

```
# Create a BTRFS Filesystem
```

```
> cd /tmp
```

```
/tmp> dd if=/dev/zero of=fs1.iso bs=1M count=64
```

```
64+0 records in
```

```
64+0 records out
```

```
67108864 bytes (67 MB) copied, 0.073061 s, 919 MB/s
```

```
/tmp> losetup -f fs1.iso
```

```
/tmp> losetup
```

```
NAME          SIZELIMIT OFFSET  AUTOCLEAR RO  BACK-FILE  
/dev/loop0    0          0          0  0  /tmp/fs1.iso
```

```
/tmp> mkfs.btrfs /dev/loop0
```

```
SMALL VOLUME: forcing mixed metadata/data groups
```

```
Btrfs v3.17
```

```
See http://btrfs.wiki.kernel.org for more information.
```

```
Performing full device TRIM (64.00MiB) ...
```

```
Turning ON incompat feature 'mixed-bg': mixed data and metadata block groups
```

```
Turning ON incompat feature 'extref': increased hardlink limit per file to 65536
```

```
Created a data/metadata chunk of size 6684672
```

```
fs created label (null) on /dev/loop0
```

```
    nodesize 4096 leafsize 4096 sectorsize 4096 size 64.00MiB
```

```
/tmp> mount /dev/loop0 /mnt
```

# BTRFS Filesystem information

**/tmp> df -h**

Filesystem	Size	Used	Avail	Use%	Mounted on
/dev/loop0	64M	32K	60M	1%	/mnt

**/tmp> btrfs fi df /mnt**

System, single: total=4.00MiB, used=4.00KiB  
Data+Metadata, single: total=6.38MiB, used=28.00KiB  
GlobalReserve, single: total=4.00MiB, used=0.00B

**/tmp> btrfs fi show /mnt**

Label: none uuid: bb56f266-94fb-45cb-b6a5-8b4415ec96bd  
Total devices 1 FS bytes used 32.00KiB  
devid 1 size 64.00MiB used 10.38MiB path /dev/loop0

**/tmp> cd /mnt**

**/mnt> cp /home/steffen/Documents/Hamlet.txt .**

**/mnt> btrfs fi sync /mnt**

FSSync '/mnt'

**/mnt> btrfs fi df /mnt**

System, single: total=4.00MiB, used=4.00KiB  
Data+Metadata, single: total=6.38MiB, used=224.00KiB  
GlobalReserve, single: total=4.00MiB, used=0.00B

**/mnt> cp /home/steffen/Documents/Ein\_Sommernachtstraum.txt .**

**/mnt> cp /home/steffen/Documents/Romeo\_und\_Julia.txt .**

**/mnt> sync**

```
/mnt> btrfs fi df /mnt
```

```
System, single: total=4.00MiB, used=4.00KiB
```

```
Data+Metadata, single: total=6.38MiB, used=480.00KiB
```

```
GlobalReserve, single: total=4.00MiB, used=0.00B
```

# Subvolumes

```
/mnt> btrfs sub create zweig
```

```
Create subvolume './zweig'
```

```
/mnt> ls
```

```
Ein_Sommernachtstraum.txt  Hamlet.txt  Romeo_und_Julia.txt  zweig
```

```
/mnt> cp /home/steffen/Documents/Stefan_Zweig_Brasilien.txt zweig/
```

```
/mnt> cp /home/steffen/Documents/Stefan_Zweig_Sternstunden_der_Menschheit.txt zweig/
```

```
/mnt> ls zweig
```

```
Stefan_Zweig_Brasilien.txt  Stefan_Zweig_Sternstunden_der_Menschheit.txt
```

```
/mnt> cd ..
```

```
/> umount /mnt
```

```
/> mount -o subvol=zweig /dev/loop0 /mnt
```

```
/> ls /mnt
```

```
Stefan_Zweig_Brasilien.txt  Stefan_Zweig_Sternstunden_der_Menschheit.txt
```

```
/> umount /mnt
```

```
/> mount /dev/loop0 /mnt
```

# Snapshots

**/> cd /mnt**

**/mnt> mkdir snapshots**

**/mnt> btrfs sub snapshot . snapshots/snapshot\_2015\_09\_22\_001**

Create a snapshot of '.' in 'snapshots/snapshot\_2015\_09\_22\_001'

**/mnt> ls snapshots/snapshot\_2015\_09\_22\_001/**

Ein\_Sommernachtstraum.txt Hamlet.txt Romeo\_und\_Julia.txt **snapshots zweig**

**/mnt> btrfs sub snapshot zweig snapshots/zweig\_snapshot\_2015\_09\_22\_001**

Create a snapshot of 'zweig' in 'snapshots/zweig\_snapshot\_2015\_09\_22\_001'

**/mnt> ls snapshots/zweig\_snapshot\_2015\_09\_22\_001/**

Stefan\_Zweig\_Brasilien.txt Stefan\_Zweig\_Sternstunden\_der\_Menschheit.txt

**/mnt> mkdir normal\_dir**

**/mnt> btrfs sub snapshot normal\_dir snapshots/normal\_dir\_2015\_09\_22\_001**

ERROR: 'normal\_dir' is not a subvolume

**/mnt> ln Romeo\_und\_Julia.txt zweig/Romeo\_und\_Julia.txt**

ln: failed to create hard link 'zweig/Romeo\_und\_Julia.txt' => 'Romeo\_und\_Julia.txt':

