# 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. anfahrs, mode ----rw-
- 2. angesprachen, mode r---wxrw-
- 3. angestehte, mode ---rw----
- 4. angegehse, mode -w-rwx-w-
- 5. belaufheit, mode rwx-----
- 6. aufwarfheit, mode r-x-wx---
- 7. ensitzung, mode -w--wx---
- 8. angekraust, mode r---wxrw-
- 9. angestehte/ansetzer, mode -w--wx-w-
- 10. angegehse/engehheit, mode --x--x-wx
- 11. aufwarfheit/auftrauer, mode r-x--x--x
- 12. anfahrs/ansprachte, mode -wx-w--wx
- 13. ensitzung/ensitzen, mode --xr-xr--
- 14. anfahrs/ansprachte/aufkrauheit, mode r--r-x--x
- 15. ensitzung/ensitzen/behaltst, mode -wx---r--
- 16. ensitzung/ensitzen/enkatzetest, mode --x-wx--x
- 17. angestehte/ansetzer/angegehse, mode r--r-xrwx
- 18. anfahrs/ansprachte/bewarfte, mode r--rwx-w-
- 19. aufwarfheit/auftrauer/enkaesst, mode -wxr-x-w-
- 20. angegehse/engehheit/einlaufte, mode r--r-x

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 2334 bytes long, while a compact script would be no larger than 942.

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
2335 bytes or more	0%
1639 - 2334 bytes	5%
943 – 1638 bytes	15%
801 - 942  bytes	25%
less than 801 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:

```
sudo tar zcf unit1-solution1.tgz unit1exercise1
    git add unit1-solution1.sh unit1-solution1.tgz
git commit unit1-solution1638.sh unit1-solution2060361639.tgz
    git push origin master
```

# 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. anlaufst, mode --xr-xr--, owner uucp, group tape
- 2. anpflumst, mode ----wx--x, owner lp, group mail
- 3. bekatzekeit, mode rw---x-w-, owner news, group cdrom
- 4. einkletten, mode -w--w-r--, owner uucp, group uucp
- 5. zersitzheit, mode r-x-wxrwx, owner news, group audio
- 6. angerauchst, mode -w--wx-w-, owner nobody, group mail

- 7. verrenner, mode --x-w---x, owner uucp, group dip
- 8. angehaltkeit, mode -w-r---wx, owner games, group student
- 9. bekatzekeit/angehkeit, mode --xr--r-x, owner lp, group voice
- 10. bekatzekeit/angehunden, mode --xrw-r--, owner nobody, group proxy
- 11. anpflumst/aufsinnte, mode rwx--xr-x, owner proxy, group proxy
- 12. angerauchst/angehalten, mode r-xr----, owner uucp, group uucp
- 13. bekatzekeit/betritttete, mode -w----, owner student, group mail
- 14. anpflumst/aufsinnte/aufwarfst, mode -wxrwxr--, owner news, group proxy
- 15. bekatzekeit/angehkeit/auspflumer, mode --x---r-, owner mail, group mail
- 16. bekatzekeit/betritttete/angesteher, mode r--rw--w-, owner student, group proxy
- 17. angerauchst/angehalten/angeraucher, mode -wxr-x-w-, owner games, group voice
- 18. bekatzekeit/betritttete/verschmecken, mode-wx-w-rwx, owner games, group fax
- 19. angerauchst/angehalten/ausgetrauung, mode r-xrw--wx, owner mail, group student
- 20. bekatzekeit/angehunden/versinnkeit, mode r---w-r-x, owner games, group fax

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 2379 bytes long, while a compact script would be no larger than 1206.

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
2380 bytes or more	0%
1793 - 2379 bytes	5%
1207 - 1792 bytes	15%
1026 - 1206 bytes	25%
less than 1026 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:

sudo tar zcf unit1-solution2.tgz unit1exercise2
 git add unit1-solution2.sh unit1-solution2.tgz
git commit unit1-solution1792.sh unit1-solution2060361639.tgz
 git push origin master

## 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. aufgestehheit, mode ----wxrw-, owner proxy, group audio
- 2. angetraut, mode -w-rw--wx, owner nobody, group audio
- 3. geschmecktest, mode --x-w-r-x, owner news, group fax
- 4. bewarfen, mode --xrw---x, owner nobody, group uucp, setuid
- 5. ansinntete, mode -w--w-r-x, owner nobody, group news
- 6. auftrittung, mode rwx--x--, owner lp, group proxy
- 7. verrennheit, mode -w-r-xr--, owner news, group fax
- 8. ausgehs, mode -wxrwxrw-, owner news, group uucp
- 9. verrennheit/ausgetraust, mode r-xr--r-, owner uucp, group voice
- 10. geschmecktest/ausgehaltung, mode ----xrwx, owner mail, group floppy, setuid
- 11. auftrittung/angehundung, mode -wxrwxrwx, owner nobody, group proxy
- 12. bewarfen/gesinnen, moder---w-rwx, owner student, group uucp, setuid

