# Contributing to OpenZFS

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<img alt="OpenZFS Logo"

src="https://openzfs.github.io/openzfs-docs/\_static/img/logo/480px-Open-ZFS-Secondary-Logo-Colour-halfsize.png"/>

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\*First of all, thank you for taking the time to contribute!\*

By using the following guidelines, you can help us make OpenZFS even better.

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Helpful resources

\* [OpenZFS Documentation](https://openzfs.github.io/openzfs-docs/)

\* [OpenZFS Developer Resources](http://open-zfs.org/wiki/Developer\_resources)

\* [Git and GitHub for beginners](https://openzfs.github.io/openzfs-docs/Developer%20Resources/Git%20and%20GitHub%20for%20beginners.html)

## What should I know before I get started?

### Get ZFS

You can build zfs packages by following [these

instructions](https://openzfs.github.io/openzfs-docs/Developer%20Resources/Building%20ZFS.html),

or install stable packages from [your distribution's

repository](https://openzfs.github.io/openzfs-docs/Getting%20Started/index.html).

### Debug ZFS

A variety of methods and tools are available to aid ZFS developers.

It's strongly recommended that when developing a patch the `--enable-debug`

configure option should be set. This will enable additional correctness

checks and all the ASSERTs to help quickly catch potential issues.

In addition, there are numerous utilities and debugging files which

provide visibility into the inner workings of ZFS. The most useful

of these tools are discussed in detail on the [Troubleshooting

page](https://openzfs.github.io/openzfs-docs/Basic%20Concepts/Troubleshooting.html).

### Where can I ask for help?

The [zfs-discuss mailing

list](https://openzfs.github.io/openzfs-docs/Project%20and%20Community/Mailing%20Lists.html)

or IRC are the best places to ask for help. Please do not file

support requests on the GitHub issue tracker.

## How Can I Contribute?

### Reporting Bugs

\*Please\* contact us via the [zfs-discuss mailing

list](https://openzfs.github.io/openzfs-docs/Project%20and%20Community/Mailing%20Lists.html)

or IRC if you aren't certain that you are experiencing a bug.

If you run into an issue, please search our [issue

tracker](https://github.com/openzfs/zfs/issues) \*first\* to ensure the

issue hasn't been reported before. Open a new issue only if you haven't

found anything similar to your issue.

You can open a new issue and search existing issues using the public [issue

tracker](https://github.com/openzfs/zfs/issues).

#### When opening a new issue, please include the following information at the top of the issue:

\* What distribution (with version) you are using.

\* The spl and zfs versions you are using, installation method (repository

or manual compilation).

\* Describe the issue you are experiencing.

\* Describe how to reproduce the issue.

\* Including any warning/errors/backtraces from the system logs.

When a new issue is opened, it is not uncommon for developers to request

additional information.

In general, the more detail you share about a problem the quicker a

developer can resolve it. For example, providing a simple test case is always

exceptionally helpful.

Be prepared to work with the developers investigating your issue. Your

assistance is crucial in providing a quick solution. They may ask for

information like:

\* Your pool configuration as reported by `zdb` or `zpool status`.

\* Your hardware configuration, such as

\* Number of CPUs.

\* Amount of memory.

\* Whether your system has ECC memory.

\* Whether it is running under a VMM/Hypervisor.

\* Kernel version.

\* Values of the spl/zfs module parameters.

\* Stack traces which may be logged to `dmesg`.

### Suggesting Enhancements

OpenZFS is a widely deployed production filesystem which is under active

development. The team's primary focus is on fixing known issues, improving

performance, and adding compelling new features.

You can view the list of proposed features

by filtering the issue tracker by the ["Type: Feature"

label](https://github.com/openzfs/zfs/issues?q=is%3Aopen+is%3Aissue+label%3A%22Type%3A+Feature%22).

If you have an idea for a feature first check this list. If your idea already

appears then add a +1 to the top most comment, this helps us gauge interest

in that feature.

Otherwise, open a new issue and describe your proposed feature. Why is this

feature needed? What problem does it solve?

### Pull Requests

#### General

\* All pull requests must be based on the current master branch and apply

without conflicts.

\* Please attempt to limit pull requests to a single commit which resolves

one specific issue.

