How to support EXT4 through MMC

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Contents

1 Purpose

The purpose of this article is to introduce EXT4 filesystem:

- General information
- Main components
- How to use EXT4

2 Overview

EXT4 (fourth extended file system)[1][2] is an advanced level of the EXT3 filesystem which incorporates scalability and reliability enhancements for supporting large filesystems (64 bit) in keeping with increasing disk capacities and state-of-the-art feature requirements.

- EXT4 is backward-compatible with EXT3 and EXT2. It is possible to mount both EXT3 and EXT2 filesystems directly using the EXT4 filesystem driver.
- EXT4 can support volumes with sizes up to 1 exbibyte (EiB) and files with sizes up to 16 tebibytes (TiB).

This file system may be used on emmc/sd-card (please refer to the MMC framework). It does not work for raw Flash memory like NOR/NAND.

3 Kernel configuration

EXT4 support is activated by default in ST deliveries. Nevertheless, if a specific configuration is needed, this section indicates how EXT4 can be activated/deactivated in the kernel.

Activate EXT4 in the kernel configuration with the Linux Menuconfig tool: Menuconfig or how to configure kernel.

```
File systems  --->
    <*> The Extended 4 (ext4) filesystem
    [*]   Use ext4 for ext2 file systems
```

4 Using a EXT4 partition as root file system

Assuming a rootfs EXT4 image is already flashed to the memory device, the user has to provide:

- The partition that has to be mounted, using root=<partition_device_path> or root=PARTUUID=XXXX where X represents the unique id of a partition.
- The file system type (rootfstype=ext4 in that case). Optional, by default the kernel find the file system type of partition.

Please refer to the SD card memory mapping to check the "rootfs" location in ST deliveries.
In this case, the kernel command-line parameters [3] that have to be added are:

- In case PARTUUID is used.

```
root=PARTUUID=45e5fc02-d536-43a4-a941-94a8329afeaf
```

- In case the partition device path is used.

```
root=/dev/mmcblk0p6
```

5 Mounting an EXT4 partition

Assuming that the "userfs" partition has been flashed on partition 7, the below steps show how to mount this partition.
Please refer to the SD card memory mapping to check the "userfs" location in ST deliveries.

- Mount "userfs".

```
Board $> mount /dev/mmcblk0p7 /media/
```

- Check that "userfs" partition is mounted.

```
Board $> mount | grep "/media"
/dev/mmcblk0p7 on /media type ext4 (rw,sync,relatime)
```

6 Create a default EXT4 filesystem on a MMC partition

- Format a MMC partition (mmcblk0p7 will be used in this example).

```
Board $> mke2fs -t ext4 -L "testfs" /dev/mmcblk0p7
mke2fs 1.43.5 (04-Aug-2017)
/dev/mmcblk0p7 contains a ext4 file system
        created on Tue Aug  7 08:28:50 2018
Proceed anyway? (y,N) y
Creating filesystem with 163595 4k blocks and 40960 inodes
Filesystem UUID: b7c6e8f5-373c-4c91-aace-0c8f69649165
Superblock backups stored on blocks:
```

```
        32768, 98304

Allocating group tables: done
Writing inode tables: done
Creating journal (4096 blocks): done
Writing superblocks and filesystem accounting information: done
```

- Mount "testfs" with device partition path or with label.

```
Board $> mount /dev/mmcblk0p7 /media
```

```
Board $> mount /dev/disk/by-label/testfs /media
```

- Check that the file system is empty.

```
Board $> ls -la /media
total 21
drwxr-xr-x 3 root root  4096 Aug  7 08:34 .
drwxr-xr-x 3 root root  1024 Aug  7 08:38 ..
drwx------ 2 root root 16384 Aug  7 08:34 lost+found
```

- Create a random data file.

```
Board $> dd if=/dev/urandom of=/tmp/random.hex bs=1M count=100 conv=fsync
100+0 records in
100+0 records out
104857600 bytes (105 MB, 100 MiB) copied, 6.49739 s, 16.1 MB/s
```

- Copy the random data file in /media.

```
Board $> cp /tmp/random.hex /media/
```

- Un-mount /media.

```
Board $> umount /media
```

- Mount "testfs".

```
Board $> mount /dev/disk/by-label/testfs /media
```

- Check that the random data file created is identical in /tmp and /media.

```
Board $> md5sum /tmp/random.hex /media/random.hex
6ab2f920c81bba53b01f9e758116a172  /tmp/random.hex
6ab2f920c81bba53b01f9e758116a172  /media/random.hex
```

- Un-mount /media.

```
Board $> umount /media
```

7 References

Please refer to the following links for full description:

1. ↑ Official ext4 wiki
2. ↑ Kernel.org Documentation
3. ↑ The kernel's command-line parameters