

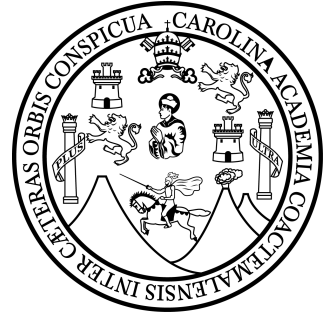
UNIVERSIDAD DE SAN CARLOS DE GUATEMALA

FACULTAD DE INGENIERÍA

ESCUELA DE CIENCIAS Y SISTEMAS

SISTEMAS OPERATIVOS 1

SECCIÓN A



MANUAL TECNICO



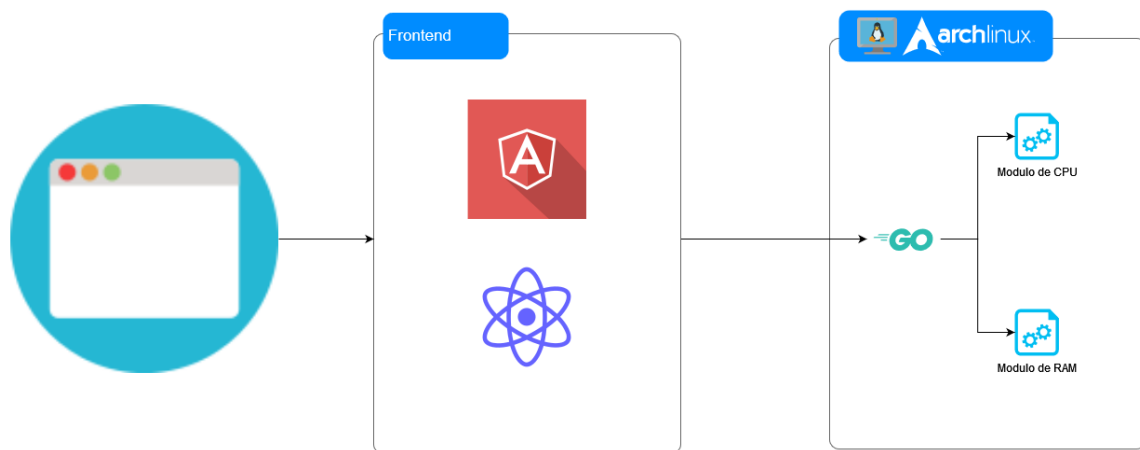
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FACULTAD DE INGENIERÍA
UNIVERSIDAD DE SAN CARLOS DE GUATEMALA

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Guatemala, 18 de junio del 2023

INTRODUCCIÓN

Se creó un sistema que se encarga de monitorear el uso en MB de memoria RAM, el porcentaje de CPU utilizado y los procesos que se encuentran activos, especificando en el mismo la información resumida sobre las asignaciones de memoria que este ha realizado. Implementado en una máquina virtual local, haciendo uso de módulos de kernel para una distribución Arch Linux con versión 5.4 de Kernel, escribiendo archivos con esta información en la carpeta /proc para posteriormente leerlos en Golang, donde serán consultados por el Frontend elaborado con Vite donde se muestra la información de forma gráfica.



OBJETIVOS

- Conocer el kernel de Linux y los módulos que actúan sobre el directorio /proc.
- Conocer la planificación de procesos de Linux.
- Investigar la función del directorio /proc para obtener la información del sistema.
- Poner en práctica los conocimientos sobre el Kernel de Linux.
- Familiarizarse con la terminal de Linux y comandos de sistema y usuario.
- Aprender a crear, monitorizar y montar procesos del Kernel de Linux.

ESPECIFICACIÓN TÉCNICA

Requisitos de Hardware y software

- Soporte de kernel y CPU de 64 bits para virtualización.
- Al menos 4 GB de RAM.
- Soporte de virtualización KVM.
- QEMU versión 5.2 o posterior.
- GCC 10.2.1-6
- Distribución de Linux (preferiblemente Debian GNU/Linux 11)

Tecnologías utilizadas

- Arch Linux release 2023.06.01
- Included Kernel: 5.4
- Vite 4.3.9
- Golang 1.13

DEPENDENCIAS

Se realizaron las siguientes instalaciones

- **GCC (instala Make también)**

```
sudo apt install build-essential  
sudo apt-get install manpages-dev
```

- **Make**

```
sudo apt install make
```

- **Linux-headers (La versión del kernel de la distribución)**

```
sudo apt-get install linux-headers-$(uname -r)
```

