# Network Engineering 2019 Exercises - Unit 1

# 1 Basic POSIX file permissions

Write a shell-script called unit1-solution1.sh that creates directories inside a directory called unit1exercise1 with the following properties, and then creates a compressed tar file called unit1-solution1.tgz

- 1. ensetztete, mode --xrw--w-
- 2. vertrittst, mode rwx--x-w-
- 3. verhunden, mode --xr---wx
- 4. anfahrs, mode r-x--x-w-
- 5. angekaeskeit, mode rw----r--
- 6. aussprachse, mode rwx--xr-x
- 7. aufkaeskeit, mode r---wx--x
- 8. angewitzung, mode ---rw--w-
- 9. angewitzung/belauft, mode r--r--w-
- 10. aussprachse/ausschmeckkeit, mode rw--w-r-x
- 11. angekaeskeit/aufrennkeit, mode --xr-x-wx
- 12. angewitzung/ausrabarbt, mode rwxrw--w-
- 13. anfahrs/eintrauer, mode rw----rw-
- 14. anfahrs/eintrauer/zertritttest, mode ---r-x-wx
- 15. anfahrs/eintrauer/auswitzte, mode r--rw-rwx
- 16. anfahrs/eintrauer/auskatzeheit, mode rw-r-x-w-
- 17. angewitzung/belauft/anpflumer, mode r-x-wx--x
- 18. anfahrs/eintrauer/gekrause, mode --xrw--wx
- 19. angewitzung/ausrabarbt/ensitzse, mode --xrw----
- 20. angekaeskeit/aufrennkeit/ausgekrautete, mode -w-r----

Your work will be **automatically marked** by comparing the contents of the compressed tar file against a template. Therefore it is important that you have every detail correct.

This exercise can be be completed using the cd, mkdir, chown, chmod and sudo shell commands, although you can use other shell commands if you wish.

An unsophisticated script to complete this would be 2410 bytes long, while a compact script would be no larger than 969.

Grading for this exercise for you is according to the following guide:

Requirement	Percentage
Correctness of solution	60%
Compactness of solution	40%

The compactness scores are according to the following table:

Length of script	Percentage
2411 bytes or more	0%
1690 - 2410 bytes	5%
970 – 1689 bytes	15%
824 – 969 bytes	25%
less than 824 bytes	40%

To test your solution, use a command like:

```
sudo tar zcf unit1-solution1.tgz unit1exercise1
./unit1-exercise-1-grade.sh unit1-solution1.sh
```

To submit your solution (which you can do as many times as you like), use a command like:

# 2 User and groups

Write a shell-script called unit1-solution2.sh that creates directories inside a directory called unit1exercise2 with the following properties, and then creates a compressed tar file called unit1-solution2.tgz

- 1. aufsinner, mode rw-r-xr--, owner lp, group mail
- 2. ausgesprachkeit, mode rw---xrwx, owner games, group student
- 3. aufgestehst, mode ---r--rw-, owner news, group fax
- 4. angelaufs, mode -w-r----, owner nobody, group dip
- 5. angepflumer, mode -wxrw-rwx, owner proxy, group student
- 6. auskraus, mode ----xr--, owner lp, group dip

- 7. auftraukeit, mode rw-rw--wx, owner student, group news
- 8. aussetzer, mode r--r--, owner uucp, group floppy
- 9. auskraus/zersetzen, mode --xr--rwx, owner lp, group student
- 10. aufsinner/einsinner, mode ----x-x, owner uucp, group proxy
- 11. aufsinner/enhalter, mode -wxrw-rw-, owner proxy, group tape
- 12. angelaufs/berennkeit, mode -wx----wx, owner news, group tape
- 13. auskraus/aufgekrauen, mode --xr-xrwx, owner mail, group voice
- 14. angelaufs/berennkeit/aufgesinns, mode r-x----, owner nobody, group tape
- 15. aufsinner/enhalter/angehtete, mode -wxr-x-w-, owner uucp, group cdrom
- 16. aufsinner/einsinner/angesetzen, mode r---wxrw-, owner news, group uucp
- 17. aufsinner/einsinner/verkatzekeit, mode rw-rw-rwx, owner games, group cdrom
- 18. angelaufs/berennkeit/ausgerauchse, moder-xr-xrw-, owner student, group audio
- 19. angelaufs/berennkeit/angespracher, mode -----x, owner nobody, group audio
- 20. auskraus/zersetzen/angekatzetete, mode r-x--xr-x, owner news, group uucp

Your work will be **automatically marked** by comparing the contents of the compressed tar file against a template. Therefore it is important that you have every detail correct.

