

# *OpenZFS on Linux Development*

OpenZFS Developer Summit

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# OpenZFS on Linux

- Current version 0.6.3 (released June 12<sup>th</sup> 2014)
- Easy to install packages for many distributions.



debian



fedora



gentoo linux™



ubuntu.

- Large enthusiastic user community.
  - [zfs-discuss@zfsonlinux.org](mailto:zfs-discuss@zfsonlinux.org)
  - #zfsonlinux on freenode.net
  - <http://zfsonlinux.org>

# OpenZFS on Linux – Version 0.6.3

- Near feature parity with other OpenZFS implementations.
- Systematically addressing gaps in functionality
- Wide spectrum of users
- Used on diverse hardware
- Contributions (0.6.2-0.6.3)
  - 58 different developers
  - 301 commits

## Highlights

Updated Write Throttle

ARC Performance Improvements

POSIX ACLs

File Attributes (immutable, append-only)

Relatime style updates

SELinux Integration

Systemd Integration

ZFS Event Daemon (ZED)

Aarch64 and Sparc64 Support

Over 200 Bug fixes

# OpenZFS on Linux – Version 0.6.4

- Continue to integrate OpenZFS features
- Continue to address known gaps
- Continue to improve Linux integration
- Contributions (0.6.3-HEAD)
  - 37 different developers
  - 141 commits

## Planned Highlights

Feature Flag: Spacemap Histograms

Feature Flag: ZFS Bookmarks

Feature Flag: Hole Birth

Feature Flag: Embedded Data

Metaslab Improvements

Xattr Improvements

AIO and DirectIO Support

Fallocate Hole Punching

Linux Tracepoints

NFS access to .zfs/snapshot

100 bug fixes and counting

# The Road to Version 1.0.0

- Minor releases have a development focus
  - 0.6.x – Functionality / Integration
  - 0.7.x – Memory Management
  - 0.8.x – ZFS+SPL Consolidation
  - 0.9.x – Stable ABI / Hardening
  - 1.0.x – Feature Development / Performance
- Longer term roadmap to guide development
- Current development activities continue in parallel
- Features and bug fixes are merged when ready

# OpenZFS on Linux - Version 0.7.x

- Focus: Memory Management
- Goal: ARC / page cache integration
  - Data buffers will be backed by page vectors
  - Data pages will be mapped in to the page cache
- Benefits:
  - Uses standard Linux memory accounting mechanisms
  - Uses standard Linux memory reclaim mechanisms
  - Eliminates fragmentation overhead
  - Eliminates mmap double caching
  - 32-Bit platform support (x86, ARM)

# OpenZFS on Linux - Version 0.8.x

- Focus: ZFS+SPL Consolidation
- Goal: Merging ZFS+SPL git repositories
  - Existing layering is preserved
  - An opportunity to define the ZFS kernel ABI
- Benefits:
  - Simpler packaging for users and maintainers
  - Eliminates the kmod dependency problem
  - Eliminates the risk of mismatched versions
  - One source tree for developers
  - Improves portability for non-Linux platforms

# OpenZFS on Linux - Version 0.9.x

- Focus: Stable ABI / Hardening
- Goal: Finalize a stable user/kernel ABI
- Benefits:
  - Smoother upgrades / downgrades
  - Establishes a clear a user/kernel ABI for Linux
- Goal: Hardening
  - Gracefully handle a wider range of potential failure modes
  - Fault management via the ZFS Event Daemon (ZED)
- Benefits:
  - Enables deployment of lower end commodity hardware
  - Even more robust operation



# OpenZFS on Linux - Version 1.0.x

- Focus: Feature development / performance
- Goal: Mature high quality code base
- Benefits:
  - Semantic Versioning
  - New feature development
  - Performance analysis



# Development Model

- Project hosted at Github
  - <https://github.com/zfsonlinux/>
  - 1201 Watchers, 300 Forks
- illumos is tracked as upstream
- Independent of the Linux Kernel
  - Decouples ZFS from kernel updates
  - Linux 2.6.32 – 3.17 kernels supported
  - Enables use on non-Linux platforms
  - ZFS utilities / kmod can share code
  - Easier to integrate OpenZFS changes from Illumos/FreeBSD/OSX/OSV

# GitHub



# Development Model – Issue Tracker

- Github issue tracker
  - Feature requests, bug reports, and milestones
    - Developers actively participate on the tracker
    - 539 open issues including 115 feature requests
  - Everything is as open and public as possible
  - Discussion by users and developers is encouraged
  - Issues are cross-linked to relevant git commits

# Development Model - Milestones

🚩 6 Open 🚩 15 Closed		Sort ▾
<h2>0.6.4</h2> <p>No due date ⌚ Last updated 27 minutes ago ZFS on Linux v0.6.4 - Functionality / Integration</p>	<div><div style="width: 74%;"></div></div> <p>74% complete 101 open 284 closed <a href="#">Edit</a> <a href="#">Close</a> <a href="#">Delete</a></p>	
<h2>0.7.0</h2> <p>No due date ⌚ Last updated 3 minutes ago ZFS on Linux v0.7.0 - Memory management</p>	<div><div style="width: 51%;"></div></div> <p>51% complete 90 open 95 closed <a href="#">Edit</a> <a href="#">Close</a> <a href="#">Delete</a></p>	
<h2>0.8.0</h2> <p>No due date ⌚ Last updated 29 minutes ago ZFS on Linux v0.8.0 - ZFS+SPL Consolidation</p>	<div><div style="width: 32%;"></div></div> <p>32% complete 17 open 8 closed <a href="#">Edit</a> <a href="#">Close</a> <a href="#">Delete</a></p>	
<h2>0.9.0</h2> <p>No due date ⌚ Last updated 1 minute ago ZFS on Linux v0.9.0 - Stable ABI / Hardening</p>	<div><div style="width: 17%;"></div></div> <p>17% complete 5 open 1 closed <a href="#">Edit</a> <a href="#">Close</a> <a href="#">Delete</a></p>	
<h2>1.0.0</h2> <p>No due date ⌚ Last updated less than a minute ago ZFS on Linux v1.0.0 - Feature Development / Performance</p>	<div><div style="width: 0%;"></div></div> <p>0% complete 0 open 0 closed <a href="#">Edit</a> <a href="#">Close</a> <a href="#">Delete</a></p>	

