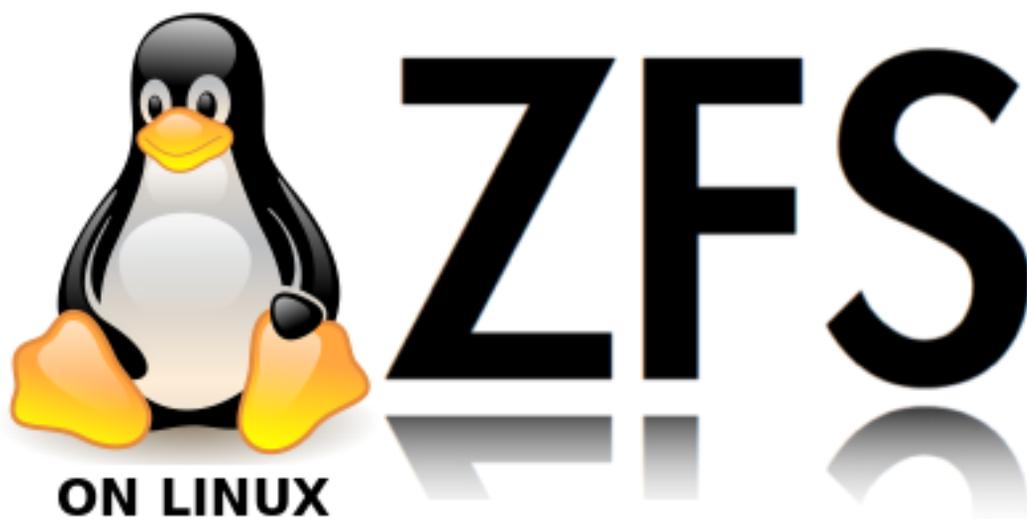


zfs-linux Roll: Users Guide



0.7.3 Edition



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Preface

The `zfs-linux` Roll installs and configures the ZFS device drivers for Linux. This roll implements the software available at the ZFS on Linux¹ project.

ZFS² stands for the Zetabyte File System and is a combined file system and logical volume manager designed by Sun Microsystems. The features of ZFS include data integrity verification against data corruption modes, support for high storage capacities, integration of the concepts of filesystem and volume management, snapshots and copy-on-write clones, continuous integrity checking and automatic repair, RAID-Z and native NFSv4 ACLs. ZFS is implemented as open-source software, licensed under the Common Development and Distribution License (CDDL). The ZFS name is a trademark of Oracle. The trademark was abandoned on September 20, 2011.[1]

[1] U.S. Trademark Serial # 85194050³

Notes

1. <http://zfsonlinux.org>
2. <http://en.wikipedia.org/wiki/ZFS>
3. <http://tdrapi.uspto.gov/ts/cd/casestatus/sn85194050/content.html>

Chapter 1. Installing the zfs-linux Roll

1.1. Getting the Roll

The `zfs-linux` roll supplies ZFS in source form *ONLY*. This is to comply with the licensing of ZFS that does not allow binary redistribution. This means that ZFS must be built on your frontend and the binaries added to your *local cluster* distribution.

This edition of the `zfs-linux` roll requires you to manually build and add the binary version of the roll.



The roll follows the process at <http://zfsonlinux.org> to build rpms. This has the effect of installing zfs kernel modules on your frontend. If you do not want this, then you should build on a development server appliance.

If you choose the `zfs-linux` roll from a Rocks central server, you the source form of the roll will be installed for you. You must then go to the directory `/opt/zfs/zfs-linux-roll-source` and build the binary version of the roll. The files in that directory are contained in the called `zfs-linux-roll-source-0.6.0-rc12.x86_64.rpm`. This source can be installed on a Rocks Development Server. To make the *binary* version of the roll

```
# cd /opt/zfs/zfs-linux-roll-source
# make binary-roll
```

