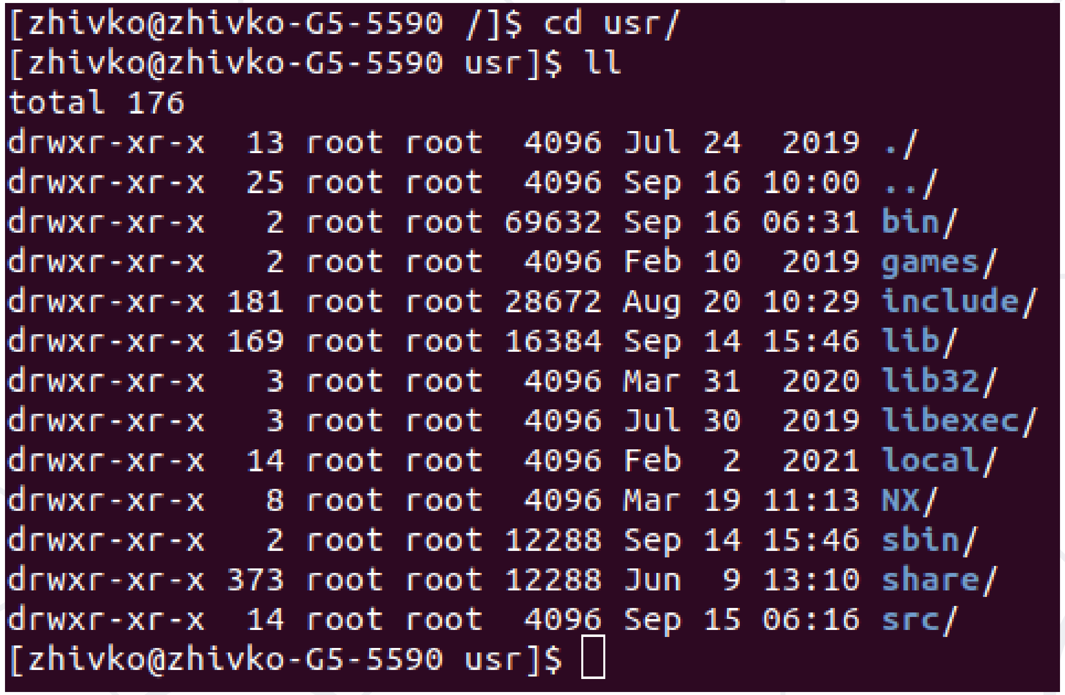
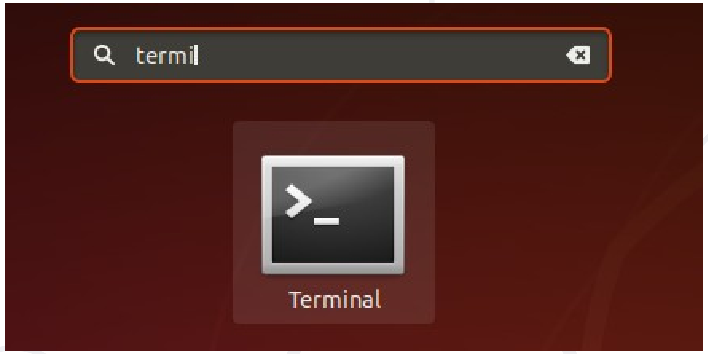
Ubuntu Basics



```
[zhivko@zhivko-G5-5590 /]$ cd usr/
[zhivko@zhivko-G5-5590 usr]$ ll
total 176
drwxr-xr-x  13 root root  4096 Jul 24  2019 ./
drwxr-xr-x  25 root root  4096 Sep 16 10:00 ../
drwxr-xr-x   2 root root 69632 Sep 16 06:31 bin/
drwxr-xr-x   2 root root  4096 Feb 10  2019 games/
drwxr-xr-x 181 root root 28672 Aug 20 10:29 include/
drwxr-xr-x 169 root root 16384 Sep 14 15:46 lib/
drwxr-xr-x   3 root root  4096 Mar 31  2020 lib32/
drwxr-xr-x   3 root root  4096 Jul 30  2019 libexec/
drwxr-xr-x  14 root root  4096 Feb  2  2021 local/
drwxr-xr-x   8 root root  4096 Mar 19 11:13 NX/
drwxr-xr-x   2 root root 12288 Sep 14 15:46 sbin/
drwxr-xr-x 373 root root 12288 Jun  9 13:10 share/
drwxr-xr-x  14 root root  4096 Sep 15 06:16 src/
[zhivko@zhivko-G5-5590 usr]$ 
```



Zhivko Petrov

A guy that knows C++

Software University

SoftUni

Software University

https://about.softuni.bg

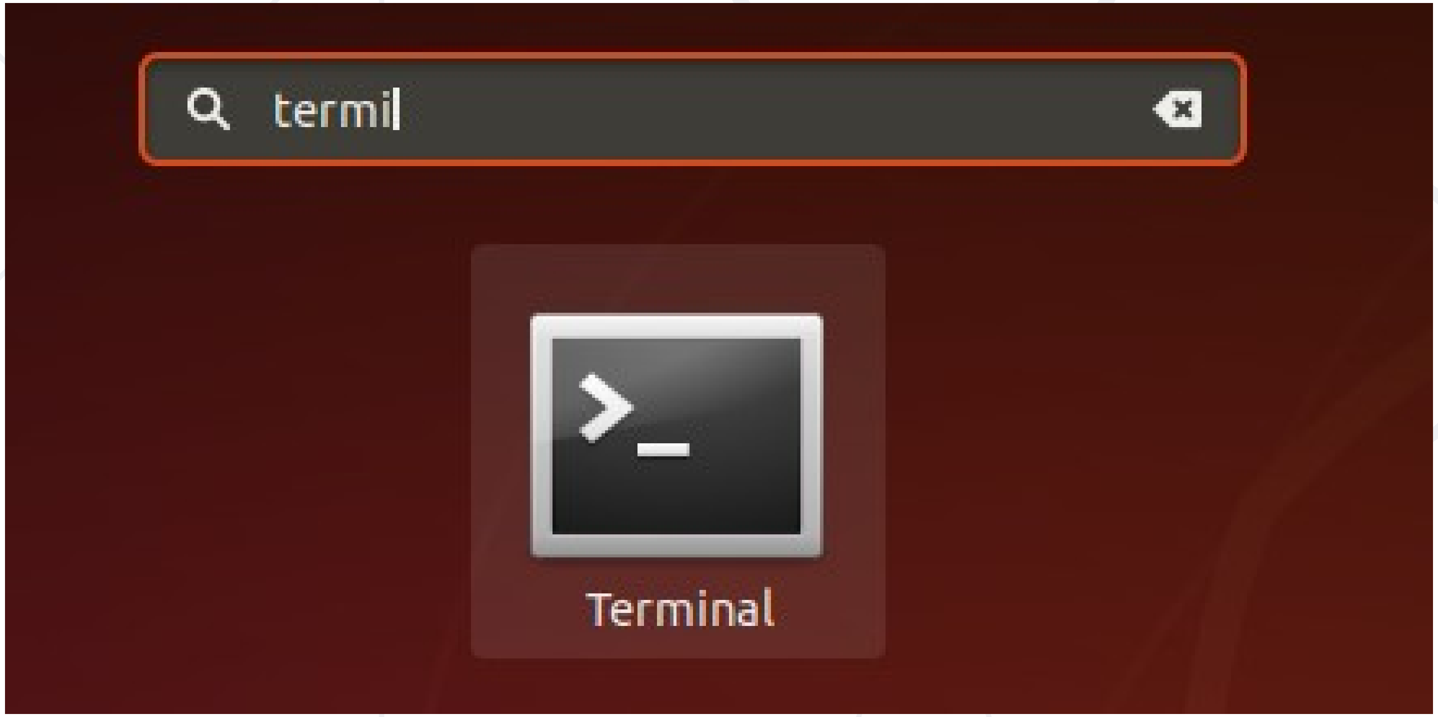
Have a Question?

sli.do

#app-dev-cpp

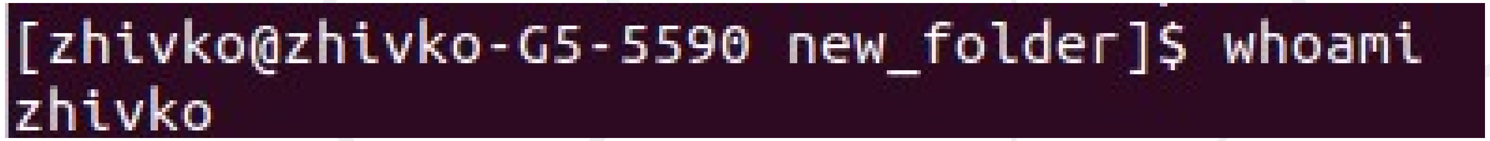
The Terminal

- Everything in the Ubuntu starts from the **terminal**
- It is the ultimate dev tool
- Bonus: it will make you feel like a hacker in-front of non-IT people :)



Bash

- The terminal supports by default a programming language – **Bash**
- Also referred to as “Shell script”*
- There are a set of incorporated bash command you can use out-of-the-box
- **whoami** – prints the current user associated with the session
- **cd** – change directory
- **ls** – lists the files in the current directory

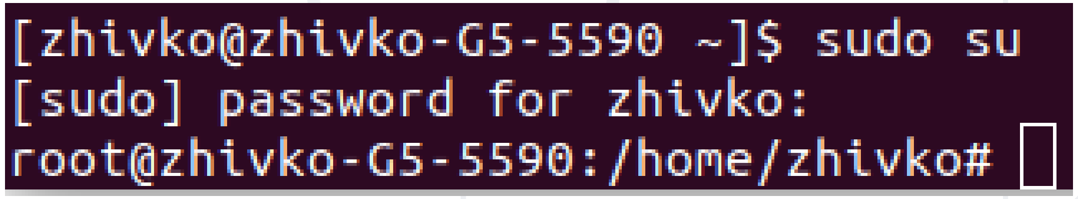


```
[zhivko@zhivko-G5-5590 new_folder]$ whoami
zhivko
```

