



CENTRO DE ANÁLISIS DE
DATOS Y SUPERCÓMPUTO

CADS

INTRODUCCIÓN A AMBIENTES HPC: Linux

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octubre 2024



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CGS  **IT**
Coordinación General de Servicios
Administrativos e Infraestructura Tecnológica



What a child can do today with
assistance, she will be able to do by
herself tomorrow.

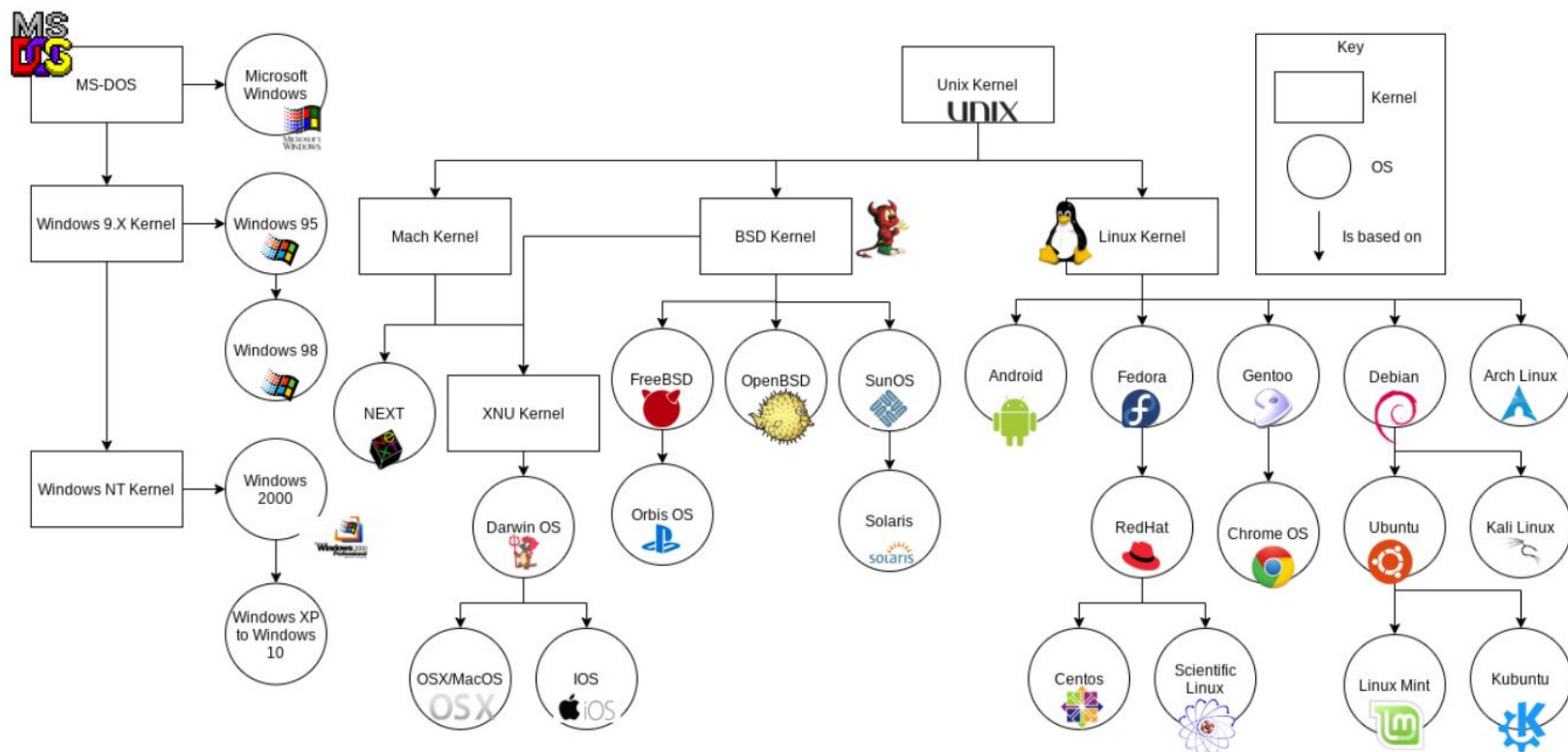
— *Lev S. Vygotsky* —

AZ QUOTES

Contenido

- Introducción qué es HPC
- Sistemas Operativos (CLI/GUI)
- Linux
- Conexión ssh e interfaces
- Aplicaciones en Leo Átrox
- Comandos básicos en Linux
- Edición de archivos

Sistemas operativos



<https://i.imgur.com/EpT5Pwf.png>

Command line Interface (CLI)

```

mars@mars:~$ pwd
/home/mars
mars@mars:~$ cd /usr/portage/app-shells/bash
mars@mars:~$ ls -al
total 108
drwxr-xr-x 3 portage portage 1024 Jul 25 10:06 .
drwxr-xr-x 33 portage portage 1024 Aug 7 22:39 ..
-rw-r--r-- 1 root root 35888 Jul 25 10:06 ChangeLog
-rw-r--r-- 1 root root 27992 Jul 25 10:06 Manifest
-rw-r--r-- 1 portage portage 4645 Mar 23 21:37 bash-3.1_p17.ebuild
-rw-r--r-- 1 portage portage 5977 Mar 23 21:37 bash-3.2_p39.ebuild
-rw-r--r-- 1 portage portage 6151 Apr 5 14:37 bash-3.2_p48-r1.ebuild
-rw-r--r-- 1 portage portage 5988 Mar 23 21:37 bash-3.2_p48.ebuild
-rw-r--r-- 1 portage portage 5643 Apr 5 14:37 bash-4.0_p10-r1.ebuild
-rw-r--r-- 1 portage portage 6230 Apr 5 14:37 bash-4.0_p10.ebuild
-rw-r--r-- 1 portage portage 5648 Apr 14 05:52 bash-4.0_p17-r1.ebuild
-rw-r--r-- 1 portage portage 5532 Apr 8 10:21 bash-4.0_p17.ebuild
-rw-r--r-- 1 portage portage 5660 May 30 03:35 bash-4.0_p24.ebuild
drwxr-xr-x 2 portage portage 2048 May 30 03:35 files
-rw-r--r-- 1 root root 5668 Jul 25 09:43 bash-4.0_p28.ebuild
drwxr-xr-x 2 portage portage 2048 May 30 03:35 files
-rw-r--r-- 1 portage portage 468 Feb 9 04:35 metadata.xml
mars@mars:~$ cat metadata.xml
<?xml version="1.0" encoding="UTF-8"?>
<CONTENTS pkgmetadata SYSTEM="http://www.gentoo.org/dtd/metadata.dtd">
<pkgmetadata>
<changelog system="/herd">
<use>
<flag name="bashlogger">Log ALL commands typed into bash; should ONLY be
used in restricted environments such as honeypots.</flag>
<flag name="net">Enable /dev/tcp/host/port redirection.</flag>
<flag name="plugins">Add support for loading builtins at runtime via
"enable".</flag>
</use>
</pkgmetadata>
mars@mars:~$ cd /usr/portage/app-shells/bash $ sudo /etc/init.d/bluetooth status
Password:
$ status: started
mars@mars:~$ cd /usr/portage/app-shells/bash $ ping -q -c 1 en.wikipedia.org
PING rr.esas.wikiimedia.org (91.196.174.2) 56(84) bytes of data.
64 bytes from rr.esas.wikiimedia.org: ping statistics =
0 packets transmitted, 1 received, 0% packet loss, time 2ms
rtt min/avg/max/mdev = 49.820/49.820/49.820/0.000 ms
mars@mars:~$ cd /usr/portage/app-shells/bash $ grep -i /dev/sda /etc/fstab | cut -f1,5 -d=
/dev/sda1 /boot none
/dev/sda2 /
/dev/sda3 /
mars@mars:~$ cd /usr/portage/app-shells/bash $ date
Sat Aug 8 02:42:24 MSD 2009
mars@mars:~$ cd /usr/portage/app-shells/bash $ lsmod
Module Size Used by
rmdisk_wlan 23424 0
rmdisk_host 8636 1 rmdisk_wlan
cdc_ether 5972 1 rmdisk_host
usbnet 18688 3 rmdisk_wlan,rmdisk_host,cdc_ether
parport_pc 38424 0
lprng 236912 0
parport 38448 1 parport_pc
lirc_wdt 12272 0
lirc_lirc 9380 0
mars@mars:~$ cd /usr/portage/app-shells/bash $

```

Terminal — top — Basic — 80x24
Processes: 421 total, 3 running, 418 sleeping, 1383 threads 16:01:01
Load Avg: 1.49, 1.20, 1.14 CPU usage: 0.48% user, 0.84% sys, 98.67% idle
SharedLibs:
MemRegions:
PhysMem: 1
VM: 2461G
Networks:
Disks: 246

Terminal — top — Red Sands — 80x24
Processes: 421 total, 3 running, 418 sleeping, 1383 threads 16:01:01
Load Avg: 1.49, 1.20, 1.14 CPU usage: 0.48% user, 0.84% sys, 98.67% idle
SharedLibs:
MemRegions:
PhysMem: 1
VM: 2461G
Networks:
Disks: 246

Terminal — top — Pro — 94x24
Processes: 421 total, 2 running, 419 sleeping, 1383 threads 16:01:01
Load Avg: 1.49, 1.20, 1.14 CPU usage: 0.54% user, 0.96% sys, 98.49% idle
SharedLibs: 515M resident, 86M data, 305M linkedit.
MemRegions: 98214 total, 2353M resident, 242M private, 1558M shared.
PhysMem: 14G used (2687M wired), 18G unused.
VM: 2461G vsz, 2277M framework vsz, 0(0) swapins, 0(0) swapouts.
Networks: packets: 168275/66M in, 191369/56M out.
Disks: 246661/3854M read, 146809/3327M written.