\* Make sure your commit messages are in the correct format. See the

[Commit Message Formats](#commit-message-formats) section for more information.

\* When updating a pull request squash multiple commits by performing a

[rebase](https://git-scm.com/docs/git-rebase) (squash).

\* For large pull requests consider structuring your changes as a stack of

logically independent patches which build on each other. This makes large

changes easier to review and approve which speeds up the merging process.

\* Try to keep pull requests simple. Simple code with comments is much easier

to review and approve.

\* All proposed changes must be approved by an OpenZFS organization member.

\* If you have an idea you'd like to discuss or which requires additional testing, consider opening it as a draft pull request.

Once everything is in good shape and the details have been worked out you can remove its draft status.

Any required reviews can then be finalized and the pull request merged.

#### Tests and Benchmarks

\* Every pull request will by tested by the buildbot on multiple platforms by running the [zfs-tests.sh and zloop.sh](

https://openzfs.github.io/openzfs-docs/Developer%20Resources/Building%20ZFS.html#running-zloop-sh-and-zfs-tests-sh) test suites.

\* To verify your changes conform to the [style guidelines](

https://github.com/openzfs/zfs/blob/master/.github/CONTRIBUTING.md#style-guides

), please run `make checkstyle` and resolve any warnings.

\* Static code analysis of each pull request is performed by the buildbot; run `make lint` to check your changes.

\* Test cases should be provided when appropriate.

This includes making sure new features have adequate code coverage.

\* If your pull request improves performance, please include some benchmarks.

\* The pull request must pass all required [ZFS

Buildbot](http://build.zfsonlinux.org/) builders before

being accepted. If you are experiencing intermittent TEST

builder failures, you may be experiencing a [test suite

issue](https://github.com/openzfs/zfs/issues?q=is%3Aissue+is%3Aopen+label%3A%22Type%3A+Test+Suite%22).

There are also various [buildbot options](https://openzfs.github.io/openzfs-docs/Developer%20Resources/Buildbot%20Options.html)

to control how changes are tested.

### Testing

All help is appreciated! If you're in a position to run the latest code

consider helping us by reporting any functional problems, performance

regressions or other suspected issues. By running the latest code to a wide

range of realistic workloads, configurations and architectures we're better

able quickly identify and resolve potential issues.

Users can also run the [ZFS Test

Suite](https://github.com/openzfs/zfs/tree/master/tests) on their systems

to verify ZFS is behaving as intended.

## Style Guides

### Coding Conventions

We currently use [C Style and Coding Standards for

SunOS](http://www.cis.upenn.edu/%7Elee/06cse480/data/cstyle.ms.pdf) as our

coding convention.

This repository has an `.editorconfig` file. If your editor [supports

editorconfig](https://editorconfig.org/#download), it will

automatically respect most of this project's whitespace preferences.

Additionally, Git can help warn on whitespace problems as well:

```

git config --local core.whitespace trailing-space,space-before-tab,indent-with-non-tab,-tab-in-indent

```

### Commit Message Formats

#### New Changes

Commit messages for new changes must meet the following guidelines:

\* In 72 characters or less, provide a summary of the change as the

first line in the commit message.

\* A body which provides a description of the change. If necessary,

please summarize important information such as why the proposed

approach was chosen or a brief description of the bug you are resolving.

Each line of the body must be 72 characters or less.

\* The last line must be a `Signed-off-by:` tag. See the

[Signed Off By](#signed-off-by) section for more information.

An example commit message for new changes is provided below.

```

This line is a brief summary of your change

Please provide at least a couple sentences describing the

change. If necessary, please summarize decisions such as

why the proposed approach was chosen or what bug you are

attempting to solve.

Signed-off-by: Contributor <contributor@email.com>

```

#### OpenZFS Patch Ports

If you are porting OpenZFS patches, the commit message must meet

the following guidelines:

\* The first line must be the summary line from the most important OpenZFS commit being ported.

It must begin with `OpenZFS dddd, dddd - ` where `dddd` are OpenZFS issue numbers.

\* Provides a `Authored by:` line to attribute each patch for each original author.

\* Provides the `Reviewed by:` and `Approved by:` lines from each original

OpenZFS commit.