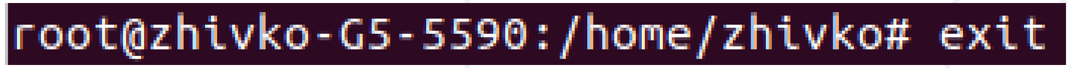
- *Geek Information - https://askubuntu.com/questions/172481/is-bash-scripting-the-same-as-shell-scripting

Super User

- Everything in the Ubuntu file system is a **file**
- In order to access certain files or perform certain operations **privileged rights** (access) is needed
- If your user does not have the required permissions – you need to use the **Super User**
- **sudo** – short for "super user do"
- You can log in as the super user (highly not recommended)
- Instead – for each command that requires permission - "sudo" is prepended to the command



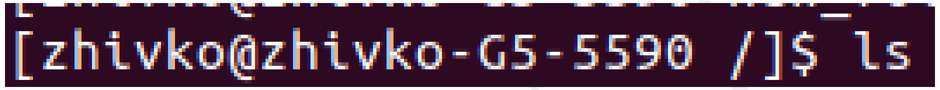
```
[zhivko@zhivko-G5-5590 ~]$ sudo su
[sudo] password for zhivko:
root@zhivko-G5-5590:/home/zhivko#
```



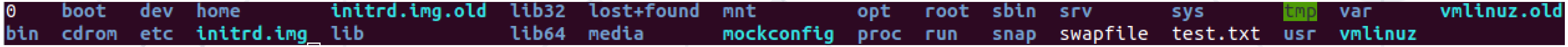
```
root@zhivko-G5-5590:/home/zhivko# exit
```

The root directory

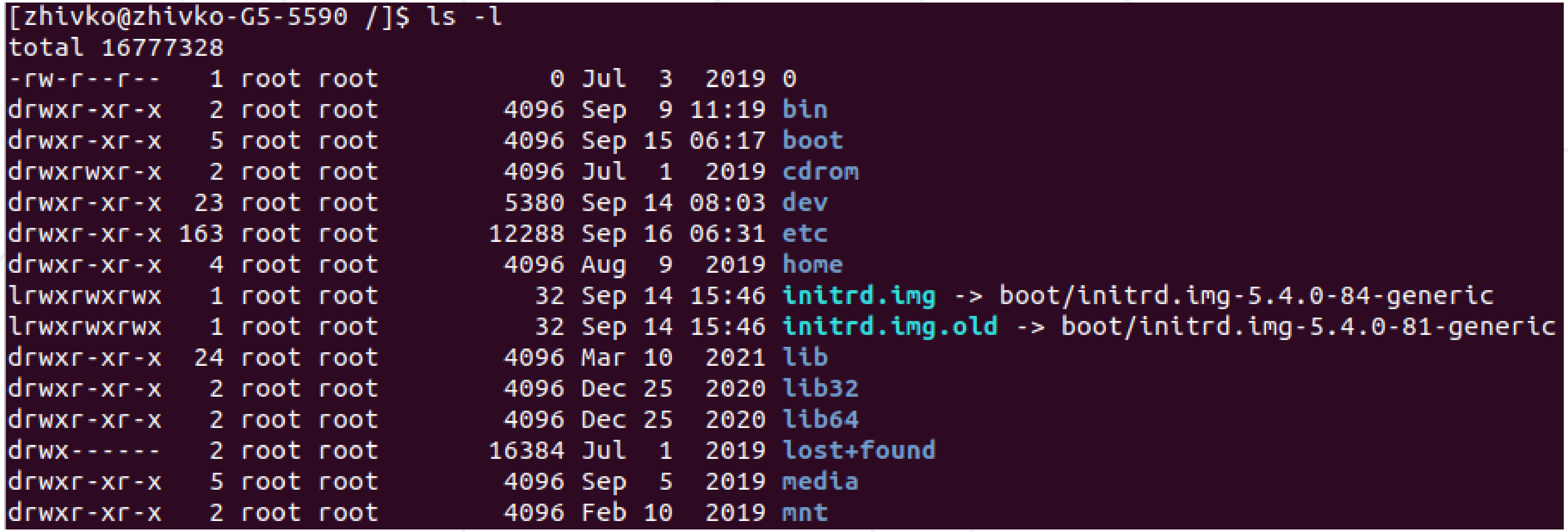
- The root directory “/”
- Equivalent to the “C:/” location in windows
- **ls** - list all the files in the directory
- **ls -l** - list files in a list view



```
[zhivko@zhivko-G5-5590 /]$ ls
```



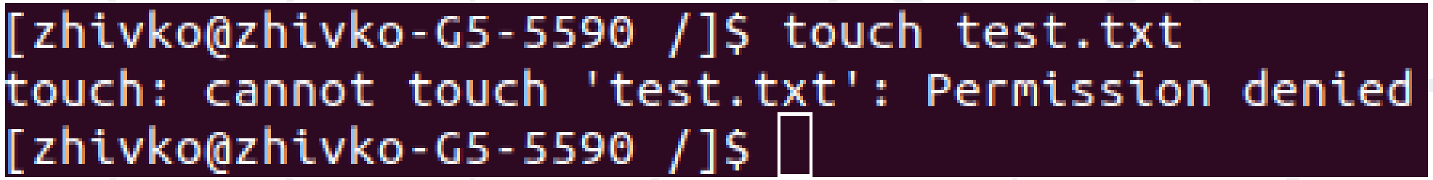
```
0    boot   dev  home        initrd.img.old  lib32  lost+found  mnt         opt   root  sbin  srv       sys       tmp  var      vmlinuz.old
bin  cdrom  etc  initrd.img  lib             lib64  media       mockconfig  proc  run   snap  swapfile  test.txt  usr  vmlinuz
```



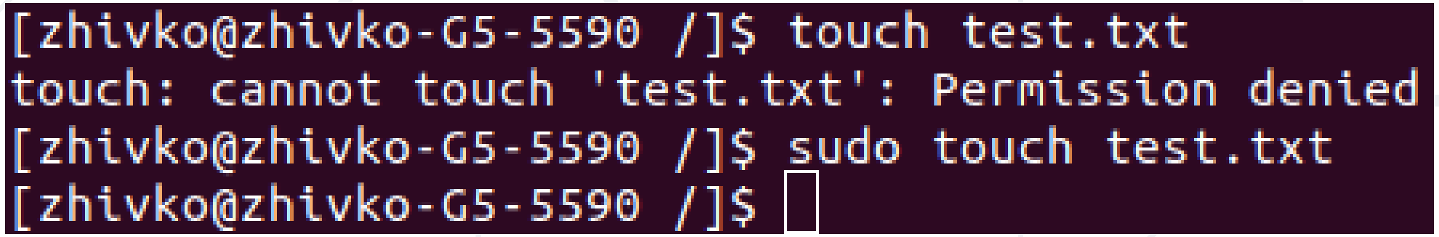
```
[zhivko@zhivko-G5-5590 /]$ ls -l
total 16777328
-rw-r--r--   1 root root          0 Jul  3  2019 0
drwxr-xr-x   2 root root       4096 Sep  9 11:19 bin
drwxr-xr-x   5 root root       4096 Sep 15 06:17 boot
drwxrwxr-x   2 root root       4096 Jul  1  2019 cdrom
drwxr-xr-x  23 root root       5380 Sep 14 08:03 dev
drwxr-xr-x 163 root root      12288 Sep 16 06:31 etc
drwxr-xr-x   4 root root       4096 Aug  9  2019 home
lrwxrwxrwx   1 root root         32 Sep 14 15:46 initrd.img -> boot/initrd.img-5.4.0-84-generic
lrwxrwxrwx   1 root root         32 Sep 14 15:46 initrd.img.old -> boot/initrd.img-5.4.0-81-generic
drwxr-xr-x  24 root root       4096 Mar 10  2021 lib
drwxr-xr-x   2 root root       4096 Dec 25  2020 lib32
drwxr-xr-x   2 root root       4096 Dec 25  2020 lib64
drwx------   2 root root      16384 Jul  1  2019 lost+found
drwxr-xr-x   5 root root       4096 Sep  5  2019 media
drwxr-xr-x   2 root root       4096 Feb 10  2019 mnt
```

Permissions

- The root directory “/” is **locked** for the normal user
- Try to create a file inside the root directory
- **touch** – creates an empty file with default permissions
- Root privileges are needed



