

# LPIC-1 101-500 – Lesson 19

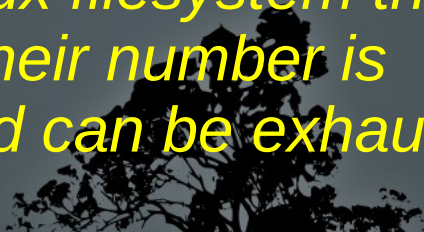
## 104.2 Maintain the integrity of filesystems




# Possible Problems with Filesystems

- A filesystem can fill up and create malfunctions on the system or the applications.
- Corrupted filesystem after an abrupt poweroff, restart or crash.
- Exhaustion of inodes and thus unable to create new files, directories etc.

**Note:** *inodes are structures in a Unix or Linux filesystem that keep the metadata for files or directories. Their number is predefined for standard Linux filesystem and can be exhausted if you create small or empty files.*




# Total size of files/directories with `du`


- The `du` works recursively to find the total size of the selected files/directories.
  - `# du /etc #` show the size of `/etc` and its contents in 1kB blocks.
  - `# du -h /etc #` show the size of `/etc` and its contents in human readable form.
  - `# du -ch /etc /boot #` show the size of `/etc` and `/boot`, and the total sum of their sizes.
  - `# du -sh /etc /boot #` summary view of the size of `/etc` and `/boot` directories.
- 

# Total size of files/directories with `du`

## Options:

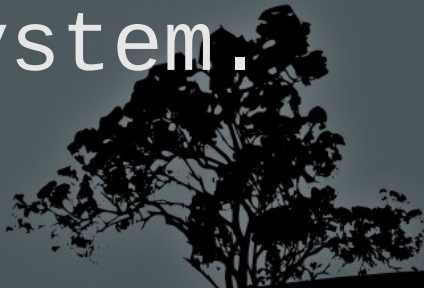
- `-a` # show files as well as directories.
  - `-h` # human readable form.
  - `-c` # show the sum of the selected files/directories.
  - `-s` # show the size of the selected files/directories only.
  - `-S` # calculate only the size of a directory excluding the subdirectories.
  - `--max-depth=2` # show the results of up to 2 subdirectories only.
  - `-x, --one-file-system` # calculate files within a filesystem only.
- 

# Show total filesystem usage with `df`

- The **df** command reports the total usage of the mounted filesystems.
  - `# df #` show filesystem usage in 1kB blocks.
  - `# df -h #` show filesystem usage in human readable form.
  - `# df -h / #` show filesystem usage of the root filesystem only.
  - `# df -h /etc #` filesystem usage of the root filesystem only (provided that `/etc` is under the root filesystem).
  - `# df -i #` show inode usage for each filesystem.
- 

# Show total filesystem usage with `df`

## Options:

- `-h` # human readable form.
  - `-i` # show inode usage instead of size.
  - `-a` # show virtual filesystems.
  - `-l` # show only local filesystem (exclude network filesystems).
  - `-T` # show type of filesystem.
- 

# Filesystem check with `fsck`

- The **fsck** command checks the filesystems for errors and corrects them. A condition, however is that the filesystem is not mounted or else the problems will multiply instead of been fixed.
- **fsck** is a generic program that in fact calls **fsck.<fstype>** or **e2fsck** to do the actual work.



# Filesystem check with `fsck`

```
# fsck /dev/sda1 # don't forget to unmount  
/dev/sda1!
```

```
fsck 1.40.8 (13-Mar-2008)
```

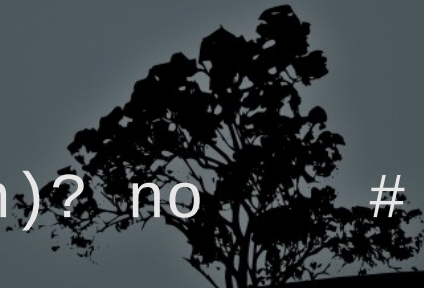
```
e2fsck 1.40.8 (13-Mar-2008)
```

```
/dev/sda1 is mounted.
```

```
WARNING!!! Running e2fsck on a mounted  
filesystem may cause
```

```
SEVERE filesystem damage.
```

```
Do you really want to continue (y/n)? no # of  
course not!
```





# Filesystem check with `fsck`

```
# fsck /dev/sda1 # filesystem is  
# clean and so  
# fsck refuses to  
# run
```

```
fsck 1.40.8 (13-Mar-2008)  
e2fsck 1.40.8 (13-Mar-2008)  
/dev/sda1: clean, 45/24480 files,  
57192/97656 blocks
```



# Filesystem check with `fsck`

```
# fsck -f /dev/sda1 # the -f option forces the  
# e2fsck to run even on a  
# clean system
```

```
fsck 1.40.8 (13-Mar-2008)
```

```
e2fsck 1.40.8 (13-Mar-2008)
```

```
Pass 1: Checking inodes, blocks, and sizes
```

```
Pass 2: Checking directory structure
```

```
Pass 3: Checking directory connectivity
```

```
Pass 4: Checking reference counts
```

```
Pass 5: Checking group summary information
```

```
/dev/sda1: 45/24480 files (26.7% non-contiguous),  
57192/97656 blocks
```



# Filesystem check with `fsck`


## Options:

- **-A** # run **fsck** in all filesystems defined in **/etc/fstab**.
- **-N** # simulate a filesystem check and show results without actually making any changes.
- **-t <fstype>** # set type of filesystem.



