpages.ubuntu.com/manpages/en/man1/git.1.html
[13] https://manpages.ubuntu.com/manpages/en/man1/uscan.1.html
[14] https://manpages.ubuntu.com/manpages/en/man1/uscan.1.html
[15] https://manpages.ubuntu.com/manpages/en/man1/uscan.1.html
[16] https://manpages.ubuntu.com/manpages/en/man1/uscan.1.html

You can always add the `--verbose` flag to see more information (e.g., which version *uscan(1)*[17] found):

```
uscan --verbose
```

### Check for new upstream version (no download)

If you just want to check if a new update is available, but you don't want to download anything, you can run the *uscan(1)*[18] command with the `--safe` flag from the *Root* of the source tree:

```
uscan --safe
```

### Force the download

You can use the `--force-download` flag to download an upstream release from the upstream project, even if the upstream Release is up-to-date with the source package:

```
uscan --force-download
```

### Download the source of older versions from the upstream project

If you want to download the source of a specific version from the upstream project you can use the `--download-version` flag.

Basic syntax:

```
uscan --download-version VERSION
```

For example:

```
uscan --download-version '1.0'
```

In the special case that you want to download the source for the current version of the source package from the upstream project you can use the `--download-current-version` flag instead, which parses the version to download from the first entry in `debian/changelog` file:

```
uscan --download-current-version
```

**Note**

The `--download-version` and `--download-current-version` flags are both a *best-effort* features of *uscan(1)*[19].

There are special cases where they do not work for technical reasons.

[17] https://manpages.ubuntu.com/manpages/en/man1/uscan.1.html
[18] https://manpages.ubuntu.com/manpages/en/man1/uscan.1.html
[19] https://manpages.ubuntu.com/manpages/en/man1/uscan.1.html

**Note**

In most cases you actually want to download the source from the *Ubuntu Archive* and not re-download the source from the upstream project.

*How to get the Source from the Archive?* (page 5)

### Further Information

- Manual page – *uscan(1)*[20]
- Debian wiki – debian/watch[21]
- Debian policy `4.6.2.0` – Upstream source location: debian/watch[22]

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## 2.1.3. Build packages

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## 2.1.4. Install built packages

You have a built *binary packages* of a *source package* and want to install it (e.g. to test the packages). This article demonstrates multiple ways how you can achieve that.

[20] https://manpages.ubuntu.com/manpages/en/man1/uscan.1.html
[21] https://wiki.debian.org/debian/watch
[22] https://www.debian.org/doc/debian-policy/ch-source.html#upstream-source-location-debian-watch

### Using your package manager

You can use the *apt(8)*[23], *apt-get(8)*[24] or *dpkg(1)*[25] *package manager* to install or uninstall packages on an Ubuntu installation.

> **Note**
>
> *apt(8)*[26] is intended to be used interactively by humans and does not guarantee a stable *command line interface* (suitable for machine-readability) while *apt-get(8)*[27] is intended for unattended usage, for example, in scripts.
>
> *dpkg(1)*[28] is a package manager for *Debian*-based systems. It can install, remove, and build packages, but unlike the *APT* package management systems, it cannot automatically download and install packages or their dependencies.
>
> See also the package management[29] guide from the *Ubuntu Server* documentation for more details.

### Install `.deb` files

#### apt

You can install one or multiple `.deb` files by using **`apt install`** command:

```
sudo apt install PACKAGE.deb...
```

For example, to install the `hello_2.10-3_amd64.deb` binary package file (version `2.10-3` of the `hello` package for the `amd64` architecture) you need to run:

```
sudo apt install 'hello_2.10-3_amd64.deb'
```

#### apt-get

You can install one or multiple `.deb` files by using **`apt-get install`** command:

```
sudo apt-get install PACKAGE.deb...
```

For example, to install the `hello_2.10-3_amd64.deb` binary package file (version `2.10-3` of the `hello` package for the `amd64` architecture) you need to run:

```
sudo apt-get install hello_2.10-3_amd64.deb
```

[23] https://manpages.ubuntu.com/manpages/en/man8/apt.8.html
[24] https://manpages.ubuntu.com/manpages/en/man8/apt-get.8.html
[25] https://manpages.ubuntu.com/manpages/en/man1/dpkg.1.html
[26] https://manpages.ubuntu.com/manpages/en/man8/apt.8.html
[27] https://manpages.ubuntu.com/manpages/en/man8/apt-get.8.html
[28] https://manpages.ubuntu.com/manpages/en/man1/dpkg.1.html
[29] https://ubuntu.com/server/docs/package-management

### dpkg

You can install one or multiple `.deb` files by using **`dpkg --install`** command:

```
sudo dpkg --install PACKAGE.deb...
```

For example, to install the `hello_2.10-3_amd64.deb` binary package file (version `2.10-3` of the `hello` package for the `amd64` architecture) you need to run:

```
sudo dpkg --install hello_2.10-3_amd64.deb
```

## Uninstall packages

Installed packages often setup configuration files and create other data files. When you want to uninstall a package you have to decide if you want to keep these files or want to delete them too.

Keeping configuration files can be useful to avoid having to reconfigure a package if it is reinstalled later, but this may have side-effects when testing to install multiple packages.

## Keep the configuration files

### apt

You can uninstall one or multiple packages and **keep** their configuration files by using the **`apt remove`** command:

```
sudo apt remove PACKAGE-NAME...
```

For example, to uninstall the currently installed `hello` package and keep its configuration files you need to run:

```
sudo apt remove hello
```

### apt-get

You can uninstall one or multiple packages and **keep** their configuration files by using the **`apt-get remove`** command:

```
sudo apt-get remove PACKAGE-NAME...
```

For example, to uninstall the currently installed `hello` package and keep its configuration files you need to run:

```
sudo apt-get remove hello
```

### dpkg

You can uninstall one or multiple packages and **keep** their configuration files by using the **`dpkg --remove`** command:

```
sudo dpkg --remove PACKAGE-NAME...
```

For example, to uninstall the currently installed `hello` package and keep its configuration files you need to run:

```
sudo dpkg --remove hello
```

## Delete the configuration files

### apt

You can uninstall one or multiple packages and **delete** their configuration files by using the **`apt purge`** command:

```
sudo apt purge PACKAGE-NAME...
```

For example, to uninstall the currently installed `hello` package and delete its configuration files you need to run:

```
sudo apt purge hello
```

### apt-get

You can uninstall one or multiple packages and **delete** their configuration files by using the **`apt-get purge`** command:

```
sudo apt-get purge PACKAGE-NAME...
```

For example, to uninstall the currently installed `hello` package and delete its configuration files you need to run:

```
sudo apt-get purge hello
```

### dpkg

You can uninstall one or multiple packages and **delete** their configuration files by using the **`dpkg --purge`** command:

```
sudo dpkg --purge PACKAGE-NAME...
```

For example, to uninstall the currently installed `hello` package and delete its configuration files you need to run:

```
sudo dpkg --purge hello
```

## Install packages from a PPA

### Using `add-apt-repository`

The **`add-apt-repository`** command adds a *Repository* (e.g. a *Personal Package Archive* (PPA) from *Launchpad*) to the **`/etc/apt/sources.list.d`** directory (see the *`sources.list(5)`*[30] manual page for more details), so you can install the packages provided by the repository like any other package from the *Ubuntu Archive*.

```
sudo add-apt-repository ppa:LP-USERNAME/PPA-NAME
```

**`LP-USERNAME`**
: The username of the Launchpad user who owns the PPA.

**`PPA-NAME`**
: The name of the PPA.

For example, to add the Launchpad PPA with the name `hello` of the Launchpad user `dviererbe` you need to run:

```
sudo add-apt-repository ppa:dviererbe/hello
```

Then, you can install, just as normal, the `hello` package contained in the PPA:

#### apt

```
sudo apt install hello
```

#### apt-get

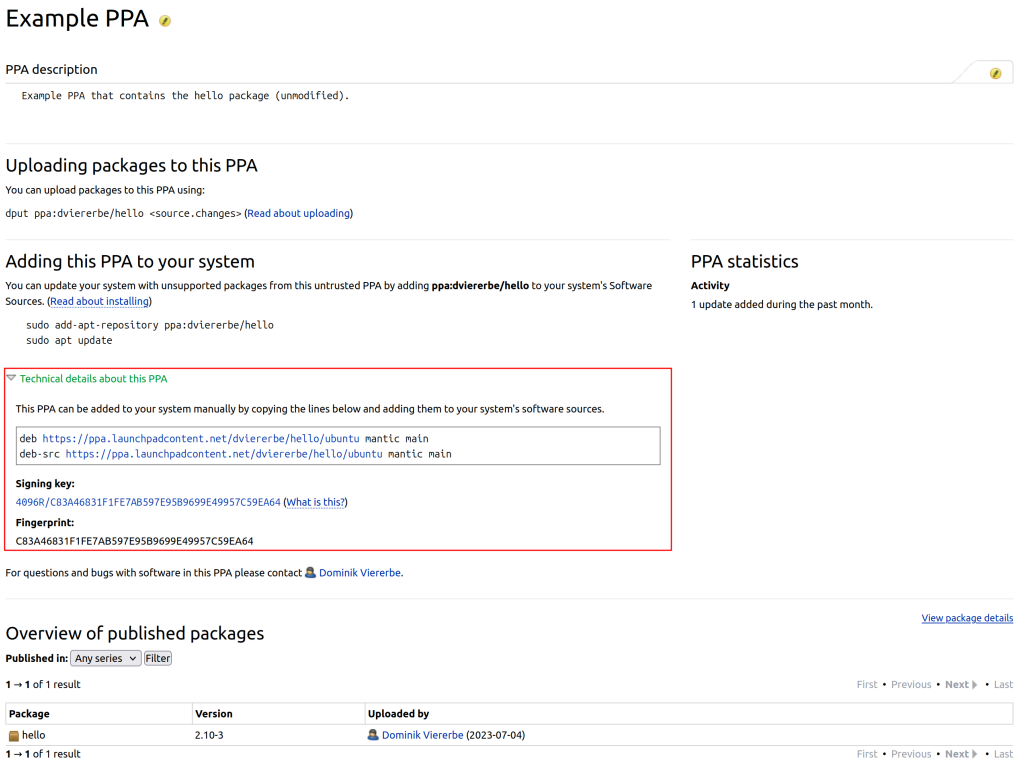
```
sudo apt-get install hello
```

See the *`add-apt-repository(1)`*[31] manual page for more details.

### Add PPA manually

When you visit the web interface of the Launchpad PPA you want to add, you can see a text reading something like “Technical details about this PPA”. When you click on the text, it will unfold and show the details you need to add the PPA.

[30] https://manpages.ubuntu.com/manpages/en/man5/sources.list.5.html
[31] https://manpages.ubuntu.com/manpages/en/man1/add-apt-repository.1.html




The steps to add the PPA are as follows:

1. Add the PPA entry to `/etc/apt/sources.list.d` directory

   ```
   sudo editor /etc/apt/sources.list.d/launchpad_ppa.sources
   ```

   Add the following lines (substituting `LAUNCHPAD-USERNAME` AND `PPA-NAME` for your own case) and save the file:

   ```
   deb https://ppa.launchpadcontent.net/LAUNCHPAD-USERNAME/PPA-NAME/ubuntu SERIES main
   deb-src https://ppa.launchpadcontent.net/LAUNCHPAD-USERNAME/PPA-NAME/ubuntu SERIES main
   ```

2. Add the of the PPA *Signing Key* to `/etc/apt/trusted.gpg.d` directory.

   The following command will download the PPA signing key from the *Ubuntu Keyserver* and store it in the correct format in the `/etc/apt/trusted.gpg.d` directory. Substitute `SIGNING_KEY` with the Fingerprint (see picture above) of the PPA signing key.

   ```
   wget --quiet --output-document - \
   "https://keyserver.ubuntu.com/pks/lookup?op=get&search=0x${SIGNING_KEY,,}" \
   | sudo gpg --output /etc/apt/trusted.gpg.d/launchpad-ppa.gpg --dearmor -
   ```

3. Update the package information:

#### apt

```
sudo apt update
```

#### apt-get

```
sudo apt-get update
```

4. Install the package from the PPA:

#### apt

```
sudo apt install PACKAGE-NAME
```

#### apt-get

```
sudo apt-get PACKAGE-NAME
```

For example, here is the full script to add the Launchpad PPA named `hello` of the user `dviererbe` and install the `hello` package from it.

```
sudo sh -c 'cat <<EOF > /etc/apt/sources.list.d/launchpad_ppa2.sources
deb https://ppa.launchpadcontent.net/dviererbe/hello/ubuntu mantic main
deb-src https://ppa.launchpadcontent.net/dviererbe/hello/ubuntu mantic main
EOF'

SIGNING_KEY=C83A46831F1FE7AB597E95B9699E49957C59EA64
wget --quiet --output-document - \
"https://keyserver.ubuntu.com/pks/lookup?op=get&search=0x${SIGNING_KEY,,}" \
| sudo gpg --output /etc/apt/trusted.gpg.d/launchpad-ppa.gpg --dearmor -

sudo apt update
sudo apt install hello
```

### Download the `.deb` files

You can also download binary packages (`.deb` files) from a Launchpad PPA and install them with a package manager (like demonstrated in the section *Install .deb files* (page 15)).

### Using `pull-ppa-debs`

The **`pull-ppa-debs`** command downloads the `.deb` files of one specific binary package or all binary packages, which are built by a source package in a Launchpad PPA.

```
pull-ppa-debs --ppa LP-USERNAME/PPA-NAME [--arch ARCH] PKG-NAME [SERIES|VERSION]
```

**`--ppa LP-USERNAME/PPA-NAME`**
The PPA to download the binary package(s) from.

**`LP-USERNAME`**
The username of the Launchpad user who owns the PPA.

**`PPA-NAME`**
The name of the PPA.

**`--arch ARCH`**
The architecture of the binary package(s) to download. Defaults to the system architecture of your host machine.

**`PKG-NAME`**
The name of the package to download. This can be the name of the source package to download all binary packages build by the source package or just the name of one specific binary package.

**`SERIES`**
Downloads the package with the latest version that targets the Ubuntu *Series* with the specified name. Defaults to the *Current Release in Development*.

**`VERSION`**
The version of the package to download.

The **`pull-ppa-debs`** command is part of the `ubuntu-dev-tools` package. You need to install it, before you can use it:

```
sudo apt install ubuntu-dev-tools
```

**Tip**

The `ubuntu-dev-tools` package also provides the commands:

- `pull-lp-debs` (to download binary packages from Launchpad) and
- `pull-debian-debs` (to download binary packages from the Debian archive).

For example, on an *amd64* machine, the following command will download the binary package named `hello` and targeting `amd64` from the Launchpad PPA named `hello` of the Launchpad user `dviererbe`:

```
pull-ppa-deb --ppa dviererbe/hello hello
```

The downloaded file will be `hello_2.10-3_amd64.deb`.

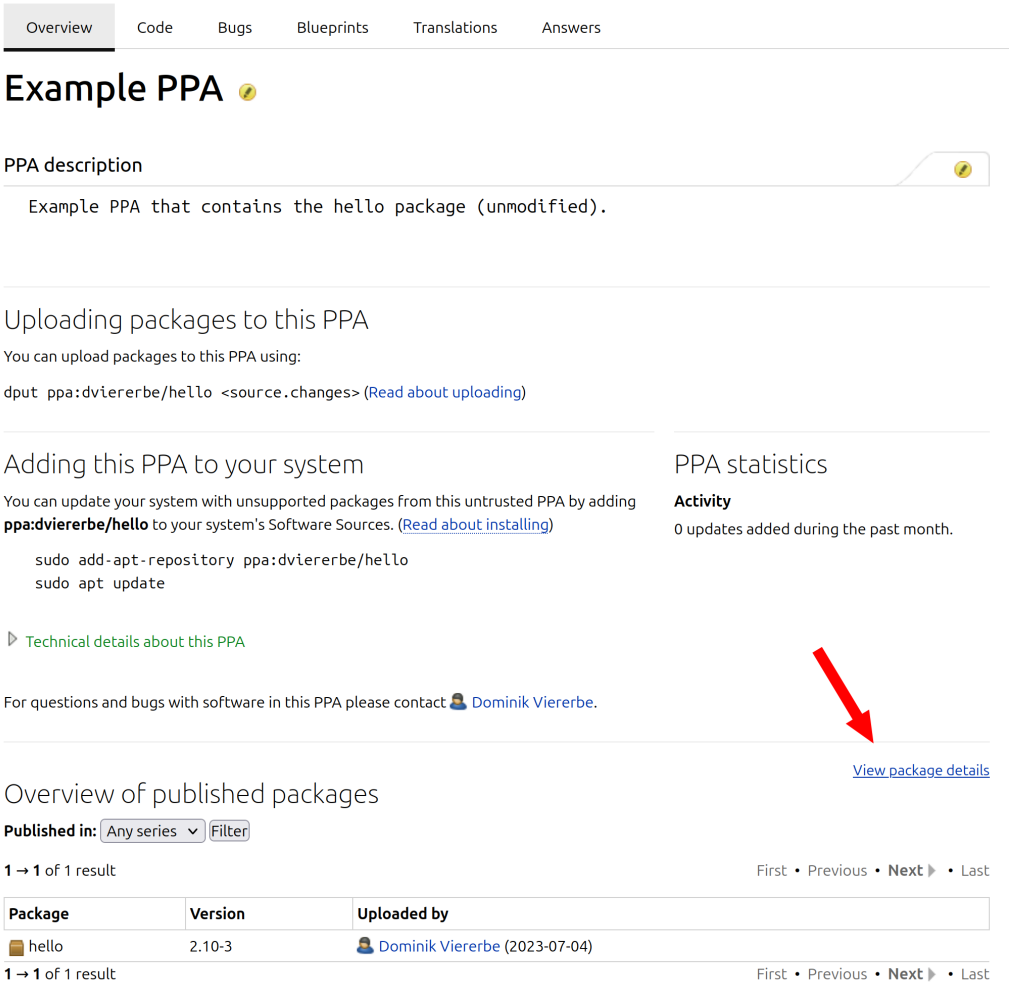
See the *`pull-pkg(1)`*[32] manual page for more details.