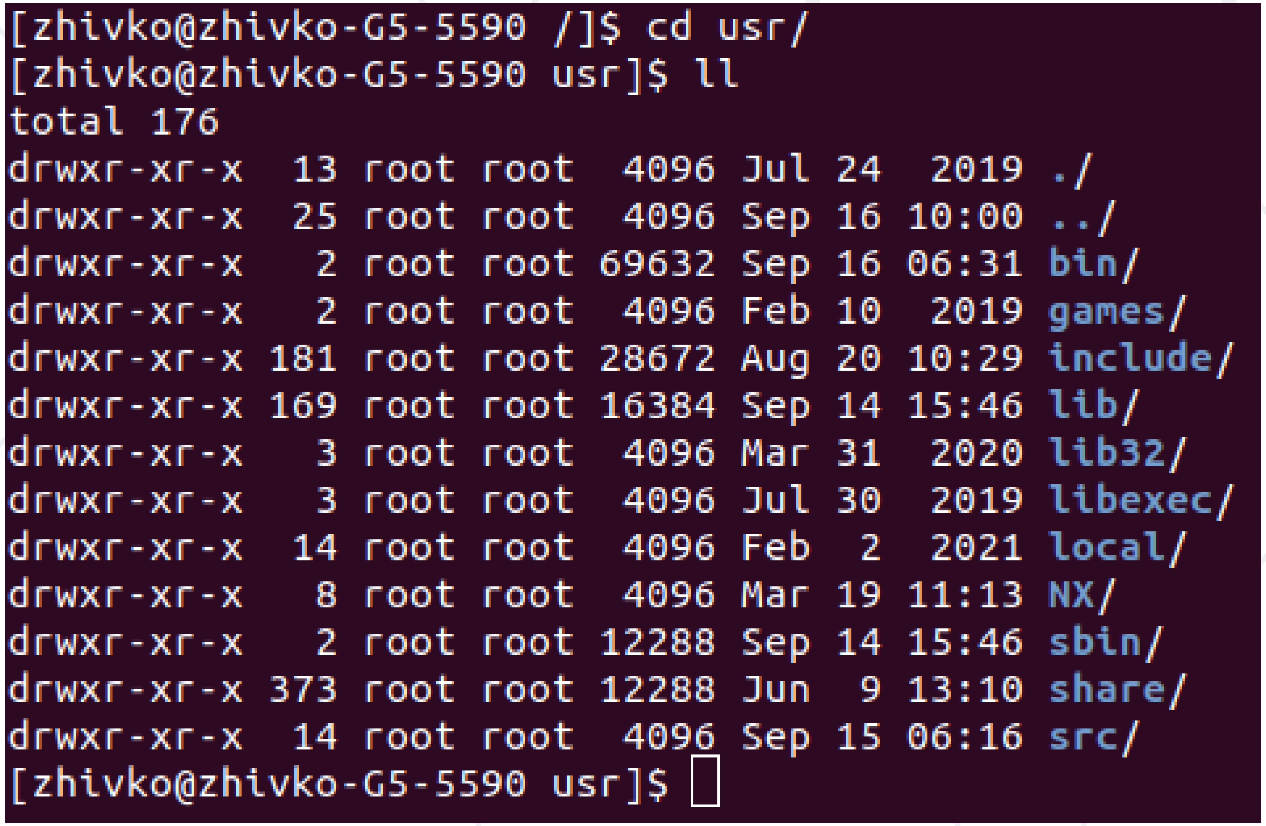
```
[zhivko@zhivko-G5-5590 /]$ touch test.txt
touch: cannot touch 'test.txt': Permission denied
[zhivko@zhivko-G5-5590 /]$ 
```



```
[zhivko@zhivko-G5-5590 /]$ touch test.txt
touch: cannot touch 'test.txt': Permission denied
[zhivko@zhivko-G5-5590 /]$ sudo touch test.txt
[zhivko@zhivko-G5-5590 /]$ 
```

usr folder

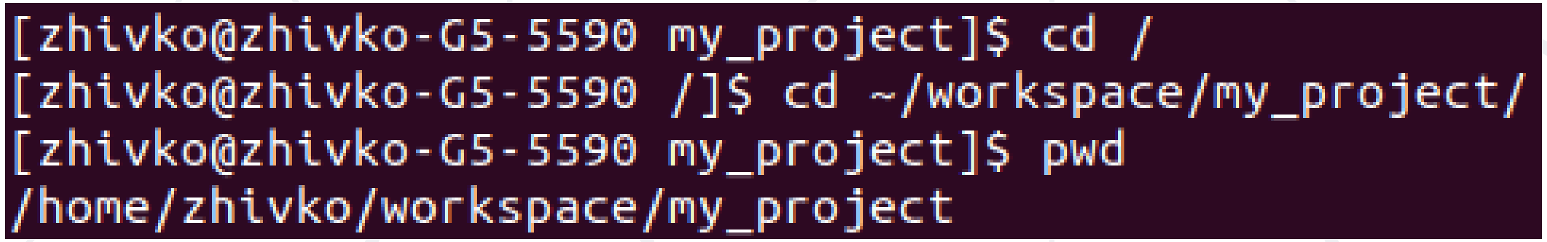
- There are many important folders in the root directory
- One of particular interest – the **usr** folder
- It contains system headers, libraries, binaries, etc...



```
[zhivko@zhivko-G5-5590 /]$ cd usr/
[zhivko@zhivko-G5-5590 usr]$ ll
total 176
drwxr-xr-x  13 root root  4096 Jul 24  2019 ./
drwxr-xr-x  25 root root  4096 Sep 16 10:00 ../
drwxr-xr-x   2 root root 69632 Sep 16 06:31 bin/
drwxr-xr-x   2 root root  4096 Feb 10  2019 games/
drwxr-xr-x 181 root root 28672 Aug 20 10:29 include/
drwxr-xr-x 169 root root 16384 Sep 14 15:46 lib/
drwxr-xr-x   3 root root  4096 Mar 31  2020 lib32/
drwxr-xr-x   3 root root  4096 Jul 30  2019 libexec/
drwxr-xr-x  14 root root  4096 Feb  2  2021 local/
drwxr-xr-x   8 root root  4096 Mar 19 11:13 NX/
drwxr-xr-x   2 root root 12288 Sep 14 15:46 sbin/
drwxr-xr-x 373 root root 12288 Jun  9 13:10 share/
drwxr-xr-x  14 root root  4096 Sep 15 06:16 src/
[zhivko@zhivko-G5-5590 usr]$ 
```

Home folder

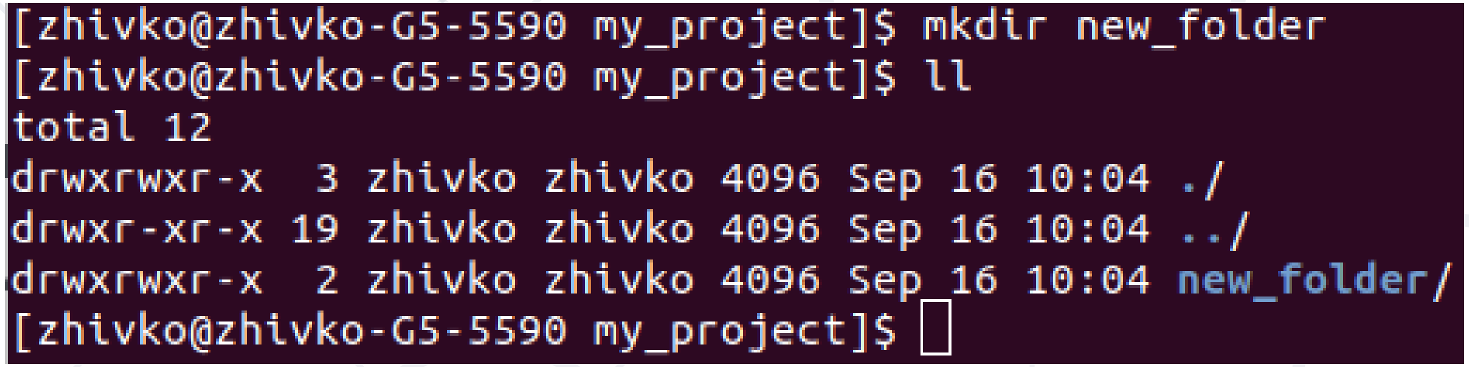
- The **HOME** folder is associated your your user home folder
- The Windows equivalent of “C:/Users/zhivko”
- You can use tilda (cd ~) as a shortcut to your home directory
- **pwd** – print working directory



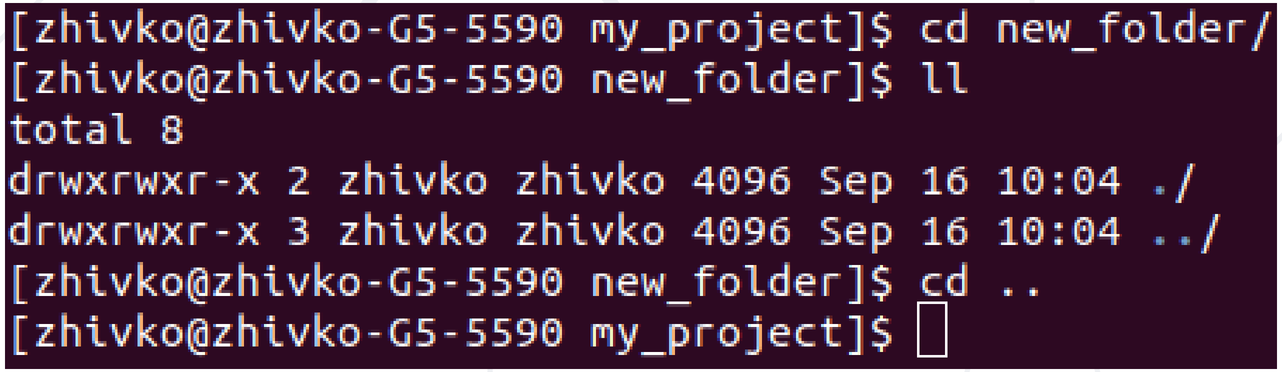
```
[zhivko@zhivko-G5-5590 my_project]$ cd /
[zhivko@zhivko-G5-5590 /]$ cd ~/workspace/my_project/
[zhivko@zhivko-G5-5590 my_project]$ pwd
/home/zhivko/workspace/my_project
```

File system & working with files

- **mkdir** – creates a folder with the specified name
- The ‘.’ is a marker for the **current folder** the terminal is located in
- The ‘..’ is a marker for the **parent folder**