- **Java**

```
sudo apt install default-jdk  
java -version
```

- **Golang**

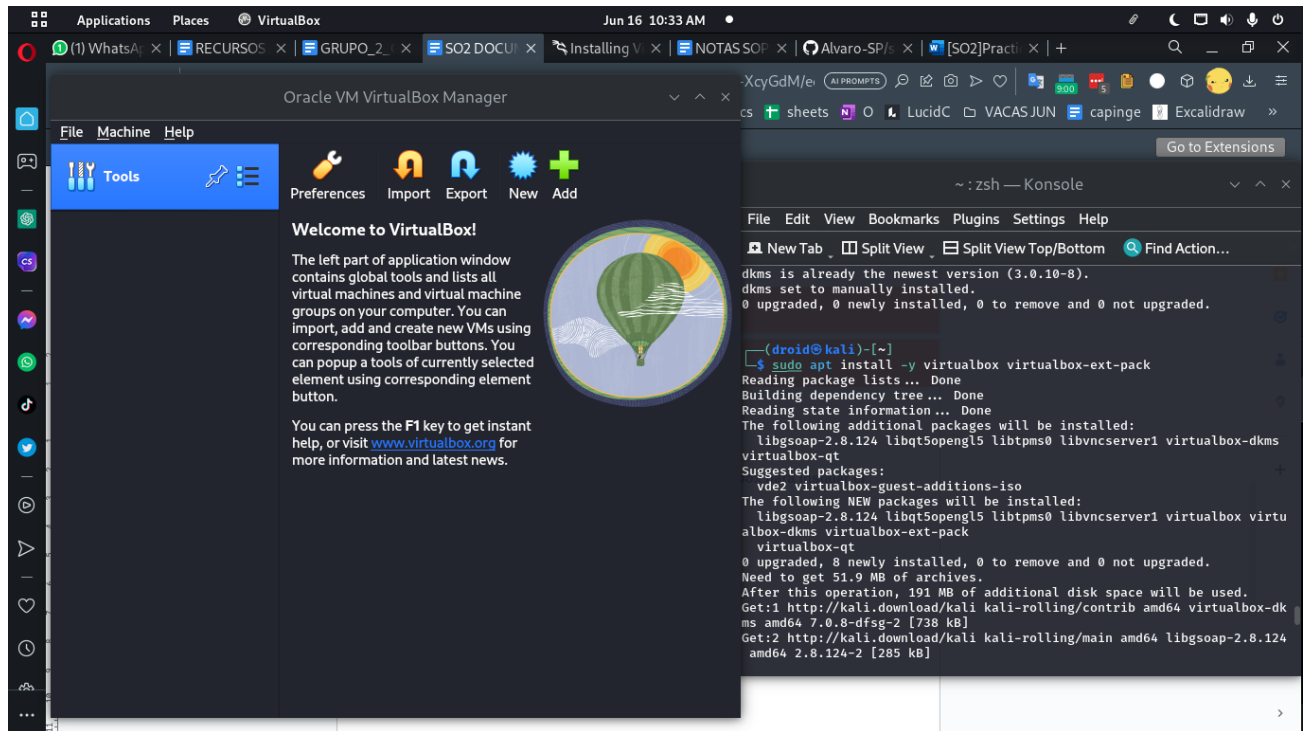
```
sudo apt install golang  
go version
```

- **Git**

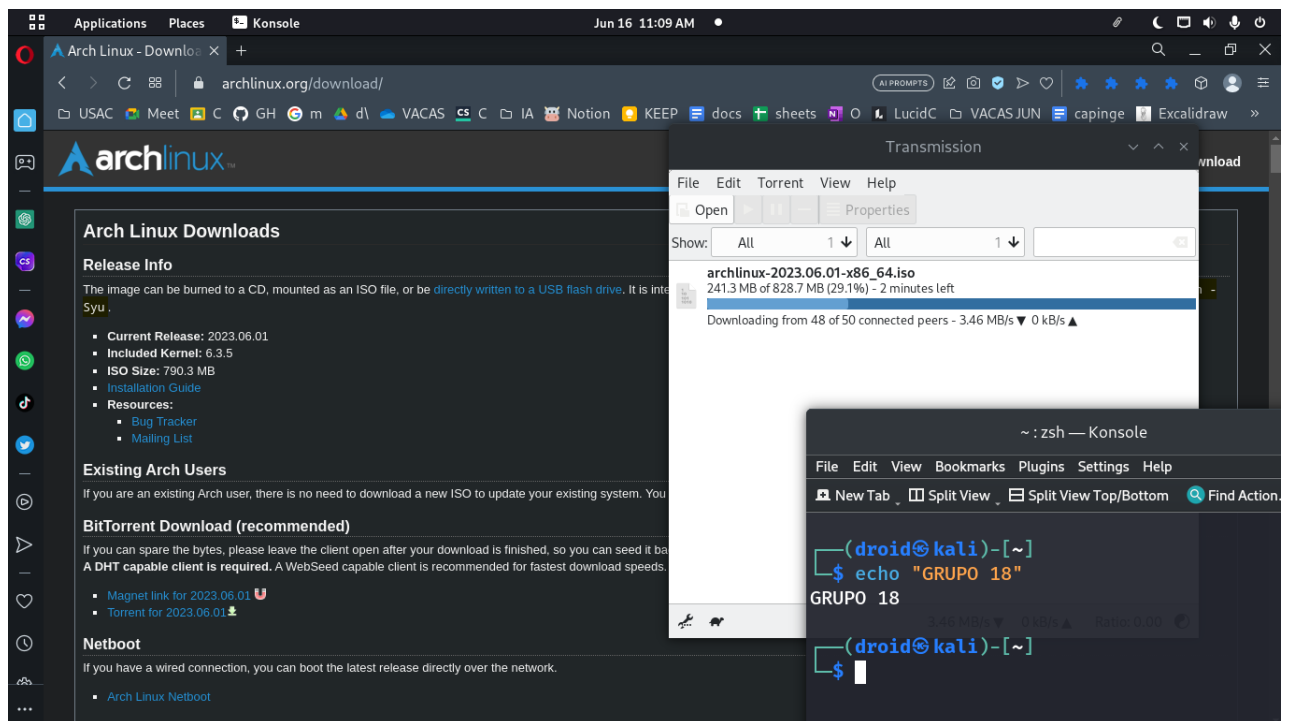
```
sudo apt install git  
git -version
```