If your roll rebuild completed properly, you should see output similar to the following indicating the binary packages that have been built and are part of your local binary roll

```
roll-zfs-linux-kickstart-0.6.0-0: 9f3dc5cfb37c5025924222c0707b46b2
roll-zfs-linux-usersguide-0.6-0: 05c6edbdbcf46cc1395d9e296ab427b3
spl-0.6.0-rc12: fb8230830b0524e0e8fe2328b2894df0
spl-modules-0.6.0-rc12.6.32_220.13.1.e16: 79a11d04f63b899d8b5dd1b1c5996aae
spl-modules-devel-0.6.0-rc12_2.6.32_220.13.1.e16: b42975737edb986f65635480f1ada7fe
zfs-0.6.0-rc12: 9c10037dacc5595fbdcaf527181ac878
zfs-devel-0.6.0-rc12: 073ab7f991089b46a160867c9645ad68
zfs-dracut-0.6.0-rc8: b8e0ad3d479ab1f85ffbadfc9cf24062
zfs-modules-0.6.0-rc12.6.32_220.13.1.e16: 287f75756a6aa92f8688de4b80d6c183
zfs-modules-devel-0.6.0-rc12.6.32_220.13.1.e16: 5e17ca87a58e06f63bbeb6ed46b834d3
zfs-source-roll-0.6.0-1: 5c9de1926da9c9cd53293a7d5b60acd8
zfs-source-modules-0.6.0-1: 13995fa53ffd2f7d12e7cd9f77336a93
zfs-test-0.6.0-rc12: eff799a298b011bf49bf73359a4cc54e
```

If you build on a development server, you must first copy the created iso image to the frontend. Once you have the iso image (in the directory where you made the binary roll on the frontend or copied to the frontend from a development server, you need to add the roll and rebuild the distribution.

```
# rocks add roll zfs-linux*iso
# rocks enable roll zfs-linux
# pushd /export/rocks/install
# rocks create distro
# popd
```

At this point, any *client* nodes can be reinstalled with ZFS support. You can enable ZFS on your frontend by "running" the roll on the frontend

```
# rocks run roll zfs-linux | sh
```

1.1.1. Enabling ZFS Support on nodes/appliances

Any node or appliance can have ZFS support added to it. Whether or not ZFS is installed on a node is controlled by an attribute called `zfs`. The attribute should be set to true, if ZFS support is desired for the node.

Example: to enable ZFS on all NAS appliances, do the following

```
# rocks add appliance attr nas attr=zfs value=true
```

Chapter 2. Updating the zfs-linux Roll

2.1. Updating the Roll

ZFS on Linux is still an in-development software and has reasonably frequent updates. It is often useful to update the zfs software without resorting to a full reinstallation of a system. This section will describe how to do that and at the same time make sure the roll is in the *local cluster* distribution.

This version of the zfs-linux roll requires you to manually build and add the binary version of the roll.



The roll follows the process at <http://zfsonlinux.org> to build rpms. This has the effect of installing zfs kernel modules on your frontend. If you do not want this, then you should build on a development server appliance.

2.1.1. Getting the updated roll source

If the ZFS source roll is not available for the version of ZFS-on-Linux that you require, then you should go to github.com so that you can first *create a source roll*. In particular, <https://github.com/rocksclusters/zfs-linux>. You should clone the repository. The following shows read-only access to the github repository.

```
# git clone https://github.com/rocksclusters/zfs-linux.git
```

At this point, you have cloned the repository locally. You will need to populate the source tarballs.

```
# cd zfs-linux
# make download
```

If the version of spl/zfs is NOT the one you want, then you need to download/create tarballs of spl and zfs and edit `zfs-version.mk` in the top level. The following is an example of how to create the tarball for spl

2.1.2. Updating with a new Rocks Source Roll

Here we will use an update from version 0.6.4.1 to 0.6.5.2 of the roll. This assumes you have downloaded a newer source roll (a source roll is one in which the ZFS binaries have not already been built for your system). The particular steps will accomplish the source roll installation so that you can build the binary roll

```
# (cd /opt/zfs/zfs-linux-roll-source; make clean)
# rocks remove roll zfs-linux
# rocks add roll zfs-linux-*0.6.5.2*iso
# rocks enable roll zfs-linux
# cd /export/rocks/install; rocks create distro
# yum clean all; yum update zfs-source-roll
```