Invalid cross-device link

```
# Copy-on-Write in Snapshots
```

```
/mnt> sync
```

```
/mnt> btrfs fi df /mnt
```

```
System, single: total=4.00MiB, used=4.00KiB
```

```
Data+Metadata, single: total=6.38MiB, used=1.41MiB
```

```
GlobalReserve, single: total=4.00MiB, used=0.00B
```

```
/mnt> nano Romeo_und_Julia.txt
```

```
# Exchange 'Nachtigall' and 'Lerche'
```

```
/mnt> sync
```

```
/mnt> btrfs fi df /mnt
```

```
System, single: total=4.00MiB, used=4.00KiB
```

```
Data+Metadata, single: total=6.38MiB, used=1.56MiB
```

```
GlobalReserve, single: total=4.00MiB, used=0.00B
```

# Multiple Devices and RAID1

```
/mnt> cd /tmp
/tmp> dd if=/dev/zero of=fs2.iso bs=1M count=64
64+0 records in
64+0 records out
67108864 bytes (67 MB) copied, 0.0703994 s, 953 MB/s
/tmp> losetup -f fs2.iso
/tmp> losetup
NAME          SIZELIMIT OFFSET AUTOCLEAR RO BACK-FILE
/dev/loop0    0          0          0  0 /tmp/fs1.iso
/dev/loop1    0          0          0  0 /tmp/fs2.iso
```

```
/tmp> btrfs dev add /dev/loop1 /mnt
Performing full device TRIM (64.00MiB) ...
```

```
/tmp> btrfs fi df /mnt
System, single: total=4.00MiB, used=4.00KiB
Data+Metadata, single: total=6.38MiB, used=1.56MiB
GlobalReserve, single: total=4.00MiB, used=0.00B
```

```
/tmp> btrfs fi show /mnt
Label: none  uuid: bb56f266-94fb-45cb-b6a5-8b4415ec96bd
  Total devices 2 FS bytes used 1.57MiB
  devid    1 size 64.00MiB used 10.38MiB path /dev/loop0
  devid    2 size 64.00MiB used 0.00B path /dev/loop1
```

```
/tmp> btrfs balance start -v -dconvert=raid1 -mconvert=raid1 /mnt
```

```
Dumping filters: flags 0x7, state 0x0, force is off
```

```
  DATA (flags 0x100): converting, target=16, soft is off
```

```
  METADATA (flags 0x100): converting, target=16, soft is off
```

```
  SYSTEM (flags 0x100): converting, target=16, soft is off
```

```
Done, had to relocate 2 out of 2 chunks
```

```
/tmp> btrfs fi show /mnt
```

```
Label: none  uuid: bb56f266-94fb-45cb-b6a5-8b4415ec96bd
```

```
  Total devices 2 FS bytes used 1.57MiB
```

```
  devid    1 size 64.00MiB used 32.00MiB path /dev/loop0
```

```
  devid    2 size 64.00MiB used 32.00MiB path /dev/loop1
```

```
# Error correction bit rot
```

```
/tmp> ghex fs1.iso
```

```
# Search for 'Nachtigall', change '4E' to '4F'
```

```
/tmp> less /mnt/Romeo_und_Julia.txt
```

```
# Search for 'Nachtigall' -> 'Oachtigall' was corrected
```

```
/tmp> btrfs scrub start -B /mnt
```

```
scrub done for bb56f266-94fb-45cb-b6a5-8b4415ec96bd
```

```
  scrub started at Sat Sep 19 21:38:48 2015 and finished after 0 seconds
```

```
  total bytes scrubbed: 3.13MiB with 1 errors
```

```
  error details: csum=1
```

```
  corrected errors: 1, uncorrectable errors: 0, unverified errors: 0
```

```
WARNING: errors detected during scrubbing, corrected.
```



**/tmp> dmesg**

[25817.992552] BTRFS: checksum error at logical 12476416 on dev /dev/loop0, sector 24368, root 5, inode 259, offset 98304, length 4096, links 1 (path:

Romeo\_und\_Julia.txt)

[25817.992579] BTRFS: bdev /dev/loop0 errs: wr 0, rd 0, flush 0, corrupt 1, gen 0

[25817.994379] BTRFS: fixed up error at logical 12476416 on dev /dev/loop0

**/tmp> btrfs scrub start -B /mnt**

scrub done for bb56f266-94fb-45cb-b6a5-8b4415ec96bd

scrub started at Sat Sep 19 21:40:02 2015 and finished after 0 seconds

total bytes scrubbed: 3.13MiB with 0 errors

# Replace a defective device

**/tmp> dd if=/dev/zero of=fs3.iso bs=1M count=64**

64+0 records in

64+0 records out

67108864 bytes (67 MB) copied, 0.0737063 s, 910 MB/s

**/tmp> losetup -f fs3.iso**

**/tmp> losetup**

NAME	SIZELIMIT	OFFSET	AUTOCLEAR	R0	BACK-FILE
/dev/loop0	0	0	0	0	/tmp/fs1.iso
/dev/loop1	0	0	0	0	/tmp/fs2.iso
/dev/loop2	0	0	0	0	/tmp/fs3.iso

**/tmp> btrfs replace start /dev/loop1 /dev/loop2 /mnt**

**/tmp> btrfs fi show /mnt**

Label: none uuid: bb56f266-94fb-45cb-b6a5-8b4415ec96bd

Total devices 2 FS bytes used 1.57MiB

devid 1 size 64.00MiB used 32.00MiB path /dev/loop0

devid 2 size 64.00MiB used 32.00MiB path /dev/loop2