INSTALACIÓN DE ARCH LINUX

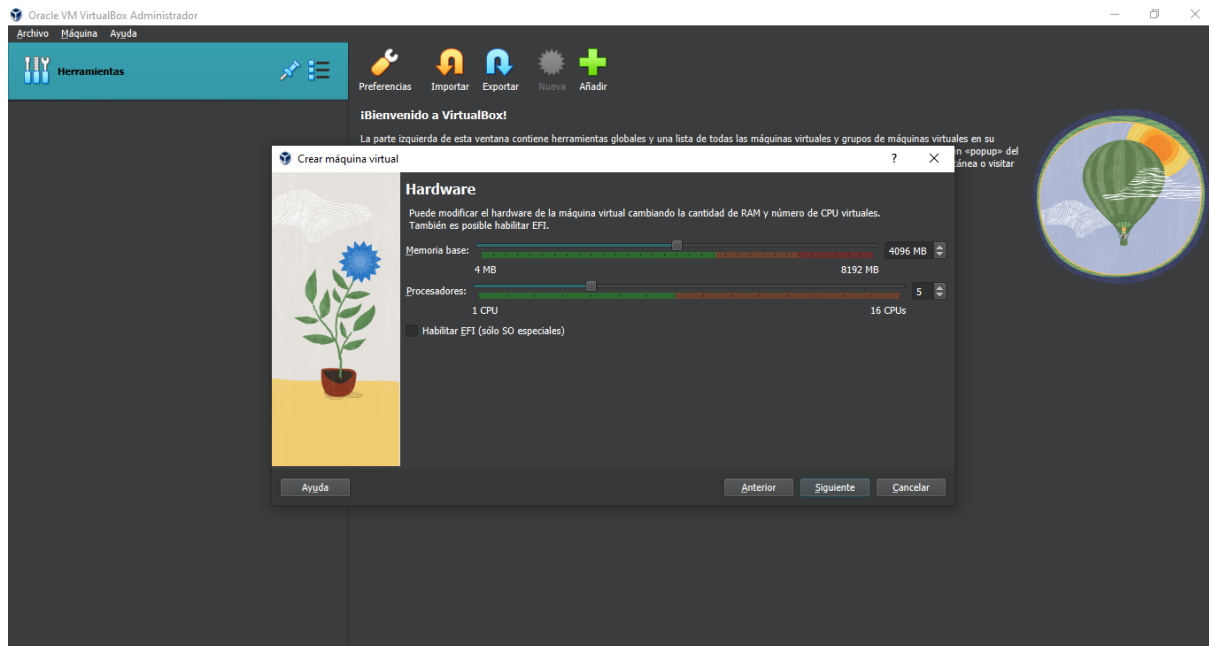
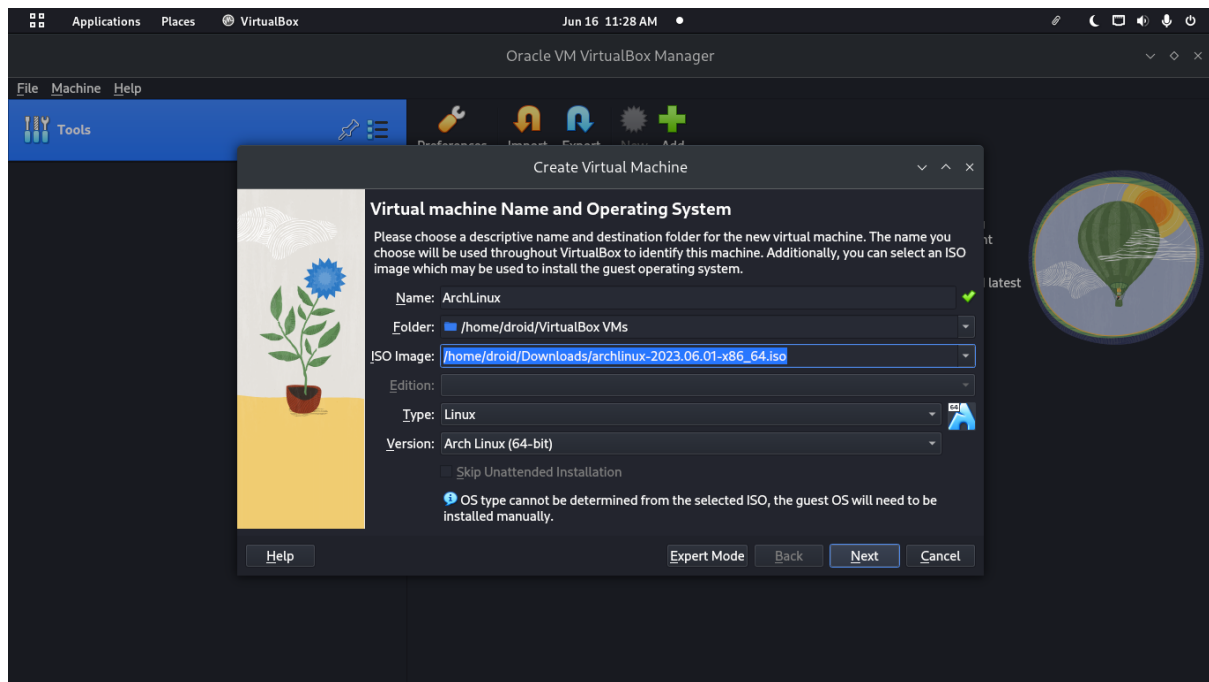
Primero se ha descargado el software de Virtualbox para instalar el ISO