This exercise can be be completed using the cd, mkdir, chown, chmod and sudo shell commands, although you can use other shell commands if you wish.

An unsophisticated script to complete this would be 2302 bytes long, while a compact script would be no larger than 1226.

Grading for this exercise for you is according to the following guide:

Requirement	Percentage
Correctness of solution	60%
Compactness of solution	40%

The compactness scores are according to the following table:

Length of script	Percentage
2303 bytes or more	0%
1765 - 2302 bytes	5%
1227 - 1764 bytes	15%
1043 - 1226 bytes	25%
less than 1043 bytes	40%

To test your solution, use a command like:

```
sudo tar zcf unit1-solution2.tgz unit1exercise2
./unit1-exercise-2-grade.sh unit1-solution2.sh
```

To submit your solution (which you can do as many times as you like), use a command like:

# 3 Set-user and Set-group ID

Write a shell-script called unit1-solution3.sh that creates directories inside a directory called unit1exercise3 with the following properties, and then creates a compressed tar file called unit1-solution3.tgz

- 1. bekatzest, mode r---w--w-, owner nobody, group news, setuid
- 2. aufgekletten, mode r--r--, owner news, group audio
- 3. gerabarbung, mode -wx-w---, owner student, group audio
- 4. befahrheit, mode rwxr--rwx, owner nobody, group uucp
- 5. enkatzet, mode rwx-wxr--, owner nobody, group mail
- 6. berabarber, mode r---wx-w-, owner nobody, group mail, setuid
- 7. zerhaltst, mode ---rw--w-, owner lp, group proxy, setuid
- 8. zersitzt, mode --xr-x---, owner games, group fax
- zerhaltst/ausgehundtete, mode ---rwx-w-, owner mail, group fax, setuid
- 10. zersitzt/aussinner, mode ---r-x-w-, owner student, group floppy, setuid
- 11. zerhaltst/aussinntest, mode rw-rwx-w-, owner lp, group uucp

- 12. aufgekletten/ausgekraut, mode --x---r-x, owner games, group dip, setuid
- 13. befahrheit/einkraute, mode -w---xr--, owner mail, group floppy, setuid
- 14. zerhaltst/ausgehundtete/zertrauen, mode rw--wxrwx, owner mail, group voice
- 15. zerhaltst/ausgehundtete/einstehse, mode rwxrwxr--, owner mail, group dip, setuid
- 16. aufgekletten/ausgekraut/aussitzer, mode -wxrw-rwx, owner news, group student
- 17. befahrheit/einkraute/angerabarbs, mode rw-r-x--x, owner student, group fax, setuid
- 18. aufgekletten/ausgekraut/angesprachung, mode r-x-wx---, owner news, group cdrom
- 19. befahrheit/einkraute/entraust, mode rwx--xrwx, owner proxy, group voice, setuid
- 20. zerhaltst/aussinntest/ausgesitztete, mode ----wx---, owner news, group student, setuid

Your work will be **automatically marked** by comparing the contents of the compressed tar file against a template. Therefore it is important that you have every detail correct.

This exercise can be be completed using the cd, mkdir, chown, chmod and sudo shell commands, although you can use other shell commands if you wish.

An unsophisticated script to complete this would be 2372 bytes long, while a compact script would be no larger than 1217.

