# Wprowadzenie

„Linux to wolność: wolność modyfikacji, udostępniania i nauki"

## 1991

Linus Torvalds, student Uniwersytetu Helsińskiego, tworzy Linux jako alternatywę dla Minix, małego systemu operacyjnego do nauki
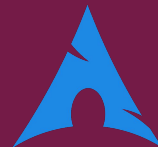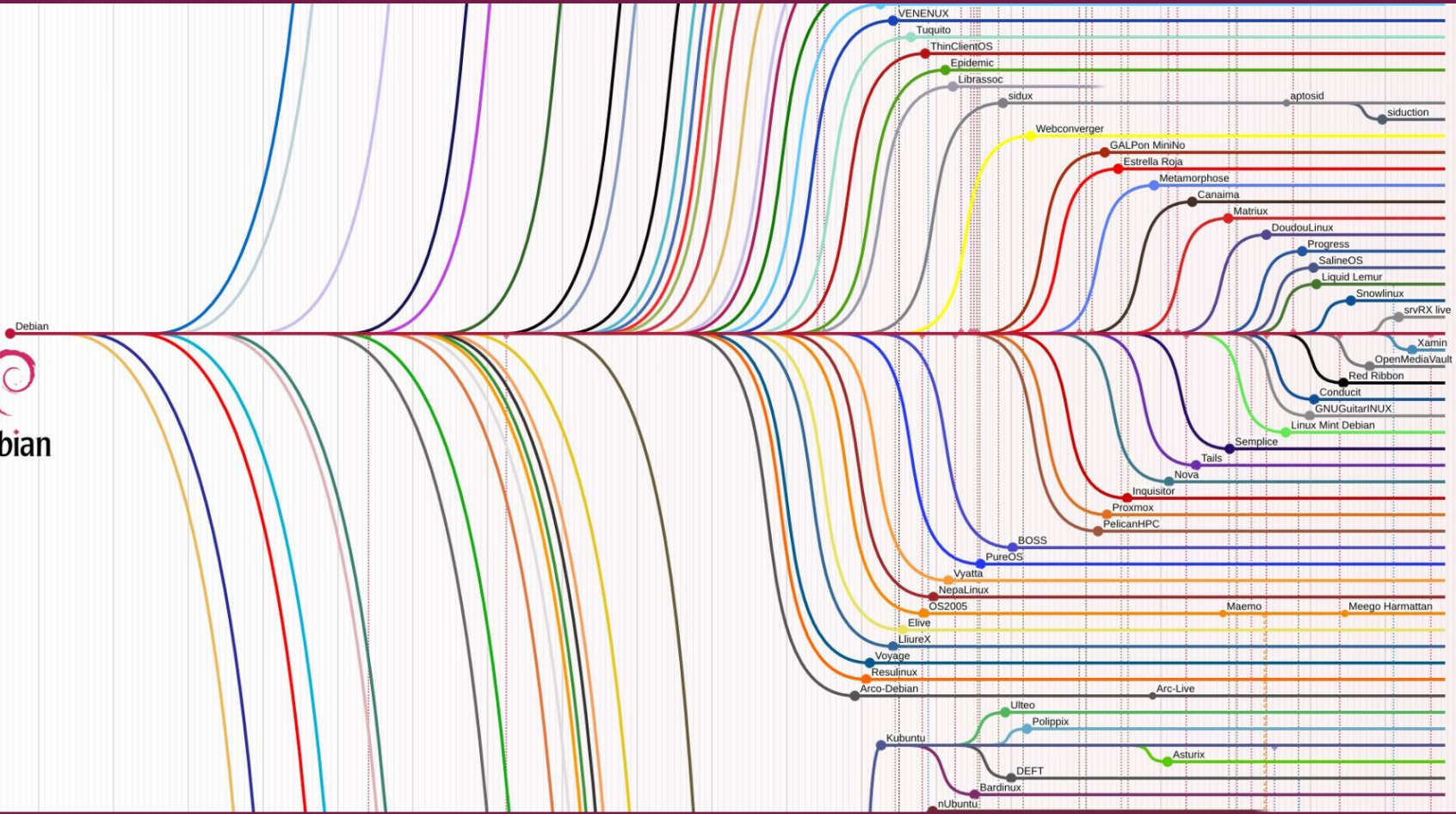
Minix ⟶ **Linux**