PID	COMM	PPID	COMMAND	%CPU	TIME	#TH	#WQ	#PORT	MEM	PURG	CMPR	PGRP	PPID	STATE
147	WindowServer	6	15:40.52	14	5	1731	746M+	31M-	0B	147	1	sleeping		
329	Touc	0	00:17.37	1	0	25	3864K	0B	0B	3725	3692	sleeping		
2734	Safa	260	00:17.41	1	0	23	3824K	0B	0B	3724	3706	sleeping		
2881	apps	3123	00:17.39	1/1	0	35	4808K	0B	0B	3723	3700	running		
238	nsur	81	00:28.08	6	1	402	106M+	6916K	0B	2947	1	sleeping		
110	cont	329	03:48.16	270/16	0	0	55M-	0B	0B	0	0	running		
2734	Safa	260	01:46.76	2	1	67	5728K	0B	0B	260	1	sleeping		
2881	apps	3123	00:37.87	3	2	77	1224K	0B	0B	3123	1	sleeping		
238	nsur	81	00:07.37	3	2	137	2080K	0B	0B	81	1	sleeping		
110	cont	329	01:11.82	4	1	325	23M	3200K	0B	329	1	sleeping		
2734	SafariBookma	0.0	00:05.08	5	3	72	4788K	12K	0B	2734	1	sleeping		
2881	appstoreagen	0.0	00:01.49	4	2	123	6236K	208K	0B	2881	1	sleeping		
141	AirPlayXPCh	0.0	00:03.40	6	2	172	2696K	0B	0B	141	1	sleeping		
238	nsurlsession	0.0	00:03.44	6	3	101+	3000K+	0B	0B	238	1	sleeping		

```

C:\Users\Brennan>
Microsoft Windows [Version 10.0.10240]
(c) 2015 Microsoft Corporation. All rights reserved.

C:\Users\Brennan>

PS C:\> Get-Childitem 'MediaCenter:\Music' -rec |
>> where {not $_.PSIsContainer -and $_.Extension -match 'maimp3'} |
>> Measure-Object -property length -sum -min -max -ave
Count          : 1387
Average        : 5491276.09563887
Sum            : 2174097957
Maximum        : 22105257
Minimum        : 3235
Property       : Length

PS C:\> Get-WmiObject CIM_DIOSElement | select biosw*, man*, ser* | Format-List
BIOSVersion    : C10CPL - 6040000, Ver 1.00PARTBL
Manufacturer   : TOSHIBA
SerialNumber   : M521116H

PS C:\> (tumiSearcher10*
>> SELECT * FROM CIM_Job
>> WHERE Priority > 1
>> (e).get() | Format-Custom
class ManagementObjectRoot\Cimv2\Win32_PrintJob
{
    Document = Monad Manifesto - Public
    JobId = 6
    JobStatus =
    Owner = User
    Priority = 42
    Size = 1027088
    Name = Epson Stylus COLOR 740 ESC/P 2. 6

PS C:\> $rssUrl = 'http://blogs.msdn.com/powershell/rss.aspx'
PS C:\> $blog = [xml](new-object System.Net.WebClient).DownloadString($rssUrl)
PS C:\> $blog.rss.channel.item | select title -first 3

title
----
PMS: What's Coming in PowerShell 02
PowerShell Presence at PMS
PMS Talk: System Center Foundation Technologies

PS C:\> $lastVersion.ToString().Insert(0, 'Windows PowerShell: ')
Windows PowerShell: 1.0.0.0
PS C:\>

```

https://es.wikipedia.org/wiki/S%C3%ADmbolo_del_sistema_de_Windows
https://es.wikipedia.org/wiki/Shell_de_Unix
<https://support.apple.com/es-es/guide/terminal/trml2df0220c/mac>

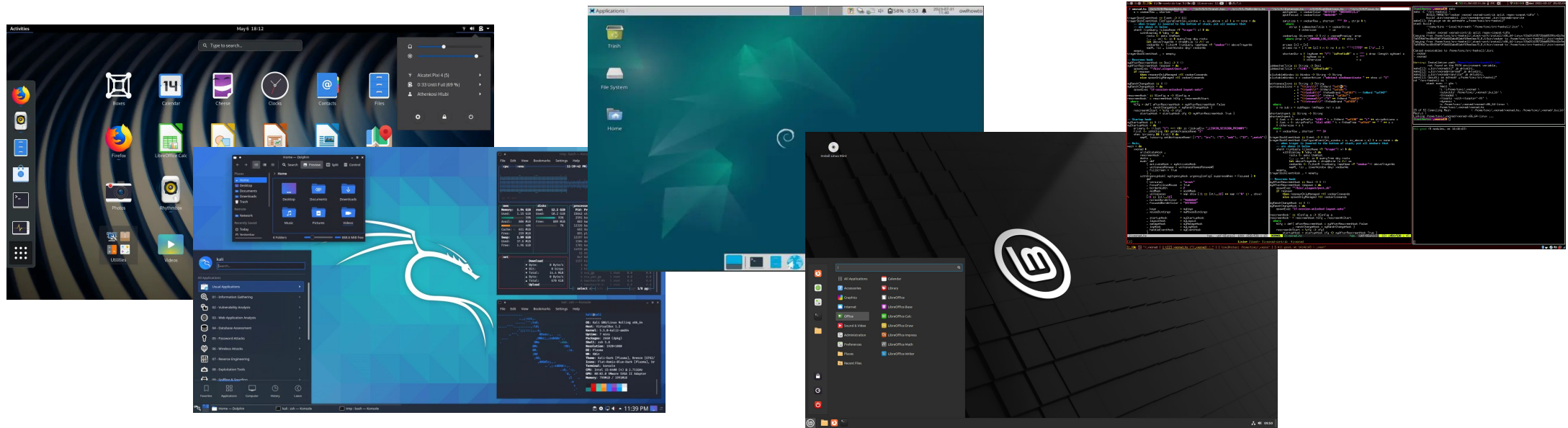
Shell

- La shell es un intérprete de comandos. Estos traducen el lenguaje escrito para que el sistema operativo lo entienda.
- Se llama shell denota una capa externa de interacción entre el usuario y sistema operativo.



https://rsg-ecuador.github.io/unix.bioinfo.rsgecuador/content/Curso_basico/03_Manejo_terminal/1_def.html

GUI (Graphics User interface)

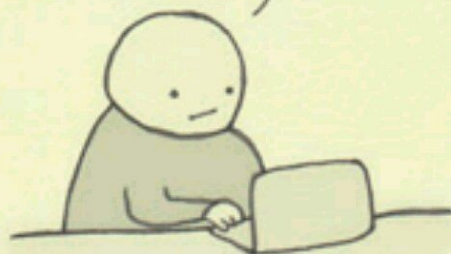




AN UPDATE IS AVAILABLE FOR YOUR COMPUTER

stickycomics.com

COOL, MORE
FREE STUFF!



linux

NOT AGAIN!



windows

OOH, ONLY
\$99!



mac



¿Por qué un sistema linux?

Gratuito: no es necesario adquirir una licencia y el código es libre.

Estabilidad: Trabaja muy bien en ambientes de multiusuarios.

Seguridad: Es más seguro que otros sistemas operativos.

HPC: Es el sistema operativo utilizado en las 500 computadoras más potentes del mundo.



Distribuciones famosas para servidor



Red Hat



fedora



ubuntu



AlmaLinux



Rocky Linux[™]



CentOS

VPN

Descargar forticlient:

Linux

<https://www.fortinet.com/support/product-downloads>

Windows

<https://drive.google.com/drive/folders/1IRoUer-d9LUjCmOyXnW8gmezziZ8-wpF?usp=sharing>

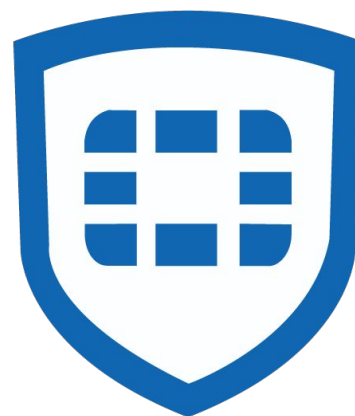
MAC FortiVPN 6

<http://148.202.15.34/files/>


Descargar mobaXterm





Windows

<https://mobaxterm.mobatek.net/download-home-edition.html>



Openfortivpn <https://github.com/adrienverge/openfortivpn>

 FortiClient VPN



Upgrade to the full version to access additional features and receive technical support.

Edit VPN Connection

VPN

SSL-VPN XML

Connection Name

leoAtrox

Description

Remote Gateway

vpn.cads.udg.mx

+Add Remote Gateway

☐ Customize port

443

Client Certificate

☒ None ☐ Prompt

Authentication

☐ Prompt on login ☒ Save login ☐ Disable

Username

cursos@cads.udg.mx

☐ Do not Warn Invalid Server Certificate

Cancel

Save

Herramientas para conexiones SSH

- PUTTY
- MOBAXTERM
- BITWISE
- TERMINAL



PuTTY



BASH
THE BOURNE-AGAIN SHELL



Transferir archivos vía terminal

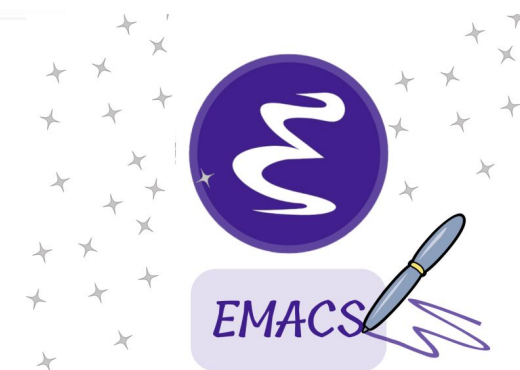
```
rsync -vp ~/archivo.txt [usuario]@login1.cads.udg.mx:/lustre/home/usuario/  
rsync -avnr [folder] [usuario]@login1.cads.udg.mx:/lustre/home/usuario
```



Aplicaciones



VSCodium



Conectarse a una sesión remota

Información de la VPN

- **Username:** cursos@cads.udg.mx
- **Contraseña:** 202404.hpc
- **Gateway:** vpn.cads.udg.mx
- **Puerto:** 443

Información de la máquina virtual

- **Dirección IP:** login1.cads.udg.mx
- **Usuario/Hostname:** curso[1-15]
- **Contraseña:** CADS.2023
- **Puerto:** 22



Linux consola

Interfaz: [nombre de usuario][nodo login][directorío home (~)]\$

```
[usuario@chn02 ~]$
```

Cómo obtener ayuda:

```
[usuario@chn02 ~]$ man ls
```

```
[usuario@chn02 ~]$ help --ls
```



Interface

pwd : (*power working directory*) ver la el directorio donde estamos trabajando:

```
[usuario@chn02 ~]$ pwd  
/lustre/home/usuario
```

\$HOME o **~/** :

```
[usuario@chn02 ~]$ $HOME  
[usuario@chn02 ~]$ ~/  
-bash: /lustre/home/usuario/: Is a director
```

Navegación

Comando	Opciones útiles	Descripción
ls	ls -l	Muestra el contenido del directorio como una lista
mkdir		Crea un directorio
cd	cd ..	Cambia el directorio de trabajo
rmdir		Borra el directorio vacío
tree		Presenta los directorios en forma de árbol
cp	-v	Copia archivos o directorios
mv	-v	Mueve archivos o directorios
rm		Borrar archivo o directorio
touch		crear un archivo vacío

Ejercicio

Visualiza el directorio en el que te encuentras actualmente.

