Leiden University
Medical Center

User Environment

Users, Groups, File permissions and Ownership

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Outline

When do we have to deal with these things?

Not all files and folders are readable for everyone.

```
1   $ cat /var/log/syslog
2   cat: /var/log/syslog: Permission denied
3   $ whoami
4   zorro
```

Listing 1: Permission denied.

Apparently, the user `zorro` is not allowed to read `syslog`.

Users

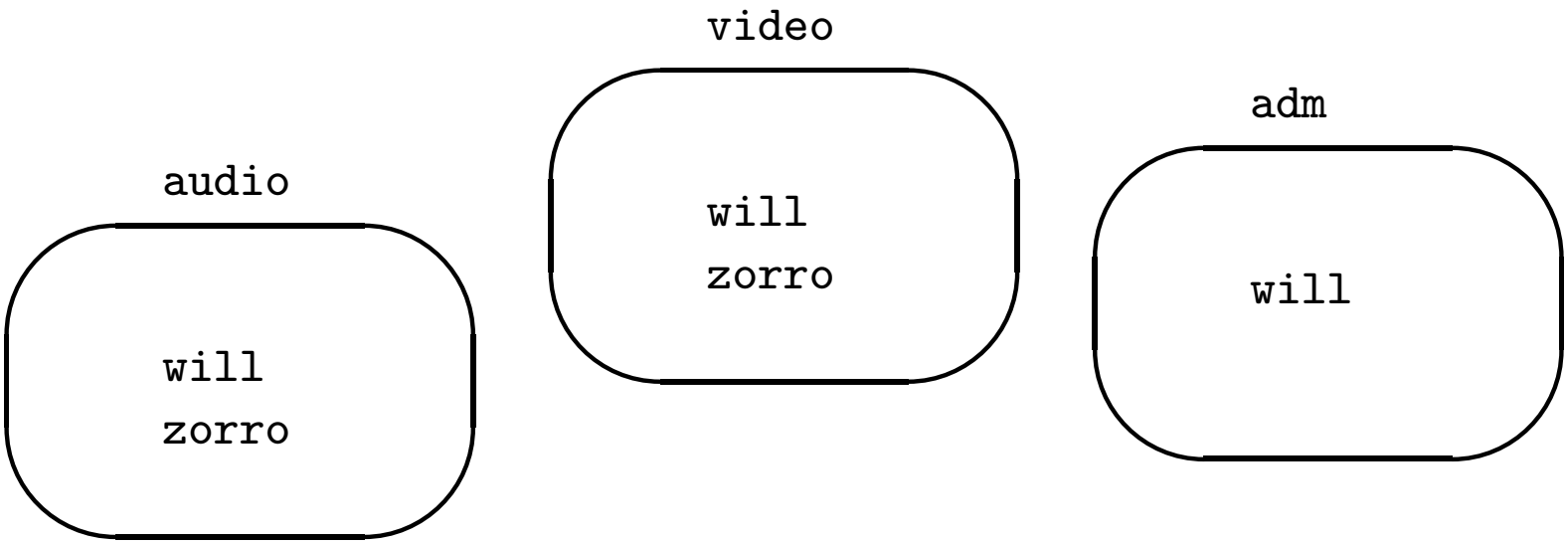
Every Linux / Unix system has multiple users:

- `zorro`
- `will`
- `root`

The users `zorro` and `will` are specific to this lecture.

The user `root` is present on *all* systems. This account is only used for administration purposes.

Group membership



group	users
audio	will, zorro
video	will, zorro
adm	will

Table 1: Group membership.

Group membership

Use `groups` to see a user's group memberships.

```
1   $ groups zorro
2   zorro : audio video
3   $ groups will
4   will : audio video adm
```

Listing 2: See group memberships.

The user `will` is member of the group `adm`.

Find out who owns files

We use the familiar `ls` to find out who owns a file and which permissions are set.

```
1   $ ls -al
```