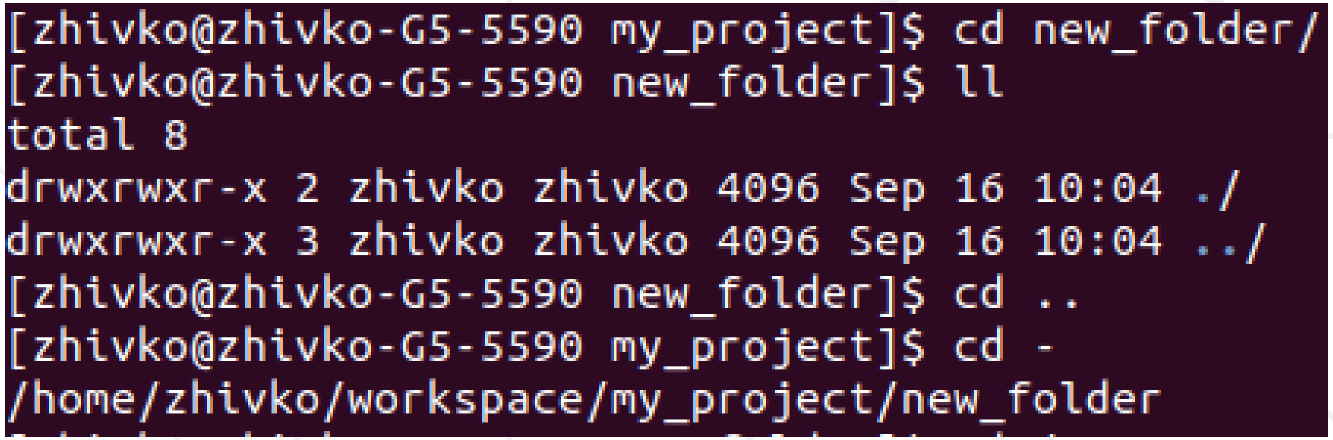
```
[zhivko@zhivko-G5-5590 my_project]$ mkdir new_folder
[zhivko@zhivko-G5-5590 my_project]$ ll
total 12
drwxrwxr-x  3 zhivko zhivko 4096 Sep 16 10:04 ./
drwxr-xr-x 19 zhivko zhivko 4096 Sep 16 10:04 ../
drwxrwxr-x  2 zhivko zhivko 4096 Sep 16 10:04 new_folder/
[zhivko@zhivko-G5-5590 my_project]$ 
```



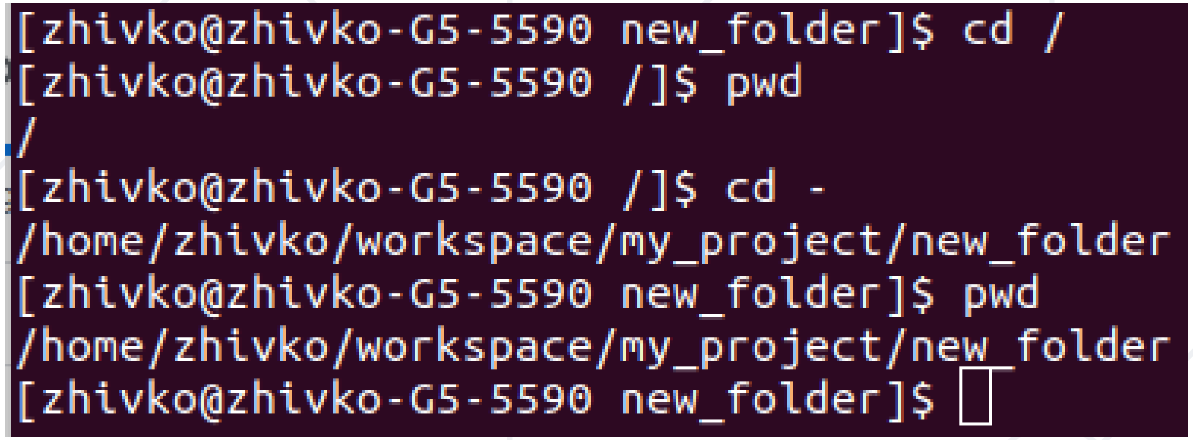
```
[zhivko@zhivko-G5-5590 my_project]$ cd new_folder/
[zhivko@zhivko-G5-5590 new_folder]$ ll
total 8
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:04 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:04 ../
[zhivko@zhivko-G5-5590 new_folder]$ cd ..
[zhivko@zhivko-G5-5590 my_project]$ 
```

Change directory shortcuts

- ‘**cd -**‘ - returns to the previous directory we came from



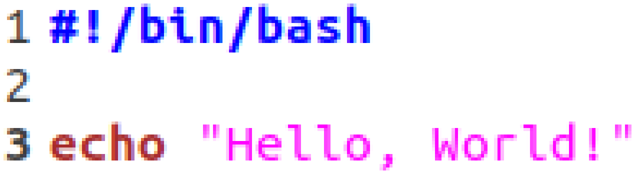
```
[zhivko@zhivko-G5-5590 my_project]$ cd new_folder/
[zhivko@zhivko-G5-5590 new_folder]$ ll
total 8
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:04 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:04 ../
[zhivko@zhivko-G5-5590 new_folder]$ cd ..
[zhivko@zhivko-G5-5590 my_project]$ cd -
/home/zhivko/workspace/my_project/new_folder
```



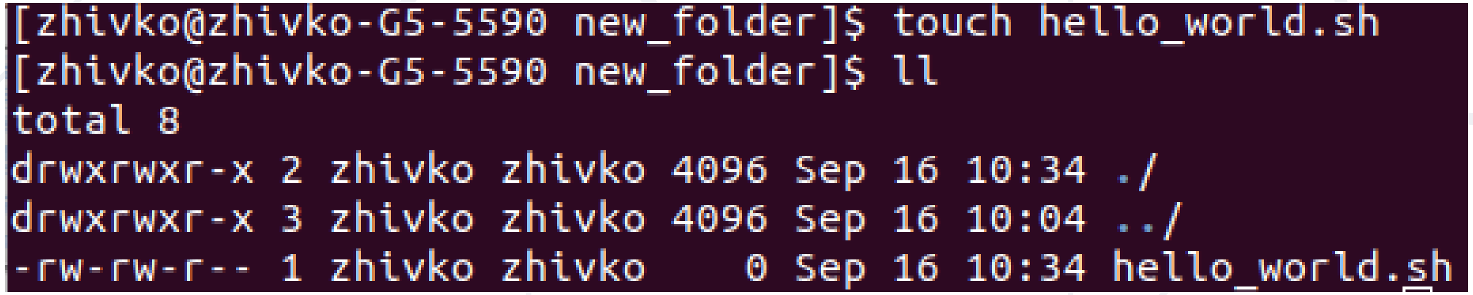
```
[zhivko@zhivko-G5-5590 new_folder]$ cd /
[zhivko@zhivko-G5-5590 /]$ pwd
/
[zhivko@zhivko-G5-5590 /]$ cd -
/home/zhivko/workspace/my_project/new_folder
[zhivko@zhivko-G5-5590 new_folder]$ pwd
/home/zhivko/workspace/my_project/new_folder
[zhivko@zhivko-G5-5590 new_folder]$
```

Bash Hello World

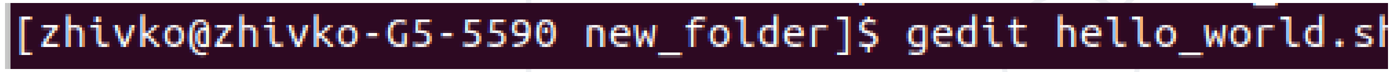
- Create an empty file “hello_world.sh”
- The extension **.sh** means “**shell script**”
- Use a text editor of choice to open it (**gedit** is chosen)
- Specify in the first row of the file – the bash scripting language will be used
- **echo** – the Shell script “print” command



```
#!/bin/bash

echo "Hello, World!"
```



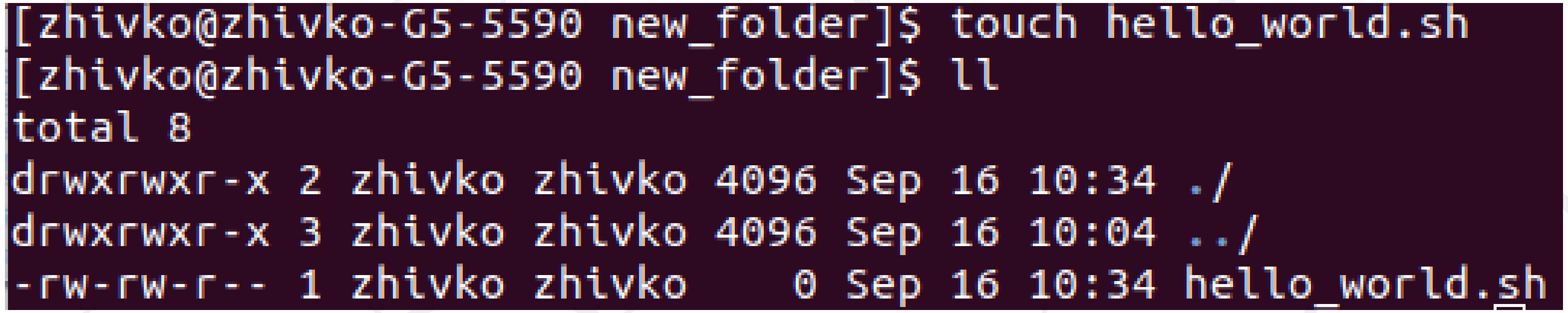
```
[zhivko@zhivko-G5-5590 new_folder]$ touch hello_world.sh
[zhivko@zhivko-G5-5590 new_folder]$ ll
total 8
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:34 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:04 ../
-rw-rw-r-- 1 zhivko zhivko    0 Sep 16 10:34 hello_world.sh
```



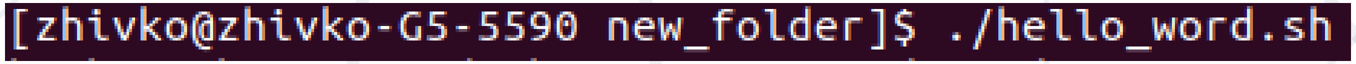
```
[zhivko@zhivko-G5-5590 new_folder]$ gedit hello_world.sh
```

Executing files

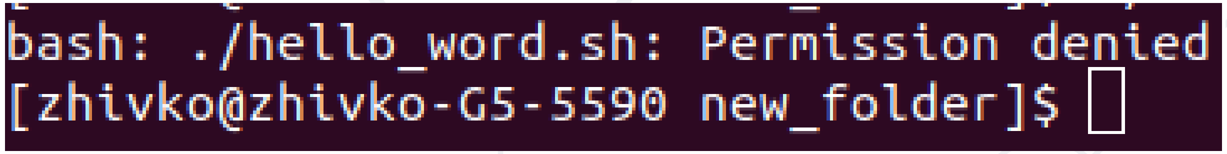
- ./filename
- The dot translates to ‘current directory’
- Ouch – permission denied!



```
[zhivko@zhivko-G5-5590 new_folder]$ touch hello_world.sh
[zhivko@zhivko-G5-5590 new_folder]$ ll
total 8
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:34 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:04 ../
-rw-rw-r-- 1 zhivko zhivko    0 Sep 16 10:34 hello_world.sh
```