[32] https://manpages.ubuntu.com/manpages/en/man1/pull-pkg.1.html

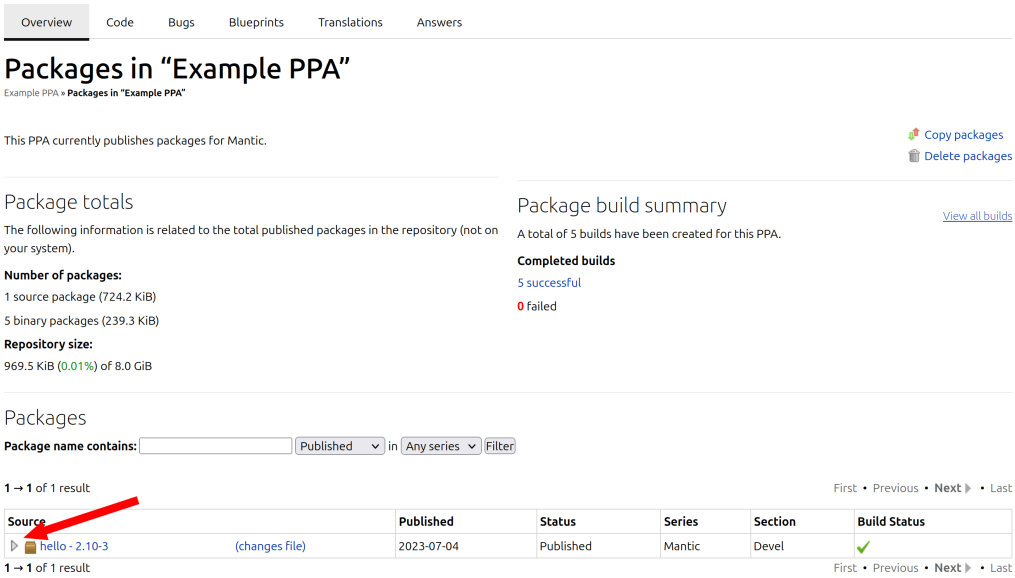
## Using the Launchpad web interface

You can download `.deb` files from a Launchpad PPA via the web interface like this:

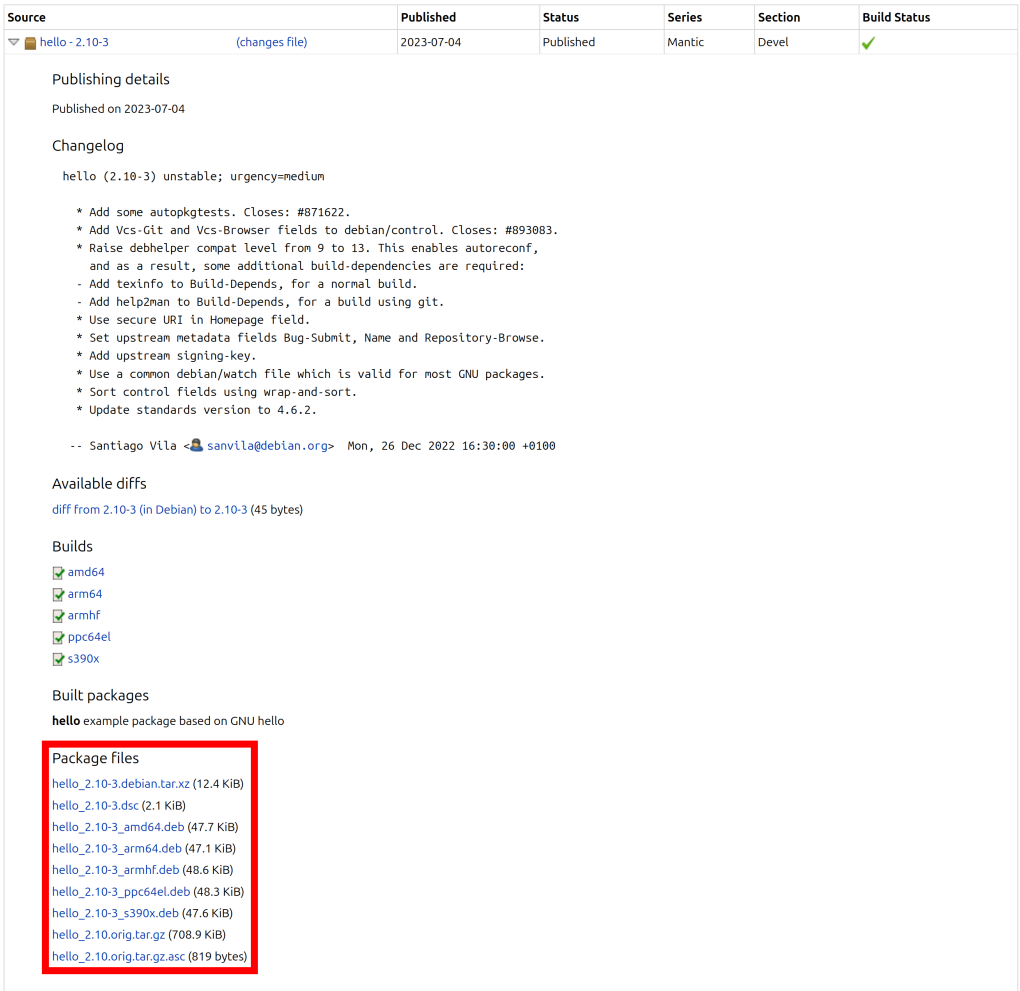
1. Go to the Launchpad PPA web interface and click on the link called “View package details”:




2. Expand the details of the package you want to download by clicking on the little triangle next to the name of the package:




3. Download the file(s) you need from the “Package files” section by clicking on the respective links:



### Resources

- Ubuntu Server documentation – Package management[33]
- Ubuntu wiki – Installing Software[34]
- manual page *add-apt-repository(1)*[35]
- manual page *pull-pkg(1)*[36]

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## 2.1.5. Run tests

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## 2.1.6. Upload packages to a PPA

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[33] https://ubuntu.com/server/docs/package-management
[34] https://help.ubuntu.com/community/InstallingSoftware
[35] https://manpages.ubuntu.com/manpages/en/man1/add-apt-repository.1.html
[36] https://manpages.ubuntu.com/manpages/en/man1/pull-pkg.1.html

### 2.1.7. Write patch files

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### 2.1.8. Propose changes

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### 2.1.9. Use schroots

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# 3. Explanation

Our explanatory and conceptual guides are written to provide a better understanding of how packaging works in Ubuntu. They enable you to expand your knowledge and become better at packaging and development.

---

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## 3.1. Upstream and downstream

An *Ubuntu* installation consists of *packages* - copied and unpacked onto the target machine. The Ubuntu project packages, distributes and maintains software of thousands of *open source* projects for users, ready to install. The collection of Ubuntu packages is derived from the collection of packages maintained by the community-driven *Debian* project.

An important duty of an Ubuntu package *Maintainer* is to collaborate with the open source projects the Ubuntu packages are derived from – especially with Debian. We do this by keeping the Ubuntu copies of packages up-to-date and by sharing improvements made in Ubuntu back up to Debian.

### 3.1.1. Terminology

In the context of open source software development, the analogy of a stream that carries modifications, improvements, and code is used. It describes the relationship and direction of changes made between projects. This stream originates (upwards) from the original project (and related entities like *Source Code*, authors, and maintainers) and flows downwards to projects (and associated entities) that depend on it.

#### Ubuntu delta

**Ubuntu delta (noun):**
A modification to an Ubuntu package that is derived from a Debian package.

## Upstream

**Upstream (noun):**
A software project (and associated entities) that another software project depends on either directly or indirectly.

**Examples:**

- Debian is the upstream of Ubuntu.
- Upstream is not interested in the patch.

**Usage note:**

- There can be many layers. For example, **Kubuntu** is a *flavour* of Ubuntu, therefore Ubuntu and Debian are both upstreams of Kubuntu.
- The adjective/adverb form is much more commonly used.

**Upstream (adjective, adverb):**
Something (usually a code modification like a *patch*) that flows in the direction or is relative to a software project closer to the original software project.

**Examples:**

- Debian is the upstream project of Ubuntu.
- There is a new upstream release.
- A pull request was created upstream.
- A bug was patched upstream.

**upstream (verb):**
Sending something (usually a patch) upstream that originated from a *Fork* or project that depended on the upstream project.

**Examples:**

- We upstreamed the patch.
- Can you upstream the bugfix?

## Downstream

**Downstream (noun):**
Similar to *Upstream (noun):* (page 27) A software project(s) (and associated entities) that depend on another software project either directly or indirectly.

**Example:**

- Ubuntu is a downstream of Debian and there are many downstreams of Ubuntu.

**Usage note:**

- The *adjective/adverb form* (page 27) is much more commonly used.
- There can be many layers. For example, **Kubuntu** is a flavour of Ubuntu, therefore Kubuntu and Ubuntu are both downstreams of Debian.

**Downstream (adjective, adverb):**
Similar to *Upstream (adjective, adverb):* (page 27) Something (usually a code modification like a patch) that flows in the direction or is relative to a software project farther away from the original software project.

**Examples:**

- Ubuntu is a downstream project of Debian.
- The bug is already patched downstream.
- The bug was reported by a downstream user.
- Downstream maintainers have submitted a bugfix.
- The change may affect downstream users.

**Downstream (verb):**
Similar to *upstream (verb):* (page 27) Sending something (usually a patch) downstream that originated from an upstream project.

**Example:**

- We downstreamed the patch.

### 3.1.2. Why do we upstream changes?

**Note**

The following list does not aim for completeness. There are plenty of other good arguments for why changes should be upstreamed.

- **Decreased maintenance complexity**: Think of any Ubuntu package derived from a Debian package that carries a *delta*. Every time the Debian package gets updated, the Ubuntu package may be subject to a *merge conflict* when the changes to the Debian package get applied to the Ubuntu package. By upstreaming changes we reduce the maintenance cost to resolve merge conflicts when they occur.
- **Quality assurance and security**: Any changes that get upstreamed will also be subject to the quality assurance of the upstream project and the testing coverage that the user base of the upstream project provides. This increases the likelihood of discovering regressions/bugs/unwanted behaviour (especially security-related bugs). Also, be aware that an unpatched *security vulnerability* in any system could lead to the indirect exposure of other systems.
- **Mutual benefit**: By syncing the Debian packages into the Ubuntu package collection, Ubuntu benefits from the upstream maintenance work. In exchange, Ubuntu Maintainers upstream changes to Debian. This results in a win-win situation where both parties benefit from working together.

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# 3.2. Package model

Because *Ubuntu* is based on the community-driven *Debian* project, Ubuntu uses the Debian packaging model/format.

This consists of *source packages* (page 29) and *binary packages* (page 33).

## 3.2.1. Source packages

A source package contains the *source* material used to build one or more binary packages.

A source package is composed of:

- a Debian Source Control (`.dsc`) file,
- one or more compressed tar files, and
- optionally additional files depending on the type and format of the source package.

The **Source Control** file contains metadata about the source package, for instance, a list of additional files, name and version, list of the binary packages it produces, dependencies, a *digital signature* and many more fields.

**Note**

The *basic overview of the debian/ directory* (page 53) article showcases the layout of an unpacked source package.

### Source package formats

There are multiple formats for how the source is packaged. The format of a source package is declared in the `debian/source/format` file. This file should always exist. If this file can not be found, the *format 1.0* (page 32) is assumed for backwards compatibility, but *`lintian(1)`*[37] will warn you about it when you try to build a source package.

**Tip**

We strongly recommend to use the *3.0 (quilt)* (page 31) format for new packages.

You should only pick a different format if you **really** know what you are doing.

[37] https://manpages.ubuntu.com/manpages/en/man1/lintian.1.html

### Native source packages

In most cases, a software project is packaged by external contributors called the *maintainers* of the package. Because the packaging is often done by a 3rd-party (from the perspective of the software project), the software to be packaged is often not designed to be packaged. In these cases the source package has to do modifications to solve specific problems for its target *distribution*. The source package can, in these cases, be considered as its own software project, like a *fork*. Consequently, the *Upstream* releases and source package releases do not always align.

Native packages almost always originate from software projects designed with Debian packaging in mind and have no independent existence outside its target distribution. Consequently native packages do not differentiate between Upstream releases and source package releases. Therefore, the version identifier of a native package does not have an Debian-specific component.

For example:

- The debhelper package[38] (provides tools for building Debian packages) is a native package from Debian. Because it is designed with packaging in mind, the packaging specific files are part of the original *source code*. The debhelper developers are also maintainers of the Debian package. The Debian debhelper package gets merged into the Ubuntu debhelper package and has therefore a `ubuntu` suffix in the version identifier.
- In contrast, the Ubuntu bash package[39] (the default *shell* on Ubuntu) is **NOT** a native package. The bash Software[40] originates from the *GNU project*. The bash releases of the GNU project project will get packaged by Debian maintainers and the Debian bash package[41] is merged into the Ubuntu bash package by Ubuntu maintainers. The Debian and Ubuntu packages both are effectively their own separate software projects maintained by other people than the developers of the software that gets packaged. This is the process how most software is packaged on Ubuntu.

> **Warning**
>
> Although native packages sound like the solution to use for your software project if you want to distribute your software to Ubuntu/Debian, we **strongly** recommend against using native package formats for new packages. Native packages are known to cause long-term maintenance problems.

[38] https://launchpad.net/ubuntu/+source/debhelper
[39] https://launchpad.net/ubuntu/+source/bash
[40] https://www.gnu.org/software/bash/
[41] https://tracker.debian.org/pkg/bash

### Format: `3.0 (quilt)`

A new-generation source package format that records modifications in a *quilt(1)*[42] *Patch* series within the `debian/patches` folder. The patches are organised as a *stack*, and you can apply, unapply, and update them easily by traversing the stack (push/pop). These changes are automatically applied during the extraction of the source package.

A source package in this format contains at least an original tarball (`.orig.tar.ext` where `ext` can be `gz`, `bz2`, `lzma` or `xz`) and a debian tarball (`.debian.tar.ext`). It can also contain additional original tarballs (`.orig-component.tar.ext`), where `component` can only contain alphanumeric (`a-z`, `A-Z`, `0-9`) characters and hyphens (`-`). Optionally, each original tarball can be accompanied by a *detached signature* from the upstream project (`.orig.tar.ext.asc` and `.orig-component.tar.ext.asc`).

For example, take a look at the `hello` package:

```
pull-lp-source --download-only 'hello' '2.10-3'
```

**Note**

You need to install `ubuntu-dev-tools` to run the **`pull-lp-source`**:

```
sudo apt install ubuntu-dev-tools
```

When you now run *ls(1)*[43]:

```
ls -1 debhelper_*
```

you should see the following files:

- `hello_2.10-3.dsc`: The **Debian Source Control** file of the source package.
- `hello_2.10.orig.tar.gz`: The tarball containing the original source code of the upstream project.
- `hello_2.10.orig.tar.gz.asc`: The detached upstream signature of `hello_2.10.orig.tar.gz`.
- `hello_2.10-3.debian.tar.xz`: The tarball containing the content of the Debian directory.

### Format: `3.0 (native)`

A new-generation source package format extends the native package format defined in the *format 1.0* (page 32).

A source package in this format is a tarball (`.tar.ext` where `ext` can be `gz`, `bz2`, `lzma` or `xz`).

For example, let's take a look at the `debhelper` package:

```
pull-lp-source --download-only 'debhelper' '13.11.6ubuntu1'
```

[42] https://manpages.ubuntu.com/manpages/en/man1/quilt.1.html
[43] https://manpages.ubuntu.com/manpages/en/man1/ls.1.html

When you now run *ls(1)*[44]:

```
ls -1 debhelper_*
```

you should see the following files:

- `debhelper_13.11.6ubuntu1.dsc`: The **Debian Source Control** file of the source package.
- `debhelper_13.11.6ubuntu1.tar.xz`: The tarball containing the source code of the project.

Other examples of native source packages are:

- ubuntu-dev-tools[45]
- ubuntu-release-upgrader[46]
- dh-cargo[47]
- ubiquity[48]
- subiquity[49]

### Format: `1.0`

The original source package format. Nowadays, this format is rarely used.

A native source package in this format consists of a single `.tar.gz` file containing the source.

A non-native source package in this format consists of a `.orig.tar.gz` file (containing the Upstream source) associated with a `.diff.gz` file (the patch containing Debian packaging modifications). Optionally, the original tarball can be accompanied by a detached Upstream signature `.orig.tar.gz.asc`.

> **Note**
>
> This format does not specify a patch system, which makes it harder for *maintainers* to track modifications. There were multiple approaches to how packages tracked patches. Therefore, the source packages of this format often contained a `debian/README.source` file explaining how to use the patch system.