## 1993

Debian distributions is created



## 2002 - 2004

Powstanie najpopularniejszych do dnia dzisiejszego dystrybucji Linuxa

Debian

VENENUX
Tuquito
ThinClientOS
Epidemic
Librassoc
sidux
aptosid
siduction
Webconverger
GALPon MiniNo
Estrella Roja
Metamorphose
Canaima
Matriux
DoudouLinux
Progress
SalineOS
Liquid Lemur
Snowlinux
srvRX live
Xamin
OpenMediaVault
Red Ribbon
Conducit
GNUGuitarINUX
Linux Mint Debian
Semplice
Tails
Nova
Inquisitor
Proxmox
PelicanHPC
BOSS
PureOS
Vyatta
NepaLinux
OS2005
Maemo
Meego Harmattan
Elive
LliureX
Voyage
Resulinux
Arco-Debian
Arc-Live
Ulteo
Polippix
Kubuntu
Asturix
DEFT
Bardinux
nUbuntu

debian

# Dlaczego Linux

1. Cost-Free and Open Source

2. Stability and Reliability

3. Customization

4. Community Support and Documentation
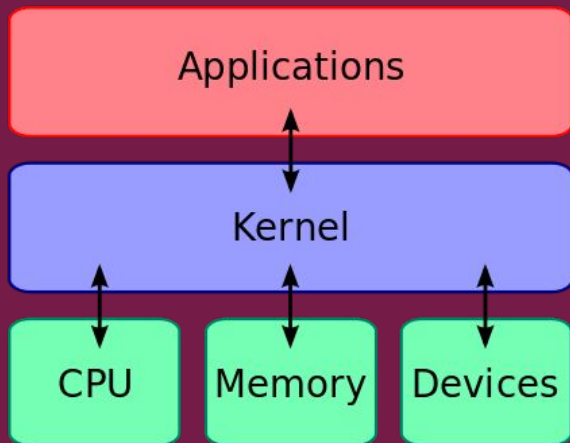
5. Developer-Friendly

```rust
41 use glutin::{
40     dpi::LogicalSize,
39     event_loop::EventLoop,
38     platform::windows::{RawContextExt, WindowExtWindows},
37     window::{Window, WindowBuilder},
36     ContextBuilder, ContextWrapper, PossiblyCurrent,
35 };
34
33 pub fn create_window(
32     title: &str,
31     width: u32,
30     heigth: u32,
29     event_loop: &EventLoop<()>,
28 ) -> (ContextWrapper<PossiblyCurrent, ()>, Window) {
27     let window_builder = WindowBuilder::new()
26         .with_title(title)
25         .with_resizable(false)
24         .with_inner_size(LogicalSize::new(width, heigth))
23         .build(&event_loop)
22         .expect("Couldnt create window");
21
20     let raw_context = unsafe {
19         let raw_context = ContextBuilder::new()
18             .with_gl(glutin::GlRequest::Specific(glutin::Api::OpenGl, (4, 5)))
17             .with_gl_profile(glutin::GlProfile::Core)
16             .build_raw_context(window_builder.hwnd())
15             .unwrap();
14         raw_context
13     };
12
11     let gl_context = unsafe { raw_context.make_current().unwrap() };
10     gl::load_with(|s| gl_context.get_proc_address(s) as *const _); //loads function points or smth
 9
 8     (gl_context, window_builder)
 7 }
 6
 5 pub fn initialize_renderer(window_width: u32, window_heigth: u32) -> Vec<u32> {
 4     unsafe {
 3         gl::Viewport(0, 0, window_width as i32, window_heigth as i32);
 2         gl::ClearColor(0.3, 0.3, 0.5, 1.0);
 1     }
42
 1     let mut vbo: gl::types::GLuint = 0;
 2     let mut vao: gl::types::GLuint = 0;
 3     let mut ebo: gl::types::GLuint = 0;
 4
 5     let vertices: Vec<f32> = vec![
 6         -1.0, 1.0, 0.0, // top left
 7         1.0, 1.0, 0.0, // top right