Grading for this exercise for you is according to the following guide:

Requirement	Percentage
Correctness of solution	60%
Compactness of solution	40%

The compactness scores are according to the following table:

Length of script	Percentage
2373 bytes or more	0%
1795 - 2372 bytes	5%
1218 – 1794 bytes	15%
1035 - 1217 bytes	25%
less than 1035 bytes	40%

To test your solution, use a command like:

```
sudo tar zcf unit1-solution3.tgz unit1exercise3
./unit1-exercise-3-grade.sh unit1-solution3.sh
```

To submit your solution (which you can do as many times as you like), use a command like:

# 4 Set-group ID Directories

Write a shell-script called unit1-solution4.sh that creates directories inside a directory called unit1exercise4 with the following properties, and then creates a compressed tar file called unit1-solution4.tgz

- 1. aufgesitzen, mode ---rwx--x, group voice, setgid
- 2. aufgepflumheit, mode --xr-xrwx, group tape, setgid
- 3. angehheit, mode r-xr--r-, group tape
- 4. anrabarbs, mode -w---rw-, group news, setgid
- 5. aussinnst, mode r----rw-, group fax, setgid
- 6. angelaufheit, mode ----w---, group cdrom, setgid
- 7. angelauft, mode r---wx--x, group fax, setgid
- 8. zerrauchse, mode r--rw-r-x, group proxy
- 9. zerrauchse/aufklettte, mode rwx----, group voice
- 10. anrabarbs/zerschmecktete, mode ----wxr-x, group mail, setgid
- 11. aussinnst/aufpflumte, mode r-xrwx-wx, group mail, setgid
- 12. aussinnst/bepflums, mode --xr-x-x, group cdrom
- 13. zerrauchse/angeschmeckt, mode -w----w-, group news, setgid
- 14. aussinnst/aufpflumte/einrauchkeit, mode ----w-rwx, group floppy, setgid
- 15. zerrauchse/angeschmeckt/enkletttete, moder---w--wx, group cdrom, setgid

- 16. zerrauchse/angeschmeckt/zerlaufen, moder--r-xr-x, group fax, setgid
- 17. aussinnst/bepflums/ausgesitzt, mode rwxrwx-w-, group cdrom
- $18. \ \ \, {\tt zerrauchse/angeschmeckt/ausgekletttest}, \ \ \, {\tt moderw-rwxrw-}, \ \, {\tt group\ voice}, \\ \ \, {\tt setgid}$
- 19. anrabarbs/zerschmecktete/angewitzt, mode ---r-rwx, group news, setgid
- 20. zerrauchse/angeschmeckt/ensinnheit, mode ----rwx, group mail

Your work will be **automatically marked** by comparing the contents of the compressed tar file against a template. Therefore it is important that you have every detail correct.

This exercise can be be completed using the cd, mkdir, chown, chmod and sudo shell commands, although you can use other shell commands if you wish.

An unsophisticated script to complete this would be 2446 bytes long, while a compact script would be no larger than 1108.

Grading for this exercise for you is according to the following guide:

Requirement	Percentage
Correctness of solution	60%
Compactness of solution	40%

The compactness scores are according to the following table:

Length of script	Percentage
2447 bytes or more	0%
1778 - 2446 bytes	5%
1109 – 1777 bytes	15%
942 – 1108 bytes	25%
less than 942 bytes	40%

To test your solution, use a command like:

```
sudo tar zcf unit1-solution4.tgz unit1exercise4
./unit1-exercise-4-grade.sh unit1-solution4.sh
```

To submit your solution (which you can do as many times as you like), use a command like:

# 5 Interpreting File Permissions

For each of the following exercises, determine whether the given file or directory can be accessed in the manner described. Remember that file or directory access can be mediated by owner, group or other permissions, and that the first matching item applies.

As you have a 50% chance of getting each item correct, you must score more than 50% to obtain a positive result for this section. There are 40 questions, and your score will be (n-20)/20, where n is the number of correct responses.

You should record your answers in a single text file called unit1-answers.txt, consisting of 40 consecutive Y, 1, 2 or 3 characters on a single line.

To submit your answers (which you can do as many times as you like), commit your answer file to your git repository, and push it to github, e.g.: git add unit1-answers.txt; git commit unit1-answers.txt; git push origin master

At the end of this section there is a hash which reflects the hash of the correct result of all 40 questions. You can use this to check if you have all answers correct. However, it will not tell you how many you have correct (that would let you work out which ones were wrong through a process of elimination.