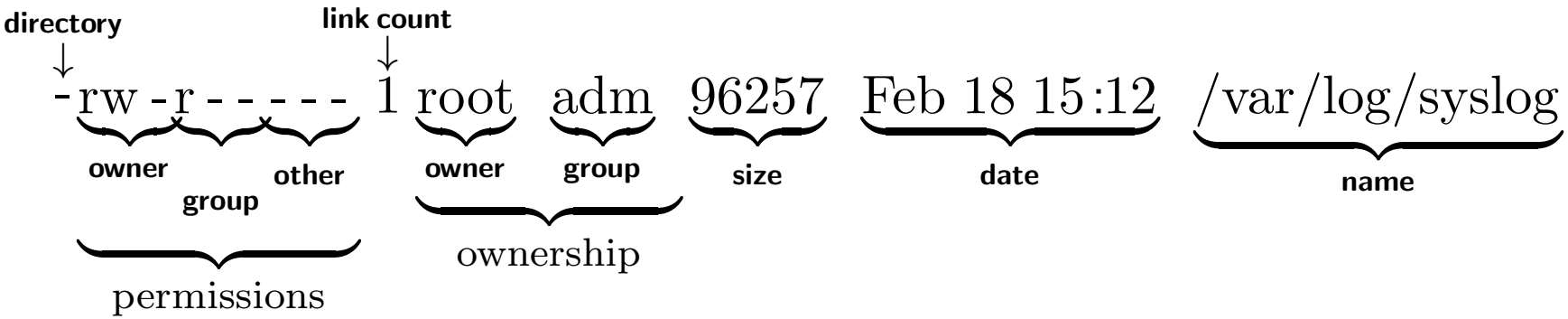
Listing 3: Long listing format.

option	meaning
`-a`	show all files (including hidden files)
`-l`	long listing format

Table 2: Some important options.

File permissions

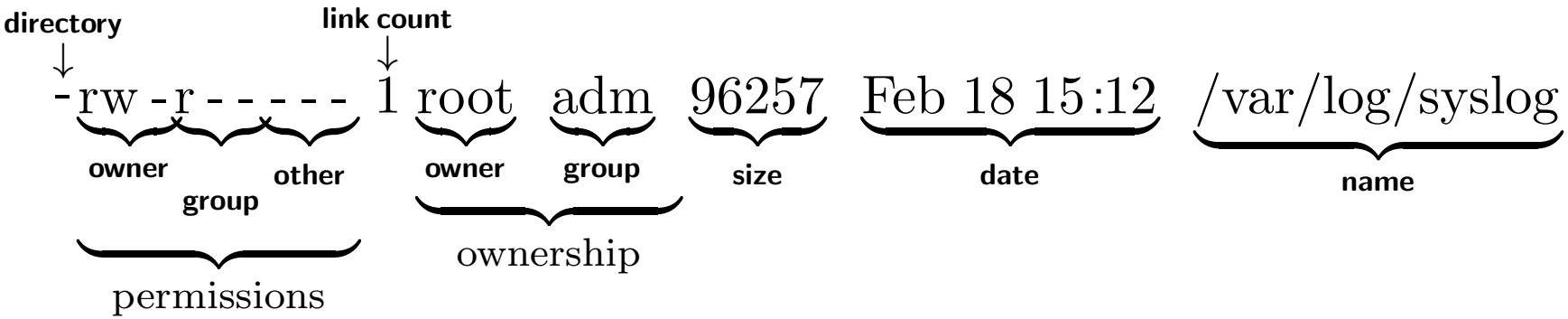
Find out who owns files



This file is owned by the user `root` and the group `adm`.

File permissions

Find out who owns files

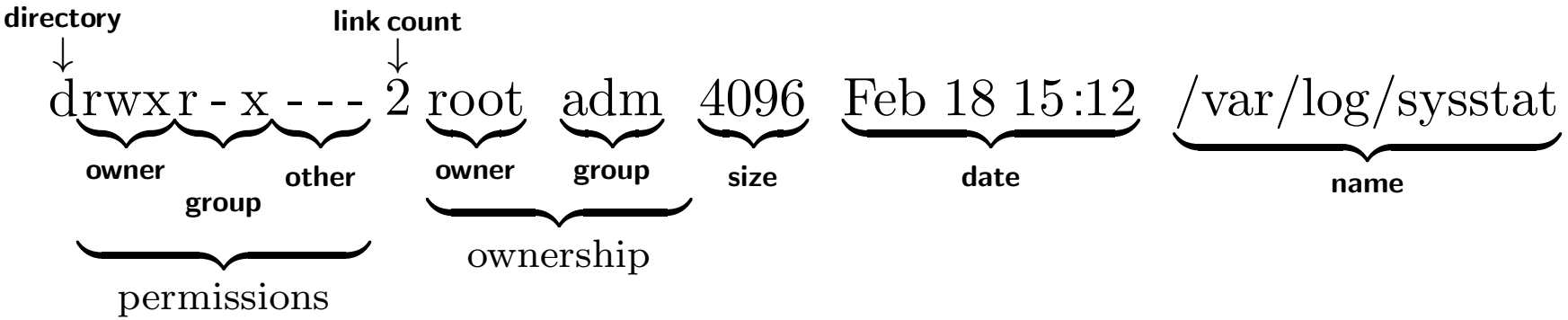


This file is owned by the user `root` and the group `adm`.