Now that you have updated the *source* version of the Roll, you need to rebuild the binary roll.

```
# cd /opt/zfs/zfs-linux-roll-source; make binary-roll
# rocks add roll zfs-linux-*0.6.5.2*iso
# cd /export/rocks/install; rocks create distro
# yum clean all; yum update
```



It is possible that you will see errors on rebuilding the binary roll on a system with ZFS running if you see a screen that looks like:

```
configure: error:
*** Please make sure the kmod spl devel <kernel> package for your
*** distribution is installed then try again.  If that fails you
*** can specify the location of the spl objects with the
*** '--with-spl-obj=PATH' option.
make[4]: Entering directory `/opt/zfs/zfs-linux-roll-source/src/zfs/zfs-0.6.5.2'
make[4]: Nothing to be done for `rpm'.
make[4]: Leaving directory `/opt/zfs/zfs-linux-roll-source/src/zfs/zfs-0.6.5.2'
/bin/cp: cannot stat `*x86_64.rpm': No such file or directory
/bin/cp: cannot stat `*src.rpm': No such file or directory
make[3]: *** [rpm] Error 1
make[3]: Leaving directory `/opt/zfs/zfs-linux-roll-source/src/zfs'
make[2]: *** [rpm] Error 2
make[2]: Leaving directory `/opt/zfs/zfs-linux-roll-source/src'
make[1]: *** [rpms] Error 2
make[1]: Leaving directory `/opt/zfs/zfs-linux-roll-source'
make: *** [binary-roll] Error 2
```

Do not panic. Simply rebuild the binary roll a second time with

```
make binary-roll
```

This allows the updated spl module to propagate through various software layers so that zfs will build correctly.

2.1.3. Rebuilding a Binary Roll when ZFS is already installed



Please see the section on "Installing the Roll" to see a proper build. Remember to add the binary roll (iso image) that was created above and then recreate the distribution on the frontend

As a quick reference you should do the following to update the zfs roll with the version you just created. Removal of the old roll is recommended.

```
# rocks remove roll zfs
# rocks add roll zfs*iso
# rocks enable roll zfs
# (cd /export/rocks/install; rocks create distro)
```

Now that your updated binary has been created and you have properly rebuilt the distribution, you can update the RPMS of a system that has its ZFS RPMS already installed. If ZFS is running on a node it is recommended to first stop zfs and then unload the zfs modules (this works also for a frontend)

```
# zfs umount -a
# service zfs-zed stop
# rmmod zfs zcommon znvpair zav1 zunicode spl zlib_deflate
```

At this point, ZFS is no longer active and can be updated. The following should properly accomplish the update

```
# yum clean all
# yum update zfs
# modprobe zfs
```