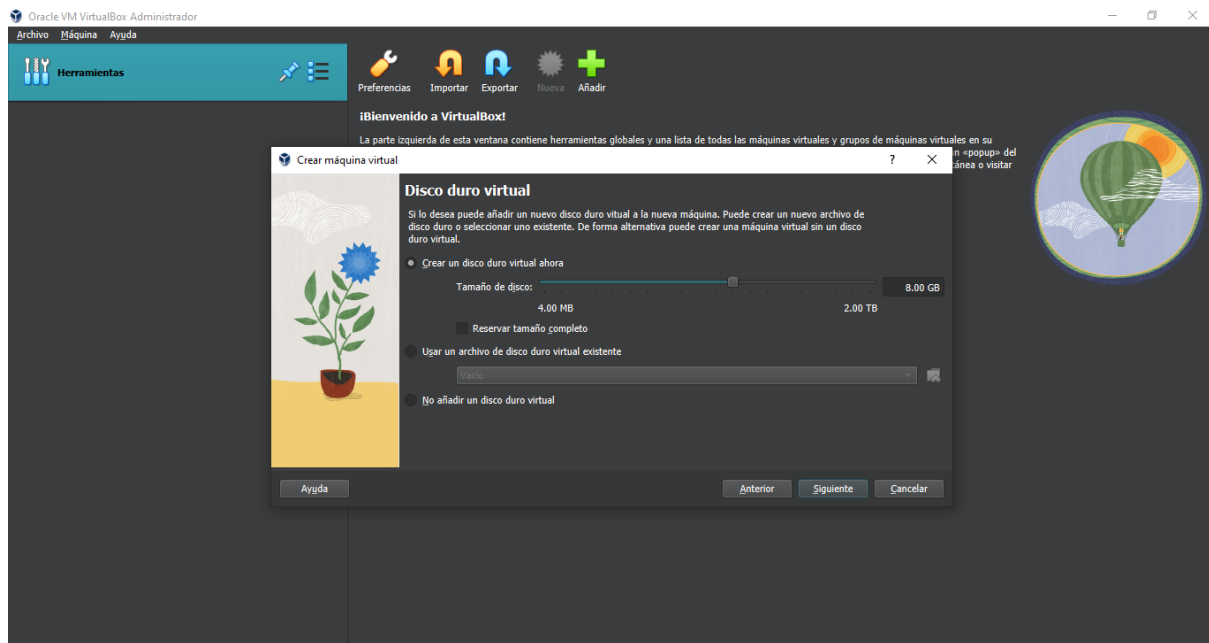


Se ha descargado el iso

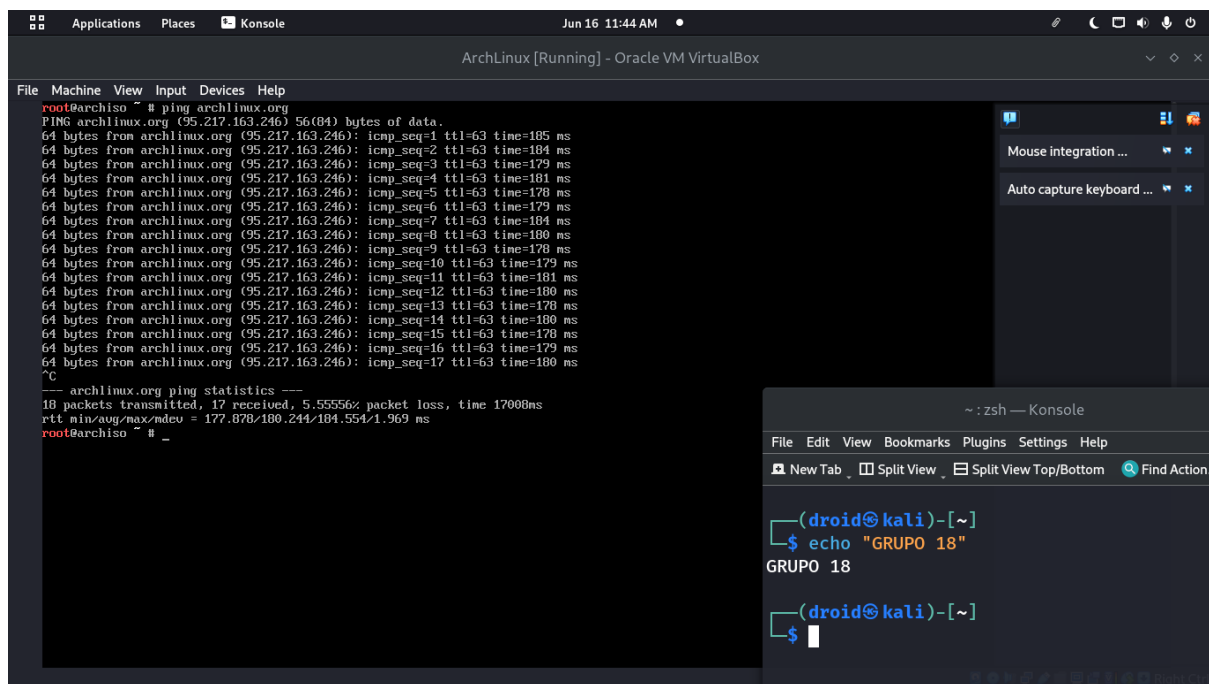


Seleccionamos la imagen y sus recursos:





Antes de seguir al iniciar la maquina verificamos conexión a internet



Posteriormente particionamos el disco:

`fdisk -l` ⇐ sirve para ver los discos

`fdisk /dev/sda` ⇐ sirve para

```
ArchLinux [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
root@archiso ~ # fdisk /dev/sda

Welcome to fdisk (util-linux 2.39).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table.
Created a new DOS (MBR) disklabel with disk identifier 0xe288f901.

Command (m for help): ls

00 Empty                27 Hidden NTFS Win    02 Linux swap / So    c1 DRDOS/sec (FAT-
01 FAT12                39 Plan 9            03 Linux              c4 DRDOS/sec (FAT-
02 XENIX root           3c PartitionMagic    04 OS/2 hidden or    c6 DRDOS/sec (FAT-
03 XENIX usr            40 Unix 80286        05 Linux extended    c7 Syrix
04 FAT16 <32M           41 PPC PReP Boot     06 NTFS volume set   da Non-FS data
05 Extended             42 SFS              07 NTFS volume set   db CP/M / CTOS / .
06 FAT16               4d QMK4.x            08 Linux plaintext   de Dell Utility
07 HPFS/NTFS/exFAT      4e QMK4.x 2nd part   0e Linux LVM         df BootIt
08 AIX                  4f QMK4.x 3rd part   09 Amosha            e1 DOS access
09 AIX bootable         50 OnTrack DM        94 Amosha BBT        e3 DOS R/O
0a OS/2 Boot Manag     51 OnTrack DM6 Aux   9f BSD/OS            e4 SpeedStor
0b W95 FAT32            52 CP/M             a0 IBM Thinkpad hi   ea Linux extended
0c W95 FAT32 (LBA)      53 OnTrack DM6 Aux   a5 FreeBSD           eb BeOS fs
0e W95 FAT16 (LBA)      54 OnTrackDM6        a6 OpenBSD           ee GPT
0f W95 Ext'd (LBA)      55 EZ-Drive          a7 NeXTSTEP          ef EFI (FAT-12/16/
10 OPUIS                56 Golden Bow        a8 Darwin UFS         f0 Linux/Pa-RISC b
11 Hidden FAT12         5c Priam Edisk       a9 MetBSD            f1 SpeedStor
12 Compaq Diagnost       61 SpeedStor         ab Darwin boot       f4 SpeedStor
14 Hidden FAT16 <3      63 GNU HURD or Sys   af HFS / HFS+        f2 DOS secondary
16 Hidden FAT16         64 Novell Netware    b7 BSDI fs           f8 EBBR protective
17 Hidden HPFS/NTF      65 Novell Netware    b8 BSDI swap         fb VMware VMFS
18 AST SmartSleep       70 DiskSecure Mult   bb Boot Wizard hid   fc VMware VMKCORE
1b Hidden W95 FAT3      75 PC/IX             bc Acronis FAT32 L    fe Linux raid auto
1c Hidden W95 FAT3      80 Old Minix          be Solaris boot       fd LAMstep
1e Hidden W95 FAT1      81 Minix / old Lin    bf Solaris            ff BBT
24 NEC DOS
```

```
Command (m for help): m

Help:

DOS (MBR)
a toggle a bootable flag
b edit nested BSD disklabel
c toggle the dos compatibility flag

Generic
d delete a partition
F list free unpartitioned space
l list known partition types
n add a new partition
p print the partition table
t change a partition type
v verify the partition table
i print information about a partition

Misc
m print this menu
u change display/entry units
x extra functionality (experts only)

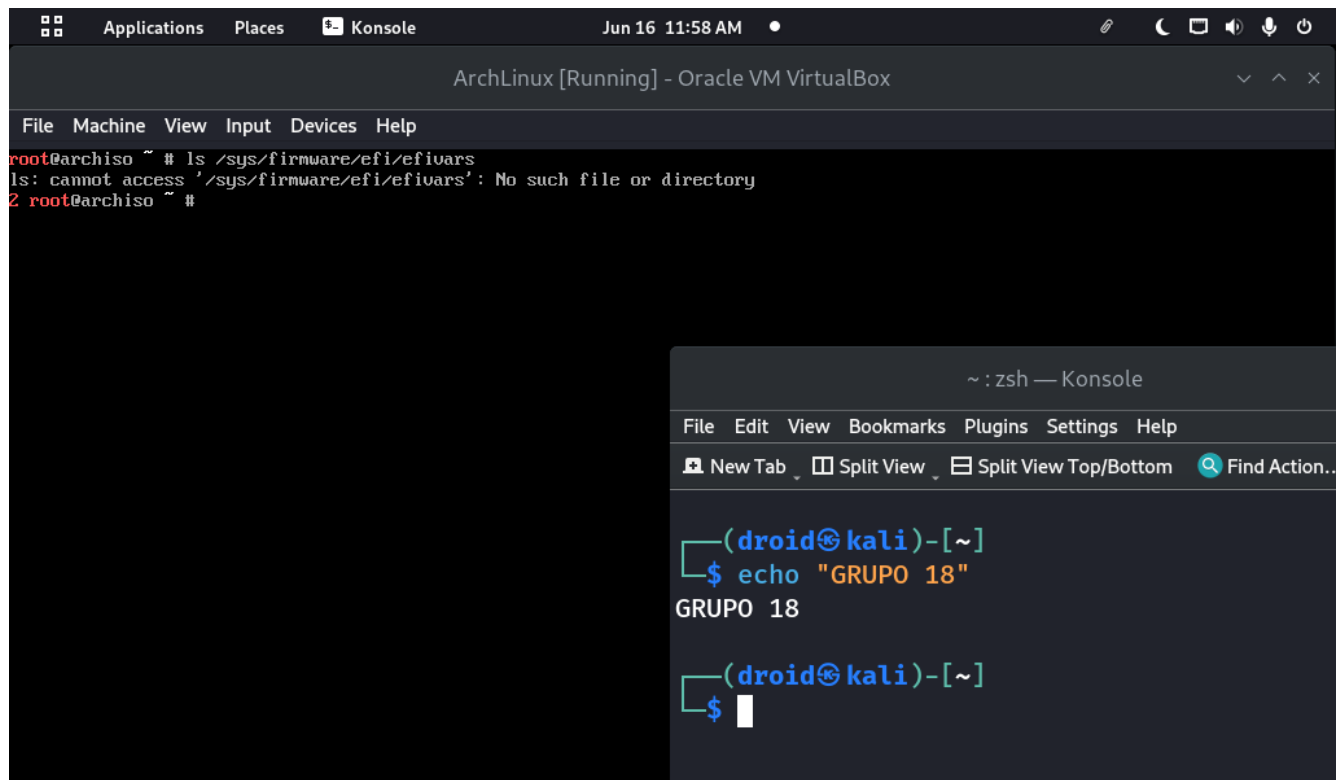
Script
I load disk layout from sfdisk script file
O dump disk layout to sfdisk script file

Save & Exit
w write table to disk and exit
q quit without saving changes

Create a new label
g create a new empty GPT partition table
G create a new empty SGI (IRIX) partition table
o create a new empty MBR (DOS) partition table
s create a new empty Sun partition table

Command (m for help): [1] 734 quit (core dumped) fdisk /dev/sda
```