Pista. El resultado del comando introducido se ve de la siguiente manera:

```
/lustre/home/curso1
```



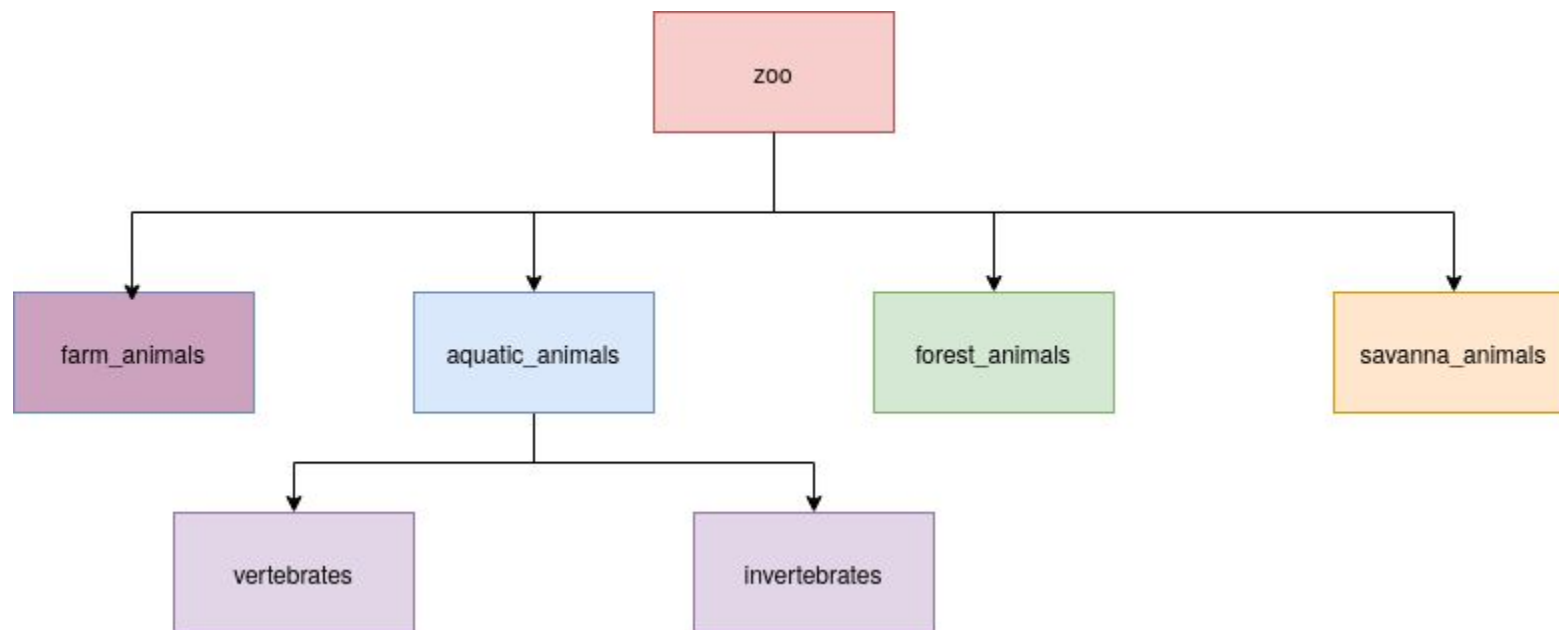

Solución

```
[curso1@chn02 ~]$ pwd  
/lustre/home/curso1
```

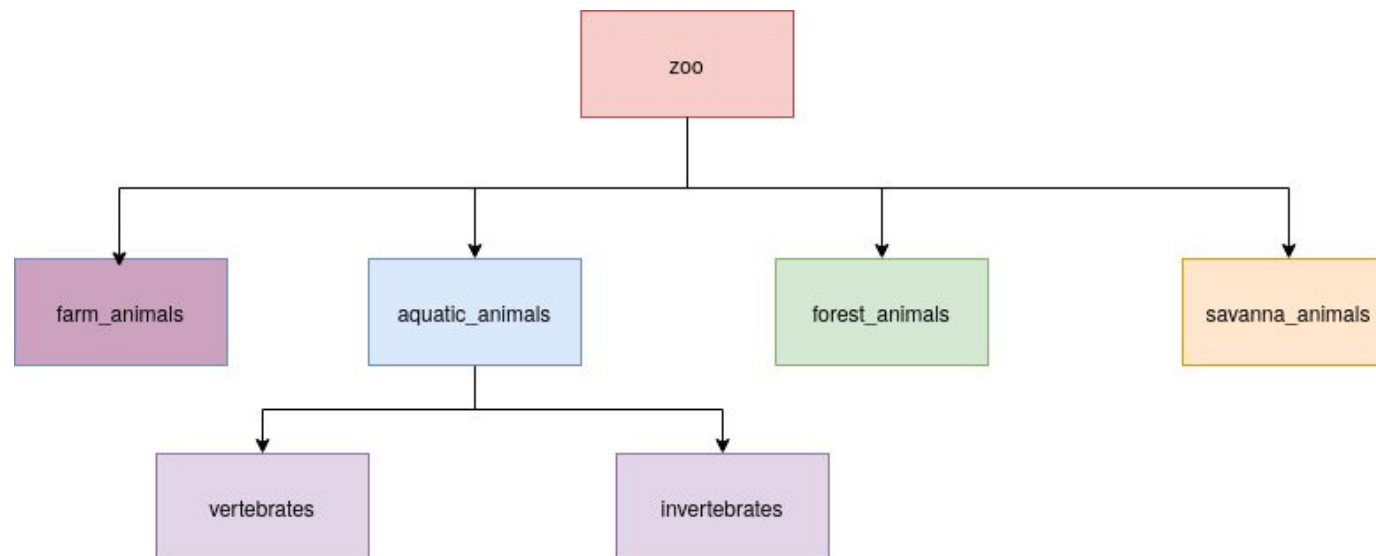


Ejercicio

Usando los comandos anteriores crea la siguiente estructura de directorios:

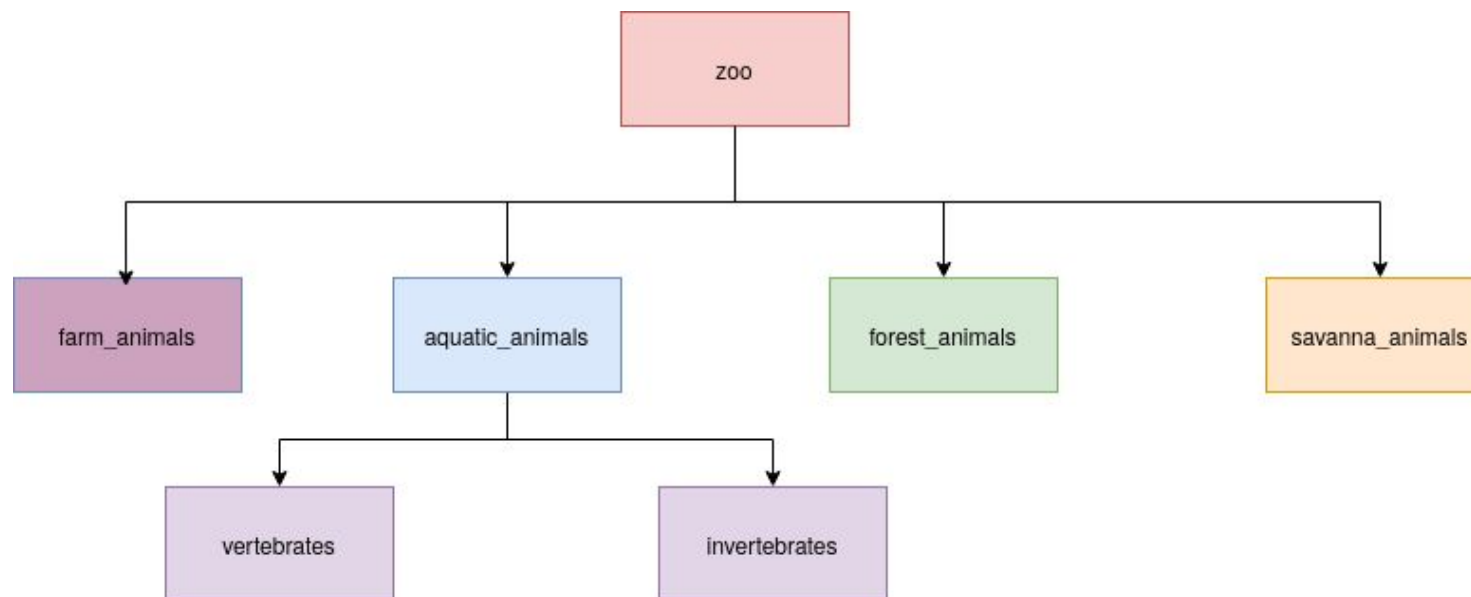


Solución 1



```
omar@ubuntu:~/Documents/presentation$ mkdir zoo
omar@ubuntu:~/Documents/presentation$ mkdir zoo/farm_animals
omar@ubuntu:~/Documents/presentation$ mkdir zoo/aquatic_animals
omar@ubuntu:~/Documents/presentation$ mkdir zoo/aquatic_animals/vertebrates
omar@ubuntu:~/Documents/presentation$ mkdir zoo/aquatic_animals/invertebrates
omar@ubuntu:~/Documents/presentation$ mkdir zoo/forest_animals
omar@ubuntu:~/Documents/presentation$ mkdir zoo/savanna_animals
```

