

Resizing Encrypted Filesystems

Posted by [dkg](#) on Tue 26 Jun 2007 at 14:13

Yes! You can grow an encrypted partition, as long as the size of the underlying block device grows first. If you have an ext3 filesystem on the encrypted partition, you can even grow the (encrypted) filesystem without unmounting it. This article gives a brief overview of how it is done.

I recommend reading the `man` pages for the commands used here. They are all quite good.

Below is a full transcript of creating and resizing an encrypted filesystem with a test setup. I don't include any RAID (`mdadm`) here, because that would all happen way before you even get to this step, since RAID devices are usually used as physical volumes to feed into an LVM Volume Group. The process below is basically two phases:

Phase 0 (Setup)

1. Create a logical volume (just a block device, no filesystem yet)
2. Overlay it with strong encryption (using LUKS)
3. Create a filesystem on top of the encrypted device
4. Mount the filesystem, and put some data into its tree

(and no, that's not my real passphrase; this is an experiment!)

```
[0 root@monkey ~]# vgs
VG      #PV #LV #SN Attr   VSize  VFree
monkey0 1   9   0 wz--n- 54.49G 20.49G
[0 root@monkey ~]# lvcreate --name=testy --size=50M monkey0
Rounding up size to full physical extent 52.00 MB
Logical volume "testy" created
[0 root@monkey ~]# cryptsetup luksFormat /dev/mapper/monkey0-testy

WARNING!
=====
This will overwrite data on /dev/mapper/monkey0-testy irrevocably.

Are you sure? (Type uppercase yes): YES
Enter LUKS passphrase: abc123
Verify passphrase: abc123
Command successful.
[0 root@monkey ~]# cryptsetup luksOpen /dev/mapper/monkey0-testy testy_crypt
Enter LUKS passphrase: abc123

key slot 0 unlocked.
Command successful.
[0 root@monkey ~]# mkfs -t ext3 -q /dev/mapper/testy_crypt
[0 root@monkey ~]# mount /dev/mapper/testy_crypt /mnt
[0 root@monkey ~]# dd if=/dev/zero of=/mnt/zeros bs=1k count=1k
1024+0 records in
1024+0 records out
1048576 bytes (1.0 MB) copied, 0.0200926 seconds, 52.2 MB/s
[0 root@monkey ~]# df -h /mnt
Filesystem                Size  Used Avail Use% Mounted on
/dev/mapper/testy_crypt
                          50M  5.9M  42M  13% /mnt
[0 root@monkey ~]#
```

Phase 1 (Resizing)

1. Grow the logical volume with `lvresize`
2. Ask the `cryptsetup` subsystem to acknowledge the new size
3. Grow the filesystem on top of the newly bigger encrypted device
4. Look to see how much more space you've got!

In the transcript below, it's interesting to watch how the kernel's representation of the underlying block devices change in size. You can see this by grepping the content of `/proc/partitions`, which i've done during these steps to demonstrate:

```
[0 root@monkey ~]# lvs | grep testy
testy          monkey0 -wi-ao 52.00M
[0 root@monkey ~]# ls -la /dev/mapper/monkey0-testy /dev/mapper/testy_crypt
brw-rw---- 1 root disk 253, 14 2007-06-06 00:10 /dev/mapper/monkey0-testy
brw-rw---- 1 root disk 253, 15 2007-06-06 00:10 /dev/mapper/testy_crypt
[0 root@monkey ~]# grep '^s*253\s*1[45]\s' /proc/partitions
253    14    53248 dm-14
253    15    52732 dm-15

[0 root@monkey ~]# lvresize --size=150M monkey0/testy
Rounding up size to full physical extent 152.00 MB
Extending logical volume testy to 152.00 MB
Logical volume testy successfully resized
[0 root@monkey ~]# grep '^s*253\s*1[45]\s' /proc/partitions
253    14    155648 dm-14
253    15    52732 dm-15
[0 root@monkey ~]# cryptsetup resize testy_crypt
[0 root@monkey ~]# grep '^s*253\s*1[45]\s' /proc/partitions
253    14    155648 dm-14
253    15    155132 dm-15

[0 root@monkey ~]# df -h /mnt
Filesystem          Size  Used Avail Use% Mounted on
/dev/mapper/testy_crypt
                    50M  5.9M   42M  13% /mnt
[0 root@monkey ~]# resize2fs /dev/mapper/testy_crypt
resize2fs 1.40-WIP (14-Nov-2006)
Filesystem at /dev/mapper/testy_crypt is mounted on /mnt; on-line resizing required
old desc_blocks = 1, new desc_blocks = 1
Performing an on-line resize of /dev/mapper/testy_crypt to 155132 (1k) blocks.
The filesystem on /dev/mapper/testy_crypt is now 155132 blocks long.

[0 root@monkey ~]# df -h /mnt
Filesystem          Size  Used Avail Use% Mounted on
/dev/mapper/testy_crypt
                    148M  6.3M  134M   5% /mnt
[0 root@monkey ~]# ls -la /mnt/
total 1046
drwxr-xr-x  3 root root   1024 2007-06-06 00:12 .
drwxr-xr-x 21 root root   4096 2007-02-27 20:08 ..
drwx-----  2 root root  12288 2007-06-06 00:10 lost+found
-rw-r--r--  1 root root 1048576 2007-06-06 00:12 zeroes
[0 root@monkey ~]#
```

Software versions

Here are the versions of the software used on `monkey` at the time i made this test, fwiw:

```
[0 dkg@monkey ~]$ uname -a
Linux monkey 2.6.18-4-686 #1 SMP Mon Mar 26 17:17:36 UTC 2007 i686 GNU/Linux
[0 dkg@monkey ~]$ dpkg -l e2fsprogs lvm2 cryptsetup
```

```
Desired=Unknown/Install/Remove/Purge/Hold
| Status=Not/Installed/Config-files/Unpacked/Failed-config/Half-installed
|/ Err?=(none)/Hold/Reinst-required/X=both-problems (Status,Err: uppercase=bad)
||/ Name          Version             Description
+++-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
ii  cryptsetup      1.0.4+svn26-1       configures encrypted block devices
ii  e2fsprogs       1.39+1.40-WIP-2006.11.14+dfsg-2
ext2 file system utilities and libraries
ii  lvm2            2.02.06-4           The Linux Logical Volume Manager
[0 dkg@monkey ~]$
```

Cleanup the experiment

And since no example is responsibly complete without the cleanup phase, here it is (note that this cleanup makes it nearly impossible to recover data from the filesystem so removed, particularly if you've forgotten the LUKS passphrase):

```
[0 root@monkey ~]# umount /mnt
[0 root@monkey ~]# cryptsetup luksClose testy_crypt

[0 root@monkey ~]# lvremove monkey0/testy
Do you really want to remove active logical volume "testy"? [y/n]: y
  Logical volume "testy" successfully removed
[0 root@monkey ~]#
```

I hope this is useful!

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- <http://www.debian-administration.org/articles/536>

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