# Development Model – Pull Requests

- Github pull requests
  - Used to submit proposed code changes
  - All proposed changes must be reviewed
  - Continuous integration development model
    - Proposed changes are automatically tested using buildbot
    - Developers get quick feedback on any proposed change
    - Good test coverage (kernel, architecture, distribution, etc)
    - Changes are tested a second time after being merged
    - The master branch is ***always*** kept stable
  - Designed to make it easy for anyone to contribute
  - LLNL currently acts as the gatekeeper

# Development Model – Pull Requests

Linux tracepoint integration #2874

Edit New issue

Open nedbass wants to merge 4 commits into zfs/linux:master from nedbass:b\_tracepoints

Conversation 0 Commits 4 Files changed 18

+1,229 -137



nedbass commented a day ago

Collaborator

See #2406

Changes from the PR by @prakashsurya:

- Implement `dprintf()` as a tracepoint.
- Implement two new `DTRACE_PROBE`'s
- Refactor patch stack and make it `cstyle`-compliant
- Address feedback from @behlendorf on #2406

One thing I'm concerned about is the 256 byte stack buffer used by `dprintf()`. While short-lived this could potentially push stack usage over the limit. I've seen messages as long as 202 bytes to this isn't an unreasonable size, but we may want to consider dynamic allocation if this turns out to be problematic.

nedbass and others added some commits 17 days ago

- Move a few internal ARC structures to `arc_impl.h` ...
- Fix `dprintf` format specifiers ...
- `cstyle`: allow right paren on its own line ...
- Swap `DTRACE_PROBE*` with Linux tracepoints ...

f772ef3  
4d0e3fc  
1be665c  
7bde2d2

Labels

Difficulty - Medium

Feature

Milestone

0.6.4

Assignee

No one—assign yourself

Notifications

Unsubscribe

You're receiving notifications because you were mentioned.

3 participants



# Development Model - Buildbot

## Console View

Branch: master Legend: Passed Failed Warnings Failed Again Running Exception Offline No data Personalized for...

Commit Hash	Author	Build 1	Build 2	Build 3	Build 4	Build 5	Build 6	Build 7	Build 8	Build 9	Build 10	Build 11	Build 12	Build 13	Build 14	Build 15	Build 16
5f91bd3dea49...	Dan Swartzendruber	Passed	Passed	Passed	Passed	Passed	Failed	Passed	Offline	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed
<p>Improve zvol symlink handling. Change the zvol helper program to replace any embedded spaces in the pool or dataset names with '+' to ensure we have valid symlinks.</p> <p>The '+' character was chosen because it is not a valid character for a dataset name but it is allowed by udev. This ensures that all dataset names with an embedded space will be translated to a unique /dev/zvol/ symlink.</p> <p>Signed-off-by: Dan Swartzendruber &lt;dswartz@druber.com&gt; Signed-off-by: Darik Horn &lt;dajhorn@vanadac.com&gt; Signed-off-by: Brian Behlendorf &lt;behlendorf1@llnl.gov&gt; Closes #2834</p>																	
11662bf969b3...	Marcel Wysocki	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed
<p>Add config/compile to config/.gitignore This file may be added by automake and therefore should be added to config/.gitignore. For the full list of possible auxiliary programs see the full automake documentation.</p> <p><a href="http://www.gnu.org/software/automake/manual/automake.html#Auxiliary-Programs">http://www.gnu.org/software/automake/manual/automake.html#Auxiliary-Programs</a></p> <p>Signed-off-by: Marcel Wysocki &lt;maci.stgn@gmail.com&gt; Signed-off-by: Brian Behlendorf &lt;behlendorf1@llnl.gov&gt; Closes #2848</p>																	
bb9d808c5a94...	Alexander Pyhalov	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed
<p>Fix modules installation directory When building zfs modules with kernel, compiled from deb.src, the packaging process ends up installing the modules in the wrong place.</p> <p>Signed-off-by: Alexander Pyhalov &lt;apyhalov@gmail.com&gt; Signed-off-by: Brian Behlendorf &lt;behlendorf1@llnl.gov&gt; Closes #2822</p>																	
b76707027cec...	Richard Yao	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Failed	Passed	Passed
<p>Make systemd-modules-load.service file directory configurable Installing outside of the prefix is not permissible under Gentoo Prefix.</p>																	

# Join Us, Contributors Welcome

- If you are a developer...
  - Port a change from Illumos/FreeBSD/OSX/OSV
  - Review or comment on a proposed pull requests
  - Implement a requested feature or fix a known issue
  - Help us improve the automated testing
- If you are a user...
  - Open a new issue if you encounter a problem
  - Open pull requests even for trivial fixes
  - Help us rigorously test new features and bug fixes



# Questions