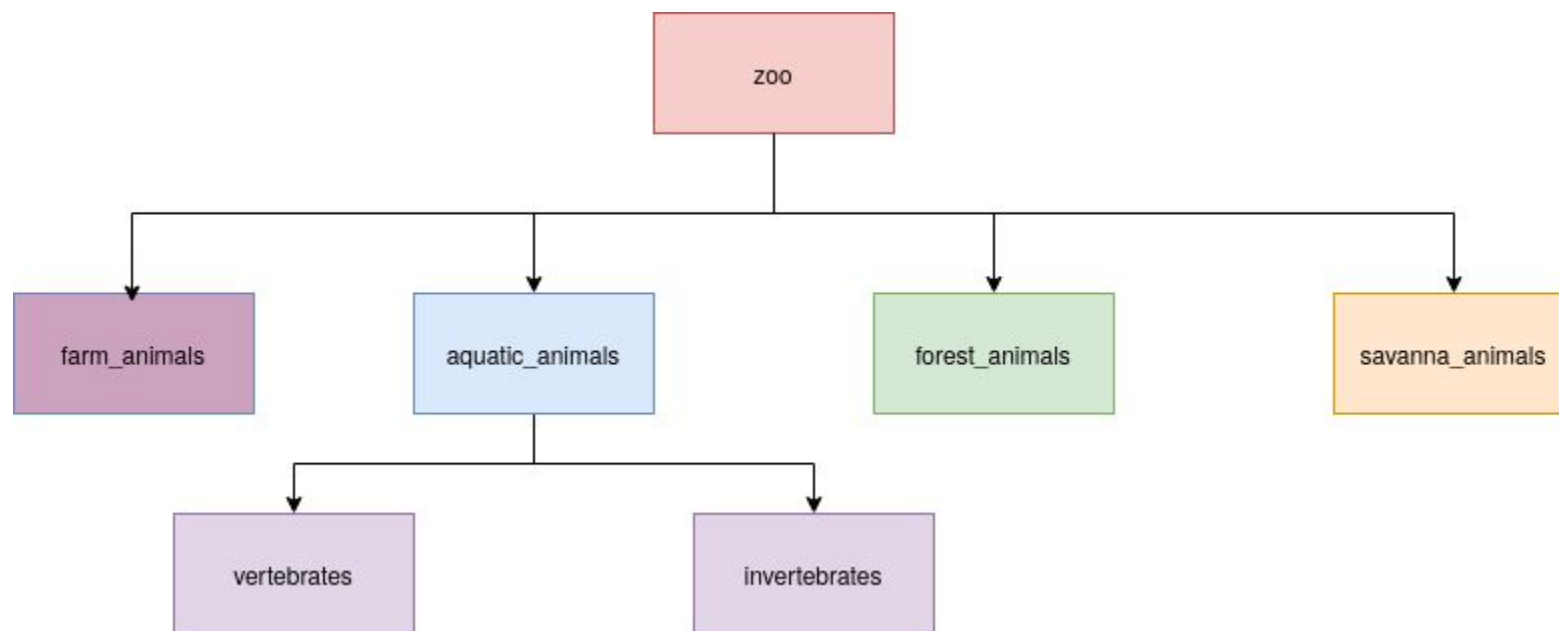
Solución 2



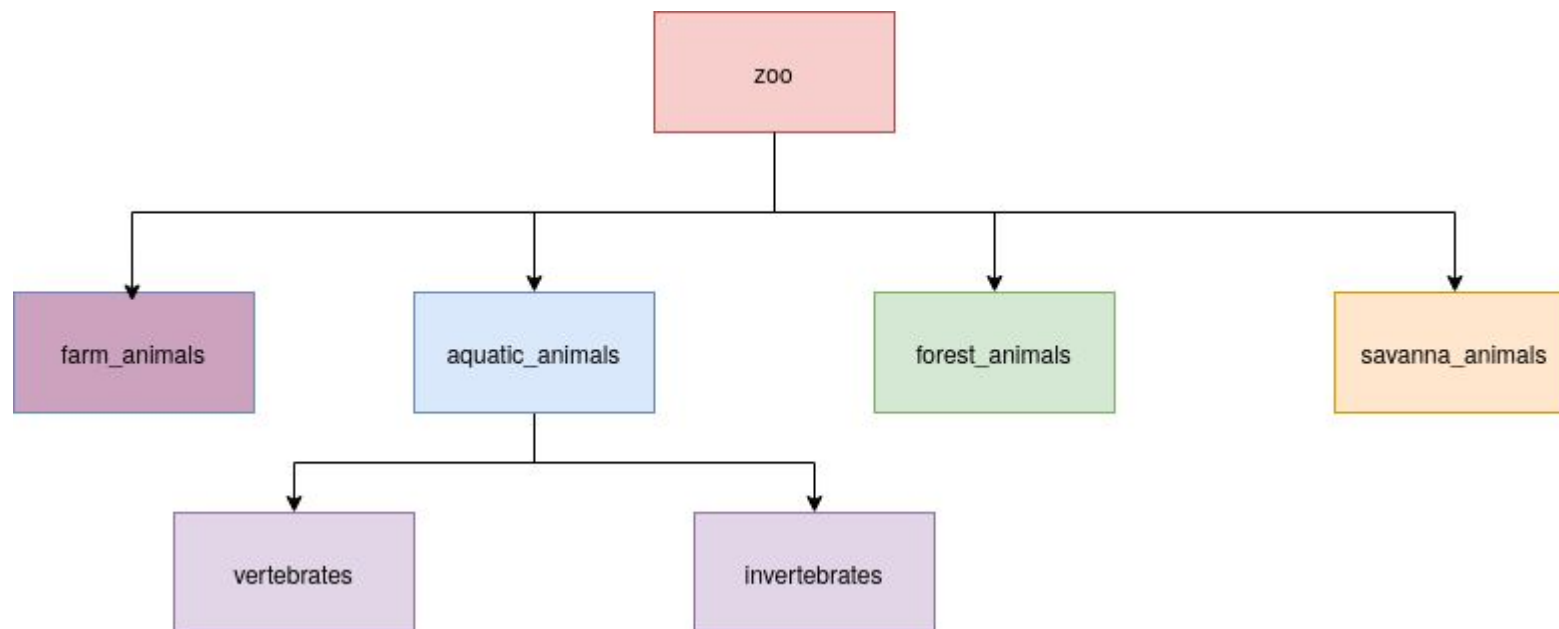
```
(base) omar@ubuntu:~/Documents/presentation$ mkdir zoo zoo/farm_animals zoo/aquatic_animals zoo/aquatic_animals/vertebrates zoo/aquatic_animals/invertebrates zoo/forest_animals zoo/savanna animals
```


Ejercicio

Lista los contenidos de cada directorio.

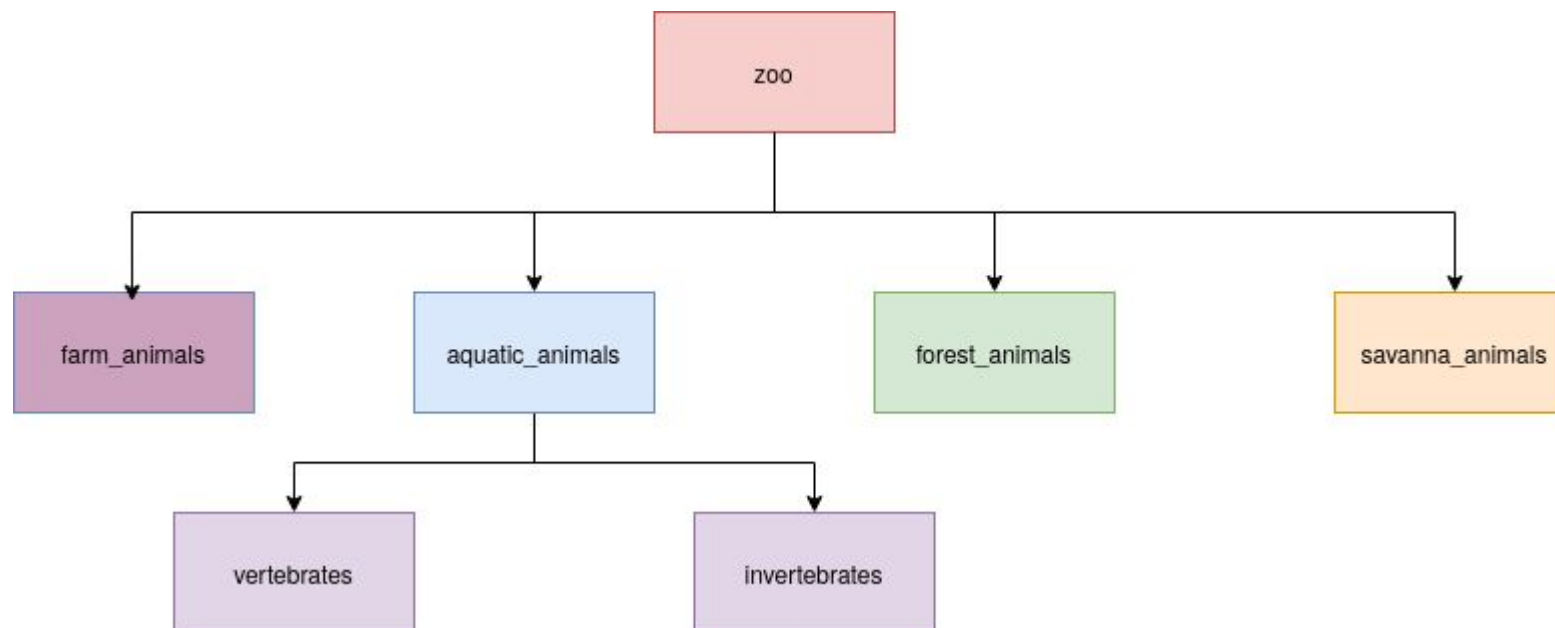


Solución 1



```
(base) omar@ubuntu:~/Documents/presentation$ ls zoo/  
aquatic_animals  farm_animals  forest_animals  savanna_animals  
(base) omar@ubuntu:~/Documents/presentation$ ls zoo/aquatic_animals/  
invertebrates  vertebrates
```