 8         1.0, -1.0, 0.0, // bottom right
 9         -1.0, -1.0, 0.0, // bottom left
10     ];
11     let indices: Vec<u32> = vec![
12         0, 1, 2, // first triangle
```

```
NORMAL  src/renderer/render_utils.rs          rust  utf-8[unix]   42%  42/98  1    [75]tra
```

```
[gato@archgato ~]$ neofetch

gato@archgato
-------------
OS: GatOS
Host: VirtualBox 1.2
Kernel: 5.14.8-arch1-1
Uptime: 1 hour, 43 mins
Packages: 441 (pacman)
Shell: bash 5.1.8
Resolution: 1920x1080
WM: bspwm
Theme: Adwaita [GTK3]
Icons: Adwaita [GTK3]
Terminal: alacritty
Terminal Font: Ubuntu Mono
CPU: AMD Ryzen 5 2600 (2) @ 3.393GHz
GPU: 00:02.0 VMware SVGA II Adapter
Memory: 434MiB / 3913MiB

[gato@archgato ~]$
```

```
  0[||||||||||||                   24.8%]  Tasks: 35, 120 thr, 82 kthr; 1 running
  1[||||||||||||                   33.6%]  Load average: 0.48 0.29 0.20
Mem[||||||||||||||                747M/3.82G]  Uptime: 01:45:37
Swp[                                0K/0K]

  PID USER      PRI  NI  VIRT   RES   SHR S CPU% MEM%   TIME+  Command
 8600 gato       20   0  619M  139M 87812 S 55.3  3.6  0:13.89 picom
 8601 gato       20   0  619M  139M 87812 S 29.2  3.6  0:06.70 picom
  276 root       20   0  266M  119M 69120 S 26.9  3.1  4:19.33 /usr/lib/Xorg :0 -seat seat0 -auth /run
 8602 gato       20   0  619M  139M 87812 S 25.3  3.6  0:06.48 picom
 8114 gato       20   0 1288M  103M 68268 S  4.7  2.6  0:02.43 alacritty -e htop
 8125 gato       20   0  8764  4808  3620 R  2.4  0.1  0:00.78 htop
 7161 gato       20   0 1301M  116M 68880 S  1.6  3.0  0:06.48 alacritty
 8039 gato       20   0 1294M  112M 68980 S  1.6  2.9  0:03.78 alacritty
 8058 gato       20   0 1287M  106M 68584 S  0.8  2.7  0:01.79 alacritty
 8120 gato       20   0 1288M  103M 68268 S  0.8  2.6  0:00.75 alacritty -e htop
    1 root       20   0 99216 10444  8124 S  0.3  0.3  0:01.32 /sbin/init
  174 root       20   0 62408 29640 28704 S  0.7  0.7  0:00.41 /usr/lib/systemd/systemd-journald
  186 root       20   0 29808  8596  7100 S  0.2  0.2  0:00.19 /usr/lib/systemd/systemd-udevd
  239 dbus       20   0 12564  6208  5052 S  0.2  0.2  0:00.75 /usr/bin/dbus-daemon --system --address
  240 root       20   0   396M 19456 16580 S  0.5  0.1  0:01.19 /usr/bin/NetworkManager --no-daemon
  244 root       20   0 23148  7696  6736 S  0.0  0.2  0:00.15 /usr/lib/systemd/systemd-logind
  250 root       20   0  287M  4440  3740 S  0.0  0.1  0:03.56 /usr/bin/VBoxService -f
F1Help  F2Setup  F3Search  F4Filter  F5Tree  F6SortBy  F7Nice -  F8Nice +  F9Kill  F10Quit
```