[44] https://manpages.ubuntu.com/manpages/en/man1/ls.1.html
[45] https://launchpad.net/ubuntu/+source/ubuntu-dev-tools
[46] https://launchpad.net/ubuntu/+source/ubuntu-release-upgrader
[47] https://launchpad.net/ubuntu/+source/dh-cargo
[48] https://launchpad.net/ubuntu/+source/ubiquity
[49] https://launchpad.net/ubuntu/+source/subiquity

#### `3.0` formats improvements

Some of the improvements that apply to most `3.0` formats are:

- Support for additional compression formats: `bzip2`, `lzma` and `xz`.
- Support for multiple Upstream tarballs.
- Supports inclusion of binary files.
- Debian-specific changes are no longer stored in a single `.diff.gz`.
- The Upstream tarball does not need to be repacked to strip the Debian directory.

#### Other formats

The following formats are rarely used, experimental and/or historical. You should only choose these if you know what you are doing.

- `3.0 (custom)`: Doesn't represent an actual source package format but can be used to create source packages with arbitrary files.
- `3.0 (git)`: An experimental format to package from a *git* repository.
- `3.0 (bzr)`: An experimental format to package from a *Bazaar* repository.
- `2.0`: The first specification of a new-generation source package format. It was never widely adopted and eventually replaced by *3.0 (quilt)* (page 31).

#### `.changes` file

Although technically not part of a source package – every time a source package is built, a `.changes` file will be created alongside it. The `.changes` file contains metadata from the Source Control file and other information (e.g. the latest changelog entry) about the source package. *Archive* tools and *Archive Administrators* use this data to process changes to source packages and determine the appropriate action to upload the source package to the *Ubuntu Archive*.

### 3.2.2. Binary packages

A **binary package** is a standardised format that the *Package Manager* (*dpkg(1)*[50] or *apt(8)*[51]) can understand to install and uninstall software on a target machine. This simplifies distributing software to a target machine and managing the software on that machine.

A Debian binary package uses the `.deb` file extension and contains a set of files that will be installed on the host system and a set of files that control how the files will be installed or uninstalled.

[50] https://manpages.ubuntu.com/manpages/en/man1/dpkg.1.html
[51] https://manpages.ubuntu.com/manpages/en/man8/apt.8.html

### 3.2.3. Resources

- Debian policy manual v4.6.2.0 – Chapter 3. Binary packages[52]
- Debian policy manual v4.6.2.0 – Chapter 4. Source packages[53]
- The manual page *dpkg-source(1)*[54]
- Debian wiki – 3.0 source package format[55]

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## 3.3. Ubuntu development process

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## 3.4. Ubuntu releases

### 3.4.1. Release cadence

*Ubuntu* follows a strict time-based release cycle. Every six months since 2004, *Canonical* publishes a new Ubuntu version and its set of *packages* are declared stable (production-quality). Simultaneously, a new version begins development; it is given its own *Code name*, but also referred to as the "*Current Release in Development*" or "*Devel*".

[52] https://www.debian.org/doc/debian-policy/ch-binary.html
[53] https://www.debian.org/doc/debian-policy/ch-source.html
[54] https://manpages.ubuntu.com/manpages/en/man1/dpkg-source.1.html
[55] https://wiki.debian.org/Projects/DebSrc3.0

### LTS releases

Since 2006, every fourth release, made every two years in April, receives *Long Term Support (LTS)* (page 37) for large-scale deployments. This is the origin of the term "LTS" for stable, maintained releases.

An estimated 95% of all Ubuntu installations are LTS releases.

> **Note**
>
> Because of the strict time-based six months release cycle, you will only see LTS releases in even-numbered years (e.g. `18`, `20`, `22`) in April (`04`). The only exception to this rule was Ubuntu 6.06 LTS (Dapper Drake).

### Point releases

To ensure that a fresh install of an *LTS release* (page 35) will work on newer hardware and not require a big download of additional updates, Canonical publishes **point releases** that include all the updates made so far.

The first point release of an LTS is published three months after the initial release and repeated every six months at least until the next LTS is published. In practice, Canonical may publish even more point releases for an LTS series, depending on the popularity of that LTS series.

For example, the Ubuntu 16.04.7 LTS (Xenial Xerus) point release was published more than four years after the initial release of Ubuntu 16.04 LTS.

### Interim releases

In the years between LTS releases, Canonical also produces **interim releases**, sometimes also called "regular releases".

Many developers use interim releases because they provide newer compilers or access to newer *Kernels* and newer libraries, and they are often used inside rapid DevOps processes like *CI*/*CD* pipelines where the lifespan of an artefact is likely to be shorter than the support period of the interim release.

### Why does Ubuntu use time-based releases?

Ubuntu releases represent an aggregation of the work of thousands of independent software projects. The time-based release process provides users with the best balance of the latest software, tight integration, and excellent overall quality.

### 3.4.2. Ubuntu version format

```
YY.MM[.POINT-RELEASE] [LTS]
```

Ubuntu version identifier as used for Ubuntu releases consist of four components, which are:

**YY**
: The 2-digit year number of the initial release.

**MM**
: The 2-digit month number of the initial release.

> **Note**
>
> Because of the strict time-based six months release cycle, you will usually only see releases in April (`04`) and October (`10`).

**POINT-RELEASE**
: The *point release* (page 35) number starts at `1` and increments with every additional point release.

  This component is omitted for the initial release, in which case zero is assumed.

**LTS**
: Any Ubuntu release that receives long term support will be marked with `LTS` (see the *release lifespan* (page 37) section for more information).

  Any Ubuntu release that does not receive long term support omits this component.

#### Examples

| Version Identifier | Release Date | Support | End of Standard Support | End of Life |
|---|---|---|---|---|
| `22.04 LTS` | 21 April 2022 | Long term | April 2027 | April 2032 |
| `22.04.1 LTS` | 11 August 2022 | Long term | April 2027 | April 2032 |
| `22.10` | 22 October 2022 | Regular | July 2023 | July 2023 |
| `22.04.2 LTS` | 13 February 2023 | Long term | April 2027 | April 2032 |
| `23.04` | 20 April 2022 | Regular | January 2024 | January 2024 |

### 3.4.3. Release lifespan

Every Ubuntu *Series* receives the same production-grade support quality, but the length of time for which an Ubuntu series receives support varies.

#### Regular support

*Interim releases* (page 35) are production-quality releases and are supported for nine months, with sufficient time provided for users to update, but these releases do not receive the long-term commitment of LTS releases.

#### Long Term Support (LTS)

LTS releases receive five years of standard security maintenance for all packages in the *Main Component*. With an *Ubuntu Pro* subscription, you get access to *Expanded Security Maintenance* (*ESM*), covering security fixes for packages in the *Universe Component*. ESM also extends the lifetime of an LTS series from five years to ten years.

### 3.4.4. Editions

Every Ubuntu release is provided as both a *Server* and *Desktop* edition.

Ubuntu Desktop provides a graphical *User Interface* (*GUI*) for everyday computing tasks, making it suitable for personal computers and laptops. *Ubuntu Server*, on the other hand, provides a text-based *User Interface* (*TUI*) instead of a *GUI*, optimised for server environments, that allows machines on the server to be run headless, focusing on server-related services and applications, making it ideal for hosting web services, databases, and other server functions.

Additionally, each release of Ubuntu is available in minimal configurations, which have the fewest possible packages installed: available in the installer for Ubuntu Server, Ubuntu Desktop, and as separate cloud images.

Canonical publishes Ubuntu on all major public clouds, and the latest *image* for each LTS version will always include any security update provided since the LTS release date, until two weeks prior to the image creation date.

### 3.4.5. Ubuntu flavours

Ubuntu flavours are *Distributions* of the default Ubuntu releases, which choose their own default applications and settings. Ubuntu flavours are owned and developed by members of the Ubuntu community and backed by the full *Ubuntu Archive* for packages and updates.

Officially recognised flavours are:

- Edubuntu[56]
- Kubuntu[57]
- Lubuntu[58]

[56] https://edubuntu.org/
[57] https://kubuntu.org/
[58] https://lubuntu.me/

- Ubuntu Budgie[59]
- Ubuntu Cinnamon[60]
- Ubuntu Kylin[61]
- Ubuntu MATE[62]
- Ubuntu Studio[63]
- Ubuntu Unity[64]
- Xubuntu[65]

In addition to the officially recognised flavours, dozens of other *Linux* distributions take Ubuntu as a base for their own distinctive ideas and approaches.

### 3.4.6. Resources

- The Ubuntu life cycle and release cadence[66]
- Ubuntu wiki – List of releases[67]
- Ubuntu flavours[68]
- Ubuntu wiki – Ubuntu flavours[69]
- Ubuntu wiki – time-based releases[70]
- Ubuntu wiki – point release process[71]
- Ubuntu wiki – end of life process[72]
- Ubuntu releases[73]

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If you are an experienced packager and would like to contribute, we would love for you to be involved! See *our contribution page* (page 97) for details of how to join in.

[59] https://ubuntubudgie.org/
[60] https://ubuntucinnamon.org/
[61] https://www.ubuntukylin.com/index-en.html
[62] https://ubuntu-mate.org/
[63] https://ubuntustudio.org/
[64] https://ubuntuunity.org/
[65] https://xubuntu.org/
[66] https://ubuntu.com/about/release-cycle
[67] https://wiki.ubuntu.com/Releases
[68] https://ubuntu.com/desktop/flavours
[69] https://wiki.ubuntu.com/UbuntuFlavors
[70] https://wiki.ubuntu.com/TimeBasedReleases
[71] https://wiki.ubuntu.com/PointReleaseProcess
[72] https://wiki.ubuntu.com/EndOfLifeProcess
[73] https://releases.ubuntu.com/

# 3.5. Ubuntu package archive

*Linux distributions* like *Ubuntu* use *repositories* (page 39) to hold *packages* you can install on target machines. Ubuntu has several repositories that anyone can access. The **Ubuntu package archive** hosts *Debian binary packages* (`.deb` files) and *source packages* (`.dsc` files). On Ubuntu installations, the Ubuntu package archive is configured as the default source for the *APT* package manager to download and install packages from.

> **Note**
>
> Some of the following terminologies have only loose or informal definitions. Also, be aware that the terminology surrounding the Ubuntu package archive gets mixed up in day-to-day communications. This can be confusing, but the meaning is usually evident from the surrounding context once you are familiar with the following terminologies.

## 3.5.1. Repositories

In the context of package management, **repositories** are servers containing sets of packages that a *package manager* can download and install.

This term can refer to the Ubuntu package archive as a whole or just *suites* (page 41), *pockets* (page 40), or *components* (page 41).

## 3.5.2. Series

A **series** refers to the packages that target a specific Ubuntu version. A series is usually referred to by its *code name*.

Examples of series are: `mantic`, `lunar`, `jammy`, `focal`, `bionic`, `xenial`, `trusty`.

> **Note**
>
> In practice, the terms “Ubuntu series” and “Ubuntu release” are often used synonymously or are mistaken for each other. There is technically a difference; for example, an LTS version usually has an initial release (e.g. 22.04 LTS) and multiple point releases (e.g. 22.04.1 LTS, 22.04.2 LTS), which are all part of the same *series* (e.g. `jammy`).

### 3.5.3. Pockets

**Pockets** are package sub-repositories within the Ubuntu package archive. Every Ubuntu series has the following pockets:

#### release

This pocket contains the packages that an Ubuntu series was initially released with. After the initial release of an Ubuntu series, the packages in this pocket are not updated (not even for security-related fixes).

#### security

This pocket contains security-related updates to packages in the *release* (page 40) pocket.

#### updates

This pocket contains non-security-related updates to packages in the *release* (page 40) pocket.

#### proposed

This pocket is a *staging environment* the Ubuntu community can opt into, to verify the stability of any updates before they get deployed to a broader range of consumers.

- Before the initial release of an Ubuntu series, this pocket contains non-security-related updates to packages in the *release* (page 40) pocket before they get uploaded to the *release* (page 40) pocket.
- After the initial release of an Ubuntu series, this pocket contains non-security-related updates to packages in the *release* (page 40) pocket before they get uploaded to the *updates* (page 40) pocket.

#### backports

This pocket contains packages the Ubuntu series was initially **NOT** released with.

The *backports article* (page 50) provides more information on backporting software.

**Important**

The **backports pocket** does not come with any security support guarantee. The Ubuntu Security Team does not update packages in the backports pocket. The Ubuntu community is responsible for maintaining packages in backports with later patches for bug fixes and security updates.

### 3.5.4. Suite

A combination of a series and a pocket. For example:

| Suite | Series | Pocket |
|---|---|---|
| `jammy` | `jammy` | *release* (page 40) |
| `jammy-security` | `jammy` | *security* (page 40) |
| `jammy-updates` | `jammy` | *updates* (page 40) |
| `jammy-proposed` | `jammy` | *proposed* (page 40) |
| `jammy-backports` | `jammy` | *backports* (page 40) |

You can see all active suites[74] in the archive.

**Note**

The `devel` series always mirrors the series with the code name of the *current release in development*.

### 3.5.5. Components

**Components** are logical subdivisions or *namespaces* of the packages in a suite. The APT package manager can subscribe to the individual components of a suite.

The packages of an Ubuntu series are categorised according to whether they are *Open Source Software* or *Closed Source Software*, and whether or not they are part of the *base packages* for a given series. On this basis they are sorted into the components "main", "restricted", "universe", or "multiverse", as shown in the following table:

| | Open source software | Closed source software |
|---|---|---|
| **Ubuntu base packages** | *main* (page 42) | *restricted* (page 42) |
| **Community packages** | *universe* (page 42) | *multiverse* (page 42) |

*Canonical* maintains the base packages and provides security updates. See *release lifespan* (page 37) for more information about the official support provided by Canonical.

For example, if you look into any of the *Pockets* (page 40) of the `devel` series (`devel-release`[75], `devel-updates`[76], `devel-security`[77], `devel-proposed`[78], `devel-backports`[79]) you will see the four components (main, restricted, universe, multiverse) as directories.

[74] http://archive.ubuntu.com/ubuntu/dists/
[75] http://archive.ubuntu.com/ubuntu/dists/devel/
[76] http://archive.ubuntu.com/ubuntu/dists/devel-updates/
[77] http://archive.ubuntu.com/ubuntu/dists/devel-security/
[78] http://archive.ubuntu.com/ubuntu/dists/devel-proposed/
[79] http://archive.ubuntu.com/ubuntu/dists/devel-backports/

#### main

This component contains open source software packages for a given series that are supported and maintained by Canonical.

#### restricted

This component contains closed source software packages for a given series that are supported and maintained by Canonical. Packages in this component are mostly proprietary drivers for devices and similar.

#### universe

This component contains open source software packages for a given series that are supported and maintained by the Ubuntu community.

#### multiverse

This component contains packages (for a given series) of closed source software, or open source software restricted by copyright or legal issues. These packages are maintained and supported by the Ubuntu community, but because of the restrictions, patching bugs or updates may not be possible.

### 3.5.6. Mirrors

Every day, hundreds of thousands of people want to download and install packages from the Ubuntu package archive. To provide a good *user experience*, the content of `http://archive.ubuntu.com/ubuntu` gets mirrored (replicated and kept in sync) by other servers to distribute network traffic, reduce latency, and provide redundancy, which ensures high availability and fault tolerance.

Here is a complete list of officially recognised Ubuntu package archive mirrors[80].

**Note**

There are also mirrors for the Ubuntu *ISO* images (also called "CD images", because ISO images can be downloaded and burned to a CD to make installation disks.)

You can find a complete list of officially recognised Ubuntu CD mirrors[81].

[80] https://launchpad.net/ubuntu/+archivemirrors
[81] https://launchpad.net/ubuntu/+cdmirrors

### Country mirrors

Ubuntu package archive mirrors that provide a very reliable service in a country can request to be the official **country mirror** for that country. Ubuntu installations are configured by default to use the country mirror for their selected country.

Country mirrors are accessible via the domain name format:

```
<country-code>.archive.ubuntu.com
```

You can see which mirror is the country mirror by doing a simple *DNS* lookup. For example:

### Finland (FI)

```
dig fi.archive.ubuntu.com +noall +answer
```

```
fi.archive.ubuntu.com.      332     IN      CNAME   mirrors.nic.funet.fi.
mirrors.nic.funet.fi.       332     IN      A       193.166.3.5
```

Therefore, `mirrors.nic.funet.fi` is Finland's country mirror.

### Tunisia (TN)

Tunisia does not have any third-party mirrors in its country. Therefore the Tunisia country mirror is just the primary Ubuntu package archive server (`archive.ubuntu.com`).

```
dig tn.archive.ubuntu.com +noall +answer
```

```
tn.archive.ubuntu.com.      60      IN      A       185.125.190.36
tn.archive.ubuntu.com.      60      IN      A       91.189.91.83
tn.archive.ubuntu.com.      60      IN      A       91.189.91.82
tn.archive.ubuntu.com.      60      IN      A       185.125.190.39
tn.archive.ubuntu.com.      60      IN      A       91.189.91.81
```

which are just the `archive.ubuntu.com` IP addresses:

```
dig archive.ubuntu.com +noall +answer
```

```
archive.ubuntu.com. 1       IN      A       185.125.190.39
archive.ubuntu.com. 1       IN      A       185.125.190.36
archive.ubuntu.com. 1       IN      A       91.189.91.83
archive.ubuntu.com. 1       IN      A       91.189.91.81
archive.ubuntu.com. 1       IN      A       91.189.91.82
```

### 3.5.7. Package uploads

Ubuntu encourages contributions from any person in the wider community. However, direct uploading to the Ubuntu package archive is restricted. These general contributions need to be reviewed and uploaded by a *sponsor*.