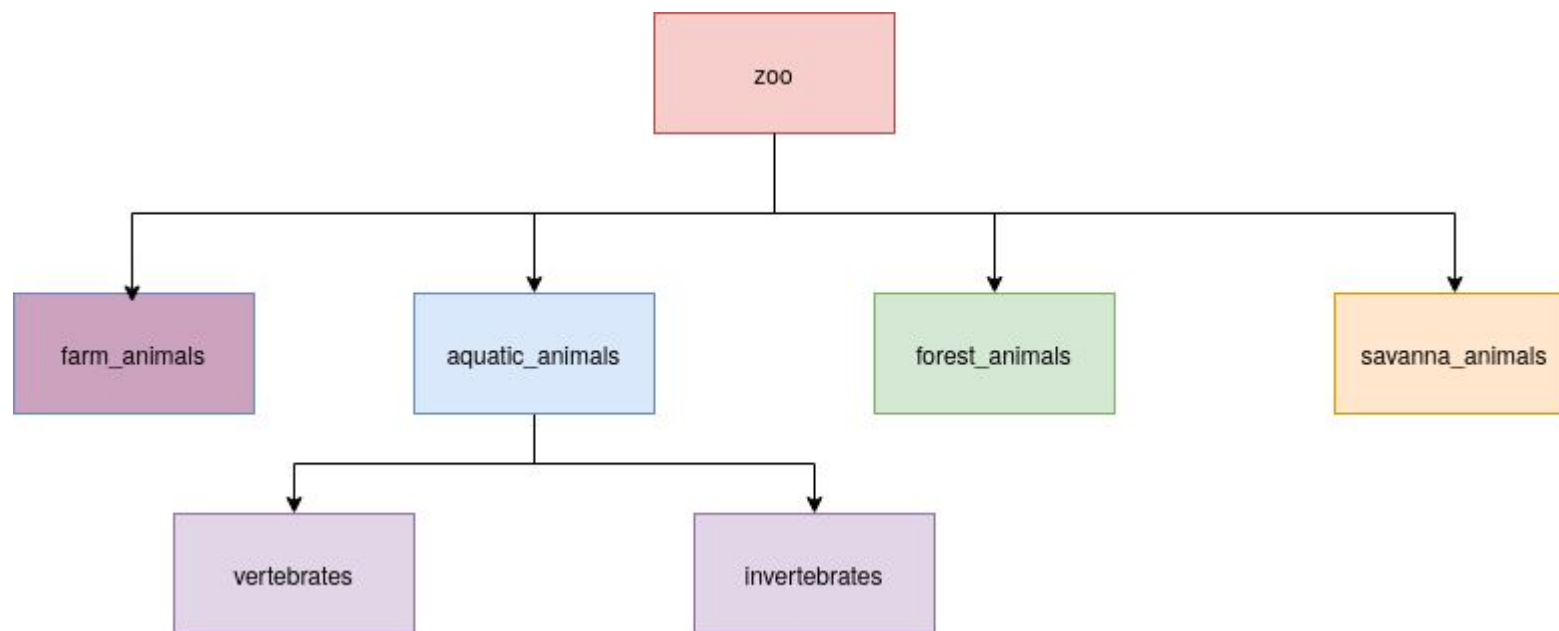
Solución 2



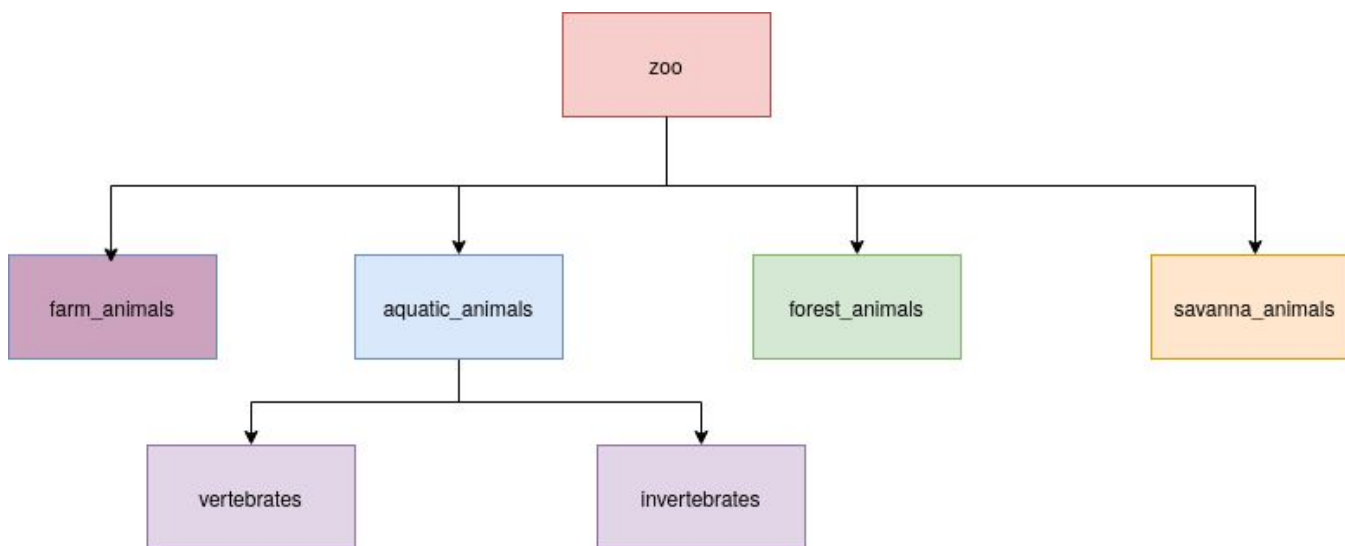
```
(base) omar@ubuntu:~/Documents/presentation$ ls -l zoo/
total 16
drwxrwxr-x 4 omar omar 4096 Oct  4 09:16 aquatic_animals
drwxrwxr-x 2 omar omar 4096 Oct  4 09:16 farm_animals
drwxrwxr-x 2 omar omar 4096 Oct  4 09:16 forest_animals
drwxrwxr-x 2 omar omar 4096 Oct  4 09:16 savanna_animals
(base) omar@ubuntu:~/Documents/presentation$ ls -l zoo/aquatic_animals/
total 8
drwxrwxr-x 2 omar omar 4096 Oct  4 09:16 invertebrates
drwxrwxr-x 2 omar omar 4096 Oct  4 09:16 vertebrates
```

Ejercicio

Navega por la estructura de directorios.



Solución

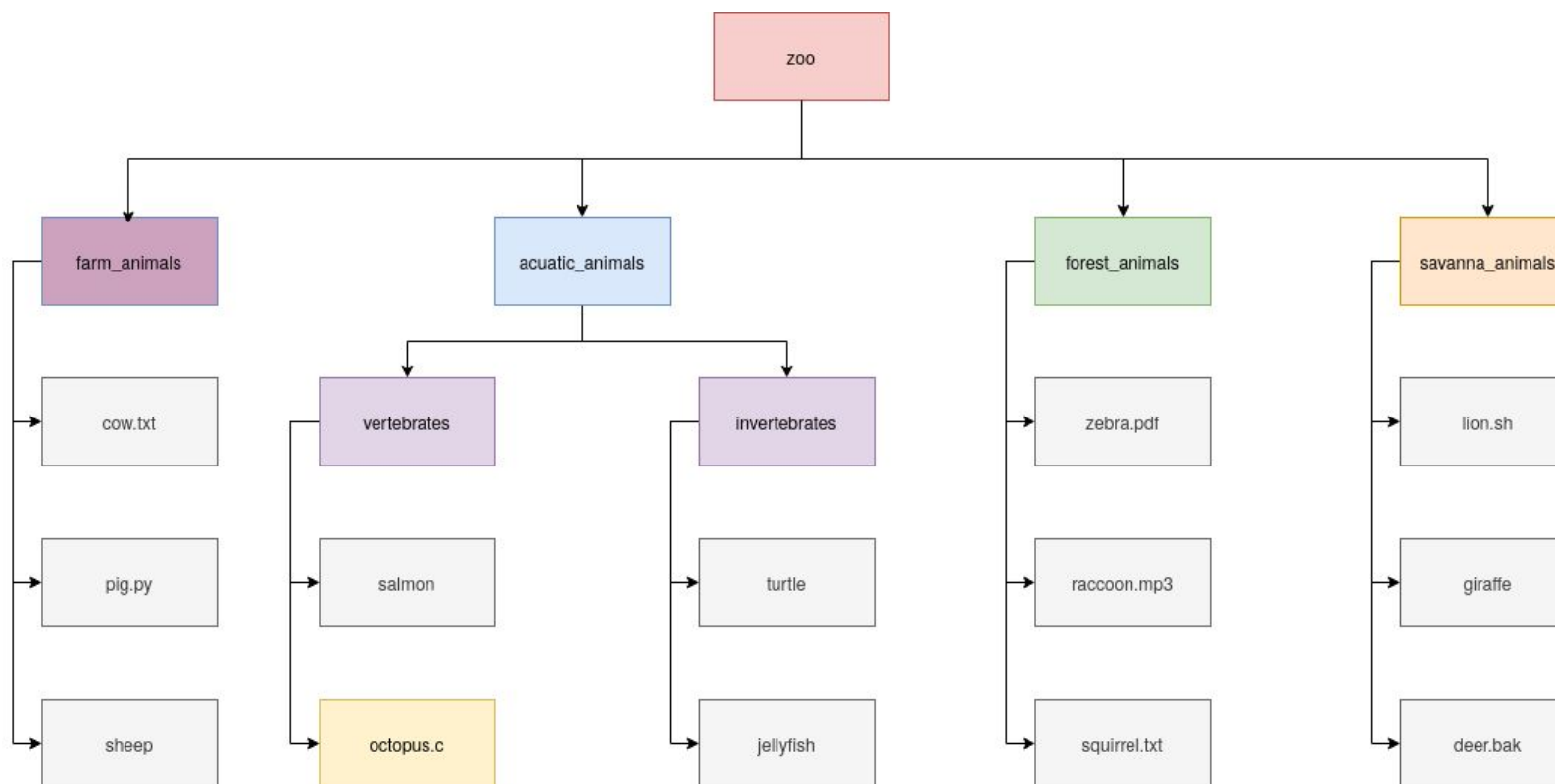


```

(base) omar@ubuntu:~/Documents/presentation$ cd zoo
(base) omar@ubuntu:~/Documents/presentation/zoo$ ll
total 24
drwxrwxr-x 6 omar omar 4096 Oct  4 09:16 ./
drwxrwxr-x 3 omar omar 4096 Oct  4 09:15 ../
drwxrwxr-x 4 omar omar 4096 Oct  4 09:16 aquatic_animals/
drwxrwxr-x 2 omar omar 4096 Oct  4 09:16 farm_animals/
drwxrwxr-x 2 omar omar 4096 Oct  4 09:16 forest_animals/
drwxrwxr-x 2 omar omar 4096 Oct  4 09:16 savanna_animals/
(base) omar@ubuntu:~/Documents/presentation/zoo$ cd aquatic_animals/
(base) omar@ubuntu:~/Documents/presentation/zoo/aquatic_animals$ ll
total 16
drwxrwxr-x 4 omar omar 4096 Oct  4 09:16 ./
drwxrwxr-x 6 omar omar 4096 Oct  4 09:16 ../
drwxrwxr-x 2 omar omar 4096 Oct  4 09:16 invertebrates/
drwxrwxr-x 2 omar omar 4096 Oct  4 09:16 vertebrates/
(base) omar@ubuntu:~/Documents/presentation/zoo/aquatic_animals$ cd ../
(base) omar@ubuntu:~/Documents/presentation/zoo$ cd farm_animals/
(base) omar@ubuntu:~/Documents/presentation/zoo/farm_animals$ cd ..
(base) omar@ubuntu:~/Documents/presentation/zoo$ cd forest_animals/
(base) omar@ubuntu:~/Documents/presentation/zoo/forest_animals$ cd ..
(base) omar@ubuntu:~/Documents/presentation/zoo$ cd savanna_animals/
  