Additional information in this output:

- Permissions (next slides).
- Link count.
- File size.
- Last modification date.
- File or directory name.

File permission flags



abbreviation	meaning
`d`	directory
`r`	read permission
`w`	write permission
`x`	execute permission

Table 3: Permissions.

File permission flags

```
1   $ ls -al syslog
2   -rw-r----- 1 root adm 9257 Feb 18 15:12 syslog
```

Listing 4: Long listing of a file.

user	status	permissions
`root`	owner	`rw-`
`will`	member of the `adm` group	`r--`
`zorro`	normal user	`---`

Table 4: How permissions are applied in Listing 4.

File permission flags

```
1   $ ls -ald sysstat
2   drwxr-x--- 2 root adm 4096 Feb 18 15:12 sysstat
```

Listing 5: Long listing of a directory.

user	status	permissions
`root`	owner	`rwx`
`will`	member of the `adm` group	`r-x`
`zorro`	normal user	`---`

Table 5: How permissions are applied in Listing 5.

The execute flag

The execute flag for files.

```
1  $ ls -al
2  drwx------  2 zorro user  1024 Mar 24 13:50 .
3  drwxrwxrwx 27 root  root 10240 Mar 24 13:50 ..
4  -rwx------  1 zorro user    29 Mar 24 13:50 hello
5  -rw-------  1 zorro user    20 Mar 24 13:50 text
```

Listing 6: Long listing of two files.

```
1  $ ./hello
2  Hello world!
3  $ ./text
4  bash: ./text: Permission denied
```

Listing 7: We can execute only one file.

Changing permissions

Setting permissions is done with `chmod`.

```
1  $ ls -al hello
2  -rw-------  1 zorro user    29 Mar 24 13:50 hello
3  $ chmod u+x hello
4  -rwx------  1 zorro user    29 Mar 24 13:50 hello
```

Listing 8: Set the execute flag.

abbreviation	meaning	example
`u`	user	`chmod u+w hello`
`g`	group	`chmod g+rx hello`
`o`	other	`chmod o-rwx hello`

Table 6: Setting permissions.

Changing permissions

The execute flag for directories.

```
1   $ ls -al
2   drwx------  2 zorro user  1024 Mar 24 13:50 .
3   drwxrwxrwx 27 root  root 10240 Mar 24 13:50 ..
4   -rwx------  1 zorro user    29 Mar 24 13:50 hello
```

Listing 9: Long listing of a directory.

```
1   $ chmod u-r .
2   $ ls -al
3   ls: cannot open directory .: Permission denied
4   $ ./hello
5   Hello world!
```

Listing 10: Make a directory unlistable.

Changing permissions

To remove access to a directory completely, remove the execute flag.

```
1   $ chmod u-x .
2   $ ./hello
3   bash: ./hello: Permission denied
```

Listing 11: Close a directory.

These manipulations are useful when you want to give people access, but you do not want them to browse.

Changing permissions

Summary of valid combinations.

type	flags	result
file	`+x +r`	Executable and readable.
file	`-x +r`	Readable.
directory	`+x +r`	Usable and readable.
directory	`+x -r`	Usable but not readable.

Table 7: Combinations of read and execute flags.

Summary

Users, groups and file permissions

Linux uses *users* and *groups* for access control.

Users and groups:

- A user can be a member of multiple groups.

Files and directories:

- Are owned by a user.
- Are owned by a group.

Access control is done by setting permissions for users and groups on files or directories.

Users, groups and file permissions

```
1   -rwxr-x---  1 zorro user    29 Mar 24 13:50 hello
```

Listing 12: Example.

Questions:

- Which user owns this file?
- Which group owns this file?

Users, groups and file permissions

```
1   -rwxr-x---  1 zorro user    29 Mar 24 13:50 hello
```

Listing 12: Example.

Questions:

- Which user owns this file?
- Which group owns this file?
- Which permissions does `zorro` have?
- Which permissions do people in the `user` group have?
- Which permissions do other people have?

Users, groups and file permissions

```
1   drwxr-x--x  1 zorro user    29 Mar 24 13:50 hello
```

Listing 13: Example.

Questions:

- Who can write to this folder?
- Who can see the contents of this folder?
- Who can access this folder?

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Acknowledgements

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