# Podstawowe pojęcia

kernel, shell, file system, package manager

**Kernel** (jądro)

Applications

Kernel

CPU   Memory   Devices

```
Linux version 5.17.3 (root@cbdev) (gcc (Gentoo 11.2.1_p20220115 p4) 11.2.1 20220115, GNU ld (Gentoo 2.38 p3) 2.38) #1 SMP PRE▶
Command line: root=/dev/nvme0n1p5
x86/fpu: Supporting XSAVE feature 0x001: 'x87 floating point registers'
x86/fpu: Supporting XSAVE feature 0x002: 'SSE registers'
x86/fpu: Supporting XSAVE feature 0x004: 'AVX registers'
x86/fpu: Supporting XSAVE feature 0x008: 'MPX bounds registers'
x86/fpu: Supporting XSAVE feature 0x010: 'MPX CSR'
x86/fpu: xstate_offset[2]:  576, xstate_sizes[2]:  256
x86/fpu: xstate_offset[3]:  832, xstate_sizes[3]:   64
x86/fpu: xstate_offset[4]:  896, xstate_sizes[4]:   64
x86/fpu: Enabled xstate features 0x1f, context size is 960 bytes, using 'compacted' format.
signal: max sigframe size: 2032
BIOS-provided physical RAM map:
BIOS-e820: [mem 0x0000000000000000-0x000000000009efff] usable
BIOS-e820: [mem 0x000000000009f000-0x00000000000fffff] reserved
BIOS-e820: [mem 0x0000000000100000-0x000000006a5b6fff] usable
BIOS-e820: [mem 0x000000006a5b7000-0x000000006e794fff] reserved
BIOS-e820: [mem 0x000000006e795000-0x000000006fb1efff] ACPI NVS
BIOS-e820: [mem 0x000000006fb1f000-0x000000006fc4efff] ACPI data
BIOS-e820: [mem 0x000000006fc4f000-0x000000006fc4ffff] usable
BIOS-e820: [mem 0x000000006fc50000-0x00000000077fffff] reserved
BIOS-e820: [mem 0x0000000078000000-0x000000078bfffff] usable
BIOS-e820: [mem 0x000000078c00000-0x000000007e7fffff] reserved
BIOS-e820: [mem 0x0000000100000000-0x000000047f7fffff] usable
NX (Execute Disable) protection: active
e820: update [mem 0x48378018-0x48388057] usable ==> usable
e820: update [mem 0x48378018-0x48388057] usable ==> usable
extended physical RAM map:
reserve setup_data: [mem 0x0000000000000000-0x000000000009efff] usable
reserve setup_data: [mem 0x000000000009f000-0x00000000000fffff] reserved
reserve setup_data: [mem 0x0000000000100000-0x0000000048378017] usable
reserve setup_data: [mem 0x0000000048378018-0x0000000048388057] usable
reserve setup_data: [mem 0x0000000048388058-0x000000006a5b6fff] usable
reserve setup_data: [mem 0x000000006a5b7000-0x000000006e794fff] reserved
```

Average Linux kernel developer

# **Shell**



cat

bash

vI

wget

ksh

csh

nano

Hardware

ls

Kernel

Shell

Utilities
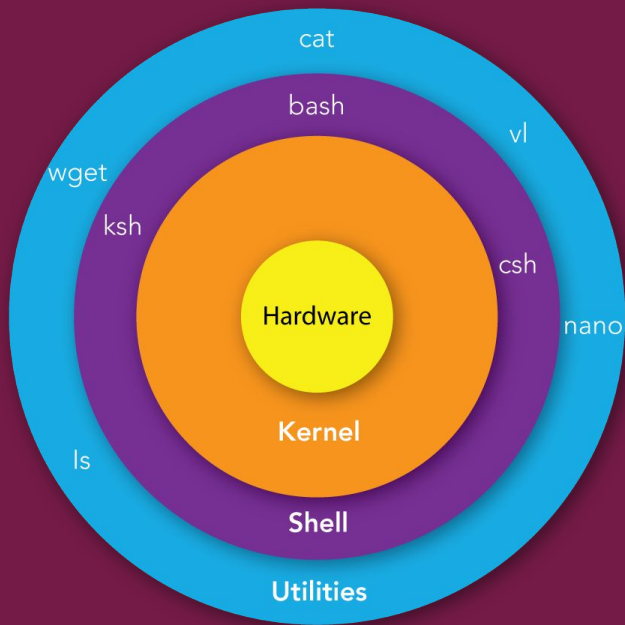
zsh



```
  cd testproject
~/testproject    master    gco detached-head-state -q
~/testproject    fdffaf6    touch dirty-working-directory
~/testproject   fdffaf6±    cd
    ssh milly
Welcome to Ubuntu 11.04 (GNU/Linux 2.6.18-308.8.2.el5.028stab101.1 x86_64)
Last login: Wed Sep 26 03:42:49 2012 from 71-215-222-90.mpls.qwest.net
  agnoster@milly
Connection to milly.agnoster.net closed.
    sudo -s
Password:
  root@Arya       top &
[1] 34523
[1]  + 34523 suspended (tty output)  top
  root@Arya       rm no-such-file
rm: no-such-file: No such file or directory
  root@Arya       kill %%
[1]  + 34523 terminated    top
  root@Arya
```