```

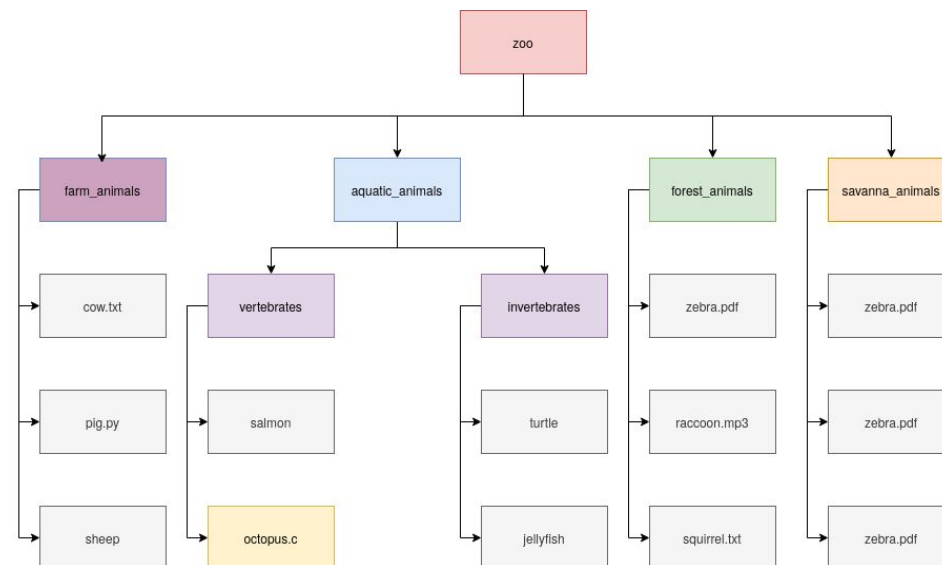
Ejercicio

Crea dentro de la estructura de directorios los siguientes ficheros.





Solución

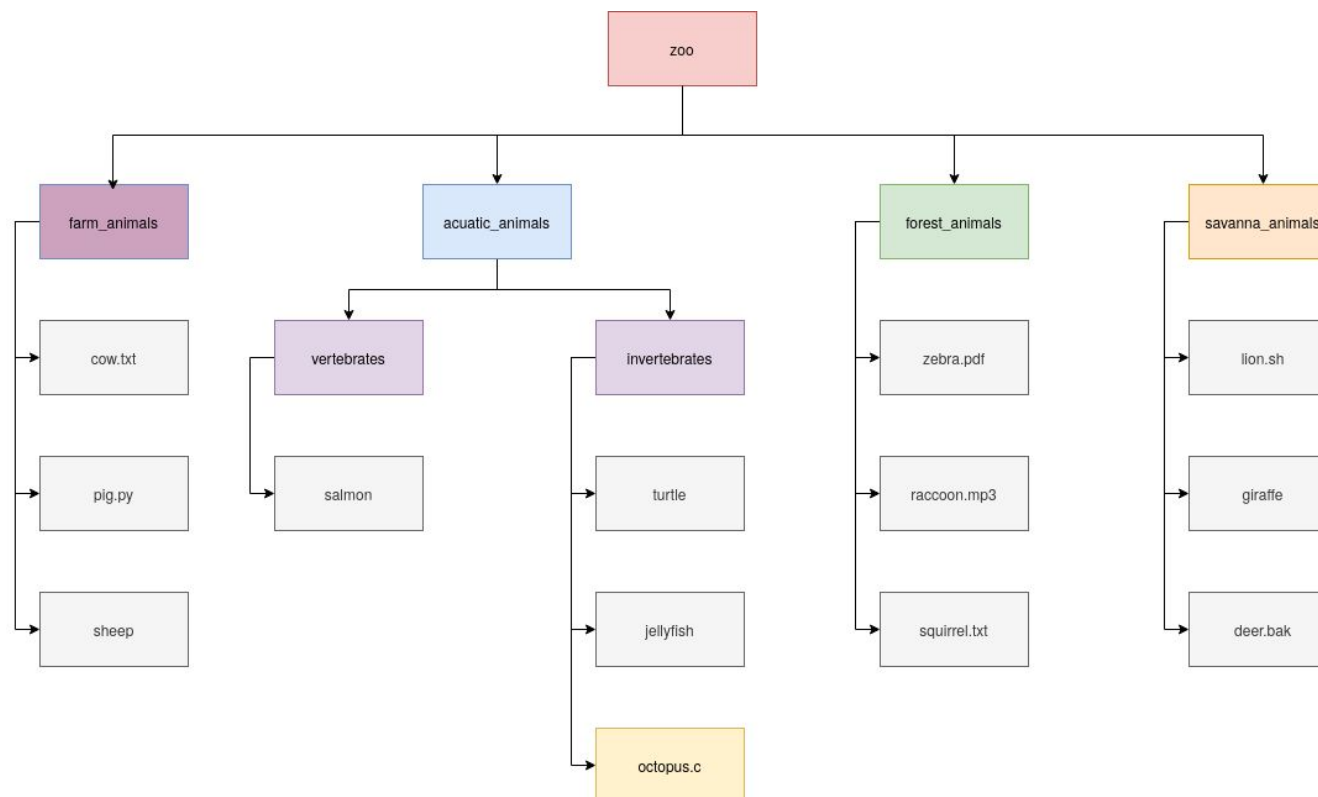


```
(base) omar@ubuntu:~/Documents/presentation/zoo$ cd farm_animals/
(base) omar@ubuntu:~/Documents/presentation/zoo/farm_animals$ touch cow.txt pig.py sheep
(base) omar@ubuntu:~/Documents/presentation/zoo/farm_animals$ cd ..
(base) omar@ubuntu:~/Documents/presentation/zoo$ cd forest_animals/
(base) omar@ubuntu:~/Documents/presentation/zoo/forest_animals$ touch zebra.pdf raccoon.mp3 squirrel.txt
(base) omar@ubuntu:~/Documents/presentation/zoo/forest_animals$ cd ../savanna_animals/
(base) omar@ubuntu:~/Documents/presentation/zoo/savanna_animals$ touch lion.sh giraffe deer.bak
(base) omar@ubuntu:~/Documents/presentation/zoo/savanna_animals$ cd ../aquatic_animals/vertebrates/
(base) omar@ubuntu:~/Documents/presentation/zoo/aquatic_animals/vertebrates$ touch salmon octopus.c
(base) omar@ubuntu:~/Documents/presentation/zoo/aquatic_animals/vertebrates$ cd ../invertebrates/
(base) omar@ubuntu:~/Documents/presentation/zoo/aquatic_animals/invertebrates$ touch turtle jellyfish
```



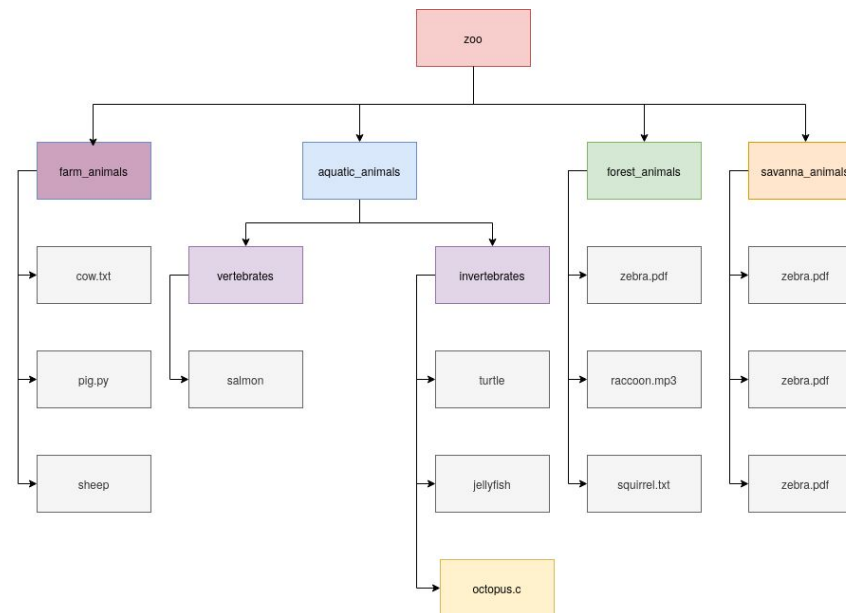
Ejercicio

Mueve el fichero octopus.c hacia el directorio aquatic_animals/invertebrates.





