

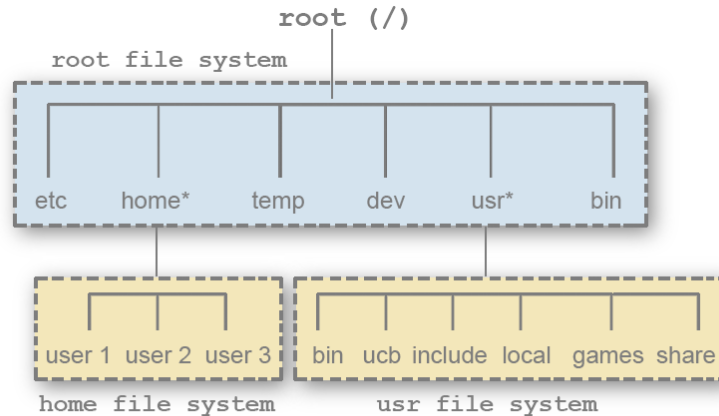


Chapter 20: Mounting Filesystems



Mounting Filesystems

- A filesystems is a tree-like structure containing directories and files
- After filesystems are created on disk-partitions, all separate filesystems are combined to form a single directory tree



* Indicates an empty directory used as a mount point



Mounting Filesystems

- Filesystems are accessible via a mount point
- A mount point is an empty directory
- When viewing the files in a mount point, you are really viewing files in a filesystem



Viewing Mounted Filesystems

- The `mount` command will either display currently mounted filesystems or mount filesystems
- With no arguments, it displays mounted filesystems
- Output includes mounted device, mount point, filesystem type and mount options
- The `df` command shows mounted filesystem and space usage, but not mount options



Viewing Mounted Filesystems

```
$ mount
```

```
/dev/sda2 on / type ext4 (rw)
```

```
proc on /proc type proc (rw)
```

```
sysfs on /sys type sysfs (rw)
```

```
devpts on /dev/pts type devpts (rw,gid=5,mode=620)
```

```
tmpfs on /dev/shm type tmpfs (rw)
```

```
/dev/sda1 on /boot type ext4 (rw)
```

```
/dev/sda5 on /home type ext4 (rw)
```

```
none on /proc/sys/fs/binfmt_misc type binfmt_misc (rw)
```

```
sunrpc on /var/lib/nfs/rpc_pipefs type rpc_pipefs (rw)
```



Mounting Filesystems Manually

- Use the `mount` command to mount a filesystem:
 - `#mount /dev/sdb1 /mnt`
 - `/mnt` exists on most distributions by default
 - `/mnt` is used for temporary mounts
 - Use `-o` to specify filesystem type
- To mount a `.img` or `.iso` file:
 - `#mount -o loop cdrom.iso /mnt`



To Unmount a Filesystem

- Use the `umount` command to unmount a filesystem:
`#umount /mnt`
- The `umount` command will fail to unmount a filesystem if:
 - There is a file open within the filesystem
 - There is an executable file running within the filesystem
 - A user has a current working directory within the filesystem



Problems with umount

- If `umount` fails, an error message is displayed:
`umount /mnt`
`umount: /mnt: device is busy.`
(In some cases useful info about processes that use the device is found by `lsdf(8)` or `fuser(1)`)
- Use `lsdf` to list all open files in filesystem
- Use `fuser` to see how filesystem is being used



The fuser command

Use `-v` to see verbose information, including a code that show how filesystem is being used

| Access Code | Meaning |
|-------------|--|
| c | The process is using the mount point or a subdirectory as its current directory. |
| e | The process is an executable file that resides in the mount point structure. |
| f | The process has an open file from the mount point structure. |
| F | The process has an open file from the mount point structure that it is writing to. |
| r | The process is using the mount point as the root directory. |
| m | The process is a mmap'ed file or shared library. |



The fuser command

- Use `-k` to stop processes:
`#fuser -k /mnt`
- Different signals can be used:
`#fuser -k -KILL /mnt`
- After all processes have been killed, the `umount` command will work



Mounting Automatically on Boot

- Modify the `/etc/fstab` file to have a filesystem mounted automatically at boot
- Must be root to modify this file
- Good idea to make a backup!



/etc/fstab Fields

- Each line describes one mount, six fields per line:
 - device field - Example: /dev/sda1
 - mount point field - Example: /data
 - filesystem field - Example: ext4
 - mount option field - Example: defaults
 - dump field - Example: 1
 - fsck field - Example: 1



The device Field

- Can be one of the following:
 - A partition device name (`/dev/sda1`)
 - A logical volume (`/dev/dm1`)
 - A UUID (`09d641d5-bc5a-4065-8d80-8ae797dfa7f3`)
 - A label (`/data`)



UUID vs label

- Partition names can change if new devices are added
- UUID
 - consistent
 - created with filesystem is created
 - hard to remember
 - use `blkid` to view



UUID vs label

- Labels
 - Can be assigned
 - Are flexible
 - Are easier to remember
 - Could be duplicated
 - View and set with `e2label` command
 - Can also be viewed with `blkid` command
 - Swap partitions can also have labels



mount options

- There are many `mount` command options!
- Different options for different filesystems
- Use `man mount` for details:



mount Options

- Typically, defaults are used, meaning whatever normal mount options are for that filesystem
- The defaults option can be replaced with specific options, separated by commas
- Common options on the next slide



mount options

| Mount Option | Purpose | Opposite |
|--------------|--|----------|
| rw | Allow reading and writing | ro |
| suid | Allow suid executates | nosuid |
| dev | Allow device files | nodev |
| exec | Allow executable files | noexec |
| auto | Automatically mount | noauto |
| nouser | Prevent ordinary users from mounting or unmounting the partition | user |
| async | All writes should be asynchronous | sync |
| relatime | Only update access time on file access if file has been modified or its metadata changed since last access | N/A |



The dump field

- Value of "1" for local real filesystems
- Value of "0" for pseudo-file systems and remote filesystems
- Used by the `dump -w` command to report a list of filesystems that should be backed up



The fsck field

- Determines the order of file system checks during boot
- A value of "0" means "do not check"
 - Should be placed on any pseudo-filesystems and remote filesystems
- A value of "1" or higher means "check filesystem in order"
- Lower numbers checked first



Mounting With fstab

- If pass only one argument (i.e. `#mount /home`), Linux will read the configuration for the mount from `/etc/fstab` if it exists
- Allows a *new* mount to be created in `/etc/fstab` then tested instead of needing a reboot
- Use `remount` to change a mounted filesystem's options without unmounting
`#mount /home -o remount, noatime`



loop Option

- Used to mount special filesystems stored within a file, with extensions of `.img` or `.iso`, which contain complete filesystems that can be mounted with `mount` using the `loop` option:

```
#mount -o loop cdrom.iso /mnt
```



Monitoring Filesystems

- The `df` command is used to view mounted filesystems
 - Use `-h` to display filesystem sizes in human-readable format
 - Use `-T` to display the filesystem type

```
# df -hT
```

| Filesystem | Type | Size | Used | Avail | Use% | Mounted on |
|------------|-------|------|------|-------|------|------------|
| /dev/sda2 | ext4 | 6.3G | 3.2G | 2.9G | 53% | / |
| tmpfs | tmpfs | 351M | 84K | 351M | 1% | /dev/shm |
| /dev/sda1 | ext4 | 485M | 52M | 408M | 12% | /boot |
| /dev/sda5 | ext4 | 2.2G | 69M | 2.0G | 4% | /home |