bash



```
aviator@DESKTOP-DRVR138: /c/Windows/System32                            -  □  ×
aviator@DESKTOP-DRVR138: /c/Windows/System32$ whatis history
history (3readline)  - GNU History Library
aviator@DESKTOP-DRVR138: /c/Windows/System32$ cat --help
Usage: cat [OPTION]... [FILE]...
Concatenate FILE(s) to standard output.

With no FILE, or when FILE is -, read standard input.

  -A, --show-all           equivalent to -vET
  -b, --number-nonblank    number nonempty output lines, overrides -n
  -e                       equivalent to -vE
  -E, --show-ends          display $ at end of each line
  -n, --number             number all output lines
  -s, --squeeze-blank      suppress repeated empty output lines
  -t                       equivalent to -vT
  -T, --show-tabs          display TAB characters as ^I
  -u                       (ignored)
  -v, --show-nonprinting   use ^ and M- notation, except for LFD and TAB
      --help     display this help and exit
      --version  output version information and exit

Examples:
  cat f - g  Output f's contents, then standard input, then g's contents.
  cat        Copy standard input to standard output.
```
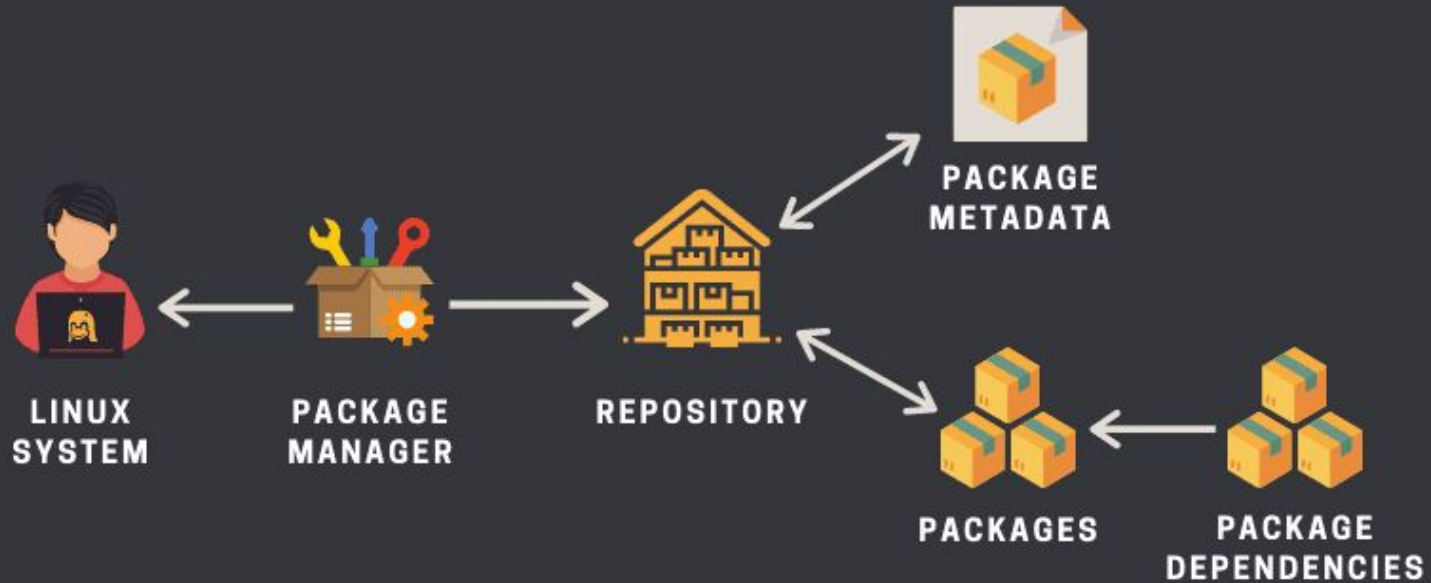
# File system