- 13. bewarfen/aufsprachtest, mode rwx-wxrwx, owner proxy, group proxy
- 14. bewarfen/gesinnen/einfahrtest, mode ---rwxrw-, owner nobody, group cdrom, setuid
- 15. bewarfen/aufsprachtest/aufgekaest, mode ---r-x-wx, owner games, group tape, setuid
- 16. geschmecktest/ausgehaltung/behaltheit, mode -wx-w-rw-, owner uucp, group proxy, setuid
- 17. auftrittung/angehundung/einhalttest, mode--xrwxr-x, owner student, group news
- 18. geschmecktest/ausgehaltung/verkrautete, mode rw--wx--x, owner uucp, group tape, setuid
- 19. bewarfen/gesinnen/aufkaestete, mode-wx-w--w-, owner nobody, group dip, setuid
- 20. auftrittung/angehundung/verhunds, mode r-xr--r-x, owner student, group proxy, 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 2408 bytes long, while a compact script would be no larger than 1244.

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
2409 bytes or more	0%
1827 - 2408 bytes	5%
1245 - 1826 bytes	15%
1058 - 1244 bytes	25%
less than 1058 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:

sudo tar zcf unit1-solution3.tgz unit1exercise3
 git add unit1-solution3.sh unit1-solution3.tgz
git commit unit1-solution1826.sh unit1-solution2060361639.tgz
 git push origin master

# 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. bekatzetest, mode --xr-xrwx, group fax, setgid
- 2. auskatzete, mode -----x, group dip
- 3. ausgehundtest, mode rwx-w-rw-, group cdrom
- 4. einkletttete, mode -wxr---x, group fax, setgid
- 5. angefahrung, mode --xr---x, group cdrom, setgid
- 6. ausgehaltse, mode ---r-rwx, group mail, setgid
- 7. gerabarbst, mode -w-r--rwx, group voice, setgid
- 8. angesitzte, mode rw--wx---, group tape, setgid
- 9. angefahrung/gerenntete, mode r-x-wx--x, group tape
- 10. auskatzete/aufstehen, mode ----w---x, group mail
- 11. ausgehaltse/zersitzen, mode rwxrwxrw-, group voice
- 12. ausgehundtest/eingehtete, mode r---wxrwx, group news
- 13. auskatzete/aussetzs, mode --xr---w-, group audio, setgid
- 14. ausgehaltse/zersitzen/gehundtest, mode --xrwx-w-, group news
- 15. auskatzete/aussetzs/einlaufung, mode --xrwx-wx, group audio
- 16. ausgehaltse/zersitzen/ausgesinns, mode ----w-rw-, group tape, setgid
- 17. auskatzete/aufstehen/auswarfkeit, mode-wx-wxr-x, group fax, setgid
- 18. auskatzete/aufstehen/ensetzkeit, mode ---rwx--x, group tape
- 19. angefahrung/gerenntete/enhundtest, mode r-xr-xrw-, group tape, setgid

20. ausgehundtest/eingehtete/enklettheit, moderw--w-r--, group proxy

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 2421 bytes long, while a compact script would be no larger than 1101.

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
2422 bytes or more	0%
1762 - 2421 bytes	5%
1102 - 1761 bytes	15%
936 – 1101 bytes	25%
less than 936 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:

```
sudo tar zcf unit1-solution4.tgz unit1exercise4
    git add unit1-solution4.sh unit1-solution4.tgz
git commit unit1-solution1761.sh unit1-solution2060361639.tgz
    git push origin master
```

# 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 lp, who is a member of the **voice** group, **execute** the file /angerabarber/enlaufer/ausgerabarber for not, which of the three directories blocks access (Y|1|2|3)

## 5.2

Can the user **news**, who is a member of the **student** group, **read from** the file /ensprachse/verkletttest/angekatzetete? If not, which of the three directories blocks access (Y|1|2|3)

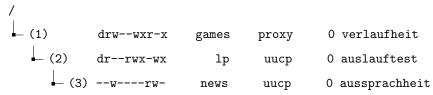
## 5.3

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

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

## 5.5

Can the user **news**, who is a member of the **uucp** group, **write to** the file /verlaufheit/auslauftest/aussprachheit? If not, which of the three directories blocks access (Y|1|2|3)