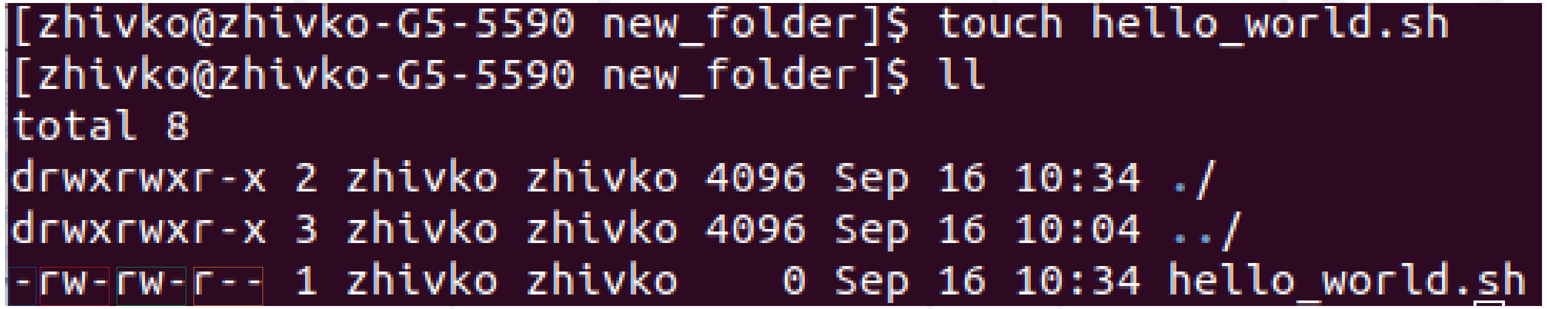
```
[zhivko@zhivko-G5-5590 new_folder]$ ./hello_word.sh
```



```
bash: ./hello_word.sh: Permission denied
[zhivko@zhivko-G5-5590 new_folder]$ 
```

File permission

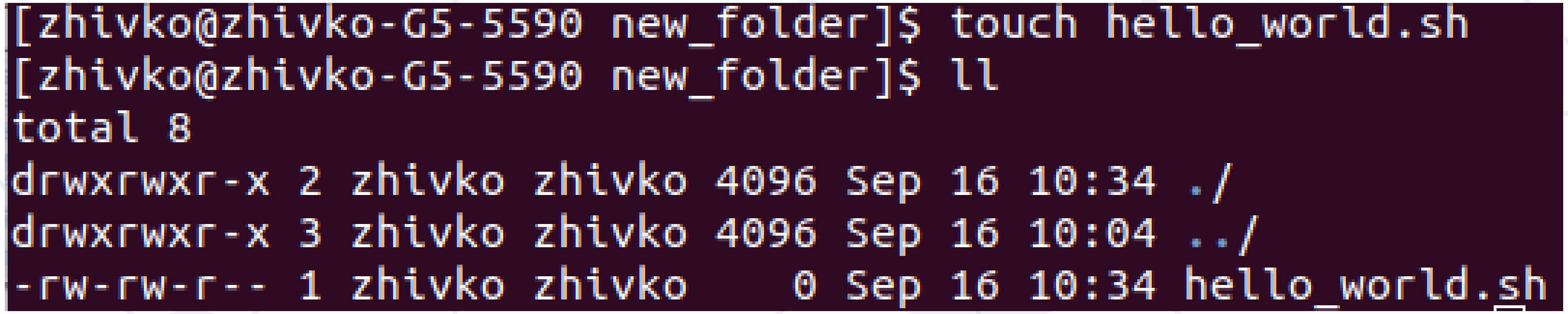
- Each file has 3 categories of permissions – read/write/execute
- Those 3 categories apply for 3 different groups
  - **Root**
  - **Group** of your user
  - **User**
- Note: the first **letter** – indicates folder or not
- More on Linux permissions: https://help.ubuntu.com/community/FilePermissions



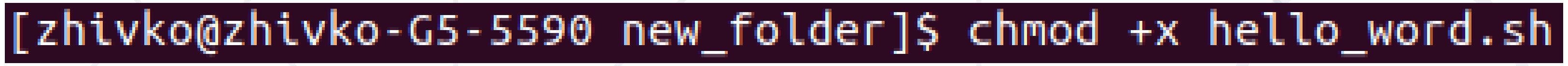
```
[zhivko@zhivko-G5-5590 new_folder]$ touch hello_world.sh
[zhivko@zhivko-G5-5590 new_folder]$ ll
total 8
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:34 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:04 ../
-rw-rw-r-- 1 zhivko zhivko    0 Sep 16 10:34 hello_world.sh
```

Modifying permissions

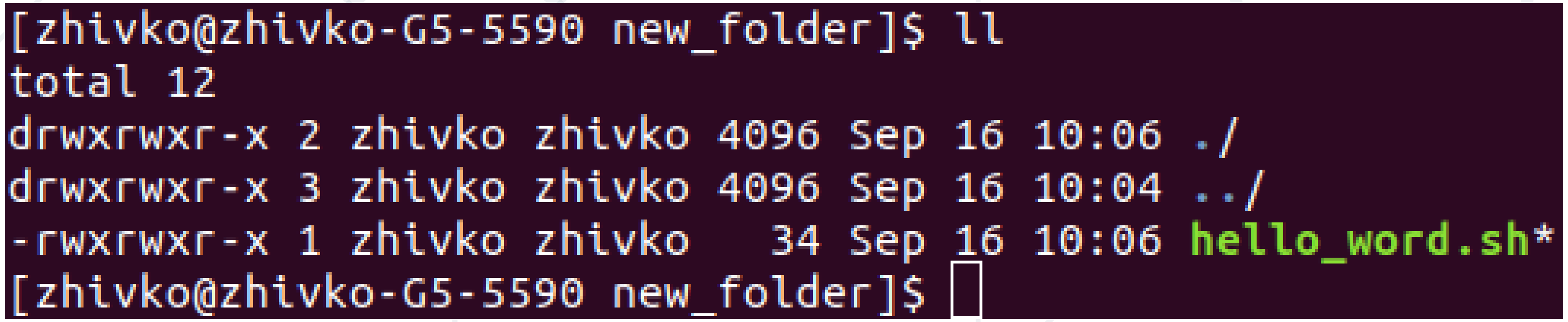
- Give explicit execute permissions to the new file



```
[zhivko@zhivko-G5-5590 new_folder]$ touch hello_world.sh
[zhivko@zhivko-G5-5590 new_folder]$ ll
total 8
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:34 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:04 ../
-rw-rw-r-- 1 zhivko zhivko    0 Sep 16 10:34 hello_world.sh
```



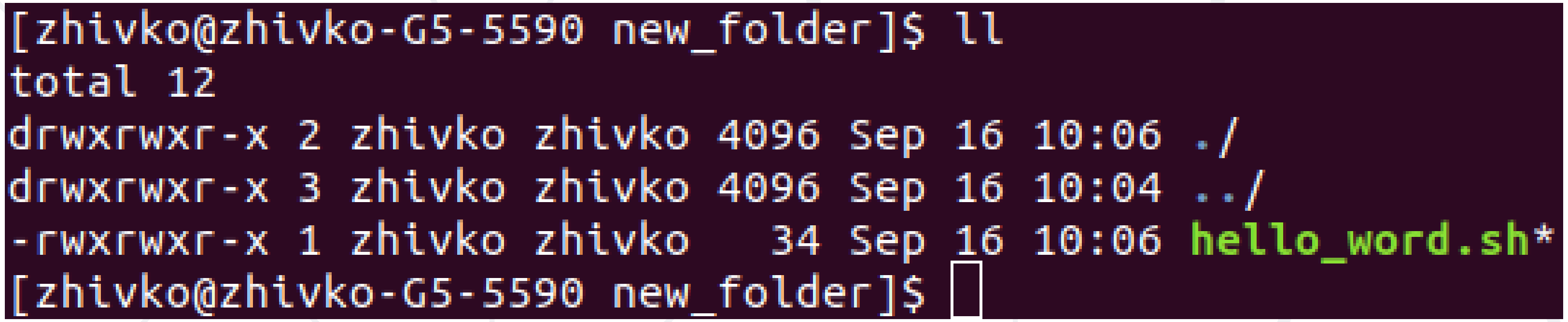
```
[zhivko@zhivko-G5-5590 new_folder]$ chmod +x hello_word.sh
```



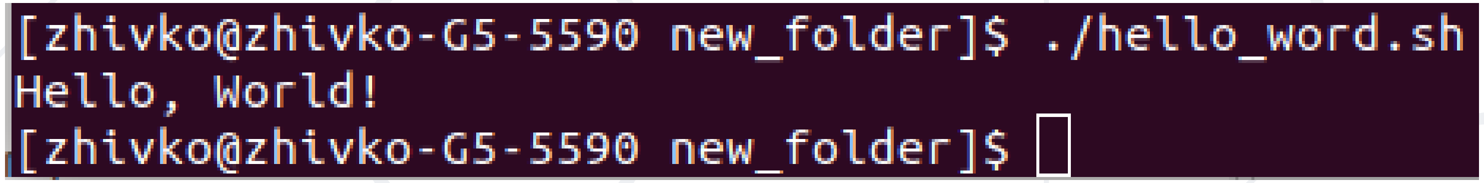
```
[zhivko@zhivko-G5-5590 new_folder]$ ll
total 12
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:06 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:04 ../
-rwxrwxr-x 1 zhivko zhivko   34 Sep 16 10:06 hello_word.sh*
[zhivko@zhivko-G5-5590 new_folder]$ 
```

Executing Files

- Now the file should be able to be executed
- Hello, World! – **mission accomplished**