| Directory | Description |
|---|---|
| /bin/ | Essential User Command Binaries |
| /boot/ | Static Files of the boot loader |
| /dev/ | Device Files |
| /etc/ | Host specific system configuration |
| /home/ | User home Directories |
| /lib/ | Shared Libraries |
| /media/ | Removable Madia |
| /mnt/ | Mounted Filesystem |
| /opt/ | Add-on Application software package |
| /sbin/ | System Binaries |
| /srv/ | Data for service from system |
| /tmp/ | Temporary Files |
| /usr/ | User Utilities and Applications |
| /proc/ | Process Information |

Root Directory /



Original File ← Soft Link

Original File → Hard Link

Data on the hard disk

# Package manager

# Komendy

od czego zacząć?

## Most Used Linux Commands

| 1 | ls | 22 | ifconfig | 43 | lsof | 64 | parted |
|---|---|---|---|---|---|---|---|
| 2 | pwd | 23 | ip | 44 | dig | 65 | wc |
| 3 | cd | 24 | wget | 45 | nslookup | 66 | ls |
| 4 | clear | 25 | curl | 46 | du | 67 | nmap |
| 5 | mkdir | 26 | apt | 47 | tree | 68 | dmesg |
| 6 | mv | 27 | apt-get | 48 | ss | 69 | chattr |
| 7 | cp | 28 | yum | 49 | partx | 70 | usermod |
| 8 | rmdir | 29 | dnf | 50 | uptime | 71 | free |
| 9 | touch | 30 | rpm | 51 | tr | 72 | cron |
| 10 | cat | 31 | alias | 52 | ping | 73 | mysql |
| 11 | echo | 32 | dd | 53 | zcat | 74 | sdiff |
| 12 | less | 33 | top | 54 | xargs | 75 | history |
| 13 | tar | 34 | useradd | 55 | rm | 76 | netstat |
| 14 | grep | 35 | sleep | 56 | stat | 77 | sftp |
| 15 | head | 36 | screen | 57 | who | 78 | tcpdump |
| 16 | tail | 37 | pv | 58 | locate | 79 | scp |
| 17 | sort | 38 | fgrep | 59 | host | 80 | rsync |
| 18 | ps | 39 | dir | 60 | find | 81 | fsck |
| 19 | kill | 40 | egrep | 61 | fuser | 82 | bc |
| 20 | df | 41 | ssh | 62 | at | 83 | chage |
| 21 | chown | 42 | fd | 63 | fdisk | 84 | ffmpeg |

TECMINT
A LINUX BLOG

TECMINT
#1 LINUX BLOG

# Nawigacja

jak poruszać się po systemie?

**ls**
*list directory*

```
bruno@MSI:~$ ls -l
total 16
drwxr-xr-x 17 bruno bruno 4096 Nov 13 21:31 archive
drwxr-xr-x  4 bruno bruno 4096 Nov 17 22:12 area
drwxr-xr-x  5 bruno bruno 4096 Nov 20 19:07 projects
drwxr-xr-x  9 bruno bruno 4096 Oct 11 18:14 resources
```

**dowiązania**
*hard links and soft links*

```
bruno@MSI:/$ ls -al
total 2460
drwxr-xr-x  47 root root     4096 Nov 25 10:04 .
drwxr-xr-x  47 root root     4096 Nov 25 10:04 ..
```

**pwd**
*present working directory*

```
bruno@MSI:~$ pwd
/home/bruno
```

**cd**
*change directory*

```
bruno@MSI:~$ cd /tmp/
bruno@MSI:/tmp$ 
```

# Operacje na plikach

tworzenie i manipulacja plików

**touch**
*create file*

```
bruno@MSI:~$ touch file.txt
bruno@MSI:~$ ls
archive   area   file.txt   projects   resources
```