Se verifica que no este en EFI (debe decir que no puede acceder):



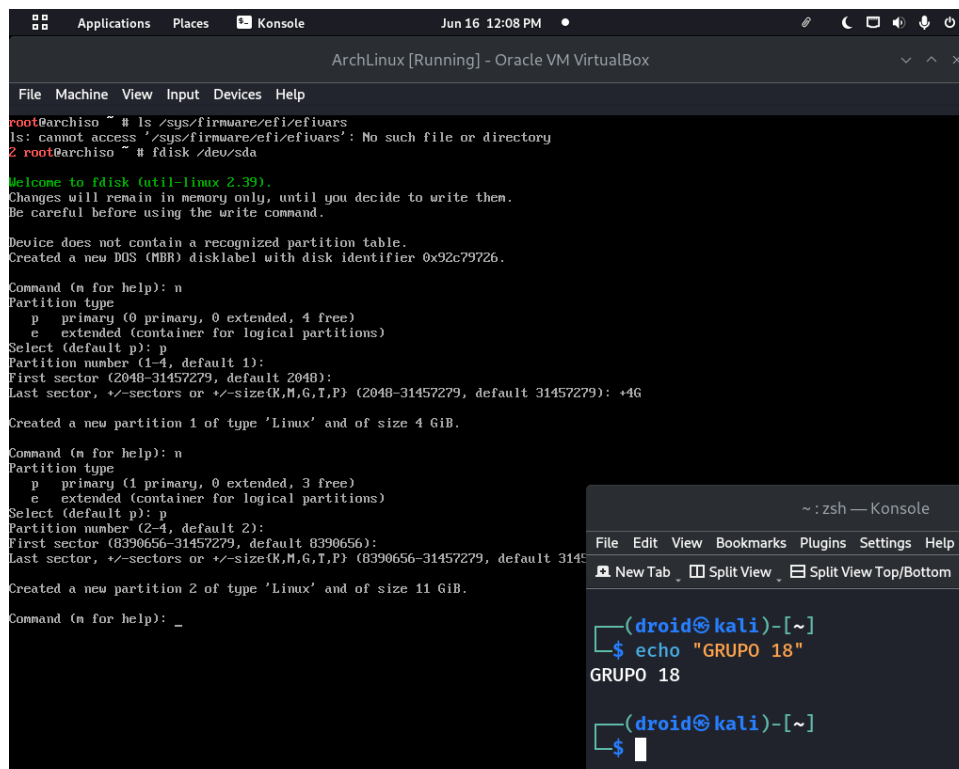
The screenshot shows a terminal window titled "ArchLinux [Running] - Oracle VM VirtualBox". The terminal output is as follows:

```
root@archiso ~ # ls /sys/firmware/efi/efivars
ls: cannot access '/sys/firmware/efi/efivars': No such file or directory
2 root@archiso ~ #
```

An inset terminal window titled "~ : zsh — Konsole" shows the following output:

```
(droid@kali)-[~]
$ echo "GRUPO 18"
GRUPO 18
(droid@kali)-[~]
$
```

Luego se crea la particion:
SWAP y ROOT



The screenshot shows a terminal window titled "ArchLinux [Running] - Oracle VM VirtualBox". The terminal output is as follows:

```
root@archiso ~ # ls /sys/firmware/efi/efivars
ls: cannot access '/sys/firmware/efi/efivars': No such file or directory
2 root@archiso ~ # fdisk /dev/sda

Welcome to fdisk (util-linux 2.39).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table.
Created a new DOS (MBR) disklabel with disk identifier 0x92c79726.

Command (n for help): n
Partition type
   p   primary (0 primary, 0 extended, 4 free)
   e   extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1):
First sector (2048-31457279, default 2048):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (2048-31457279, default 31457279): +4G

Created a new partition 1 of type 'Linux' and of size 4 GiB.

Command (n for help): n
Partition type
   p   primary (1 primary, 0 extended, 3 free)
   e   extended (container for logical partitions)
Select (default p): p
Partition number (2-4, default 2):
First sector (8390656-31457279, default 8390656):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (8390656-31457279, default 31457279): +11G

Created a new partition 2 of type 'Linux' and of size 11 GiB.

Command (n for help): _
```

An inset terminal window titled "~ : zsh — Konsole" shows the following output:

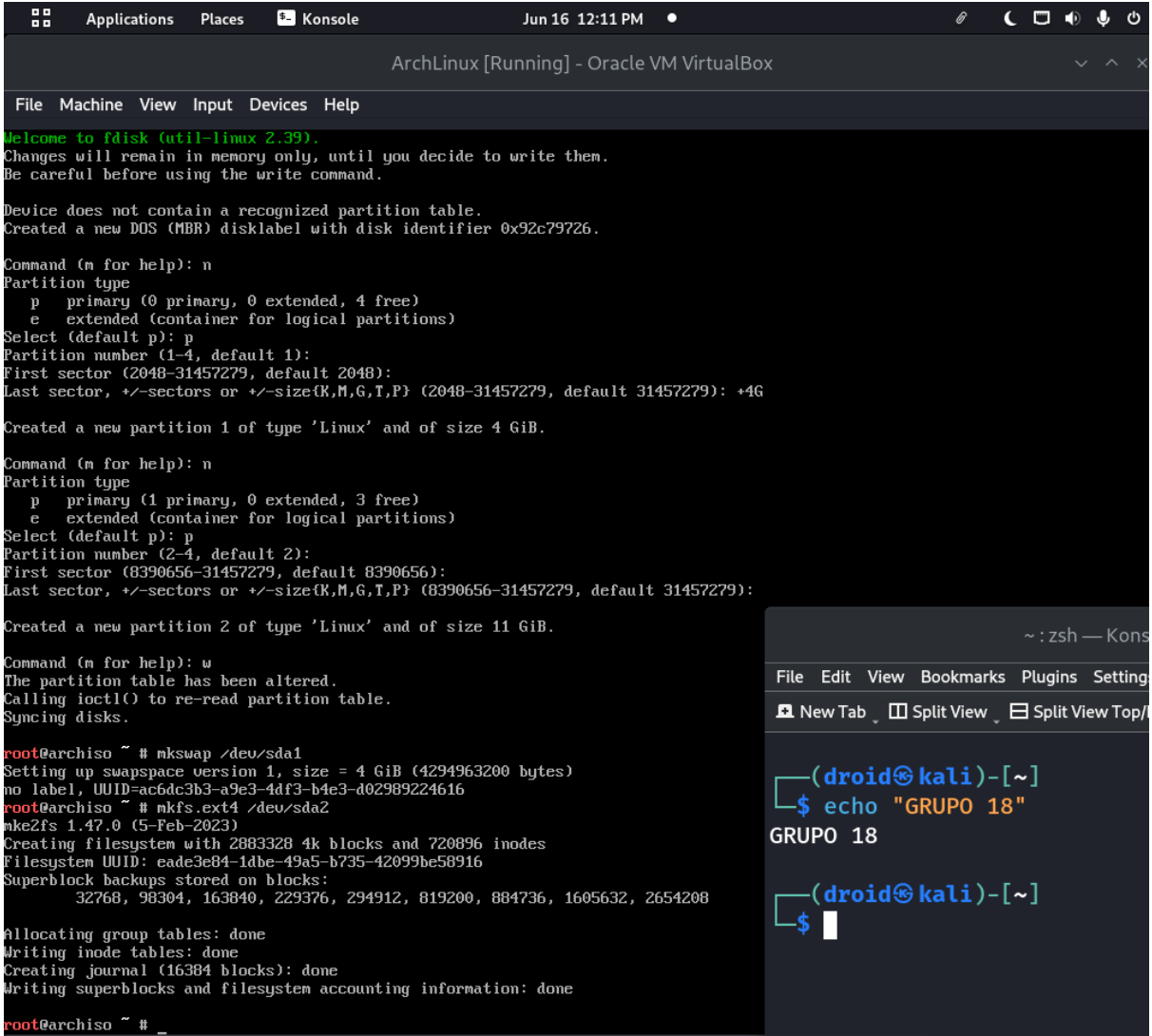
```
(droid@kali)-[~]
$ echo "GRUPO 18"
GRUPO 18
(droid@kali)-[~]
$
```

Antes de seguir presionamos “w” que es para guardar tabla en disco y salir

```
Command (m for help): w
The partition table has been altered.
Calling ioctl() to re-read partition table.
Syncing disks.

root@archiso ~ #
```

Luego formateamos SWAP y la otra con ext4



The screenshot shows a terminal window titled "ArchLinux [Running] - Oracle VM VirtualBox". The terminal output shows the following commands and their results:

```
Welcome to fdisk (util-linux 2.39).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table.
Created a new DOS (MBR) disklabel with disk identifier 0x92c79726.

Command (m for help): n
Partition type
  p   primary (0 primary, 0 extended, 4 free)
  e   extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1):
First sector (2048-31457279, default 2048):
Last sector, +/-sectors or +/-size(K,M,G,T,P) (2048-31457279, default 31457279): +4G

Created a new partition 1 of type 'Linux' and of size 4 GiB.

Command (m for help): n
Partition type
  p   primary (1 primary, 0 extended, 3 free)
  e   extended (container for logical partitions)
Select (default p): p
Partition number (2-4, default 2):
First sector (8390656-31457279, default 8390656):
Last sector, +/-sectors or +/-size(K,M,G,T,P) (8390656-31457279, default 31457279):

Created a new partition 2 of type 'Linux' and of size 11 GiB.

Command (m for help): w
The partition table has been altered.
Calling ioctl() to re-read partition table.
Syncing disks.

root@archiso ~ # mkswap /dev/sda1
Setting up swapspace version 1, size = 4 GiB (4294963200 bytes)
no label, UUID=ac6dc3b3-a9e3-4df3-b4e3-d02989224616
root@archiso ~ # mkfs.ext4 /dev/sda2
mke2fs 1.47.0 (5-Feb-2023)
Creating filesystem with 2883328 4k blocks and 720896 inodes
Filesystem UUID: eade3e84-1dbe-49a5-b735-42099be58916
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208

Allocating group tables: done
Writing inode tables: done
Creating journal (16384 blocks): done
Writing superblocks and filesystem accounting information: done

root@archiso ~ # _
```