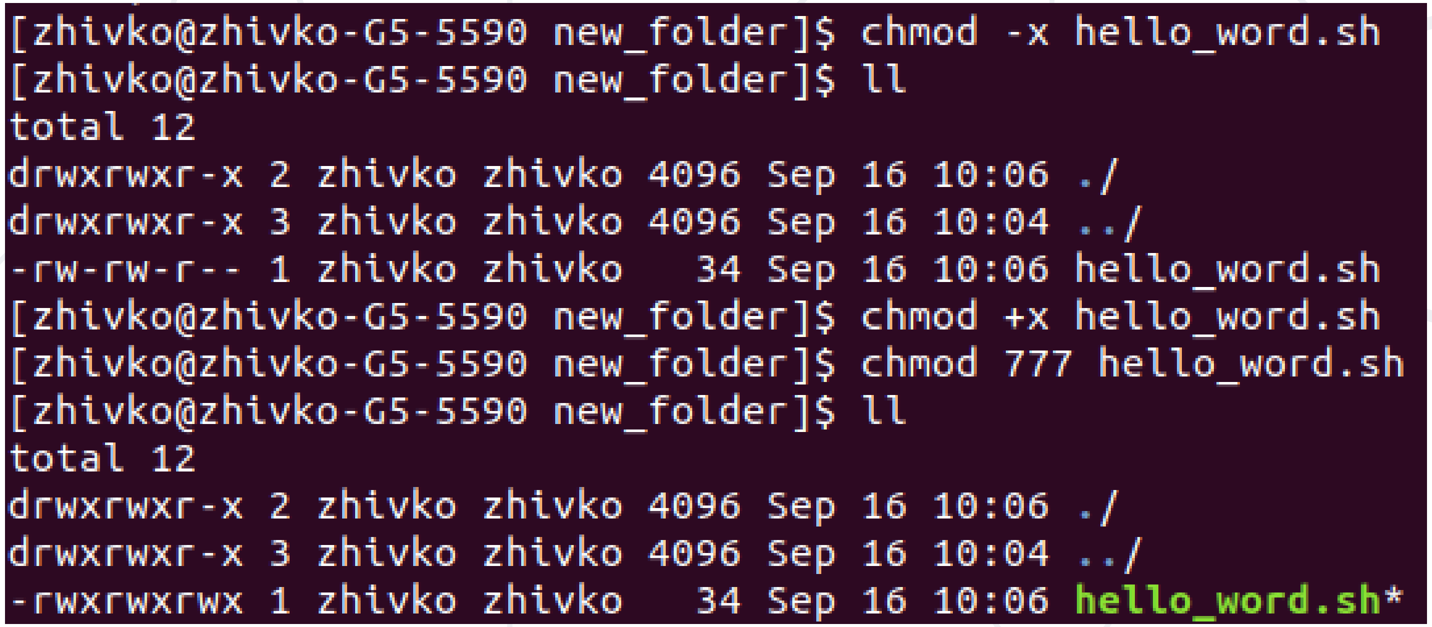
```
[zhivko@zhivko-G5-5590 new_folder]$ ll
total 12
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:06 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:04 ../
-rwxrwxr-x 1 zhivko zhivko   34 Sep 16 10:06 hello_word.sh*
[zhivko@zhivko-G5-5590 new_folder]$ 
```



```
[zhivko@zhivko-G5-5590 new_folder]$ ./hello_word.sh
Hello, World!
[zhivko@zhivko-G5-5590 new_folder]$ 
```

Permissions

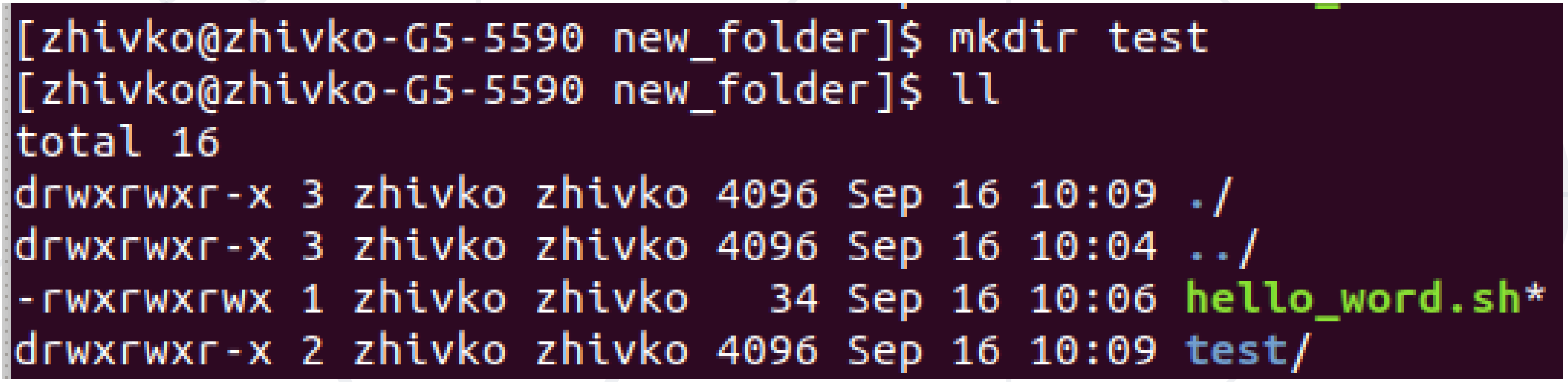
- Permissions could not only be granted
- They could be revoked as well
- **chmod 777 file_name** – another syntax for the command
- read (4) + write (2) + execute (1) = 7
- 777 – read/write/execute permissions for the 3 groups



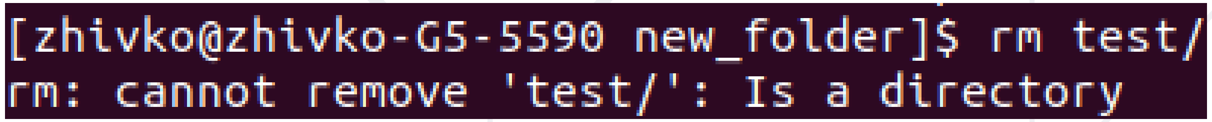
```
[zhivko@zhivko-G5-5590 new_folder]$ chmod -x hello_word.sh
[zhivko@zhivko-G5-5590 new_folder]$ ll
total 12
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:06 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:04 ../
-rw-rw-r-- 1 zhivko zhivko   34 Sep 16 10:06 hello_word.sh
[zhivko@zhivko-G5-5590 new_folder]$ chmod +x hello_word.sh
[zhivko@zhivko-G5-5590 new_folder]$ chmod 777 hello_word.sh
[zhivko@zhivko-G5-5590 new_folder]$ ll
total 12
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:06 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:04 ../
-rwxrwxrwx 1 zhivko zhivko   34 Sep 16 10:06 hello_word.sh*
```

Working with folders

- **mkdir** – creates an empty folder with the specified name
- **rm** – deletes a file
  - rm only works on files
  - Use **rmdir** for removing folders



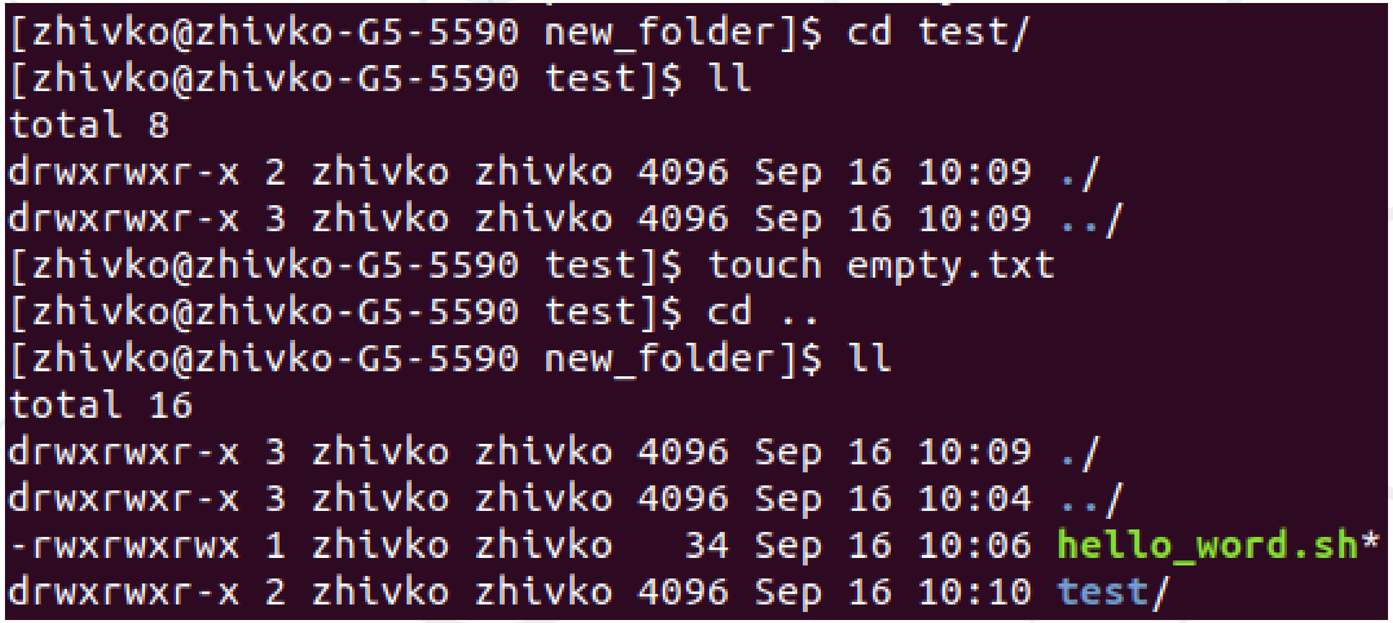
```
[zhivko@zhivko-G5-5590 new_folder]$ mkdir test
[zhivko@zhivko-G5-5590 new_folder]$ ll
total 16
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:09 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:04 ../
-rwxrwxrwx 1 zhivko zhivko   34 Sep 16 10:06 hello_word.sh*
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:09 test/
```