**mv**
*move*

```
bruno@MSI:~/warsztaty$ mv file.txt ~/projects/linux_cli_basics/
bruno@MSI:~/warsztaty$ ls ~/projects/linux_cli_basics/
README.md  file.txt  images  instrukcje
```

**echo**
*send to standard output*

```
bruno@MSI:~$ echo "SKN Telephoners"
SKN Telephoners
```

**rm**
*remove*

```
bruno@MSI:~/projects/linux_cli_basics$ ls
README.md  file.txt  images  instrukcje
bruno@MSI:~/projects/linux_cli_basics$ rm file.txt
bruno@MSI:~/projects/linux_cli_basics$ ls
README.md   images  instrukcje
```

**cp**
*copy*

```
bruno@MSI:~$ cp file.txt warsztaty/
bruno@MSI:~$ cd warsztaty/
bruno@MSI:~/warsztaty$ ls
file.txt
```

**cat**
*display*

```
bruno@MSI:~/projects/linux_cli_basics$ cat instrukcje/warsztaty_linux_1.md
# Instrukcja

Poniżej plan poszczególnych ćwiczeń.
```

# Przetwarzanie potokowe

łączenie komend



Piping in Linux

commandONE          commandTWO

output          input
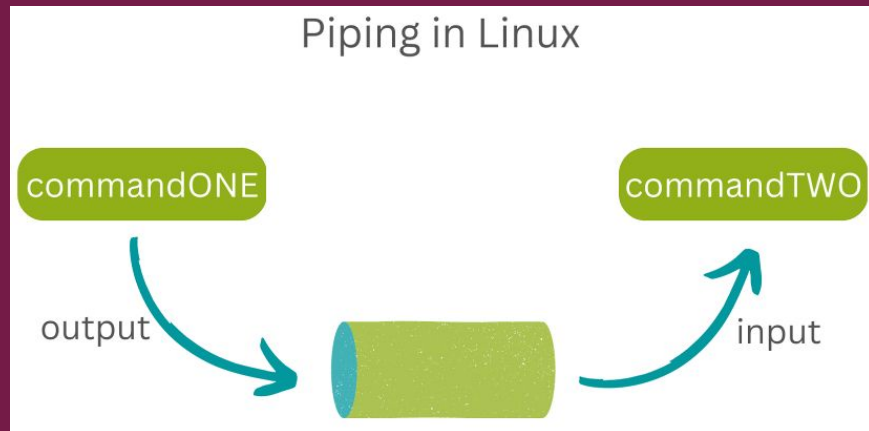
```
bruno@MSI:/$ cat /etc/passwd | grep postgres
postgres:x:108:118:PostgreSQL administrator,,,:/var/lib/postgresql:/bin/bash
```

# Root

czyli superuser

**su**
*switch user*

```
bruno@MSI:~$ su root
Password:
root@MSI:/home/bruno#
```

**sudo**
*superuser do*

```
bruno@MSI:~$ sudo addgroup guest
```

**whoami**
*kim jestem*

```
bruno@MSI:~$ whoami
bruno
bruno@MSI:~$ su root
Password:
root@MSI:/home/bruno# whoami
root
```



With great power comes great responsibility.

# Prawa dostępu

users, groups, access rights

## ls -l
*list directory (long)*

```
bruno@MSI:/$ ls -l
total 2452
drwxr-xr-x    3 root root    4096 Jan  8  2024 Docker
lrwxrwxrwx    1 root root       7 May  1  2023 bin → usr/bin
drwxr-xr-x    2 root root    4096 Apr 18  2022 boot
drwxr-xr-x   16 root root    3560 Nov 25 10:04 dev
drwxr-xr-x   99 root root    4096 Nov 25 10:20 etc
```

## stat
*statistics*

```
bruno@MSI:/$ stat .
  File: .
  Size: 4096          Blocks: 8           IO Block: 4096    directory
Device: 820h/2080d    Inode: 2            Links: 47
Access: (0755/drwxr-xr-x)  Uid: (    0/    root)   Gid: (    0/    root)
Access: 2024-11-25 10:04:11.412953676 +0100
Modify: 2024-11-25 10:04:11.012953672 +0100
Change: 2024-11-25 10:04:11.012953672 +0100
 Birth: 2023-06-18 18:42:27.000000000 +0200
```