See our *article on sponsoring* (page 49) that explains this process in more detail.

### 3.5.8. Security update propagation

This section is a niche technical explanation. You can skip it if you don't feel that this is currently relevant for you.

Because security updates contain fixes for *Common Vulnerabilities and Exposures* (CVE), it is mission critical to distribute them as fast as possible to end users. Mirrors are a technical burden in this case, because there is a delay between the synchronisation of a mirror and the primary Ubuntu package archive server.

In the worst case a bad actor gets informed about a CVE and can use it, before the update reaches a target machine.

Therefore the APT package manager is configured by default (on Ubuntu) to also check for updates from `security.ubuntu.com`. Security updates will get uploaded here first. If a mirror does not provide the update yet a client will download it from `security.ubuntu.com` instead from the mirror.

You can see this yourself if you look what the *`sources.list(5)`*[82] file contains on your Ubuntu machine:

```
cat /etc/apt/sources.list
```

At the end of the file you will find something similar to this:

```
deb http://security.ubuntu.com/ubuntu SERIES-security main restricted
# deb-src http://security.ubuntu.com/ubuntu SERIES-security main restricted
deb http://security.ubuntu.com/ubuntu SERIES-security universe
# deb-src http://security.ubuntu.com/ubuntu SERIES-security universe
deb http://security.ubuntu.com/ubuntu SERIES-security multiverse
# deb-src http://security.ubuntu.com/ubuntu SERIES-security multiverse
```

Because the *`sources.list(5)`*[83] file is read from top to bottom, the APT package manager will download updates from the mirror first and only download it from `security.ubuntu.com` if the mirror has an older version, because the mirror has not synchronised with the primary Ubuntu package archive server yet.

`security.ubuntu.com` points to the same servers as `archive.ubuntu.com` if you do a DNS lookup. It is used in the *`sources.list(5)`*[84] file for the security pocket to prevent a user/script from accidentally changing it to a mirror.

[82] https://manpages.ubuntu.com/manpages/en/man5/sources.list.5.html
[83] https://manpages.ubuntu.com/manpages/en/man5/sources.list.5.html
[84] https://manpages.ubuntu.com/manpages/en/man5/sources.list.5.html

### 3.5.9. Resources

- Ubuntu release cycle[85]
- Ubuntu blog – Ubuntu updates, releases and repositories explained[86]
- Ubuntu Server docs – package management[87]
- Ubuntu wiki – mirrors[88]
- Ubuntu help – repositories[89]
- Ubuntu help – repositories/Ubuntu[90]

#### Landscape repositories

Landscape[91] is a management and administration tool for Ubuntu. Landscape allows you to mirror *APT* repositories like the Ubuntu package archive. Although it is not directly related to the Ubuntu package archive it can be educational to understand how APT repositories work in general.

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## 3.6. Launchpad

Launchpad is a software collaboration and hosting platform similar to platforms like GitHub[92]. Launchpad is also the platform where the *Ubuntu* project lives. This is one of the major differences between the Ubuntu and *Debian* infrastructure.

**Note**

Although the Ubuntu project is probably the largest user base of Launchpad, Launchpad can be used by anyone.

Launchpad features, among others, are:

[85] https://ubuntu.com/about/release-cycle
[86] https://ubuntu.com/blog/ubuntu-updates-releases-and-repositories-explained
[87] https://ubuntu.com/server/docs/package-management
[88] https://wiki.ubuntu.com/Mirrors
[89] https://help.ubuntu.com/community/Repositories
[90] https://help.ubuntu.com/community/Repositories/Ubuntu
[91] https://ubuntu.com/landscape
[92] https://github.com/

- **Bugs**: *Bug Tracking System*
- **Code**: *source code* hosting with *Git* or *Bazaar*, *version control* and *code review* features
- **Answers**: community support site and knowledge base
- **Translations**: collaboration platform for localising software
- **Blueprints**: feature planning and specification tracking
- Ubuntu *package* building and hosting
- Team/Group management

While platforms like GitHub put users and groups at the top level, Launchpad puts projects at the top level. If you take Ubuntu as an example, you can see that you can access it at the top level: *https://launchpad.net/ubuntu*. Users and groups begin with a ~, for instance *https://launchpad.net/~ubuntu-foundations-team*.

### 3.6.1. Why not use platforms like GitHub?

Although Launchpad's *UI* and *UX* are a bit dated, Launchpad offers an unparalleled Ubuntu package building and hosting infrastructure that no other platform offers. Even simple requirements like building for architectures like *PowerPC*, *s390x*, or *RISC-V* can not be fulfilled by GitHub or similar platforms.

### 3.6.2. Personal Package Archive (PPA)

Launchpad PPA repositories allow you to build installable Ubuntu packages for multiple *architectures* and to host them in your own software *repository*.

Using a PPA is straightforward; you don't need the approval of anyone, therefore users have to enable it manually. See how to *Install packages from a PPA* (page 18).

This is useful when you want to test a change, or to show others that a change builds successfully or is installable. Some people have special permission to trigger the *autopkgtests* for packages in a PPA.

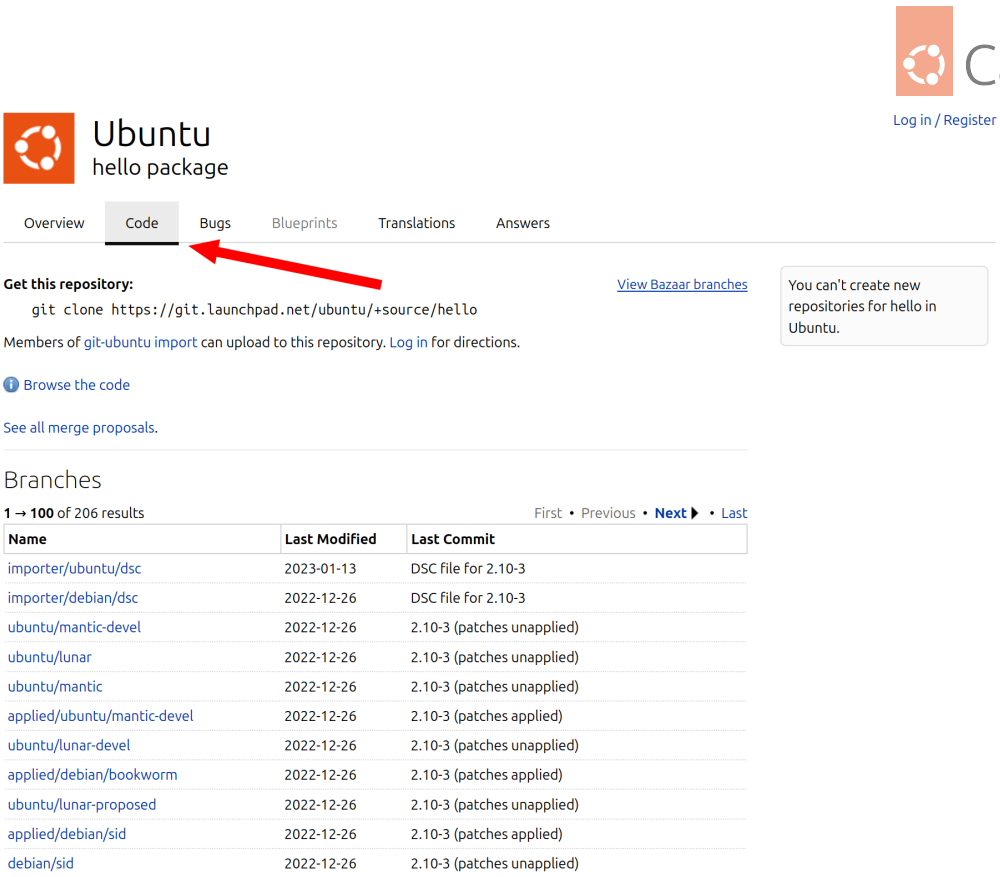
> **Tip**
>
> You can ask in the *IRC* channel `#ubuntu-devel` if someone can trigger autopkgtests in your PPA if you don't have the permission.

### 3.6.3. git-based workflow for the development of Ubuntu source packages

Launchpad hosts a *git-ubuntu* (page 55) importer service that maintains a view of the entire packaging version history of Ubuntu *source packages* using git repositories with a common branching and tagging scheme. The git-ubuntu *CLI* provides tooling and automation that understands these repositories to make the development of Ubuntu itself easier.

You can see the web-view of these repositories when you click on the "Code" tab of any source package on Launchpad, for example, in the "hello" source package[93] as shown in the following screenshot:

[93] https://code.launchpad.net/ubuntu/+source/hello




### 3.6.4. Text markup

Launchpad has some markup features that you can use when you e.g. report bugs, write comments, create merge proposals.

See the *Launchpad text markup* (page 56) reference for more details.

### 3.6.5. Getting help

If you need help with Launchpad you can choose any of the following methods:

#### IRC chat rooms

On the `irc.libera.chat` *IRC* server you will find the `#launchpad` channel, where you can ask the Launchpad team and the Ubuntu community for help.

#### Mailing lists

If you prefer to ask for help via email, you can write to the launchpad-users[94] mailing list (`launchpad-users@lists.launchpad.net`).

[94] https://launchpad.net/~launchpad-users

#### Ask a question

As mentioned above, Launchpad has a community FAQ feature[95] (called "Answers") where you can see other people's questions or ask one yourself. Use can use the *Answers* feature of the Launchpad project on Launchpad itself.

#### Report a bug

If you encounter any bug related to Launchpad, you can submit a bug report to the *Bug Tracking System* of the Launchpad project on Launchpad itself[96].

### 3.6.6. Staging environment

Before new features are deployed to the production environment they get deployed to a staging environment[97] where the changes can get tested.

You can use the staging environment, to try out Launchpad features.

### 3.6.7. API

Launchpad has a web *API* that you can use to interact with its services. This makes it easy for developer communities like Ubuntu's to automate specific workflows.

You can find the reference documentation for the web API[98] on Launchpad.

The Launchpad team even created an *open source* Python library, launchpadlib[99].

### 3.6.8. Resources

- Launchpad home page[100]
- **The Launchpad software project on Launchpad itself**[101]
  - Launchpad bug tracker[102]
  - Launchpad questions and answers[103]
- Launchpad wiki[104]
- Launchpad development wiki[105]
- Launchpad blog[106]
- *git-ubuntu* (page 55)

[95] https://answers.launchpad.net/launchpad
[96] https://bugs.launchpad.net/launchpad
[97] https://qastaging.launchpad.net/
[98] https://launchpad.net/+apidoc/
[99] https://help.launchpad.net/API/launchpadlib
[100] https://launchpad.net
[101] https://launchpad.net/launchpad
[102] https://bugs.launchpad.net/launchpad
[103] https://answers.launchpad.net/launchpad
[104] https://help.launchpad.net/
[105] https://dev.launchpad.net/
[106] https://blog.launchpad.net/

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## 3.7. Sponsoring

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## 3.8. Proposed migrations

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## 3.9. Stable Release Updates (SRU)

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## 3.10. Debian syncs

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## 3.11. Debian merges

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## 3.12. Transitions

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## 3.13. Backports

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# 3.14. Main Inclusion Review (MIR)

**Important**

Do not confuse the abbreviation *MIR* with the display server[107] Mir.

*Packages* in *Main* and *Restricted* are officially maintained, supported and recommended by the *Ubuntu* project. *Canonical's* support services applies to these packages, which include security updates and certain *SLA* guarantees when bugs are reported and technical support is requested.

Therefore, special consideration is necessary before adding new packages to Main or Restricted. The Ubuntu *MIR Team* reviews packages for promotion:

- from *Universe* to *Main*, or
- from *Multiverse* to *Restricted*.

This review process is called **Main Inclusion Review (MIR)**.

## 3.14.1. Submit a package for Main Inclusion Review

The Main Inclusion Review documentation[108] by the MIR team provides instructions on how to apply for *Main Inclusion Review* for a package. The documentation even contains details of how the application gets reviewed by the MIR team.

**Note**

The guidelines and review process is constantly evolving. Therefore you should re-read the MIR documentation even if you have submitted a package for Main Inclusion Review in the past.

The MIR documentation is also a living document. External contributions, suggestions, discussions or questions about the process are always welcome.

## 3.14.2. MIR team weekly meeting

The MIR team holds weekly meetings every Tuesday at 16:30 CET on the *IRC* server `irc.libera.chat` in the `#ubuntu-meeting` channel. You can follow these instructions[109] on how to connect to `irc.libera.chat`.

The purpose of the meeting is:

- to distribute the workload fairly between the members of the MIR team
- to provide a timely response to reporters of MIR applications

[107] https://mir-server.io/
[108] https://github.com/canonical/ubuntu-mir
[109] https://libera.chat/guides/connect

- detection and discussion of any current or complex cases

You should attend these meetings if you submit an MIR request until it is approved or rejected.

Usually, the amount of MIR requests increases during the six-month development period of a new Ubuntu release. Especially right before the various feature freezes (see *Ubuntu development process* (page 34)), Ubuntu developers submit MIR requests they have been working on before they have to submit an exception request. As a result, the meetings tend to be quieter, and response times to MIR requests are, on average, faster after the release of a new Ubuntu version.

### 3.14.3. Resources

- **Main Inclusion Review documentation**[110] **by the MIR team**
  - MIR process overview[111]
  - MIR application template[112]
  - Helper tools[113]
  - Bug lists[114]
  - Pull requests[115]
  - Issues[116]
- MIR team on *Launchpad*: `~ubuntu-mir`[117]

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[110] https://github.com/canonical/ubuntu-mir
[111] https://github.com/canonical/ubuntu-mir#process-states
[112] https://github.com/canonical/ubuntu-mir#main-inclusion-requirements
[113] https://github.com/canonical/ubuntu-mir#tools
[114] https://github.com/canonical/ubuntu-mir#bug-lists
[115] https://github.com/canonical/ubuntu-mir/pulls
[116] https://github.com/canonical/ubuntu-mir/issues
[117] https://launchpad.net/~ubuntu-mir

# 4. Reference

Our reference section contains support information related to packaging in Ubuntu. This includes details on the network requirements, API definitions, support matrices, and so on.

---

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## 4.1. Basic overview of the `debian/` directory

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## 4.2. Supported architectures

| Identifier | Alternative Architecture Names | Endianness | Architecture Type |
|---|---|---|---|
| `amd64` | x86-64, x86_64, x64, AMD64, Intel 64 | *Little-Endian* | *CISC* |
| `i386`[1] | Intel x86, 80x86 | *Little-Endian* | *CISC* |
| `arm64` | ARM64, ARMv8, AArch64 | *Little-Endian* | *RISC* |
| `armhf` | ARM32, ARMv7, AArch32, ARM Hard Float | *Little-Endian* | *RISC* |
| `ppc64el` | PowerPC64 Little-Endian | *Little-Endian* | *RISC* |
| `powerpc` | PowerPC (32-bit) | *Big-Endian* | *RISC* |
| `s390x` | IBM System z, S/390, S390X | *Big-Endian* | *CISC* |
| `riscv64` | RISC-V (64-bit) | *Little-Endian* | *RISC* |

[1] `i386` is a partial-port of Ubuntu, which is supported as a multi-arch supplementary architecture. There is no kernel, no installers, and no bootloaders for `i386`, therefore it cannot be booted as a pure `i386` installation. You have to crossbuild `i386` or build in a `i386` chroot on a `amd64` host.

### 4.2.1. Other architectures

*Ubuntu* doesn't currently support any other *architectures*. This doesn't mean that Ubuntu won't run on other architectures – in fact it is entirely possible for it to install without a problem, because Ubuntu is based on the *Debian* distribution, which has support for eight additional architectures (see Debian Supported Architectures[118]).

However, if you run into problems, the Ubuntu community may not be able to help you.