The following, very long screen dump illustrates the output of the update process.

```
# yum update zfs
Setting up Update Process
Rocks-6.1 | 3.6 kB
Rocks-6.1/primary_db | 2.3 MB
Resolving Dependencies
--> Running transaction check
---> Package zfs.x86_64 0:0.6.5-1.el6 will be updated
--> Processing Dependency: zfs(x86-64) = 0.6.5-1.el6 for package: zfs-test-0.6.5-1.el6.x86_64
--> Processing Dependency: zfs(x86-64) = 0.6.5-1.el6 for package: zfs-dracut-0.6.5-1.el6.x86_64
---> Package zfs.x86_64 0:0.6.5.2-1.el6 will be an update
--> Processing Dependency: zfs-kmod = 0.6.5.2 for package: zfs-0.6.5.2-1.el6.x86_64
--> Processing Dependency: libzpool2 = 0.6.5.2 for package: zfs-0.6.5.2-1.el6.x86_64
--> Processing Dependency: libzfs2 = 0.6.5.2 for package: zfs-0.6.5.2-1.el6.x86_64
--> Processing Dependency: libuutil1 = 0.6.5.2 for package: zfs-0.6.5.2-1.el6.x86_64
--> Processing Dependency: libnvpair1 = 0.6.5.2 for package: zfs-0.6.5.2-1.el6.x86_64
--> Running transaction check
---> Package kmod-zfs-2.6.32-573.3.1.el6.x86_64.x86_64 0:0.6.5-1.el6 will be updated
---> Package kmod-zfs-2.6.32-573.3.1.el6.x86_64.x86_64 0:0.6.5.2-1.el6 will be an update
---> Package libnvpair1.x86_64 0:0.6.5-1.el6 will be updated
---> Package libnvpair1.x86_64 0:0.6.5.2-1.el6 will be an update
---> Package libuutil1.x86_64 0:0.6.5-1.el6 will be updated
---> Package libuutil1.x86_64 0:0.6.5.2-1.el6 will be an update
---> Package libzfs2.x86_64 0:0.6.5-1.el6 will be updated
---> Package libzfs2.x86_64 0:0.6.5.2-1.el6 will be an update
---> Package libzpool2.x86_64 0:0.6.5-1.el6 will be updated
---> Package libzpool2.x86_64 0:0.6.5.2-1.el6 will be an update
---> Package zfs-dracut.x86_64 0:0.6.5-1.el6 will be updated
---> Package zfs-dracut.x86_64 0:0.6.5.2-1.el6 will be an update
---> Package zfs-test.x86_64 0:0.6.5-1.el6 will be updated
---> Package zfs-test.x86_64 0:0.6.5.2-1.el6 will be an update
--> Finished Dependency Resolution

Dependencies Resolved

=====
Package                               Arch          Version          Repository
=====
Updating:
```

zfs	x86_64	0.6.5.2-1.el6	Rocks-6.1
Updating for dependencies:			
kmod-zfs-2.6.32-573.3.1.el6.x86_64	x86_64	0.6.5.2-1.el6	Rocks-6.1
libnvpair1	x86_64	0.6.5.2-1.el6	Rocks-6.1
libuutil1	x86_64	0.6.5.2-1.el6	Rocks-6.1
libzfs2	x86_64	0.6.5.2-1.el6	Rocks-6.1
libzpool2	x86_64	0.6.5.2-1.el6	Rocks-6.1
zfs-dracut	x86_64	0.6.5.2-1.el6	Rocks-6.1
zfs-test	x86_64	0.6.5.2-1.el6	Rocks-6.1

Transaction Summary

```
=====
Upgrade      8 Package(s)
```

```
Total download size: 2.6 M
```

Downloading Packages:

```
(1/8): kmod-zfs-2.6.32-573.3.1.el6.x86_64-0.6.5.2-1.el6.x86_64.rpm | 601 kB
(2/8): libnvpair1-0.6.5.2-1.el6.x86_64.rpm | 73 kB
(3/8): libuutil1-0.6.5.2-1.el6.x86_64.rpm | 76 kB
(4/8): libzfs2-0.6.5.2-1.el6.x86_64.rpm | 288 kB
(5/8): libzpool2-0.6.5.2-1.el6.x86_64.rpm | 1.2 MB
(6/8): zfs-0.6.5.2-1.el6.x86_64.rpm | 340 kB
(7/8): zfs-dracut-0.6.5.2-1.el6.x86_64.rpm | 11 kB
(8/8): zfs-test-0.6.5.2-1.el6.x86_64.rpm | 45 kB
```

```
-----
Total                                                    49 MB/s | 2.6 MB
```

```
Running rpm_check_debug
```

```
Running Transaction Test
```

```
Transaction Test Succeeded
```