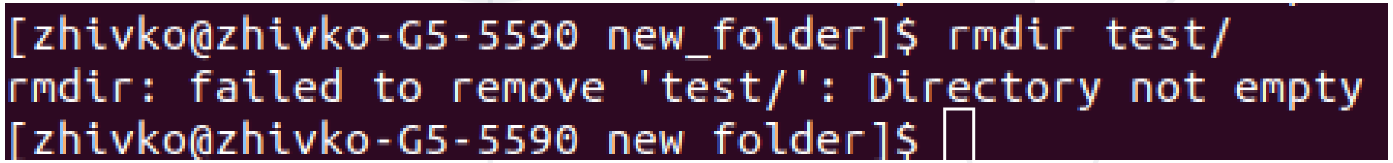
```
[zhivko@zhivko-G5-5590 new_folder]$ rm test/
rm: cannot remove 'test/': Is a directory
```

Working with folders

- What if the folder was not empty?
- Use ‘**rm -rf folder_name**’ instead
  - The rm command is taking additional flags (recursive + force)



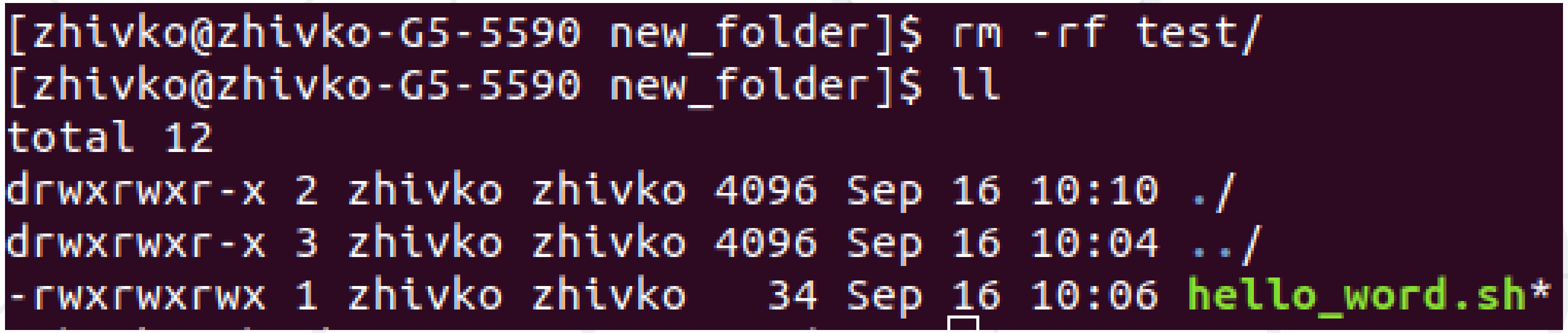
```
[zhivko@zhivko-G5-5590 new_folder]$ cd test/
[zhivko@zhivko-G5-5590 test]$ ll
total 8
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:09 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:09 ../
[zhivko@zhivko-G5-5590 test]$ touch empty.txt
[zhivko@zhivko-G5-5590 test]$ cd ..
[zhivko@zhivko-G5-5590 new_folder]$ ll
total 16
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:09 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:04 ../
-rwxrwxrwx 1 zhivko zhivko   34 Sep 16 10:06 hello_word.sh*
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:10 test/
```



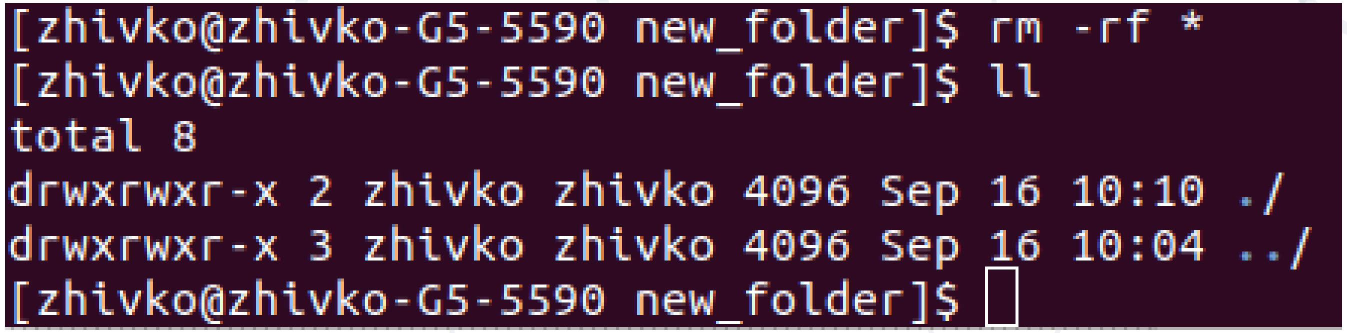
```
[zhivko@zhivko-G5-5590 new_folder]$ rmdir test/
rmdir: failed to remove 'test/': Directory not empty
[zhivko@zhivko-G5-5590 new_folder]$
```

rm -rf

- **rm -rf** in action
- The wildcard (*) will erase everything in the current folder
- **WARNING**: use with caution – you can easily delete your entire hard drive with this single command



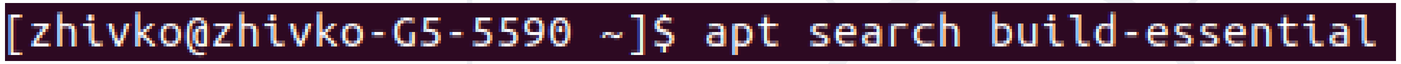
```
[zhivko@zhivko-G5-5590 new_folder]$ rm -rf test/
[zhivko@zhivko-G5-5590 new_folder]$ ll
total 12
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:10 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:04 ../
-rwxrwxrwx 1 zhivko zhivko   34 Sep 16 10:06 hello_word.sh*
```



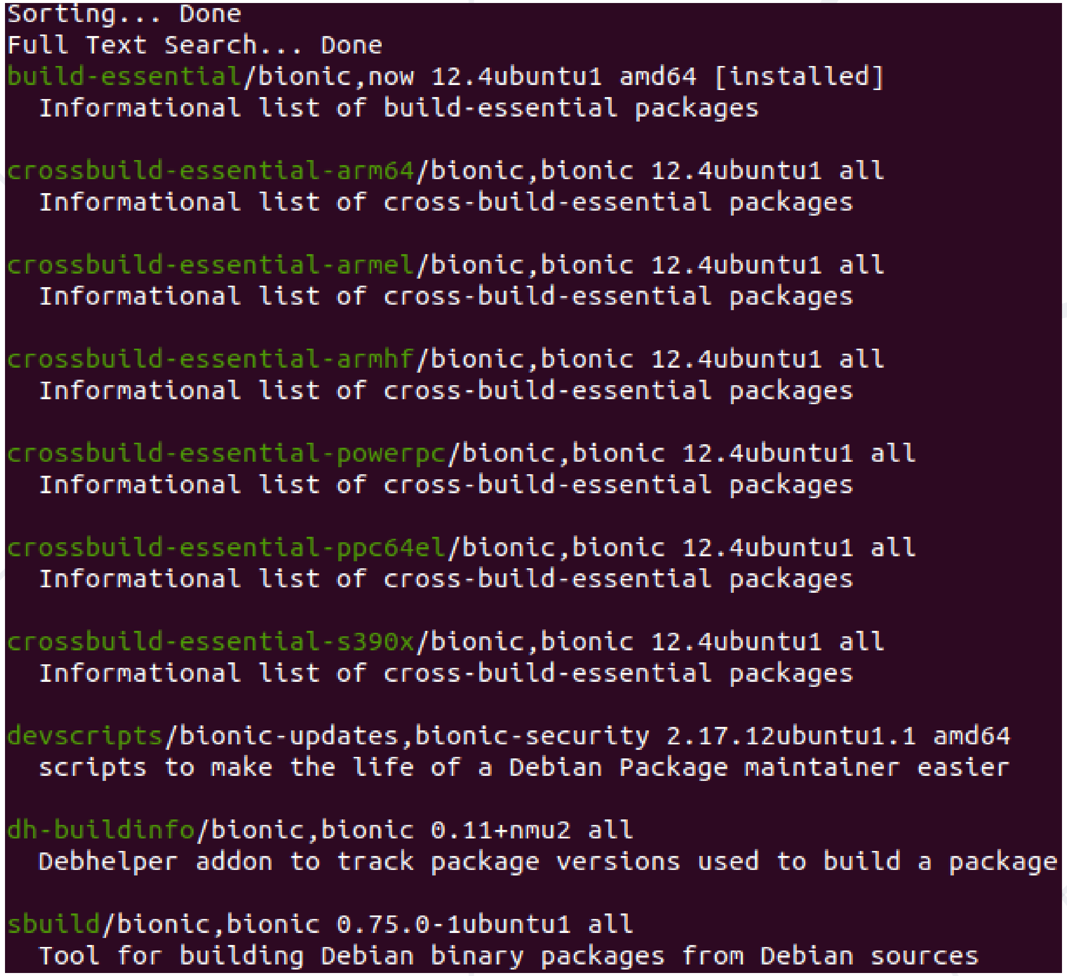
```
[zhivko@zhivko-G5-5590 new_folder]$ rm -rf *
[zhivko@zhivko-G5-5590 new_folder]$ ll
total 8
drwxrwxr-x 2 zhivko zhivko 4096 Sep 16 10:10 ./
drwxrwxr-x 3 zhivko zhivko 4096 Sep 16 10:04 ../
[zhivko@zhivko-G5-5590 new_folder]$ 
```

Searching packages using apt

- With the help of the terminal packages could easily be searched



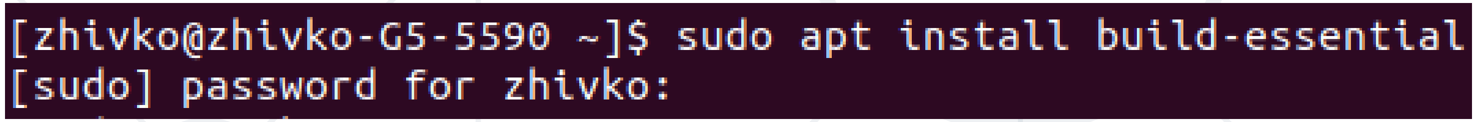
```
[zhivko@zhivko-G5-5590 ~]$ apt search build-essential
```