### 4.2.2. Resources

- Ubuntu Wiki – Supported Architectures[119]
- Ubuntu Wiki – i386[120]
- Statement on 32-bit i386 packages for Ubuntu 19.10 and 20.04 LTS[121]
- Ubuntu Wiki – S390X[122]
- Ubuntu Downloads[123]
- Endianness[124]

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## 4.3. Package tests

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[118] https://wiki.debian.org/SupportedArchitectures
[119] https://help.ubuntu.com/community/SupportedArchitectures
[120] https://wiki.ubuntu.com/i386
[121] https://canonical.com/blog/statement-on-32-bit-i386-packages-for-ubuntu-19-10-and-20-04-lts
[122] https://wiki.ubuntu.com/S390X
[123] https://ubuntu.com/download
[124] https://en.wikipedia.org/wiki/Endianness

## 4.4. Package version format

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## 4.5. git-ubuntu

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## 4.6. APT

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## 4.7. Debian policy

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## 4.8. Filesystem Hierarchy Standard (FHS)

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## 4.9. (To be) Outdated packaging tools

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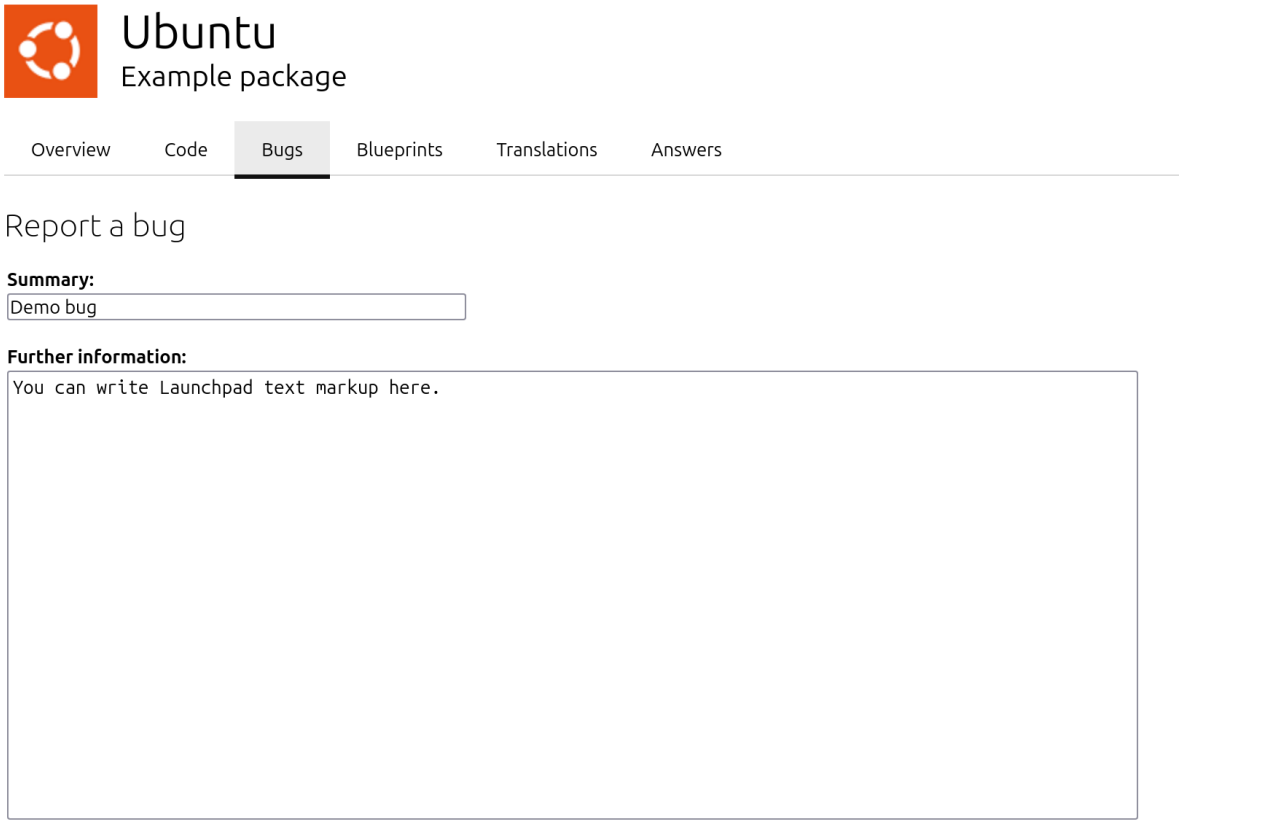
## 4.10. Launchpad text markup

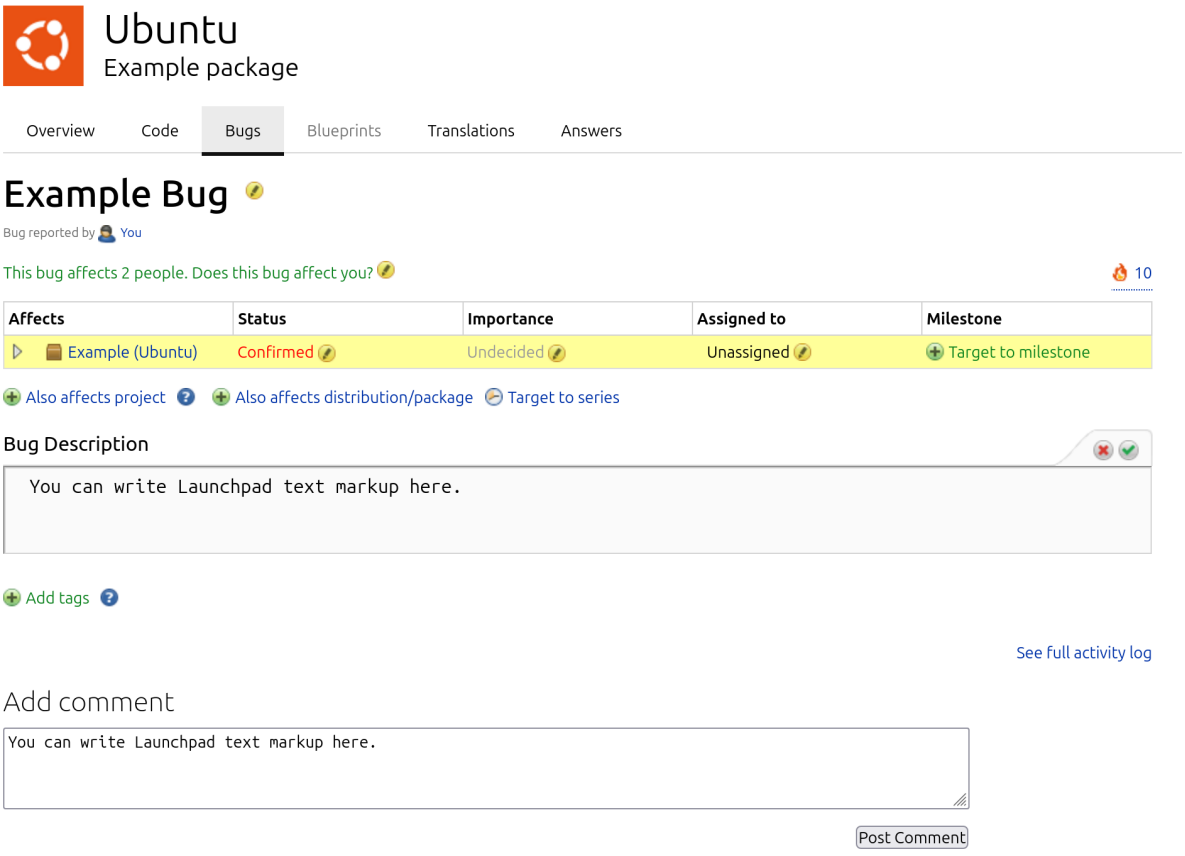
Any textarea[125] input field on Launchpad will process the entered text to recognise certain patterns to enhance the resulting displayed output.

Examples of textareas where the Launchpad text markup is accepted are:

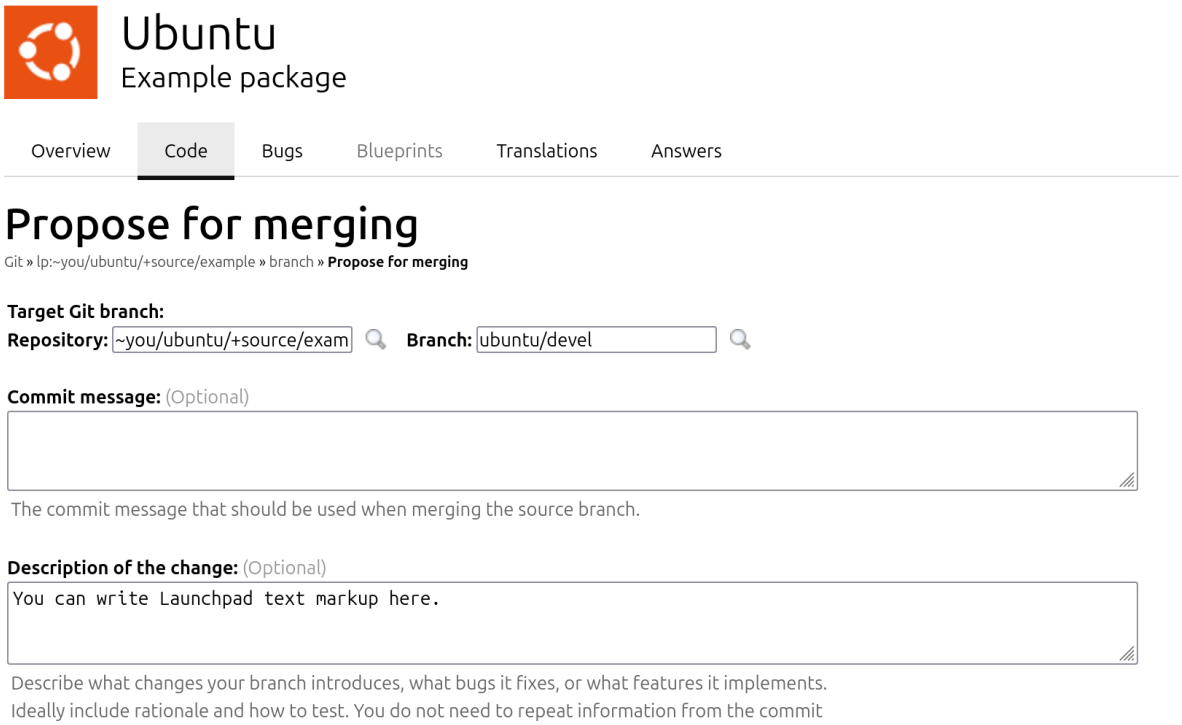
[125] https://developer.mozilla.org/en-US/docs/Web/HTML/Element/textarea



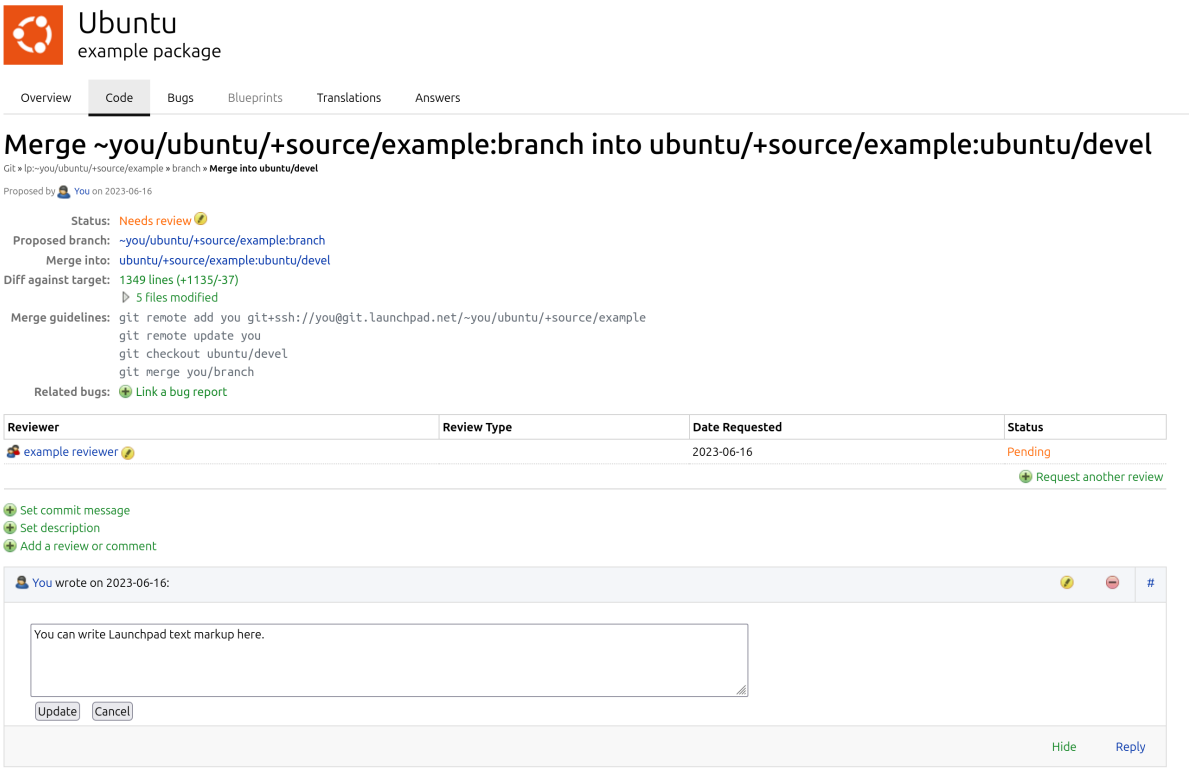

## Bug reporting



## Bug report descriptions and comments




## Merge proposal creation




## Comment for a Merge proposal

You

Overview | Code | Bugs | Blueprints | Translations | Answers

You can write Launchpad text markup here.

Related packages | Related projects | Authorized applications | OCI registry credentials

User information

**Launchpad Id:**
you

**Email:**
you@example.com
Change email settings
Manage mailing list subscriptions

**Jabber:**
No Jabber IDs registered.

**OpenID login:**
https://launchpad.net/~you

**Member since:**
2023-04-11

**Signed Ubuntu Code of Conduct:**
Yes

**IRC:**
No IRC nicknames registered.

**SSH keys:**
No SSH keys registered.

**Time zone:**
UTC (UTC+0000)

**OpenPGP keys:**
No OpenPGP keys registered.

**Languages:**
English

**Karma:**
0

Profile description

You

Overview | Code | Bugs | Blueprints | Translations | Answers

Example PPA

PPA description

You can type Launchpad text markup here.

Change details
Edit PPA dependencies
View package details
Delete PPA

Latest updates

**hello** 13 weeks ago
Successfully built

*PPA* description

Unlike platforms like GitHub, Launchpad unfortunately only recognises a very limited set of markup patterns when you write comments. The most useful pattern are documented in this article.

> **Note**
>
> Support for a wider range of markup patterns is a very common and old request/wish; take for example LP: #391780[126].
>
> You can “upvote” (mark yourself as affected) or leave a comment on this bug report to show your support for the feature request.
>
> **Reminder:** Please stay civil! The Launchpad team has only limited resources.

### 4.10.1. Referencing Launchpad bugs

It is very common to refer to a specific Launchpad bug e.g. to point other people to a bug during a discussion.

#### Pattern

The following pattern is used by Launchpad to detect bug references:

```
LP: #<LP-Bug-Number>[, #<LP-Bug-Number>]...
```

This pattern is case invariant, and the amount of blank space can be variable, but if you place blank space anywhere else, the regular expression used by Launchpad might not parse the bug reference correctly.

> **Note**
>
> This pattern is also commonly used outside of Launchpad e.g. on *IRC*, in *source package changelogs* or on *Discourse*.

[126] https://bugs.launchpad.net/launchpad/+bug/391780

### Examples

The following table shows examples how text entered into a text input field will be displayed on Launchpad:

| Input | Result | Comment |
|---|---|---|
| `LP: #1` | LP: #1[127] | references Launchpad bug with the number 1 |
| `(LP: #1)` | (LP: #1[128]) | a bug reference can be surrounded by brackets |
| `LP: #1, #2.` | LP: #1[129], #2[130]. | there can be multiple bug references<br>separated by a , |
| `LP:`<br>`#1,`<br>`#2,`<br>`#3,`<br>`#4` | LP:<br>#1[131],<br>#2[132],<br>#3[133],<br>#4[134] | the amount of *blank space* can be variable and<br>a new-line will not disrupt this pattern |
| `lp: #1` | lp: #1[135] | the pattern is case invariant |
| `(lp: #1)` | (lp: #1[136]) | the pattern is case invariant |
| `lp: #1, #2.` | lp: #1[137], #2[138]. | the pattern is case invariant |
| `LP #1` | LP #1 | the : is strictly needed |
| `LP: #1 , #2` | LP: #1[139] , #2 | if you place blank space anywhere else the *regular expression* might not parse the<br>input correctly |
| `LP: #1, #2,`<br><br>`#3` | LP: #1[140], #2[141],<br><br>#3 | an empty new-line will interrupt the pattern,<br>but a trailing , will not |

### 4.10.2. Blank spaces

Launchpad will:

- cut off any blank space to the right,
- keep any blank space to the left, and
- reduce any blank space between non-blank-space characters to just one (this includes new-line characters as well).

**Note**

Technically Launchpad passes blank space through and the browser just ignores the blank space.

**Warning**

Because of the behaviour described above you will have a hard time trying to write a table or long chunks of blank space between two sections.

The following table shows examples how text entered into a text input field will be displayed on Launchpad:

[127] https://bugs.launchpad.net/ubuntu/+bug/1
[128] https://bugs.launchpad.net/ubuntu/+bug/1
[129] https://bugs.launchpad.net/ubuntu/+bug/1
[130] https://bugs.launchpad.net/ubuntu/+bug/2
[131] https://bugs.launchpad.net/ubuntu/+bug/1
[132] https://bugs.launchpad.net/ubuntu/+bug/2
[133] https://bugs.launchpad.net/ubuntu/+bug/3
[134] https://bugs.launchpad.net/ubuntu/+bug/4
[135] https://bugs.launchpad.net/ubuntu/+bug/1
[136] https://bugs.launchpad.net/ubuntu/+bug/1
[137] https://bugs.launchpad.net/ubuntu/+bug/1
[138] https://bugs.launchpad.net/ubuntu/+bug/2
[139] https://bugs.launchpad.net/ubuntu/+bug/1
[140] https://bugs.launchpad.net/ubuntu/+bug/1
[141] https://bugs.launchpad.net/ubuntu/+bug/2

| Input | Result |
| --- | --- |
| `\| Column 1 \| Column 2 \| Column 3 \|`<br>`\|----------\|----------\|----------\|`<br>`\| Example \| table \| text \|`<br>`\| Example \| table \| text \|`<br>`\| Example \| table \| text \|` | \| Column 1 \| Column 2 \| Column 3 \|<br>\|----------\|----------\|----------\|<br>\| Example \| table \| text \|<br>\| Example \| table \| text \|<br>\| Example \| table \| text \| |
| `Here are two paragraphs with lots`<br>`of blank space between them.`<br><br><br><br>`But they're still just two paragraphs` | Here are two paragraphs with lots of blank space between them.<br><br>But they're still just two paragraphs |

### 4.10.3. URI addresses

Launchpad can recognise `http`, `https`, `ftp`, `sftp`, `mailto`, `news`, `irc` and `jabber` *URIs*.