Solución

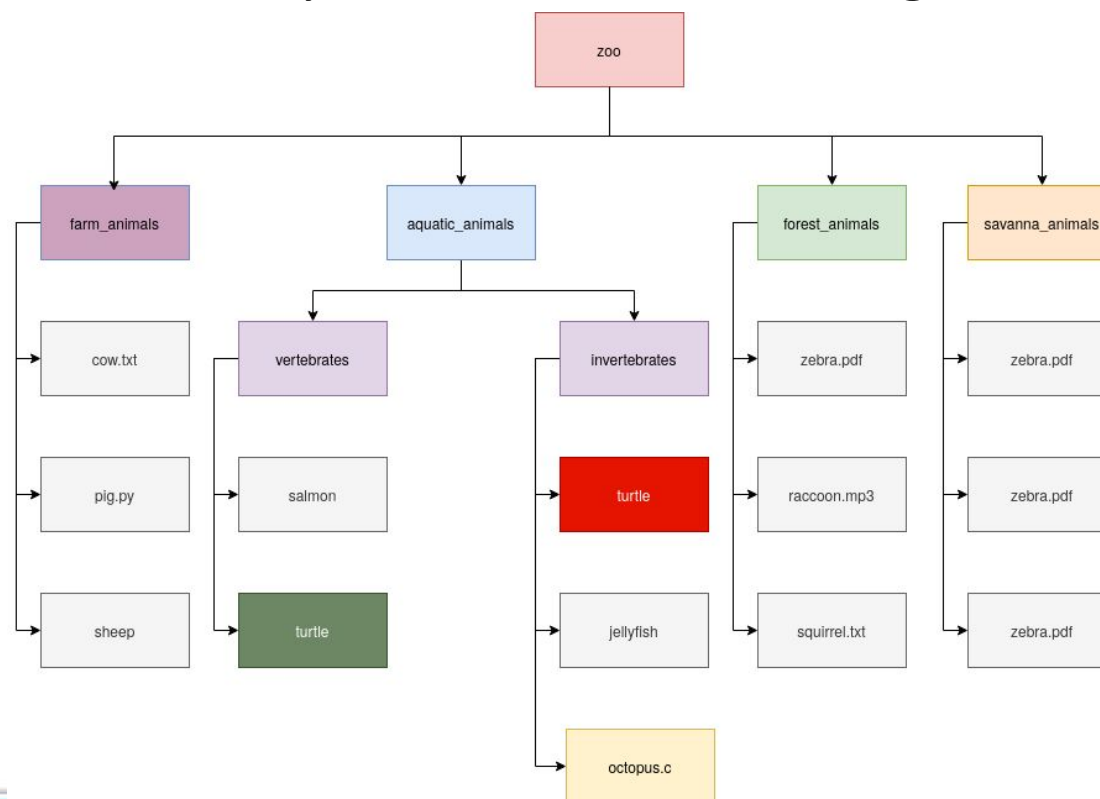


```
(base) omar@ubuntu:~/Documents/presentation/zoo/aquatic_animals/vertebrates$ cd ../../
(base) omar@ubuntu:~/Documents/presentation/zoo$ cd aquatic_animals/vertebrates/
(base) omar@ubuntu:~/Documents/presentation/zoo/aquatic_animals/vertebrates$ mv octopus.c ../invertebrates/
(base) omar@ubuntu:~/Documents/presentation/zoo/aquatic_animals/vertebrates$ ll ../invertebrates/
total 8
drwxrwxr-x 2 omar omar 4096 Oct  4 09:40 ./
drwxrwxr-x 4 omar omar 4096 Oct  4 09:16 ../
-rw-rw-r-- 1 omar omar   0 Oct  4 09:35 jellyfish
-rw-rw-r-- 1 omar omar   0 Oct  4 09:35 octopus.c
-rw-rw-r-- 1 omar omar   0 Oct  4 09:35 turtle
```

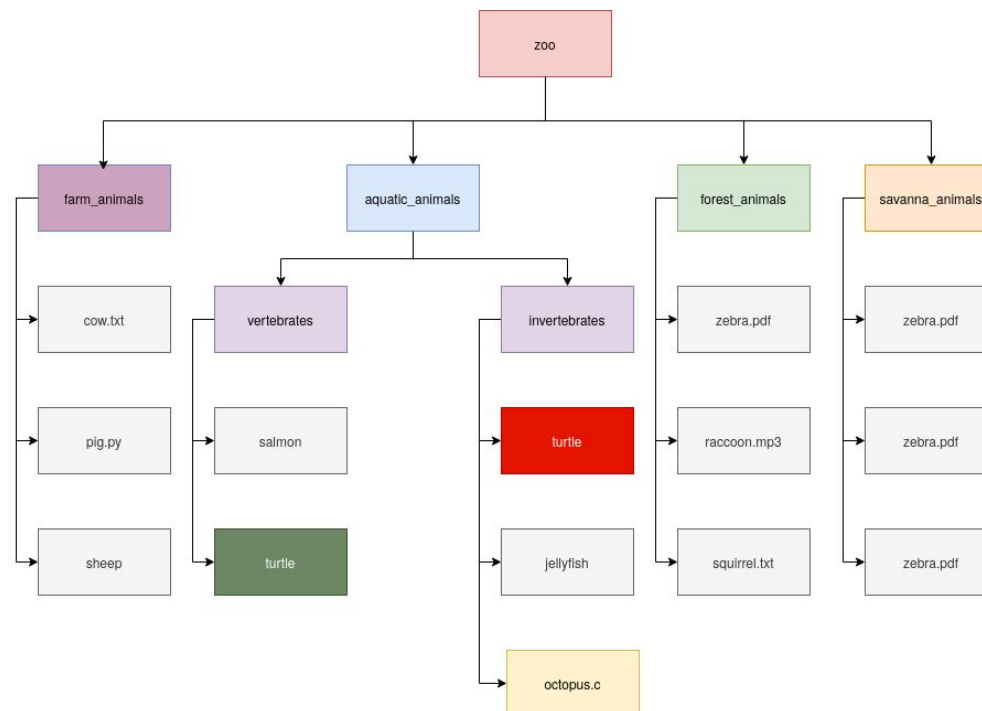


Ejercicio

Copia el fichero turtle desde el directorio aquatic_animals/invertebrates hacia aquatic_animals/vertebrates y elimina el fichero original.



Solución

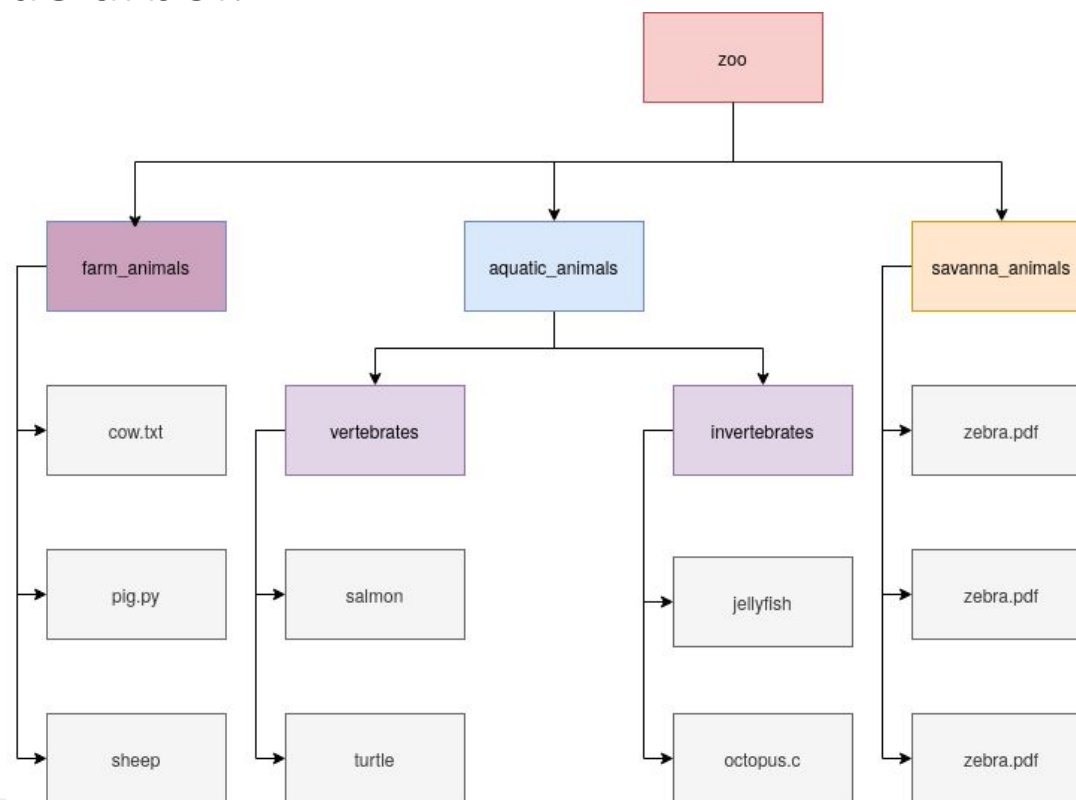


```

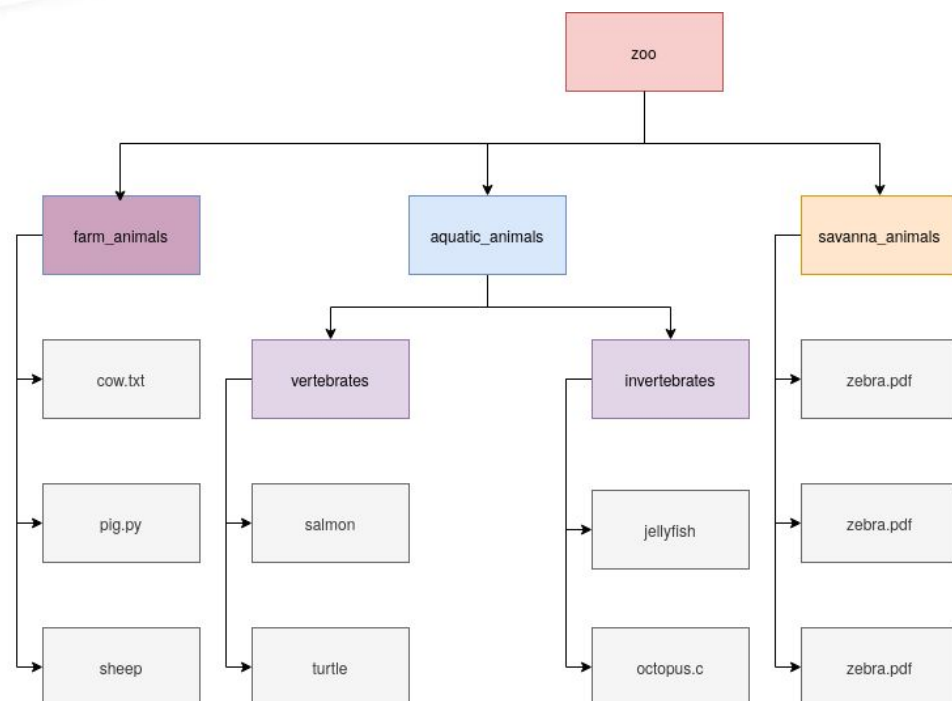
(base) omar@ubuntu:~/Documents/presentation/zoo$ cp aquatic_animals/invertebrates/turtle aquatic_animals/vertebrates/
(base) omar@ubuntu:~/Documents/presentation/zoo$ rm aquatic_animals/invertebrates/turtle
(base) omar@ubuntu:~/Documents/presentation/zoo$ ls aquatic_animals/vertebrates/
salmon  turtle
(base) omar@ubuntu:~/Documents/presentation/zoo$ ls aquatic_animals/invertebrates/
jellyfish  octopus.c
  
```

Ejercicio

Elimina el directorio forest_animals y lista los contenidos del directorio zoo en forma jerárquica o de árbol.