Running Transaction

```
Updating   : libuutil1-0.6.5.2-1.el6.x86_64
Updating   : libnvpair1-0.6.5.2-1.el6.x86_64
Updating   : libzpool2-0.6.5.2-1.el6.x86_64
Updating   : libzfs2-0.6.5.2-1.el6.x86_64
Updating   : kmod-zfs-2.6.32-573.3.1.el6.x86_64-0.6.5.2-1.el6.x86_64
Updating   : zfs-0.6.5.2-1.el6.x86_64
Updating   : zfs-test-0.6.5.2-1.el6.x86_64
Updating   : zfs-dracut-0.6.5.2-1.el6.x86_64
Cleanup    : zfs-dracut-0.6.5-1.el6.x86_64
Cleanup    : zfs-test-0.6.5-1.el6.x86_64
Cleanup    : kmod-zfs-2.6.32-573.3.1.el6.x86_64-0.6.5-1.el6.x86_64
Cleanup    : zfs-0.6.5-1.el6.x86_64
Cleanup    : libzfs2-0.6.5-1.el6.x86_64
Cleanup    : libzpool2-0.6.5-1.el6.x86_64
Cleanup    : libnvpair1-0.6.5-1.el6.x86_64
Cleanup    : libuutil1-0.6.5-1.el6.x86_64
Verifying  : libnvpair1-0.6.5.2-1.el6.x86_64
Verifying  : libzfs2-0.6.5.2-1.el6.x86_64
Verifying  : zfs-test-0.6.5.2-1.el6.x86_64
Verifying  : libzpool2-0.6.5.2-1.el6.x86_64
Verifying  : kmod-zfs-2.6.32-573.3.1.el6.x86_64-0.6.5.2-1.el6.x86_64
Verifying  : libuutil1-0.6.5.2-1.el6.x86_64
Verifying  : zfs-0.6.5.2-1.el6.x86_64
Verifying  : zfs-dracut-0.6.5.2-1.el6.x86_64
Verifying  : zfs-test-0.6.5-1.el6.x86_64
Verifying  : zfs-dracut-0.6.5-1.el6.x86_64
Verifying  : kmod-zfs-2.6.32-573.3.1.el6.x86_64-0.6.5-1.el6.x86_64
```

```
Verifying : libuutil1-0.6.5-1.el6.x86_64
Verifying : libzpool2-0.6.5-1.el6.x86_64
Verifying : zfs-0.6.5-1.el6.x86_64
Verifying : libnvpair1-0.6.5-1.el6.x86_64
Verifying : libzfs2-0.6.5-1.el6.x86_64
```

Updated:

```
zfs.x86_64 0:0.6.5.2-1.el6
```

Dependency Updated:

```
kmod-zfs-2.6.32-573.3.1.el6.x86_64.x86_64 0:0.6.5.2-1.el6
libuutil1.x86_64 0:0.6.5.2-1.el6
libzpool2.x86_64 0:0.6.5.2-1.el6
zfs-test.x86_64 0:0.6.5.2-1.el6
```

```
libnvpair1.x86_64 0:0.6.5.2-1
libzfs2.x86_64 0:0.6.5.2-1.el
zfs-dracut.x86_64 0:0.6.5.2-1
```

Complete!

You may see an error that lsscsi package does not exist. This is because the package is not part of the standard OS roll, but is part of the CentOS Distribution. To fix this problem

```
# yum --enablerepo=base install lsscsi
# yum update
# reboot
```

Chapter 3. Using the zfs-linux Roll

3.1. Using the zfs-linux Roll

General Information about ZFS on Linux and be found at the [zfs on linux web site](#)¹. General Tutorials for Using ZFS on Linux and be found at the [zfs on linux documentation](#)².

3.2. Updating The Device Drivers

The Rocks ZFS-linux roll comes with a Makefile `/opt/zfs/Makefile`. If your client node runs a different kernel (via updates or other choice), then using the `rebuild` target of this Makefile will rebuild the `spl` (Solaris Porting Layer) and `zfs` kernel modules. The `rebuild` targets checks first if the modules already exist.

```
# cd /opt/zfs
# make rebuild
```



The startup script `/etc/init.d/zfs-modules` will automatically check and rebuild the ZFS modules.

Notes

1. <http://zfsonlinux.org/>
2. <http://zfsonlinux.org/>

Chapter 4. Copyrights

4.1. Open Solaris: COMMON DEVELOPMENT AND DISTRIBUTION LICENSE (CDDL)

COMMON DEVELOPMENT AND DISTRIBUTION LICENSE (CDDL)
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