**Note**

`tel`, `urn`, `telnet`, `ldap` *URI*, relative *URLs* like `example.com` and email addresses like `test@example.com` are **NOT** recognised.

#### Examples

The following examples show how text entered into a text input field will be displayed on Launchpad:

| Input | `http://localhost:8086/example/sample.html` |
| --- | --- |
| Result | http://localhost:8086/example/sample.html |

| Input | `http://localhost:8086/example/sample.html` |
| --- | --- |
| Result | http://localhost:8086/example/sample.html |

| Input | `ftp://localhost:8086/example/sample.html` |
| --- | --- |
| Result | ftp://localhost:8086/example/sample.html |

| Input | `sftp://localhost:8086/example/sample.html.` |
| --- | --- |
| Result | sftp://localhost:8086/example/sample.html. |

| Input | `http://localhost:8086/example/sample.html;` |
| --- | --- |
| Result | http://localhost:8086/example/sample.html; |

| Input | `news://localhost:8086/example/sample.html:` |
| --- | --- |
| Result | news://localhost:8086/example/sample.html: |

| Input | `http://localhost:8086/example/sample.html?` |
| --- | --- |
| Result | http://localhost:8086/example/sample.html? |

| Input | `http://localhost:8086/example/sample.html,` |
| --- | --- |
| Result | http://localhost:8086/example/sample.html, |

| Input | `<http://localhost:8086/example/sample.html>` |
| --- | --- |
| Result | <http://localhost:8086/example/sample.html> |

| Input | `<http://localhost:8086/example/sample.html>,` |
| --- | --- |
| Result | <http://localhost:8086/example/sample.html>, |

| Input | `<http://localhost:8086/example/sample.html>.` |
| --- | --- |
| Result | <http://localhost:8086/example/sample.html>. |

| Input | `<http://localhost:8086/example/sample.html>;` |
| --- | --- |
| Result | <http://localhost:8086/example/sample.html>; |

| Input | `<http://localhost:8086/example/sample.html>:` |
| --- | --- |
| Result | <http://localhost:8086/example/sample.html>: |

| Input | `<http://localhost:8086/example/sample.html>?` |
| --- | --- |
| Result | <http://localhost:8086/example/sample.html>? |

| Input | `(http://localhost:8086/example/sample.html)` |
| --- | --- |
| Result | (http://localhost:8086/example/sample.html) |

| | |
|---|---|
| Input | `(http://localhost:8086/example/sample.html),` |
| Result | (http://localhost:8086/example/sample.html), |

| | |
|---|---|
| Input | `(http://localhost:8086/example/sample.html).` |
| Result | (http://localhost:8086/example/sample.html). |

| | |
|---|---|
| Input | `(http://localhost:8086/example/sample.html);` |
| Result | (http://localhost:8086/example/sample.html); |

| | |
|---|---|
| Input | `(http://localhost:8086/example/sample.html):` |
| Result | (http://localhost:8086/example/sample.html): |

| | |
|---|---|
| Input | `http://localhost/example/sample.html?a=b&b=a` |
| Result | http://localhost/example/sample.html?a=b&b=a |

| | |
|---|---|
| Input | `http://localhost/example/sample.html?a=b&b=a.` |
| Result | http://localhost/example/sample.html?a=b&b=a. |

| Input | `http://localhost/example/sample.html?a=b&b=a,` |
| --- | --- |
| Result | http://localhost/example/sample.html?a=b&b=a, |

| Input | `http://localhost/example/sample.html?a=b&b=a;` |
| --- | --- |
| Result | http://localhost/example/sample.html?a=b&b=a; |

| Input | `http://localhost/example/sample.html?a=b&b=a:` |
| --- | --- |
| Result | http://localhost/example/sample.html?a=b&b=a: |

| Input | `http://localhost/example/sample.html?a=b&b=a:b;c@d_e%f~g#h,j!k-l+m$n*o'p` |
| --- | --- |
| Result | http://localhost/example/sample.html?a=b&b=a:b;c@d_e%l+m$n*o'p[142] |

| Input | `http://www.example.com/test/example(parentheses).html` |
| --- | --- |
| Result | http://www.example.com/test/example(parentheses).html |

| Input | `http://www.example.com/test/example-dash.html` |
| --- | --- |
| Result | http://www.example.com/test/example-dash.html |

[142] http://localhost/example/sample.html?a=b&b=a:b;c@d_e%f~g#h,j!k-l+m\protect\TU\textdollarn*o'p

| Input | `http://www.example.com/test/example_underscore.html` |
| --- | --- |
| Result | http://www.example.com/test/example_underscore.html |

| Input | `http://www.example.com/test/example.period.x.html` |
| --- | --- |
| Result | http://www.example.com/test/example.period.x.html |

| Input | `http://www.example.com/test/example!exclamation.html` |
| --- | --- |
| Result | http://www.example.com/test/example!exclamation.html |

| Input | `http://www.example.com/test/example~tilde.html` |
| --- | --- |
| Result | http://www.example.com/test/example~tilde.html |

| Input | `http://www.example.com/test/example*asterisk.html` |
| --- | --- |
| Result | http://www.example.com/test/example*asterisk.html |

| Input | `irc://chat.freenode.net/launchpad` |
| --- | --- |
| Result | irc://chat.freenode.net/launchpad |

| Input | `irc://chat.freenode.net/%23launchpad,isserver` |
| --- | --- |
| Result | irc://chat.freenode.net/%23launchpad,isserver |

| Input | `mailto:noreply@launchpad.net` |
| --- | --- |
| Result | mailto:noreply@launchpad.net[143] |

| Input | `jabber:noreply@launchpad.net` |
| --- | --- |
| Result | jabber:noreply@launchpad.net |

| Input | `http://localhost/foo?xxx&` |
| --- | --- |
| Result | http://localhost/foo?xxx& |

| Input | `http://localhost?testing=[square-brackets-in-query]` |
| --- | --- |
| Result | http://localhost?testing={[}square-brackets-in-query{]} |

### 4.10.4. Removal of “

If the entire comment is encapsulated in “ like this Launchpad will remove the “.

The following table shows an example how text entered into a text input field will be displayed on Launchpad:

| Input | Result |
| --- | --- |
| `"Content"` | Content |

### 4.10.5. Resources

- Comments (help.launchpad.net)[144]

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[143] noreply@launchpad.net
[144] https://help.launchpad.net/Comments

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## 4.11. Glossary

**80x86**
See *i386*

**AA**
Abbreviation for *Archive Admin*

**AArch32**
See *armhf*

**AArch64**
See *arm64*

**ABI**
Abbreviation for *Application Binary Interface*

> **Warning**
>
> Do not confuse with *Application Programming Interface* (*API*)!

**amd64**
*CPU Architecture* identifier for the `AMD64` (also known as *x64*, *x86-64*, *x86_64*, and *Intel 64*) architecture; a 64-bit version of the *i386* instruction set.

See also: X86-64 (Wikipedia)[145]

**ANAIS**
Abbreviation for *Architecture Not Allowed In Source*

**API**
Abbreviation for *Application Programming Interface*

> **Warning**
>
> Do not confuse with *Application Binary Interface* (*ABI*)!

**Application Binary Interface**
Defines how two binary applications interface eachother like calling conventions, data type sizes, and system call interfaces, ensuring compatibility and proper communication between different parts of a software system, such as libraries, executables, and the *Operating System*. *Application Binary Interfaces* are crucial for enabling software components compiled on different systems to work together seamlessly.

[145] https://en.wikipedia.org/wiki/X86-64

See also: Kernel ABI (Ubuntu Wiki)[146], Application binary interface (Wikipedia)[147]

> **Warning**
>
> Do not confuse with *Application Programming Interface* (*API*)!

**Application Programming Interface**

An *Application Programming Interface* (API), is a set of rules that allows different software applications to communicate with each other. It defines the methods and data formats that applications can use to request and exchange information, perform specific tasks, or access the functionality of another software component, such as an *Operating System*, library, or online service. *APIs* enable developers to build upon existing software and create new applications by providing a standardized way to interact with external systems, services, or libraries without needing to understand their internal workings.

> **Warning**
>
> Do not confuse with *Application Binary Interface* (*ABI*)!

**APT**

Abbreviation for *Advanced Package Manager*.

See: *APT* (page 55)

**Architecture**

Within the context of *Ubuntu*, this refers to the system architecture (more specifically, the CPU architecture and its instruction set) an application is designed for.

See also: *Supported architectures* (page 53), Computer Architecture (Wikipedia)[148]

**Architecture Not Allowed In Source**

*Work in Progress*

**Archive**

See *Ubuntu Archive*

**Archive Admin**

An administrator that is responsible for maintenance tasks of the *Ubuntu Package Archive*, including processing of new *Packages*, migration of *Packages* between *Components*, and other administrative matters.

See also: "Ubuntu Package Archive Administrators" team on Launchpad[149]

**Archive Mirror**

A *Mirror* of the *Ubuntu Archive*.

See the section *Mirrors* (page 42) for more details.

[146] https://wiki.ubuntu.com/KernelTeam/BuildSystem/ABI
[147] https://en.wikipedia.org/wiki/Application_binary_interface
[148] https://en.wikipedia.org/wiki/Computer_architecture
[149] https://launchpad.net/~ubuntu-archive

**ARM**
: *ARM* (formerly an acronym for *Advanced RISC Machines* and originally *Acorn RISC Machine*) is a widely used family of *RISC CPU Architectures* known for their efficiency, low power consumption, and versatility, which are widely used in *Embedded Systems* and mobile devices.

  Notable examples are *arm64* and *armhf*.

  See also: ARM architecture family (Wikipedia)[150]

**ARM Hard Float**
: See *armhf*

**arm64**
: *CPU Architecture* identifier (also known as ARM64, *ARMv8*, and *AArch64*) for a 64-bit *ARM Architecture* variant.

  See also: AArch64 (Wikipedia)[151]

**armhf**
: *CPU Architecture* identifier (also known as ARM32, *ARMv7*, *AArch32*, and *ARM Hard Float*) for a 32-bit *ARM Architecture* variant.

  See also: AArch64 (Wikipedia)[152]

**ARMv7**
: See *armhf*

**ARMv8**
: See *arm64*

**autopkgtest**
: *Work in Progress*

**Backports**
: *Work in Progress*

**Bazaar**
: A distributed *Version Control System* to collaborate on software development, that was developed by *Canonical* and is part of the *GNU* system.

  *Bazaar* as a *Canonical* project is discontinued. Development has been carried forward in the community as *Breezy*.

  See also: *Bazaar (Launchpad) <https://launchpad.net/bzr>*

  > **Note**
  >
  > *Bazaar* is replaced in favor of a *git*-based workflow as the main *Version Control System* within *Ubuntu*. There are some projects that still use it, but be aware that documents that reference *Bazaar* as an actively used *Version Control System* within *Ubuntu* are most likely outdated.
  >
  > See also: *git-ubuntu*

[150] https://en.wikipedia.org/wiki/ARM_architecture_family
[151] https://en.wikipedia.org/wiki/AArch64
[152] https://en.wikipedia.org/wiki/AArch64

**best-effort**
*Work in Progress*

**Big-Endian**
*Work in Progress*

See also: *Endianness*

**Binaries**
*Work in Progress*

**Binary Package**
A *Debian binary package* is a standardized format with the file extension `.deb` that the *Package Manager* (*dpkg(1)*[153] or *apt(8)*[154]) can understand to install and uninstall software on a target machine to simplify distributing software to a target machine and managing software on a target machine.

See: *Binary Packages (explanation)* (page 33)

**Blank space**
*Blank space* characters refer to characters in a text (especially *Source Code*) that are used for formatting and spacing but do not produce visible marks or symbols when rendered. Common *blank space* characters include spaces, tabs and newline characters.

**Branch**
*Work in Progress*

**Breezy**
A *Fork* of the *Bazaar Version Control System*.

See also: Breezy (Launchpad)[155], www.breezy-vcs.org[156]

**BTS**
Abbreviation for *Bug Tracking System*

**Bug**
In software development a *"bug"* refers to unintended or unexpected behaviour of a computer program or system that produce incorrect results, or crashes. *Bugs* can occur due to programming mistakes, design issues, or unexpected interactions between different parts of the software.

Identifying and fixing *Bugs* is a fundamental part of the software development process to ensure that the software functions as intended and is free of errors.

See also: Software bug (Wikipedia)[157]

**Bug Tracking System**
A platform used by software development teams to manage and monitor the progress of reported issues or *Bugs* within a software project. It provides a centralized platform for users to report problems, assign tasks to developers, track the status of issues, prioritize fixes, and maintain a comprehensive record of software defects and their resolutions. This system helps streamline the debugging process and enhances communication among team members, ultimately leading to improved software quality.

[153] https://manpages.ubuntu.com/manpages/en/man1/dpkg.1.html
[154] https://manpages.ubuntu.com/manpages/en/man8/apt.8.html
[155] https://launchpad.net/brz
[156] https://www.breezy-vcs.org/
[157] https://en.wikipedia.org/wiki/Software_bug

*Launchpad* is the *Bug Tracking System* for *Ubuntu Packages*.

See also: Bug tracking system (Wikipedia)[158]

**BZR**
Abbreviation for *Bazaar*

**Canonical**
*Canonical Ltd.* is a UK-based private company that is devoted to the *Free and Open Source Software* philosophy and created several notable software projects, including *Ubuntu*. *Canonical* offers commercial support for *Ubuntu* and related services and is responsible for delivering six-monthly milestone releases and regular *LTS* releases for enterprise production use, as well as security updates, support and the entire online infrastructure for community interaction.

Find out more on the Canonical website: canonical.com[159]

**Canonical Discourse**
A *Discourse* instance for internal/company-wide discussions. The discussions here will only be accessible to the *Canonical* employes.

See: discourse.canonical.com[160]

**CD**
Abbreviation for *Continuous Delivery*

**CD Mirror**
A *Mirror* of the *Ubuntu Image* archive (cdimage.ubuntu.com[161]).

See the complete list of officially recognized Ubuntu image archive mirrors[162].

**Central Processing Unit**
The main component of a computer, that is responsible for executing the instructions of a computer program, such as arithmetic, logic, and input/output (I/O) operations.

**Certified Ubuntu Engineer**
Develop and certify your skills on the world's most popular *Linux OS*. https://ubuntu.com/credentials

**Changelog**
The `debian/changelog` file in a *Source Package*.

See: *Basic overview of the debian/ directory* (page 53)

See also: Section 4.4 Debian changelog (Debian Policy Manual v4.6.2.0)[163]

**Checkout**
*Work in Progress*

**CI**
Abbreviation for *Continuous Integration*

**Circle of Friends**
The *Ubuntu* logo is called *Circle of Friends*, because it is derived from a picture that shows

[158] https://en.wikipedia.org/wiki/Bug_tracking_system
[159] https://canonical.com/
[160] https://discourse.canonical.com
[161] https://cdimage.ubuntu.com/
[162] https://launchpad.net/ubuntu/+cdmirrors
[163] https://www.debian.org/doc/debian-policy/ch-source.html#debian-changelog-debian-changelog

three friends extending their arms, overlapping in the shape of a circle. It should represent the core values of Ubuntu[164]: *Freedom*, *Reliable*, *Precise* and *Collaborative*.


**CISC**
Abbreviation for *Complex Instruction Set* Computer

**CLA**
Abbreviation for *Contributor Licence Agreement*

**CLI**
Abbreviation for *Command Line Interface*

**Closed Source Software**
*Work in Progress*

**CoC**
Abbreviation for *Code of Conduct*

**Code name**
*Work in Progress*

**Code of Conduct**
*Work in Progress*

See also: *Ubuntu Code of Conduct*

**Code Review**
*Work in Progress*

**CoF**
Abbreviation for *Circle of Friends*

[164] https://design.ubuntu.com/brand

**Command Line Interface**
*Work in Progress*

**Commit**
*Work in Progress*

**Common Vulnerabilities and Exposures**
*Work in Progress*

**Complex Instruction Set**
A *CPU Architecture* featuring a rich and diverse set of instructions, often capable of performing complex operations in a single instruction. *CISC* processors aim to minimize the number of instructions needed to complete a task, potentially sacrificing execution speed for instruction richness.

See also: Complex instruction set computer (Wikipedia)[165]

**Component**
*Components* are logical subdivisions or namespaces of the *Packages* in a *Suite* (page 41). The *APT Package Manager* can individually subscribe to the *components* of a *Suite* (page 41).