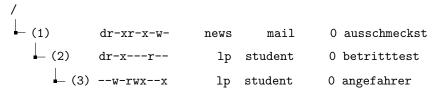
## 5.6

Can the user **nobody**, who is a member of the **cdrom** group, **read from** the file /ausgerauchung/zerrabarbtest/einkaeskeit? If not, which of the three directories blocks access (Y|1|2|3)

## 5.7

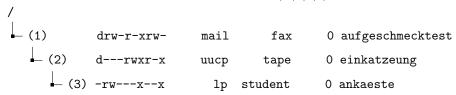
Can the user mail, who is a member of the fax group, execute the file /zerpflumtest/einwarfheit/angesinntest? If not, which of the three directories blocks access (Y|1|2|3)

Can the user **news**, who is a member of the **student** group, **write to** the file /ausschmeckst/betritttest/angefahrer? If not, which of the three directories blocks access (Y|1|2|3)



### 5.9

Can the user lp, who is a member of the fax group, execute the file /aufgeschmecktest/einkatzeung/ankaes. If not, which of the three directories blocks access (Y|1|2|3)



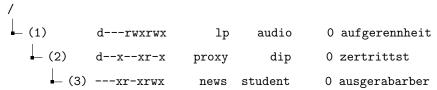
### 5.10

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

### 5.11

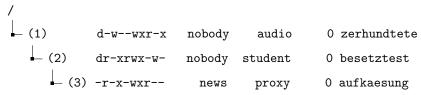
Can the user **news**, who is a member of the **fax** group, **read from** the file /aufgerenheit/zertrittst/ausgerabarber? If not, which of the three di-

rectories blocks access (Y|1|2|3)



## 5.12

Can the user **news**, who is a member of the **student** group, **read from** the file /zerhundtete/besetztest/aufkaesung? If not, which of the three directories blocks access (Y|1|2|3)

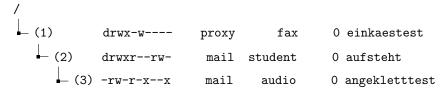


### 5.13

Can the user **nobody**, who is a member of the **fax** group, **execute** the file /einklettse/aufrabarbkeit/zersinns? If not, which of the three directories blocks access (Y|1|2|3)

### 5.14

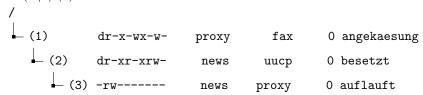
Can the user **mail**, who is a member of the **floppy** group, **write to** the file /einkaestest/aufsteht/angekletttest? If not, which of the three directories blocks access (Y|1|2|3)



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

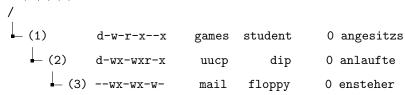
### 5.16

Can the user **news**, who is a member of the **tape** group, **write to** the file /angekaesung/besetzt/auflauft? If not, which of the three directories blocks access (Y|1|2|3)



## 5.17

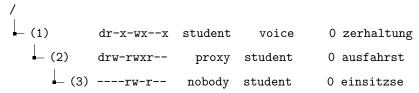
Can the user **mail**, who is a member of the **student** group, **execute** the file /angesitzs/anlaufte/ensteher? If not, which of the three directories blocks access (Y|1|2|3)



## 5.18

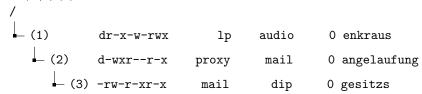
Can the user **mail**, who is a member of the **news** group, **read from** the file /gepflumse/gesetzse/ausrenntest? If not, which of the three directories blocks access (Y|1|2|3)

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



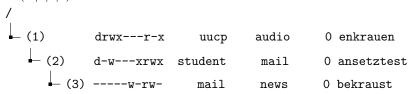
## 5.20

Can the user mail, who is a member of the voice group, execute the file /enkraus/angelaufung/gesitzs? If not, which of the three directories blocks access (Y|1|2|3)



## 5.21

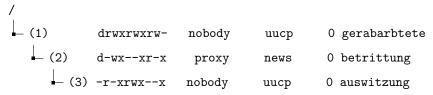
Can the user  $\mathbf{uucp}$ , who is a member of the  $\mathbf{dip}$  group,  $\mathbf{write}$  to the file /enkrauen/ansetztest/bekraust? If not, which of the three directories blocks access (Y|1|2|3)



Can the user **nobody**, who is a member of the **floppy** group, **write to** the file /einsprachtest/enstehst/angehaltheit? If not, which of the three directories blocks access (Y|1|2|3)