\* Provides a `Ported-by:` line with the developer's name followed by

their email for each OpenZFS commit.

\* Provides a `OpenZFS-issue:` line with link for each original illumos

issue.

\* Provides a `OpenZFS-commit:` line with link for each original OpenZFS commit.

\* If necessary, provide some porting notes to describe any deviations from

the original OpenZFS commits.

An example OpenZFS patch port commit message for a single patch is provided

below.

```

OpenZFS 1234 - Summary from the original OpenZFS commit

Authored by: Original Author <original@email.com>

Reviewed by: Reviewer One <reviewer1@email.com>

Reviewed by: Reviewer Two <reviewer2@email.com>

Approved by: Approver One <approver1@email.com>

Ported-by: ZFS Contributor <contributor@email.com>

Provide some porting notes here if necessary.

OpenZFS-issue: https://www.illumos.org/issues/1234

OpenZFS-commit: https://github.com/openzfs/openzfs/commit/abcd1234

```

If necessary, multiple OpenZFS patches can be combined in a single port.

This is useful when you are porting a new patch and its subsequent bug

fixes. An example commit message is provided below.

```

OpenZFS 1234, 5678 - Summary of most important OpenZFS commit

1234 Summary from original OpenZFS commit for 1234

Authored by: Original Author <original@email.com>

Reviewed by: Reviewer Two <reviewer2@email.com>

Approved by: Approver One <approver1@email.com>

Ported-by: ZFS Contributor <contributor@email.com>

Provide some porting notes here for 1234 if necessary.

OpenZFS-issue: https://www.illumos.org/issues/1234

OpenZFS-commit: https://github.com/openzfs/openzfs/commit/abcd1234

5678 Summary from original OpenZFS commit for 5678

Authored by: Original Author2 <original2@email.com>

Reviewed by: Reviewer One <reviewer1@email.com>

Approved by: Approver Two <approver2@email.com>

Ported-by: ZFS Contributor <contributor@email.com>

Provide some porting notes here for 5678 if necessary.

OpenZFS-issue: https://www.illumos.org/issues/5678

OpenZFS-commit: https://github.com/openzfs/openzfs/commit/efgh5678

```

#### Coverity Defect Fixes

If you are submitting a fix to a

[Coverity defect](https://scan.coverity.com/projects/zfsonlinux-zfs),

the commit message should meet the following guidelines:

\* Provides a subject line in the format of

`Fix coverity defects: CID dddd, dddd...` where `dddd` represents

each CID fixed by the commit.

\* Provides a body which lists each Coverity defect and how it was corrected.

\* The last line must be a `Signed-off-by:` tag. See the

[Signed Off By](#signed-off-by) section for more information.

An example Coverity defect fix commit message is provided below.

```

Fix coverity defects: CID 12345, 67890

CID 12345: Logically dead code (DEADCODE)

Removed the if(var != 0) block because the condition could never be

satisfied.

CID 67890: Resource Leak (RESOURCE\_LEAK)

Ensure free is called after allocating memory in function().

Signed-off-by: Contributor <contributor@email.com>

```

#### Signed Off By

A line tagged as `Signed-off-by:` must contain the developer's

name followed by their email. This is the developer's certification

that they have the right to submit the patch for inclusion into

the code base and indicates agreement to the [Developer's Certificate

of Origin](https://www.kernel.org/doc/html/latest/process/submitting-patches.html#sign-your-work-the-developer-s-certificate-of-origin).

Code without a proper signoff cannot be merged.

Git can append the `Signed-off-by` line to your commit messages. Simply

provide the `-s` or `--signoff` option when performing a `git commit`.

For more information about writing commit messages, visit [How to Write

a Git Commit Message](https://chris.beams.io/posts/git-commit/).

#### Co-authored By

If someone else had part in your pull request, please add the following to the commit:

`Co-authored-by: Name <gitregistered@email.address>`

This is useful if their authorship was lost during squashing, rebasing, etc.,

but may be used in any situation where there are co-authors.

The email address used here should be the same as on the GitHub profile of said user.

If said user does not have their email address public, please use the following instead:

`Co-authored-by: Name <[username]@users.noreply.github.com>`