The *Packages* of an *Ubuntu Series* (page 39) are categorized if they are *Open Source Software* and part of the Base *Packages* for a given *Series* (page 39) and sorted into the *components* *main* (page 42), *restricted* (page 42), *universe* (page 42), or *multiverse* (page 42), as shown in the following table:

| | *Open Source Software* | *Closed Source Software* |
|---|---|---|
| **Ubuntu Base Packages** | *main* (page 42) | *restricted* (page 42) |
| **Community Packages** | *universe* (page 42) | *multiverse* (page 42) |

See: *Components (explanation)* (page 41)

**Continuous Delivery**
*Work in Progress*

See also: Continuous delivery (Wikipedia)[166]

**Continuous Integration**
*Work in Progress*

See also: Continuous integration (Wikipedia)[167]

**Contributor Licence Agreement**
*Work in Progress*

**Control File**
The `debian/control` file in a *Source Package*.

See: *Basic overview of the debian/ directory* (page 53)

This can also refer to a *Debian* source control file (`.dsc` file) or the control file in a *Binary Package* (`.deb` file).

[165] https://en.wikipedia.org/wiki/Complex_instruction_set_computer
[166] https://en.wikipedia.org/wiki/Continuous_delivery
[167] https://en.wikipedia.org/wiki/Continuous_integration

See: Chapter 5. Control files and their fields (Debian Policy Manual v4.6.2.0)[168]

**Coordinated Release Date**
The date at which the details of a *CVE* are to be publicly disclosed.

**Copyleft**
*Work in Progress*

**Copyright**
*Work in Progress*

**Copyright File**
The `debian/copyright` file in a *Source Package*.

See: *Basic overview of the debian/ directory* (page 53)

See also: Section 4.5. Copyright (Debian Policy Manual v4.6.2.0)[169]

**CPU**
Abbreviation for *Central Processing Unit*

**CRD**
Abbreviation for *Coordinated Release Date*

**Cryptographic Signature**
*Work in Progress*

**CUE**
Abbreviation for *Certified Ubuntu Engineer*

**Current Release in Development**
*Ubuntu* follows a strict time-based release cycle. Every six months a new *Ubuntu* version is released.

The *"Current Release in Development"* is the *Ubuntu* version that is in development for the next release at any given time. It is also often referred to as "devel".

See: *Ubuntu Releases (explanation)* (page 34)

**CVE**
Abbreviation for *Common Vulnerabilities and Exposures*

**Debian**
*Debian* is a widely used community-driven *Free and Open Source Operating System* known for its stability and extensive software *Repository*. It follows a strict commitment to *Free and Open Source Software* principles and serves as the basis for various *Linux Distributions* (including *Ubuntu*). *Debian' Package Manager*, *APT*, simplifies software installation and updates, making it a popular choice for servers and desktops.

See also: www.debian.org[170]

**Debian System Administration**
*Work in Progress*

**deb**
**debs**
*.deb* is the file extension of a *Debian Binary Package*.

[168] https://www.debian.org/doc/debian-policy/ch-controlfields.html
[169] https://www.debian.org/doc/debian-policy/ch-source.html#copyright-debian-copyright
[170] https://www.debian.org/

**Detached Signature**
A detached signature is a *Digital Signature* that is separated from the data it signs. In contrast to an embedded signature, which is included within the data it signs, a detached signature is kept as a separate file or entity.

**Devel**
Shorthand term for the *Current Release in Development*.

**Developer Membership Board**
*Work in Progress*

See also: Developer Membership Board (Ubuntu Wiki)[171]

**diff**
A text format that shows the difference between files that are compared. A file that contains text in this format usually has the file extension *.diff*. This file format does not work well for comparing files in a non-text encoded fromat (e.g. `.bin`, `.png`, `.jpg`).

See also *`diff(1)`*[172], *`git-diff(1)`*[173]

**Discourse**
An *open-source* forum software that is used by *Ubuntu* and *Canonical*.

See also: *Ubuntu Discourse*, *Canonical Discourse*, Discourse Project Homepage[174]

**Distribution**
In general, a software *distribution* (also called *"distro"*) is a set of software components that is distributed as a whole to users.

Usually people think specifically of *Linux distributions*. A *Linux distribution* (or distro), is a complete *Operating System* based on the *Linux Kernel*. It includes essential system components, software applications, and *Package Management Tools*, tailored to a specific purpose or user preferences. *Linux* distributions vary in features, desktop environments, and software *Repositories*, allowing users to choose the one that best suits their needs.

See also: Linux distribution (Wikipedia)[175]

**DMB**
Abbreviation for *Developer Membership Board*

**DNS**
Abbreviation for *Domain Name System*

**Domain Name System**
*Work in Progress*

**Downstream**
A software project(s) (and associated entities) that depend on another software project directly or indirectly.

See *Downstream (explanation)* (page 27)

[171] https://wiki.ubuntu.com/DeveloperMembershipBoard
[172] https://manpages.ubuntu.com/manpages/en/man1/diff.1.html
[173] https://manpages.ubuntu.com/manpages/en/man1/git-diff.1.html
[174] https://www.discourse.org/
[175] https://en.wikipedia.org/wiki/Linux_distribution

**DSA**
Abbreviation for *Debian System Administration*

**dsc**
*.dsc* is the file extension of a *Debian* source control file.

See: Chapter 5. Control files and their fields (Debian Policy Manual v4.6.2.0)[176]

**End of Life**
Refers to the *End of Support* (Life) for a product/software.

**End of Line**
The end of a line of *encoded text* is indicated by a control character or sequence of control characters.

This is relevant for text parser which often parse text line by line.

The most common examples for control character(s) that indicate a *end of line* are:

| *Operating System* | Abbreviation* | hex value(s)* | dec value(s)* | Escape sequence* |
|---|---|---|---|---|
| *Unix* and *Unix*-like systems | `LF` | `0A` | `10` | `\n` |
| Windows systems | `CR LF` | `0D 0A` | `13 10` | `\r \n` |

* for the character encoding `ASCII`

**End of Support**
*Work in Progress*

**End-user license agreement**
*Work in Progress*

**Embedded Systems**
*Work in Progress*

**Endianness**
*Work in Progress*

See also: *Little-Endian*, *Big-Endian*, Endianness (Wikipedia)[177]

**EoL**
Abbreviation for either *End of Life* or *End of Line*

**EoS**
Abbreviation for *End of Support*

**ESM**
Abbreviation for *Expanded Security Maintenance*

**EULA**
Abbreviation for *End-user license agreement*

**Expanded Security Maintenance**
*Work in Progress*

[176] https://www.debian.org/doc/debian-policy/ch-controlfields.html
[177] https://en.wikipedia.org/wiki/Endianness

See also: Expanded Security Maintenance (homepage)[178]

**Failed to build from Source**
*Work in Progress*

**Failed to install**
*Work in Progress*

**Feature Freeze Exception**
*Work in Progress* (see https://wiki.ubuntu.com/FreezeExceptionProcess)

**Feature Request**
*Work in Progress*

**Federal Information Processing Standards**
A set of standards and guidelines of the United States federal government developed by *National Institute of Standards and Technology* (*NIST*) to ensure the security and interoperability of computer systems and software used by non-military federal agencies and its contractors.

See also: Federal Information Processing Standards (Wikipedia)[179]

**FFE**
Abbreviation for *Feature Freeze Exception*

**FIPS**
Abbreviation for *Federal Information Processing Standards*

**Fork**
In the context of *Open Source Software* development, a *"fork"* refers to the process of creating a new, independent version of a software project by copying its *Source Code* to evolve separately, potentially with different goals, features, or contributors.

**FOSS**
Abbreviation for *Free and Open Source Software*

**FR**
Abbreviation for *Feature Request*

**Free and Open Source Software**
*Work in Progress*

See also: Free and open-source software (Wikipedia)[180]

**Free Software**
*Work in Progress*

**FTBFS**
Abbreviation for *Failed to build from Source*

**FTI**
Abbreviation for *Failed to install*

**GA**
Abbreviation for *General Availability*

[178] https://ubuntu.com/esm
[179] https://en.wikipedia.org/wiki/Federal_Information_Processing_Standards
[180] https://en.wikipedia.org/wiki/Free_and_open-source_software

**General Availability**
*Work in Progress*

**General Public License**
*Work in Progress*

**git**
*Work in Progress*

**git-ubuntu**
*Work in Progress*

**GNU**
*GNU* is a recursive acronym for *"GNU's Not Unix!"*. It is a collection of *Free and Open Source Software* that can be used as an *Operating System* and aims to respect its users' freedom. The collection of *Free and Open Source Software* is often used with *Unix*-like kernels like *Linux* (these *Distributions* are commonly referred to as *"GNU/Linux"*).

For example, *Debian* and *Ubuntu* are *GNU/Linux Distributions*.

Most of the *GNU* software is licensed under the *GNU General Public License* (*GPL*).

See also: GNU (Wikipedia)[181], www.gnu.org[182]

**GPL**
Abbreviation for *GNU General Public License*

**GUI**
Abbreviation for Graphical *User Interface*

**i386**
*CPU Architecture* identifier (also known as *Intel x86*, *80x86*, and *x86*), that was originally released as 80386; a 32-Bit Microprocessor by Intel.

See also: i386 (Wikipedia)[183]

**IBM**
*Work in Progress* Abbreviation for *International Business Machines*

Find more information on the IBM website[184].

**IBM zSystems**
*Work in Progress*

**IC**
Abbreviation for *Individual Contributor*

**ICE**
Abbreviation for *Internal Compiler Error*

**IEEE**
Abbreviation for *Institute of Electrical and Electronics Engineers*

**Intel 64**
See *arm64*

[181] https://en.wikipedia.org/wiki/GNU
[182] https://www.gnu.org
[183] https://en.wikipedia.org/wiki/I386
[184] https://www.ibm.com/

**Intel x86**
See *i386*

**IRC**
Abbreviation for *Internet Relay Chat*

**IRCC**
Abbreviation for *Ubuntu IRC Council*

**Image**
Within the context of *Ubuntu* development, an *"Image"* refers to an `.iso` file that contains a bootable *Ubuntu* installer that can be burned to a CD to make installation disks.

See also: www.releases.ubuntu.com[185], Optical disc image (Wikipedia)[186]

**Individual Contributor**
*Work in Progress*

**Institute of Electrical and Electronics Engineers**
*Work in Progress* (see https://www.ieee.org/)

**Intent to Package**
*Work in Progress* (see https://wiki.debian.org/ITP)

**Internal Compiler Error**
*Work in Progress*

**Internet Relay Chat**
Internet Relay Chat (*IRC*)

**ISO**
*Work in Progress*

**ITP**
Abbreviation for *Intent to Package*

**Kernel**
*Work in Progress*

**Keyring**
*Work in Progress*

**Launchpad**
The general development platform where *Ubuntu* itself and most of *Ubuntu* related software projects live.

See: *Launchpad (explanation article)* (page 45)

**Linux**
*Linux* is an *Open Source Operating System Kernel* originally created by *Linus Torvalds* in 1991. It forms the core of various *Linux Distributions*, such as *Debian* and *Ubuntu*. *Linux* is known for its stability, security, and flexibility, making it a popular choice for servers, desktops, and embedded systems.

See also: Linux (Wikipedia)[187]

[185] https://www.releases.ubuntu.com/
[186] https://en.wikipedia.org/wiki/Optical_disc_image
[187] https://en.wikipedia.org/wiki/Linux

**LinuxONE**
*Work in Progress*

**Linux Containers**
See *LXC*

**Little-Endian**
*Work in Progress*

See also: *Endianness*

**Long Term Support**
*Work in Progress*

**LP**
Abbreviation for *Launchpad*

**LTS**
Abbreviation for *Long Term Support*

**LXC**
*Linux* Containers (see https://linuxcontainers.org/lxc/introduction/)

**LXD**
LXD is system container manager (see https://documentation.ubuntu.com/lxd/en/latest/)

**Main**
A *Component* of every *Ubuntu Series* (page 39) in the *Ubuntu Archive* that contains *Open Source Packages* which are supported and maintained by *Canonical*.

See: *Components* (page 41)

**Main Inclusion Review**
The review process when a *Package* in *Universe* or *Multiverse* gets requested to be promoted to *Main* or *Restricted*.

See: *Main Inclusion Review (explanation article)* (page 51)

**Mailing List**
*Work in Progress*

**Maintainer**
*Work in Progress*

**Masters of the Universe**
*Work in Progress*

**Merge**
*Work in Progress*

**Merge Conflict**
*Work in Progress*

**Merge Proposal**
*Work in Progress*

**Micro Release Exception**
See https://wiki.ubuntu.com/StableReleaseUpdates/MicroReleaseExceptions

**MIR**
Abbreviation for *Main Inclusion Review*

**MIR Team**
The *Ubuntu* team that reviews requests to promote *Packages* in *Universe* or *Multiverse* to *Main* or *Restricted*.

See: *Main Inclusion Review (explanation article)* (page 51)

**Mirror**
A server that *"mirrors"* (replicates and keeps in sync) the content of another server to distribute network traffic, reduce latency, and provide redundancy, ensuring high availability and fault tolerance.

See also: *Archive Mirror*, *CD Mirror*

**MOTU**
Abbreviation for *Masters of the Universe*

**MP**
Abbreviation for *Merge Proposal*

**MRE**
Abbreviation for *Micro Release Exception*

**Multiverse**
A *Component* of every *Ubuntu Series* (page 39) in the *Ubuntu Archive* that contains *Packages* of *Closed Source Software* or *Open Source Software* restricted by copyright or legal issues. These *Packages* are maintained and supported by the *Ubuntu* community.

See: *Components* (page 41)

**Namespace**
A concept in computer science and software development that defines a scope or context in which identifiers (such as variable names, functions, or classes) are unique and distinct. It helps prevent naming conflicts and organizes code elements into separate compartments. Namespaces are commonly used in programming languages to group and categorize code, making it more manageable and maintainable. They play a crucial role in encapsulation and modularity, allowing developers to create reusable and organized code structures. Namespaces are particularly important in larger software projects where numerous components and libraries need to coexist without clashing with each other's names.

**National Institute of Standards and Technology**
*Work in Progress*

**Native Package**
*Native source packages* are *Source Packages* that are their own *Upstream*, therefore they do not have an *orig tarball*.

See: *Native Source Packages (explanation)* (page 30)

**Not built from Source**
*Work in Progress*

**NBS**
Abbreviation for *Not built from Source*

**Never Part Of A Stable Release**
*Work in Progress*

**NIST**
Abbreviation for *National Institute of Standards and Technology*

**NPOASR**
Abbreviation for *Never Part Of A Stable Release*

**NVIU**
Abbreviation for *Newer Version in Unstable*

**Newer Version in Unstable**
*Work in Progress*

**Open Source Software**
*Work in Progress*

**Operating System**
An *operating system* (OS) is essential system software that manages computer hardware and software resources. It provides crucial services for computer programs, including hardware control, task scheduling, memory management, file operations, and user interfaces, simplifying program development and execution.

See also: Operating system (Wikipedia)[188]

**orig tarball**
**original tarball**
The `.orig.tar.ext` and `.orig-component.tar.ext` (where `ext` can be `gz`, `bz2`, `lzma` and `xz` and `component` can contain alphanumeric characters (`a-zA-Z0-9`) and hyphens `-`) *`tar(5)`*[189] archive files of a *Debian Source Package* that contains the original *Source* of the *Upstream* project.

See also: *`dpkg-source(1)`*[190], *tarball*

**OS**
Abbreviation for *Operating System*

**OSS**
Abbreviation for *Open Source Software*

**Package**
*Work in Progress*

**Package Manager**
*Work in Progress*

**Patch**
A *patch* is a (often small) piece of code or a software update designed to fix or improve a computer program or system. It is typically applied to address *Security Vulnerabilities*, *Bugs*, or enhance functionality, ensuring the software remains up-to-date and reliable. *Patches* are essential for maintaining software integrity and security.

See also: Patch (Wikipedia)[191]

[188] https://en.wikipedia.org/wiki/Operating_system
[189] https://manpages.ubuntu.com/manpages/en/man5/tar.5.html
[190] https://manpages.ubuntu.com/manpages/en/man1/dpkg-source.1.html
[191] https://en.wikipedia.org/wiki/Patch_(computing)

**PCRE**
Abbreviation for *Perl Compatible Regular Expressions*

**Perl Compatible Regular Expressions**
*Work in Progress*

See also: PCRE (Reference Implementation)[192]

**Personal Package Archive**
*Work in Progress*

**PKCS**
Abbreviation for *Public Key Cryptography Standards*

**Pocket**
A *pocket* is a *Package* sub-*repository* within the *Ubuntu Archive*. Every *Ubuntu Series* has the *pockets release* (page 40), *security* (page 40), *updates* (page 40), *proposed* (page 40), and *backports* (page 40).

See: *Pockets (explanation)* (page 40)

**POSIX**
Abbreviation for *Portable Operating System Interface*: A family of standards specified by the *IEEE* Computer Society for maintaining compatibility between *Operating Systems*. POSIX defines the *API*, along with command line shells and utility interfaces, for software compatibility with variants of Unix and other *Operating Systems*.

**PowerPC**
*Work in Progress*

**PPA**
Abbreviation for *Personal Package Archive*

**ppc64el**
*Work in Progress* (PowerPC64 Little-Endian)

**PR**
Abbreviation for *Pull Request*

**Public Key Cryptography Standards**
*Work in Progress*

See also: PKCS (Wikipedia)[193]

**Pull**
*Work in Progress*

**Pull Request**
*Work in Progress*

**Push**
*Work in Progress*

**Real Time Operating System**
*Work in Progress*

**Rebase**
*Work in Progress*

[192] https://www.pcre.org/
[193] https://en.wikipedia.org/wiki/PKCS

**Reduced Instruction Set**
a *CPU* characterized by a simplified and streamlined set of instructions, optimized for efficient and fast execution of basic operations. *RISC* processors typically prioritize speed over complexity.