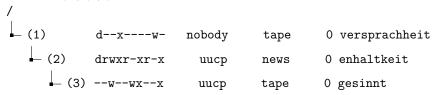
## 5.23

Can the user mail, who is a member of the uucp group, execute the file /gerabarbtete/betrittung/auswitzung? If not, which of the three directories blocks access (Y|1|2|3)



### 5.24

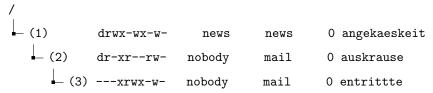
Can the user **uucp**, who is a member of the **news** group, **write to** the file /versprachheit/enhaltkeit/gesinnt? If not, which of the three directories blocks access (Y|1|2|3)



## 5.25

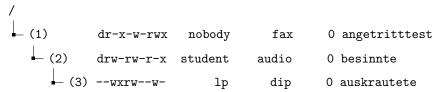
Can the user **nobody**, who is a member of the **proxy** group, **write to** the file /angehundse/ausgesetzt/enfahrer? If not, which of the three directories blocks access (Y|1|2|3)

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



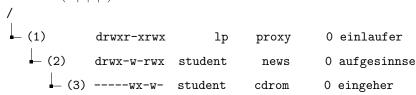
## 5.27

Can the user **nobody**, who is a member of the **dip** group, **write to** the file /angetritttest/besinnte/auskrautete? If not, which of the three directories blocks access (Y|1|2|3)



### 5.28

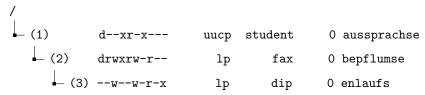
Can the user **student**, who is a member of the **voice** group, **write to** the file /einlaufer/aufgesinnse/eingeher? If not, which of the three directories blocks access (Y|1|2|3)



Can the user **mail**, who is a member of the **cdrom** group, **write to** the file /ausfahrte/einrabarbte/bewitzheit? If not, which of the three directories blocks access (Y|1|2|3)

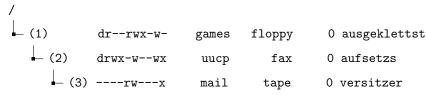
### 5.30

Can the user lp, who is a member of the **student** group, **write to** the file /aussprachse/bepflumse/enlaufs? If not, which of the three directories blocks access (Y|1|2|3)



## 5.31

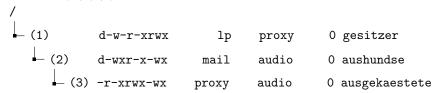
Can the user **uucp**, who is a member of the **mail** group, **execute** the file /ausgeklettst/aufsetzs/versitzer? If not, which of the three directories blocks access (Y|1|2|3)



### 5.32

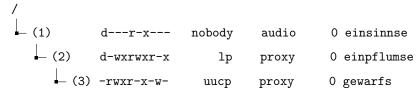
Can the user mail, who is a member of the mail group, read from the file /angesetzkeit/einkrautest/anwarftest? If not, which of the three directories blocks access (Y|1|2|3)

Can the user **uucp**, who is a member of the **audio** group, **write to** the file /gesitzer/aushundse/ausgekaestete? If not, which of the three directories blocks access (Y|1|2|3)



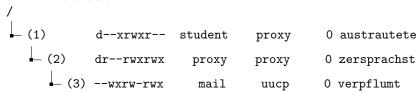
### 5.34

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



## 5.35

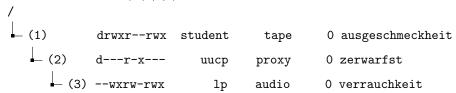
Can the user mail, who is a member of the **proxy** group, **read from** the file /austrautete/zersprachst/verpflumt? If not, which of the three directories blocks access (Y|1|2|3)



Can the user games, who is a member of the floppy group, read from the file /bekrauen/engeht/enlaufte? If not, which of the three directories blocks access (Y|1|2|3)

### 5.37

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



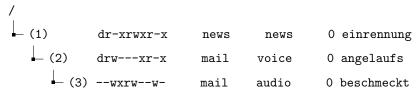
## 5.38

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

## 5.39

Can the user lp, who is a member of the **proxy** group, **write to** the file /verrabarbkeit/zersetzst/behundkeit? If not, which of the three directories blocks access (Y|1|2|3)

Can the user games, who is a member of the audio group, read from the file /einrennung/angelaufs/beschmeckt? If not, which of the three directories blocks access (Y|1|2|3)



## Hash for checking if you have all 40 correct

d2635936800238cc950c2c9c2acf9e6d2d8340133da4633ba6a70e4ff0c54b47

You can check your result with a command like:

echo "2YY13YY2YYYY3Y3YY2Y22YY11Y2Y1YY2YYY3Y3YY" | 
$$\$$
 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.