#### 5.1

Can the user **uucp**, who is a member of the **floppy** group, **execute** the file /austritttest/ausgerauchs/ausgefahrst? If not, which of the three directories blocks access (Y|1|2|3)

## 5.2

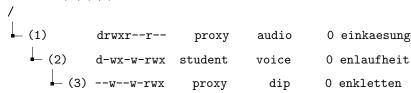
Can the user **student**, who is a member of the **uucp** group, **execute** the file /zersitzst/ausgekrause/aufkaesung? If not, which of the three directories blocks access (Y|1|2|3)

```
/
(1) dr-xrw-rw- student tape 0 zersitzst
(2) d-wxr--r-x news cdrom 0 ausgekrause
(3) ----rwxrw- student mail 0 aufkaesung
```

Can the user **uucp**, who is a member of the **tape** group, **execute** the file /geraucher/anwitzte/versitzse? If not, which of the three directories blocks access (Y|1|2|3)

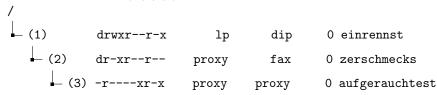
#### 5.4

Can the user **proxy**, who is a member of the **proxy** group, **execute** the file /einkaesung/enlaufheit/enkletten? If not, which of the three directories blocks access (Y|1|2|3)



### 5.5

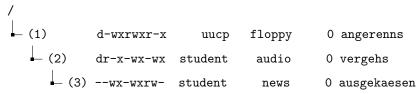
Can the user **proxy**, who is a member of the **floppy** group, **read from** the file /einrennst/zerschmecks/aufgerauchtest? If not, which of the three directories blocks access (Y|1|2|3)



## 5.6

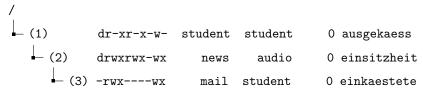
Can the user **news**, who is a member of the **uucp** group, **execute** the file /versinntete/angegehtest/verrabarbtest? If not, which of the three directories blocks access (Y|1|2|3)

Can the user **student**, who is a member of the **floppy** group, **write to** the file /angerenns/vergehs/ausgekaesen? If not, which of the three directories blocks access (Y|1|2|3)



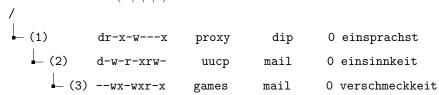
#### 5.8

Can the user **proxy**, who is a member of the **audio** group, **write to** the file /ausgekaess/einsitzheit/einkaestete? If not, which of the three directories blocks access (Y|1|2|3)



## 5.9

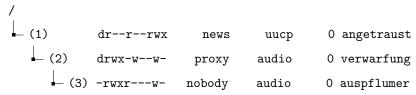
Can the user **proxy**, who is a member of the **mail** group, **execute** the file /einsprachst/einsinnkeit/verschmeckkeit? If not, which of the three directories blocks access (Y|1|2|3)



Can the user **games**, who is a member of the **student** group, **read from** the file /auskatzetete/einklettkeit/angepflumung? If not, which of the three directories blocks access (Y|1|2|3)

#### 5.11

Can the user **mail**, who is a member of the **audio** group, **read from** the file /angetraust/verwarfung/auspflumer? If not, which of the three directories blocks access (Y|1|2|3)



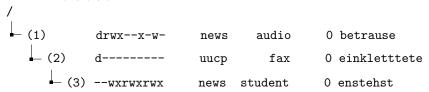
## 5.12

Can the user **news**, who is a member of the **dip** group, **write to** the file /aufgekrauheit/zerlaufkeit/einrabarbtete? If not, which of the three directories blocks access (Y|1|2|3)

## 5.13

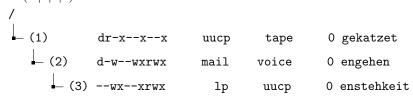
Can the user **proxy**, who is a member of the **audio** group, **execute** the file /antraukeit/bekletttete/anschmeckte? If not, which of the three directories blocks access (Y|1|2|3)

Can the user **news**, who is a member of the **fax** group, **write to** the file /betrause/einkletttete/enstehst? If not, which of the three directories blocks access (Y|1|2|3)