# Filesystem check with `fsck`

## Options for e2fsck:

- **-f** # force run **e2fsck** on a clean system.
  - **-c** # check for corrupted blocks.
  - **-b <superblock>** # define an alternative superblock.
  - **-p** # automatic repair without prompts.
  - **-y** # answer "Yes" in all prompts.
  - **-v** # verbose output.
- 

# Interactive filesystem repair with `debugfs`

- The **debugfs** command provides interactive control and repair of **ext2**, **ext3** or **ext4** filesystems. For advanced users only!
- ```
# debugfs /dev/sda1 #  
interactively repair sda1  
debugfs 1.40.8 (13-Mar-2008)  
debugfs: help  
debugfs: quit
```



# Show filesystem information with `dumpe2fs`

- The `dumpe2fs` command shows detailed information about `ext2`, `ext3` or `ext4` filesystems.
- `# dumpe2fs /dev/sda1 | less #` show information about `sda1`.
- `# dumpe2fs -h /dev/sda1 | less #` show information about `sda1` excluding group descriptors.




# Change filesystem parameters with `tune2fs`

- The **tune2fs** command shows and modifies filesystem parameters for **ext2**, **ext3** or **ext4**. Use only on unmounted filesystems!
- **# tune2fs -c 360 /dev/sda1 # set filesystem checks every 360 mounts.**
- **# tune2fs -i 6m /dev/sda1 # set filesystem checks every 6 months.**



# Change filesystem parameters with `tunefs`

## Options:

- `-l #` show all adjustable parameters.
  - `-c <number> #` set number of mounts which will trigger an `e2fsck` check. If the value is 0 this function is disabled.
  - `-i <number> #` set time after which an `e2fsck` check is triggered. The default value is in days (`d`) unless followed by `w` (weeks) or `m` (months). If the value is 0 this function is disabled.
  - `-j #` add `ext3` journal in the system (convert `ext2` to `ext3`).
  - `-L #` set filesystem label.
  - `-U #` set filesystem UUID.
  - `-m 10 #` set 10% of the filesystem space as reserved for `toot`. The default value is 5%.
- 

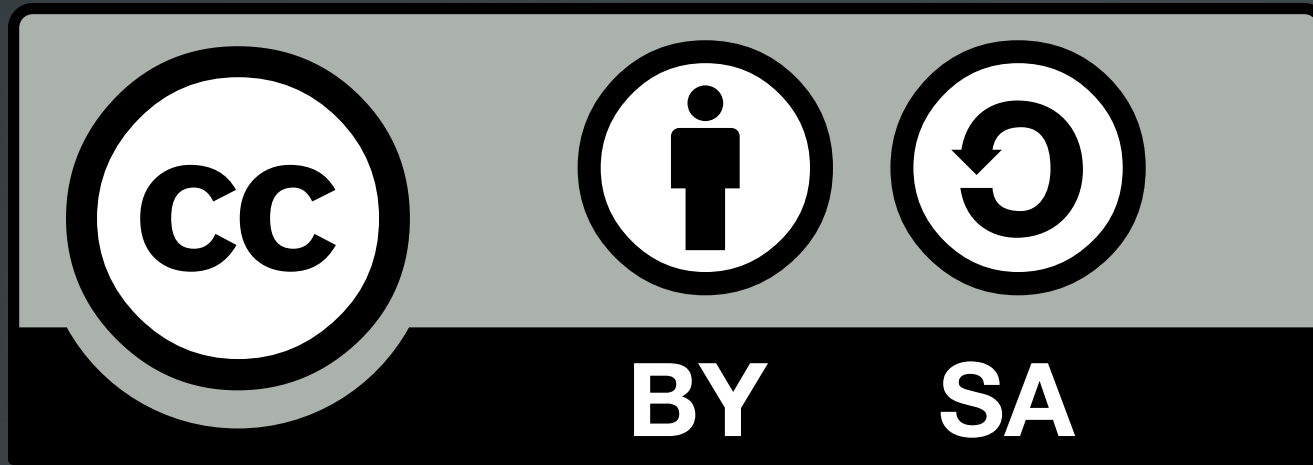


# *XFS* tools

- `# xfs_repair /dev/sda5 metadata.xfs #`  
repair a damaged filesystem (unmount first!).
- `# xfs_fsr /dev/sda5 #` reorganizes the filesystem to improve performance.
- `# xfs_db /dev/sda5 #` debug a filesystem using an interactive shell.



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