Examples of *RISC Architectures* are *arm64*, *armhf*, *RISC-V*, *ppc64el*, and *PowerPC*.

See also: Reduced instruction set computer (Wikipedia)[194]

**RegEx**
Abbreviation for *Regular Expression*

**Regular Expression**
A sequence of characters that specifies a text-matching pattern. String-search algorithms usually use these patterns for input validation or find (and replace) operations on strings.

While this general term stems from theoretical computer science and formal language theory, people usually think of *Perl Compatible Regular Expressions* (*PCRE*).

**Repository**
*Work in Progress*

> **Note**
> ambiguity between git or apt repository

**Request for Comments**
*Work in Progress*

See also: Request for Comments (Wikipedia)[195]

**Request of Maintainer**
*Work in Progress*

**Request of Porter**
*Work in Progress*

**Requested by the QA team**
*Work in Progress*

**Request of Security Team**
*Work in Progress*

**Request of Stable Release Manager**
*Work in Progress*

**Restricted**
A *Component* of every *Ubuntu Series* (page 39) in the *Ubuntu Archive* that contains *Closed Source Packages* which are supported and maintained by *Canonical*.

See: *Components* (page 41)

**RFC**
Abbreviation for *Request for Comments*

[194] https://en.wikipedia.org/wiki/Reduced_instruction_set_computer
[195] https://en.wikipedia.org/wiki/Request_for_Comments

**RISC**
Abbreviation for *Reduced Instruction Set* Computer

**RISC-V**
*Work in Progress*

**riscv64**
*Work in Progress*

**RoM**
Abbreviation for *Request of Maintainer*

**Root**
*Work in Progress*

**RoP**
Abbreviation for *Request of Porter*

**RoQA**
Abbreviation for *Requested by the QA team*

**RoSRM**
Abbreviation for *Request of Stable Release Manager*

**RoST**
Abbreviation for *Request of Security Team*

**RTOS**
Abbreviation for *Real Time Operating System*

**Rules File**
The `debian/rules` file in a *Source Package*.

See: *Basic overview of the debian/ directory* (page 53)

See also: Section 4.9. Main building script (Debian Policy Manual v4.6.2.0)[196]

**s390x**
*Work in Progress*

**Series**
A *series* refers to the *Packages* in the *Ubuntu Archive* that target a specific *Ubuntu* version. A *series* is usually referred to by its *Code name*.

See: *Series (explanation)* (page 39)

**Service-level Agreement**
*Work in Progress*

**Shell**
*Work in Progress*

**Signature**
A digital signature is a cryptographic record that verifies the authenticity and integrity of data.

Every *Package* in the *Ubuntu Archive* is digitally signed, enabling users to detect data corruption during the download or unwanted/malicious modifications. Furthermore, some *Upstream* projects sign their releases, which lets Ubuntu *Maintainers* and users of

[196] https://www.debian.org/doc/debian-policy/ch-source.html#main-building-script-debian-rules

the corresponding packages verify that the *Source Code* is from the developers of the upstream project.

The tool *gpg(1)*[197] is commonly used to create and modify digital signatures. Further information can be found in the GNU Privacy Handbook[198].

**Signing Key**
*Work in Progress*

**SLA**
Abbreviation for *Service-level Agreement*

**Source**
*Work in Progress*

**Source Code**
*Work in Progress*

**Source Package**
A *Debian source package* contains the *Source* material used to build one or more *Binary Packages*.

See: *Source Packages (explanation)* (page 29)

**Source Tree**
*Work in Progress*

**Sponsor**
*Work in Progress*

**SRU**
Abbreviation for *Stable Release Update*

**Stable Release Update**
*Work in Progress*

**Stack**
In computer science, a **Stack** is a data-structure that can store a collection of elements linearly with two primary operations:

- "Push": adds an element to the collection
- "Pop": removes the most recently added element in the collection

Stack implementatuons also often have a "Peak" operation to see the most recently added element in the collection without removing it.

The name **Stack** stems from the analogy of items "stacked" ontop of eachother like a stack of plates where you have to remove the plates above to access the plates below.

See also: Stack (abstract data type)[199]

**Staging Environment**
*Work in Progress*

**Standard Output**
*Work in Progress*

[197] https://manpages.ubuntu.com/manpages/en/man1/gpg.1.html
[198] https://www.gnupg.org/gph/en/manual.html#AEN136
[199] https://en.wikipedia.org/wiki/Stack_(abstract_data_type)

**tarball**
: A file in the *tar(5)*[200] archive format, which collects any number of files, directories, and other file system objects (symbolic links, device nodes, etc.) into a single stream of bytes. The format was originally designed to be used with tape drives, but nowadays it is widely used as a general packaging mechanism.

  See also: *orig tarball*

**Text Encoding**
: **Text encoding** refers to the method or schema used to represent and store text characters in a digital format. It involves assigning numerical codes (typically binary) to each character in a character set, which allows computers to process and display text.

  For example, `ASCII` and `UTF-8` are commonly used text encoding formats.

  The choice of a text encoding format is essential for ensuring proper character representation, especially when dealing with different languages and special characters.

**TLS**
: Abbreviation for *Transport Layer Security*

**TPM**
: Abbreviation for *Trusted Platform Module*

**Transport Layer Security**
: *Work in Progress*

**Trusted Platform Module**
: *Work in Progress*

**TUI**
: Abbreviation for text-based *User Interface*

**Ubuntu**
: The word *"ubuntu"* is derived from the pronunciation of an an ancient African word *"oǒ'boǒntoō"* meaning *'humanity to others'*. It is often described as reminding us that *'I am what I am because of who we all are'*.

  The *Ubuntu Operating System* tries to bring that spirit to the world of computers and software. The *Ubuntu Distribution* is a *Debian*-based *Linux Distribution* and aims to represents the best of what the world's software community has shared with the world.

  See: The story of Ubuntu[201], Ubuntu ethos[202], Ubuntu Project Governance[203]

**Ubuntu Archive**
: The *Ubuntu Package Archive* is and *APT Repository* that is preconfigured by default on *Ubuntu* installations. It hosts *Debian Binary Packages* (`.deb` files) and *Source Packages* (`.dsc` files).

  See: *Ubuntu Package Archive (explanation)* (page 39)

**Ubuntu autopkgtest Cloud**
: *Work in Progress*

[200] https://manpages.ubuntu.com/manpages/en/man5/tar.5.html
[201] https://ubuntu.com/about
[202] https://ubuntu.com/community/ethos
[203] https://ubuntu.com/community/governance

See: autopkgtest.ubuntu.com[204]

**Ubuntu Base Packages**
*Packages* that are in the *Main* or *Restricted Component*. These are packages that are maintained by *Canonical*, because they are fundamental for *Ubuntu*.

See also: *Main Inclusion Review*

**Ubuntu Cloud Archive**
*Work in Progress*

See: Cloud Archive (Ubuntu Wiki)[205]

**Ubuntu Code of Conduct**
*Work in Progress*

See: https://ubuntu.com/community/ethos/code-of-conduct

**Ubuntu CVE Tracker**
*Work in Progress* (see https://launchpad.net/ubuntu-cve-tracker and https://ubuntu.com/security/cves)

**Ubuntu Delta**
A modification to an *Ubuntu Package* that is derived from a *Debian Package*.

See also: *Upstream & Downstream (explanation)* (page 26)

**Ubuntu Desktop**
*Work in Progress*

**Ubuntu Developer Summit**
Between 2004 and 2012, *Ubuntu* releases were planned during regularly scheduled summits, where the greater *Ubuntu* community would come together for planning and hacking sessions. This event occurred two times a year, each one running for a week. The discussions were highly technical and heavily influenced the direction of the subsequent *Ubuntu* release.

These events were called *"Ubuntu Developer Summit"* (UDS).

These events are continued since November 2022 as "*Ubuntu Summit*" (US) to include the broader *Ubuntu* community and not only developers.

See also: Ubuntu Developer Summit is now Ubuntu Summit (Ubuntu Blog)[206], Developer Summit (Ubuntu Wiki)[207]

**Ubuntu Discourse**
A *Discourse* instance about general *Ubuntu* development that is accessible to the general public, where you can find discussions, announcements, team updates, documentation and much more.

Feel free to introduce yourself[208].

See: discourse.ubuntu.com[209]

[204] https://autopkgtest.ubuntu.com/
[205] https://wiki.ubuntu.com/OpenStack/CloudArchive
[206] https://ubuntu.com/blog/uds-is-now-ubuntu-summit
[207] https://wiki.ubuntu.com/DeveloperSummit
[208] https://discourse.ubuntu.com/c/intro/101
[209] https://discourse.ubuntu.com

**Ubuntu flavours**

*Ubuntu flavours* are *Distributions* of the default *Ubuntu* releases, which choose their own default applications and settings. *Ubuntu flavours* are owned and developed by members of the *Ubuntu* community and backed by the full *Ubuntu Archive* for *Packages* and updates.

Officially recognised flavours are:

- Edubuntu[210]
- Kubuntu[211]
- Lubuntu[212]
- Ubuntu Budgie[213]
- Ubuntu Cinnamon[214]
- Ubuntu Kylin[215]
- Ubuntu MATE[216]
- Ubuntu Studio[217]
- Ubuntu Unity[218]
- Xubuntu[219]

**Ubuntu IRC Council**

*Work in Progress*

See also: IRC Council (Ubuntu Wiki)[220]

**Ubuntu Keyserver**

*Work in Progress*

**Ubuntu Pro**

*Work in Progress*

See: Ubuntu Pro (homepage)[221]

**Ubuntu Server**

*Work in Progress*

**Ubuntu Summit**

The *Ubuntu Summit* (US) is a continuation of *Ubuntu Developer Summit* since November 2022. The change in name aims to broadening the scope, which opens the event up to additional audiences.

[210] https://edubuntu.org/
[211] https://kubuntu.org/
[212] https://lubuntu.me/
[213] https://ubuntubudgie.org/
[214] https://ubuntucinnamon.org/
[215] https://www.ubuntukylin.com/index-en.html
[216] https://ubuntu-mate.org/
[217] https://ubuntustudio.org/
[218] https://ubuntuunity.org/
[219] https://xubuntu.org/
[220] https://wiki.ubuntu.com/IRC/IrcCouncil
[221] https://ubuntu.com/pro

While the *Ubuntu Developer Summit* was focused on technical development, the talks and workshops of the *Ubuntu Summit* will cover development as well as design, writing, and community leadership with a wide range of technical skill levels.

The name also results in a nifty new acronym, *"US"*, or more appropriately, simply *"Us"*. This fits very nicely with the meaning of *Ubuntu*, *"I am what I am because of who we all are"*.

If you have any question feel free to send an email at summit@ubuntu.com.

Also, check out the Ubuntu Summit mailing list[222].

You can find more information at summit.ubuntu.com[223].

**UCA**
Abbreviation for *Ubuntu Cloud Archive*

**UCT**
Abbreviation for *Ubuntu CVE Tracker*

**UDS**
Abbreviation for *Ubuntu Developer Summit*

**UI**
Abbreviation for *User Interface*

**UIFe**
Abbreviation for *User Interface Freeze Exception*

**Uniform Resource Identifier**
*Work in Progress*

See also: Uniform Resource Identifier (Wikipedia)[224]

**Uniform Resource Locator**
*Work in Progress*

See also: URL (Wikipedia)[225]

**Universe**
A *Component* of every *Ubuntu Series* (page 39) in the *Ubuntu Archive* that contains *Open Source Packages* which are supported and maintained by the *Ubuntu* community.

See: *Components* (page 41)

**Unix**
*Unix* is an *Operating System* whose development started in the late 1960s at AT&T Bell Labs. It is characterized by its multi-user and multi-tasking capabilities, hierarchical file system, and a suite of *Command Line* utilities. *Unix* has been influential in shaping modern *Operating Systems* and remains the basis for various *Unix*-like systems, including *Linux* and *macOS*.

See also: Unix (Wikipedia)[226]

[222] https://lists.ubuntu.com/mailman/listinfo/summit-news
[223] https://summit.ubuntu.com/
[224] https://en.wikipedia.org/wiki/Uniform_Resource_Identifier
[225] https://en.wikipedia.org/wiki/URL
[226] https://en.wikipedia.org/wiki/Unix

**Upstream**
A software project (and associated entities), another software project depends on directly or indirectly.

See *Upstream (explanation)* (page 27)

**URI**
Abbreviation for *Uniform Resource Identifier*

**URL**
Abbreviation for *Uniform Resource Locator*

**US**
Abbreviation for *Ubuntu Summit*

**User Experience**
The overall experience and satisfaction a user has while interacting with a product or system. It considers usability, accessibility, user flow, and the emotional response of users to ensure a positive and efficient interaction with the *User Interface* and the product as a whole.

**User Interface**
Refers to the visual elements and design of a digital product or application that users interact with. It includes components like buttons, menus, icons, and layout, focusing on how information is presented and how users navigate through the interface.

**User Interface Freeze Exception**
*Work in Progress*

See: *Ubuntu development process* (page 34)

**UX**
Abbreviation for *User Experience*

**VCS**
Abbreviation for *Version Control System*

**Version Control System**
A software tool or system that enables developers to track and manage changes to their *Source Code* and collaborate with others effectively. It maintains a history of *Source Code* revisions, allowing users to revert to previous versions, track modifications, and work on different *Branches* of *Source Code* simultaneously. *Version Control Systems* are crucial for *Source Code* management and collaboration in *Open Source Software* development projects.

**Waiting on Upstream**
*Work in Progress*

See also: *Upstream*

**Watch File**
The `debian/watch` file in a *Source Package*.

See: *Basic overview of the debian/ directory* (page 53)

See also: *uscan(1)*[227], Section 4.11. Upstream source location (Debian Policy Manual v4.6.2.0)[228]

[227] https://manpages.ubuntu.com/manpages/en/man1/uscan.1.html
[228] https://www.debian.org/doc/debian-policy/ch-source.html#upstream-source-location-debian-watch

**WoU**
: Abbreviation for *Waiting on Upstream*

**x64**
: See *amd64*

**x86**
: See *i386*

**x86-64**
: See *amd64*

**x86_64**
: See *amd64*

**Caution**

The Packaging and Development guide is currently undergoing a major overhaul to bring it up to date. The current state you are seeing now is a preview of this effort.

The current version is unstable (changing URLs can occur at any time) and most content is not in properly reviewed yet. Proceed with caution and be aware of technical inaccuracies.

If you are an experienced packager and would like to contribute, we would love for you to be involved! See *our contribution page* (page 97) for details of how to join in.

# 5. Contribute to the Ubuntu Packaging Guide

The Ubuntu Packaging Guide[229] is an open source project that warmly welcomes community contributions and suggestions.

This document describes how to contribute changes to the Ubuntu Packaging Guide. If you don't already have a GitHub account, you can sign up on their website[230].

## 5.1. How to contribute

### 5.1.1. I want to raise an issue

We use GitHub issues to track things that need to be fixed. If you find a problem and want to report it to us, you can click on the "Give feedback" button at the top of any page in the Guide, and it will open an issue for you.

Alternatively, you can open an issue directly[231] and describe the problem you're having, or the suggestion you want to add.

### 5.1.2. I have a question about packaging

If you're stuck and have a question, you can use our GitHub discussion board to ask, or start a discussion[232].

Note that we may not be able to respond immediately, so please be patient!

### 5.1.3. I want to submit a fix

If you found an issue and want to submit a fix for it, or have written a guide you would like to add to the documentation, feel free to open a pull request to submit your fix[233] against our `main` branch. If you need help, please use the discussion board or contact one of the repository administrators.

## 5.2. Contribution format for the project

### 5.2.1. Sphinx & reStructuredText

The Guide is built using Sphinx[234]. Articles should be written in reStructuredText. The following links might be helpful:

- A ReStructuredText Primer[235]
- Quick reStructuredText[236]

[229] https://github.com/canonical/ubuntu-packaging-guide
[230] https://github.com
[231] https://github.com/canonical/ubuntu-packaging-guide/issues
[232] https://github.com/canonical/ubuntu-packaging-guide/discussions
[233] https://github.com/canonical/ubuntu-packaging-guide/pulls
[234] https://www.sphinx-doc.org/
[235] https://docutils.sourceforge.io/docs/user/rst/quickstart.html
[236] https://docutils.sourceforge.io/docs/user/rst/quickref.html

### 5.2.2. How to add a new Sphinx extension

In general, there are two places you will need to update to add new extensions.

- `docs/conf.py` - add the name of the extension to the extensions configuration parameter
- `docs/.sphinx/requirements.txt` - add the name of the extension to the bottom of the list

The documentation for most Sphinx extensions will tell you what text to add to the `conf.py` file, as in this example:

```
extensions = [
    'sphinx_copybutton',
    'sphinx_design',
]
```

### 5.2.3. Translations

We use the localisation (l10n) module for Sphinx and gettext for translating the Ubuntu Packaging Guide.

Some notes about translating the guide:

- Some formatting is part of reStructuredText and should not be changed, including emphasis (which uses asterisks or underscores), paragraph ending before a code block (`::`) and double backtick quotes (``` `` ```).
- The Guide uses email-style reStructuredText links. If you see a link in the text like:

  ```
  `Translatable link text <Link_Reference_>`_
  ```

  Then replace the "Translatable link text" with your translations, but keep the `Link_Reference` unchanged (even if it is in English). The same applies if a URL is used instead of `Link_Reference`.

To test your translation, use `make BUILDER-LANGUAGE` command (for example, `make html-it` will build HTML docs in Italian language).

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