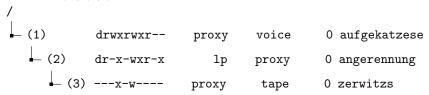
#### 5.15

Can the user **uucp**, who is a member of the **floppy** group, **write to** the file /gekatzet/engehen/enstehkeit? If not, which of the three directories blocks access (Y|1|2|3)



## 5.16

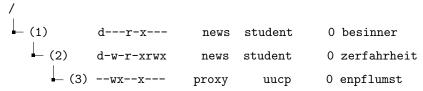
Can the user **proxy**, who is a member of the **student** group, **read from** the file /aufgekatzese/angerennung/zerwitzs? If not, which of the three directories blocks access (Y|1|2|3)



Can the user **nobody**, who is a member of the **tape** group, **write to** the file /aufwitztest/ausfahrung/verstehung? If not, which of the three directories blocks access (Y|1|2|3)

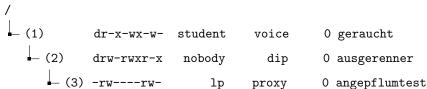
#### 5.18

Can the user **games**, who is a member of the **uucp** group, **execute** the file /besinner/zerfahrheit/enpflumst? If not, which of the three directories blocks access (Y|1|2|3)



## 5.19

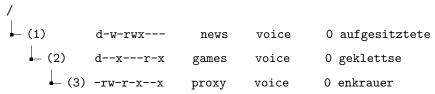
Can the user lp, who is a member of the tape group, read from the file /geraucht/ausgerenner/angepflumtest? If not, which of the three directories blocks access (Y|1|2|3)



#### 5.20

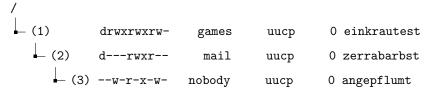
Can the user **proxy**, who is a member of the **audio** group, **execute** the file /gewarfkeit/angehundtest/enschmecken? If not, which of the three directories blocks access (Y|1|2|3)

Can the user lp, who is a member of the **voice** group, **execute** the file /aufgesitztete/geklettse/enkrauer? If not, which of the three directories blocks access (Y|1|2|3)



#### 5.22

Can the user **student**, who is a member of the **uucp** group, **read from** the file /einkrautest/zerrabarbst/angepflumt? If not, which of the three directories blocks access (Y|1|2|3)

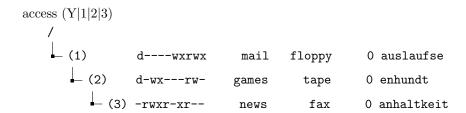


## 5.23

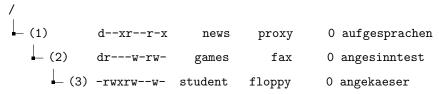
Can the user **nobody**, who is a member of the **student** group, **write to** the file /aufgekatzetest/angewarfs/aufgeklettst? If not, which of the three directories blocks access (Y|1|2|3)

### 5.24

Can the user lp, who is a member of the tape group, read from the file /auslaufse/enhundt/anhaltkeit? If not, which of the three directories blocks

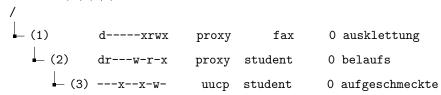


Can the user **student**, who is a member of the **fax** group, **execute** the file /aufgesprachen/angesinntest/angekaeser? If not, which of the three directories blocks access (Y|1|2|3)



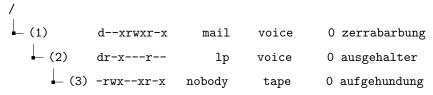
## 5.26

Can the user **nobody**, who is a member of the **student** group, **execute** the file /ausklettung/belaufs/aufgeschmeckte? If not, which of the three directories blocks access (Y|1|2|3)



## 5.27

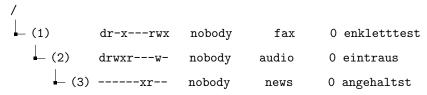
Can the user **nobody**, who is a member of the **voice** group, **execute** the file /zerrabarbung/ausgehalter/aufgehundung? If not, which of the three directories blocks access (Y|1|2|3)