## /etc/passwd
*users list*

```
bruno@MSI:/$ cat /etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/bin/sync
```

- rwx rwx rwx

r = Readable
w = Writeable
x = Executable
- = Denied

Others
Group
User
File Type

d = Directory
- = Regular File
l = Symbolic link
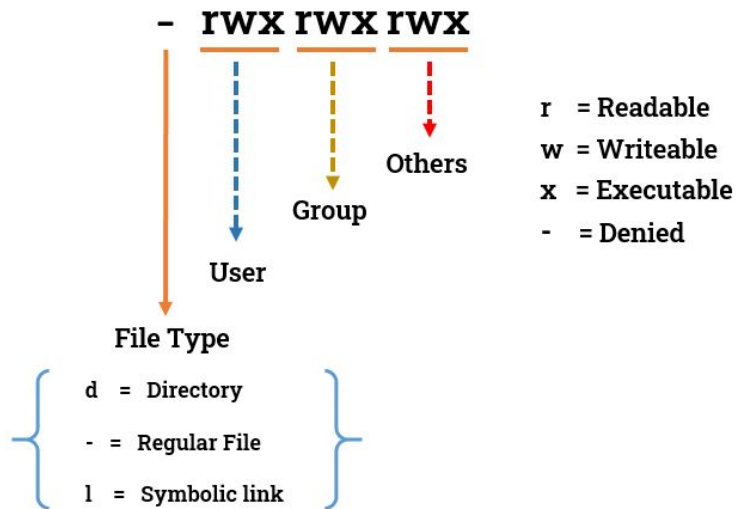


u g o
754

| access | r w x | | | r w x | | | r w x | | |
|--------|---|---|---|---|---|---|---|---|---|
| binary | 4 | 2 | 1 | 4 | 2 | 1 | 4 | 2 | 1 |
| enabled | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| result | 4 | 2 | 1 | 4 | 0 | 1 | 4 | 0 | 0 |
| total | 7 | | | 5 | | | 4 | | |

# Zmiana uprawnień

chmod, chown, chgrp

**chmod**
*change mode*

```
bruno@MSI:~$ sudo chmod 700 file.txt
[sudo] password for bruno:
bruno@MSI:~$ stat file.txt
  File: file.txt
  Size: 0            Blocks: 0
Device: 820h/2080d   Inode: 38355
Access: (0700/-rwx————)  Uid: ( 1000
```

**chown**
*change owner*

```
bruno@MSI:~$ sudo chown postgres file.txt
bruno@MSI:~$ ls -l
total 20
drwxr-xr-x 17 bruno     bruno 4096 Nov 13 21:31 archive
drwxr-xr-x  4 bruno     bruno 4096 Nov 17 22:12 area
-rwx————    1 postgres  bruno    0 Nov 25 10:41 file.txt
```
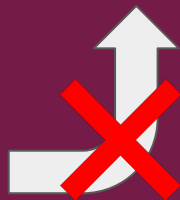
**chgrp**
*change group*

```
bruno@MSI:~$ sudo chgrp root file.txt
bruno@MSI:~$ ls -l
total 20
drwxr-xr-x 17 bruno     bruno 4096 Nov 13 21:31 archive
drwxr-xr-x  4 bruno     bruno 4096 Nov 17 22:12 area
-rwx————    1 postgres  root     0 Nov 25 10:41 file.txt
```

# Grupy

po co grupy?

guest

admin

```
-rwxrwx---
bruno@MSI:~$ stat file.txt
Gid: (  115/   admin)
```

# Informacje przed rozpoczęciem

ważne

1. Instrukcję wykonuj w katalogu domowym: **/home/student** lub **~** (chyba że w instrukcji podano inaczej).
2. Przy tworzeniu użytkowników **zignoruj komunikat o zbyt krótkim haśle** (jeśli się pojawi) i użyj hasła z instrukcji.

Link do repozytorium:
https://github.com/SKN-Telephoners/linux_cli_basics

# ❯ *Dzieki za feedback*