Solución



```
(base) omar@ubuntu:~/Documents/presentation/zoo$ rm -r forest_animals/
(base) omar@ubuntu:~/Documents/presentation/zoo$ tree
```

```

.
├── aquatic_animals
│   ├── invertebrates
│   │   ├── jellyfish
│   │   └── octopus.c
│   └── vertebrates
│       ├── salmon
│       └── turtle
├── farm_animals
│   ├── cow.txt
│   ├── pig.py
│   └── sheep
└── savanna_animals
    ├── deer.bak
    ├── giraffe
    └── lion.sh
  
```

6 directories, 10 files

Error común

No todas las distribuciones de Linux vienen con el comando 'tree' preinstalado, en caso de enfrentarse a esa situación se deberá instalar vía el administrador de paquetes predeterminado de la distribución a usar.

```
(base) omar@ubuntu:~/Documents/presentation/zoo$ tree
Command 'tree' not found, but can be installed with:
sudo snap install tree # version 2.1.3+pkg-5852, or
sudo apt install tree # version 2.1.1-2
See 'snap info tree' for additional versions.
(base) omar@ubuntu:~/Documents/presentation/zoo$ sudo apt install tree
[sudo] password for omar:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  tree
0 upgraded, 1 newly installed, 0 to remove and 20 not upgraded.
Need to get 47.1 kB of archives.
After this operation, 111 kB of additional disk space will be used.
Get:1 http://mx.archive.ubuntu.com/ubuntu noble/universe amd64 tree amd64 2.1.1-2ubuntu3 [47.1 kB]
Fetched 47.1 kB in 1s (79.2 kB/s)
Selecting previously unselected package tree.
(Reading database ... 163656 files and directories currently installed.)
Preparing to unpack .../tree_2.1.1-2ubuntu3_amd64.deb ...
Unpacking tree (2.1.1-2ubuntu3) ...
Setting up tree (2.1.1-2ubuntu3) ...
Processing triggers for man-db (2.12.0-4build2) ...
```

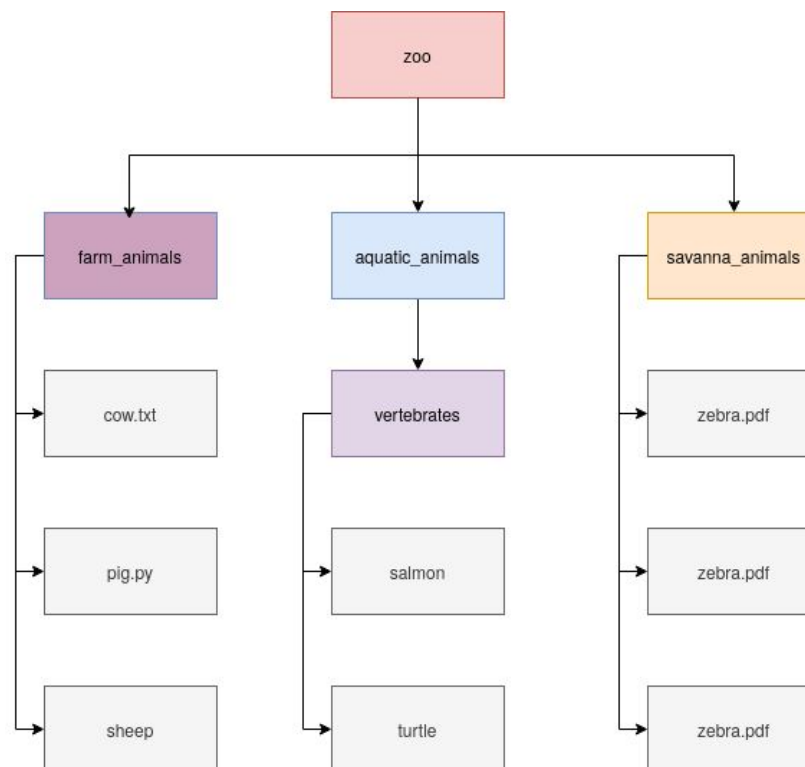


```
(base) omar@ubuntu:~/Documents/presentation/zoo$ tree .
.
├── aquatic_animals
│   ├── invertebrates
│   │   ├── jellyfish
│   │   └── octopus.c
│   └── vertebrates
│       ├── salmon
│       └── turtle
├── farm_animals
│   ├── cow.txt
│   ├── pig.py
│   └── sheep
└── savanna_animals
    ├── deer.bak
    ├── giraffe
    └── lion.sh

6 directories, 10 files
```

Ejercicio

Elimina todos los archivos dentro del directorio aquatic_animals/invertebrates y posteriormente elimina el propio directorio vacío.



Solución

```
(base) omar@ubuntu:~/Documents/presentation/zoo$ rm aquatic_animals/invertebrates/*
(base) omar@ubuntu:~/Documents/presentation/zoo$ tree
.
├── aquatic_animals
│   ├── invertebrates
│   └── vertebrates
│       ├── salmon
│       └── turtle
├── farm_animals
│   ├── cow.txt
│   ├── pig.py
│   └── sheep
└── savanna_animals
    ├── deer.bak
    ├── giraffe
    └── lion.sh

6 directories, 8 files
(base) omar@ubuntu:~/Documents/presentation/zoo$ rmdir aquatic_animals/invertebrates/
(base) omar@ubuntu:~/Documents/presentation/zoo$ tree
.
├── aquatic_animals
│   └── vertebrates
│       ├── salmon
│       └── turtle
├── farm_animals
│   ├── cow.txt
│   ├── pig.py
│   └── sheep
└── savanna_animals
    ├── deer.bak
    ├── giraffe
    └── lion.sh

5 directories, 8 files
```

Ejercicios extras

Básico

<https://linuxsurvival.com/>

Intermedio

<https://cmdchallenge.com>

Comando	Descripción
echo “...” ‘... ‘ ’...’	imprimir texto
cat	muestra el contenido completo de archivos
>	Crear un archivo
>>	Agrupar (concatenar) contenido
 	pipes
hostname	
ls -lscpi lscpu	
vi	Editor de texto
nano	Editor de texto
emacs	Editor de texto (cargar módulo)

Componentes Básicos de un Script SLURM

Componentes Básicos de un Script SLURM

#!/bin/sh: Shell utilizado para ejecutar el script.

#SBATCH -p q1: Selección de la partición (cola) para el trabajo.

#SBATCH -n 1: Número de tareas solicitadas (en este caso, 1).

#SBATCH --time=hh:mm: Tiempo máximo de ejecución.

#SBATCH -o salida.txt : Salida o impresiones

#SBATCH -e error.txt : Errores o warning

Trabajos en Slurm

Crear el script SLURM: \$ **nano preba.slurm**

```
#!/bin/sh
#SBATCH -p q1           # Nombre de la partición
#SBATCH -J Hostname     # Nombre del trabajo
#SBATCH -n 1            # Numero de nucleos (cores)
#SBATCH -o salida%j.txt  # Salida o impresiones
#SBATCH -e error%j.txt   # Errores o warning
sleep 5
hostname
```

Enviar el trabajo con: \$ **sbatch prueba.slurm**

```
[crojas@chn02 ~]$ sbatch prueba.slurm
Submitted batch job 428043
```

Ejercicio 1

1: Crear un script: llamando run.sh

```
#!/bin/sh  
#SBATCH -p q1  
#SBATCH -n 1  
hostname > file1.txt
```

2: leer el archivo run.sh

3: Ejecutar script: sbatch run.sh

4: leer el archivo: file1.txt

Hint:

- echo “...” >> run.sh
- nano run.sh
- vi run.sh
- Emacs run.sh

5: Modificar script anterior:

```
#!/bin/sh  
#SBATCH -p q1  
#SBATCH -n 2  
hostname >> file2.txt
```

6: Ejecutar script: sbatch run.sh

7: Leer archivo de salida: file2.txt



Ejercicio 2

Script: run.sh

```
GNU nano 2.9.8      run.sh

#!/bin/sh

#SBATCH -p q1          # Nombre de la partición
#SBATCH -J randomNum   # Nombre del trabajo
#SBATCH -n 1           # Número de núcleos (cores)
#SBATCH -o salida.txt  # Salida o impresiones
#SBATCH -e error.txt   # Errores o warning

Error 2
echo "Esto se va a la salida estándar '-o'"
sleep 3

echo $RANDOM > numeroAlatorio.txt
echo hostname >> numeroAlatorio.txt
```



Solucion: ejercicio 1

Script: run.sh

- 1 \$ **sbatch run.sh**
- 2 \$ **ls**
- 3 \$ **cat numeroAlatorio.txt**
- 4 \$ **cat error.txt**
- 5 \$ **cat salida.txt**
- 6 Edita run.sh y corrige el error y cambia la salida



```
$ cat error.txt  
$ head error.txt  
$ tail error.txt
```





- <https://shop.elsevier.com/books/high-performance-computing/sterling/978-0-12-420158-3>
- <https://www.ibm.com/topics/hpc>
- <https://insidehpc.com/hpc-basic-training/what-is-hpc/>
- https://hbctraining.github.io/Intro-to-shell-fasrc-flipped/lessons/08_HPC_intro_and_terms.html