Can the user **uucp**, who is a member of the **student** group, **execute** the file /auftraut/angekrauung/versitzer? If not, which of the three directories blocks access (Y|1|2|3)

## 5.29

Can the user **nobody**, who is a member of the **uucp** group, **execute** the file /enkletttest/eintraus/angehaltst? If not, which of the three directories blocks access (Y|1|2|3)



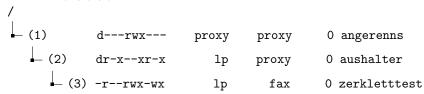
### 5.30

Can the user **uucp**, who is a member of the **floppy** group, **read from** the file /auflaufte/auftraute/gesprachte? If not, which of the three directories blocks access (Y|1|2|3)

## 5.31

Can the user **uucp**, who is a member of the **student** group, **write to** the file /zersitztete/aufrabarbte/berabarbkeit? If not, which of the three directories blocks access (Y|1|2|3)

Can the user **news**, who is a member of the **fax** group, **execute** the file /angerenns/aushalter/zerkletttest? If not, which of the three directories blocks access (Y|1|2|3)

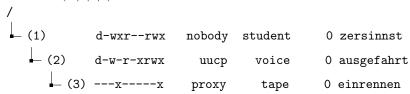


#### 5.33

Can the user games, who is a member of the student group, read from the file /bepflumte/auswarfse/vergehtest? If not, which of the three directories blocks access (Y|1|2|3)

#### 5.34

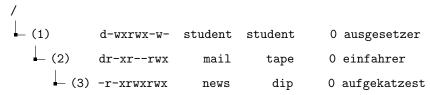
Can the user **proxy**, who is a member of the **mail** group, **read from** the file /zersinnst/ausgefahrt/einrennen? If not, which of the three directories blocks access (Y|1|2|3)



Can the user **uucp**, who is a member of the **dip** group, **read from** the file /eintraust/ausrenntete/zerpflums? If not, which of the three directories blocks access (Y|1|2|3)

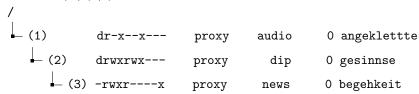
#### 5.36

Can the user **news**, who is a member of the **cdrom** group, **execute** the file /ausgesetzer/einfahrer/aufgekatzest? If not, which of the three directories blocks access (Y|1|2|3)



## 5.37

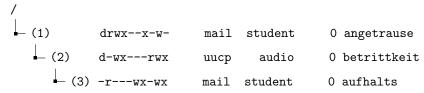
Can the user **proxy**, who is a member of the **student** group, **read from** the file /angeklettte/gesinnse/begehkeit? If not, which of the three directories blocks access (Y|1|2|3)



## 5.38

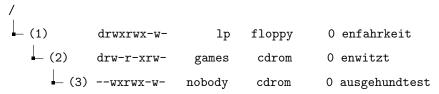
Can the user **nobody**, who is a member of the **news** group, **execute** the file /ankaesen/bekrause/angestehkeit? If not, which of the three directories blocks access (Y|1|2|3)

Can the user **mail**, who is a member of the **audio** group, **read from** the file /angetrause/betrittkeit/aufhalts? If not, which of the three directories blocks access (Y|1|2|3)



#### 5.40

Can the user lp, who is a member of the **cdrom** group, **execute** the file /enfahrkeit/enwitzt/ausgehundtest? If not, which of the three directories blocks access (Y|1|2|3)



## Hash for checking if you have all 40 correct

af 8026270 e 43 b 19227566 b 27c698 e 22 a b 04 b 0 d b b a e b 04 c 513 a 454 b c c 75 a 3 c 169 a feature of the contraction of the contractio

You can check your result with a command like:

echo "2YY13YY2YYY3Y3YY2Y22YY11Y2Y1YY2YYY3Y3YY" | 
$$\setminus$$
 shasum -a 512 | cut -c1-64

(But don't forget to put your string of Y's and N's in place of those)

If the output of that command matches the hash at the end of this section, then you almost certainly have all 40 correct.