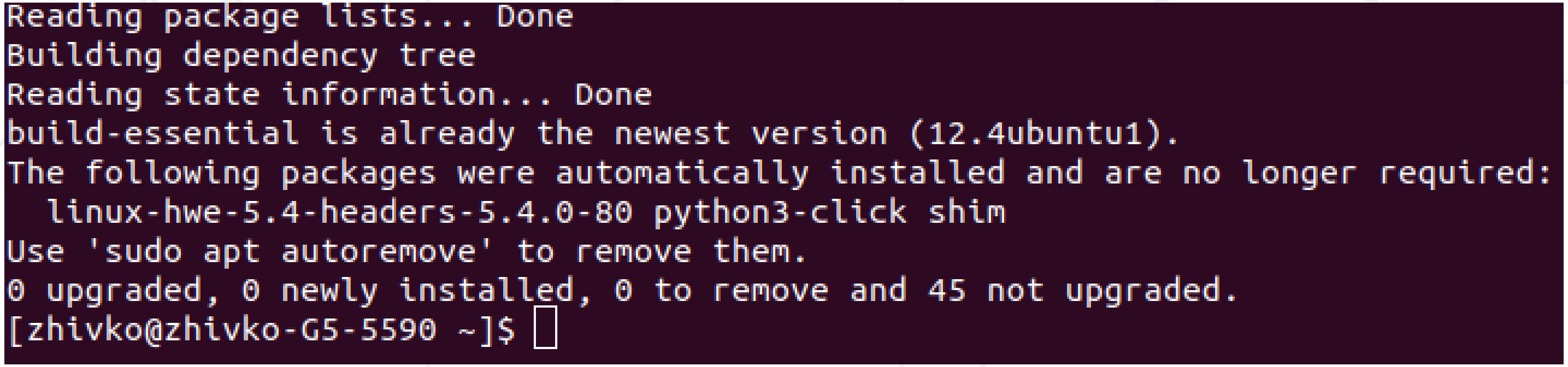
```
Sorting... Done
Full Text Search... Done
build-essential/bionic,now 12.4ubuntu1 amd64 [installed]
  Informational list of build-essential packages

crossbuild-essential-arm64/bionic,bionic 12.4ubuntu1 all
  Informational list of cross-build-essential packages

crossbuild-essential-armel/bionic,bionic 12.4ubuntu1 all
  Informational list of cross-build-essential packages

crossbuild-essential-armhf/bionic,bionic 12.4ubuntu1 all
  Informational list of cross-build-essential packages

crossbuild-essential-powerpc/bionic,bionic 12.4ubuntu1 all
  Informational list of cross-build-essential packages

crossbuild-essential-ppc64el/bionic,bionic 12.4ubuntu1 all
  Informational list of cross-build-essential packages

crossbuild-essential-s390x/bionic,bionic 12.4ubuntu1 all
  Informational list of cross-build-essential packages

devscripts/bionic-updates,bionic-security 2.17.12ubuntu1.1 amd64
  scripts to make the life of a Debian Package maintainer easier

dh-buildinfo/bionic,bionic 0.11+nmu2 all
  Debhelper addon to track package versions used to build a package

sbuild/bionic,bionic 0.75.0-1ubuntu1 all
  Tool for building Debian binary packages from Debian sources
```

Installing packages using apt

- Installation is as easy as a typing a single command
- Marking a package for installation will automatically install all of it’s dependencies



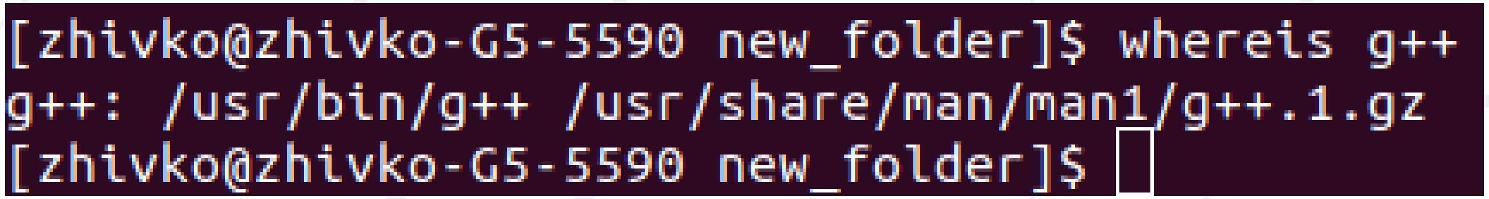
```
[zhivko@zhivko-G5-5590 ~]$ sudo apt install build-essential
[sudo] password for zhivko:
```



```
Reading package lists... Done
Building dependency tree
Reading state information... Done
build-essential is already the newest version (12.4ubuntu1).
The following packages were automatically installed and are no longer required:
  linux-hwe-5.4-headers-5.4.0-80 python3-click shim
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 45 not upgraded.
[zhivko@zhivko-G5-5590 ~]$
```

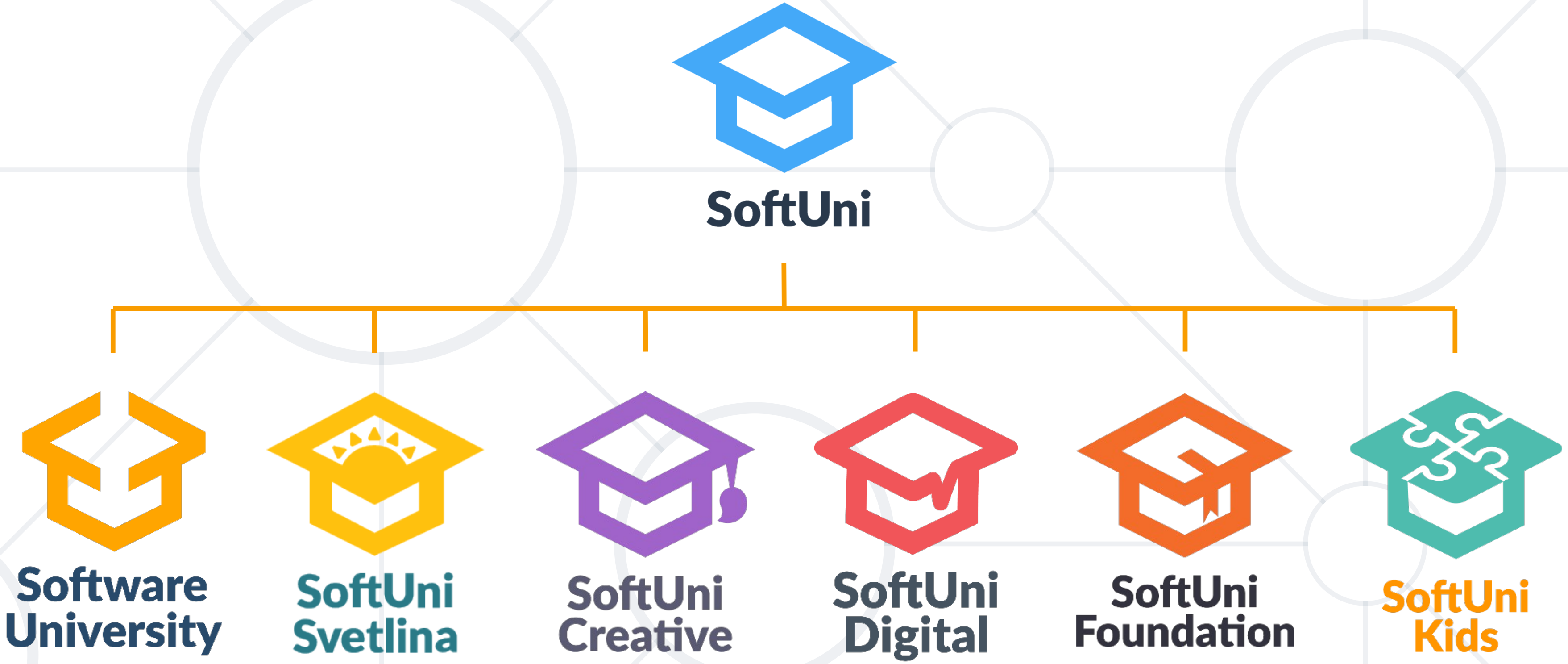
The Bash universe

- In time you will learn new and new bash commands
- Quick example for finish:
- **whereis** ‘program_name’ - locates where a program is **installed**
- For now this is more that enough information
- But there is a whole new universe waiting you there
- Welcome … to the magnificent world of Linux!



```
[zhivko@zhivko-G5-5590 new_folder]$ whereis g++
g++: /usr/bin/g++ /usr/share/man/man1/g++.1.gz
[zhivko@zhivko-G5-5590 new_folder]$ 
```

Questions?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SoftUni Svetlina

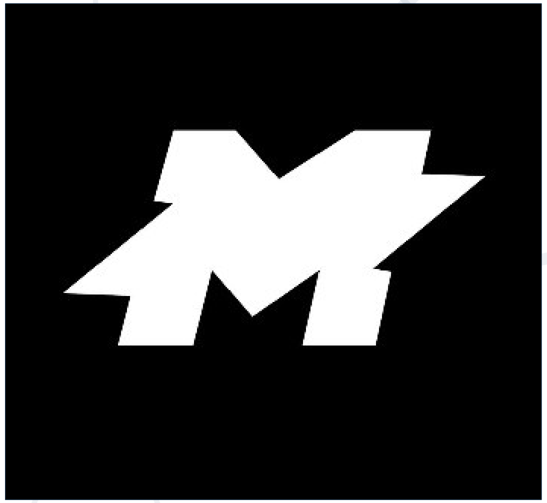
SoftUni Creative

SoftUni Digital

SoftUni Foundation

SoftUni Kids

Diamond Partners



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