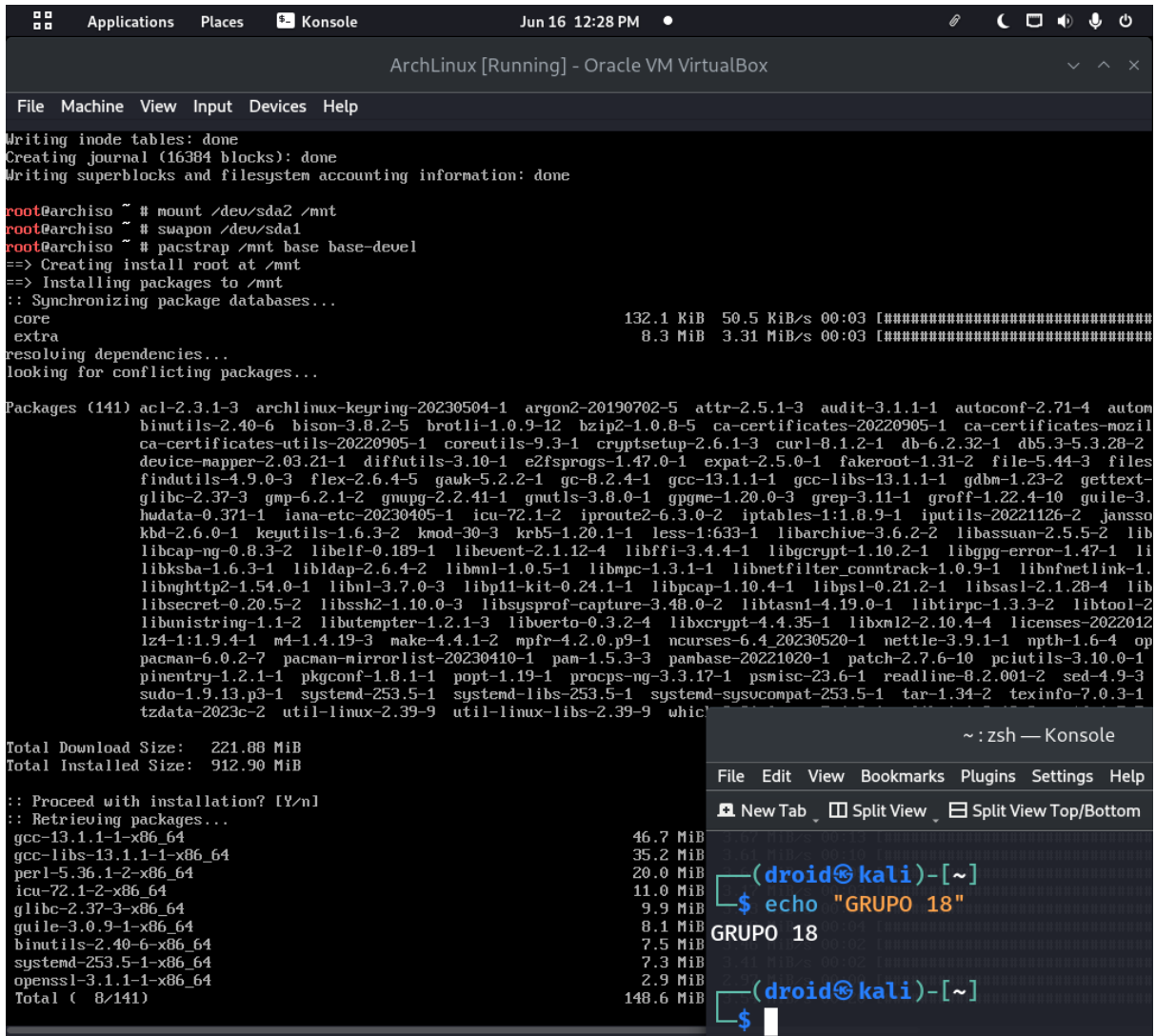
On the right side of the terminal window, there is a smaller terminal window titled "droid@kali-[~]". It shows the command `echo "GRUPO 18"` being executed, resulting in the output `GRUPO 18`.

Montamos la partición y el sistema de archivos con: `mount /dev/sda2 /mnt` y también: `swapon /dev/sda1`

```
Creating journal (16384 blocks): done
Writing superblocks and filesystem accounting information: done

root@archiso ~ # mount /dev/sda2 /mnt
root@archiso ~ # swapon /dev/sda1
```

Descargar los paquetes para la instalación de arch
`pacstrap /mnt base base-devel`



```
Applications Places Konsole Jun 16 12:28 PM
ArchLinux [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Writing inode tables: done
Creating journal (16384 blocks): done
Writing superblocks and filesystem accounting information: done

root@archiso ~ # mount /dev/sda2 /mnt
root@archiso ~ # swapon /dev/sda1
root@archiso ~ # pacstrap /mnt base base-devel
==> Creating install root at /mnt
==> Installing packages to /mnt
:: Synchronizing package databases...
core                               132.1 KiB   50.5 KiB/s   00:03 [#####]
extra                             8.3 MiB    3.31 MiB/s   00:03 [#####]
resolving dependencies...
looking for conflicting packages...

Packages (141) acl-2.3.1-3 archlinux-keyring-20230504-1 argon2-20190702-5 attr-2.5.1-3 audit-3.1.1-1 autoconf-2.71-4 autom
binutils-2.40-6 bison-3.8.2-5 brotli-1.0.9-12 bzip2-1.0.8-5 ca-certificates-20220905-1 ca-certificates-mozil
ca-certificates-utils-20220905-1 coreutils-9.3-1 cryptsetup-2.6.1-3 curl-8.1.2-1 db-6.2.32-1 db5.3.5.3.28-2
device-mapper-2.03.21-1 diffutils-3.10-1 e2fsprogs-1.47.0-1 expat-2.5.0-1 fakeroot-1.31-2 file-5.44-3 files
findutils-4.9.0-3 flex-2.6.4-5 gawk-5.2.2-1 gc-8.2.4-1 gcc-13.1.1-1 gcc-libs-13.1.1-1 gdbm-1.23-2 gettext-
glibc-2.37-3 gmp-6.2.1-2 gnupg-2.2.41-1 gnutls-3.8.0-1 gpgme-1.20.0-3 grep-3.11-1 groff-1.22.4-10 guile-3.
hdata-0.371-1 iana-etc-20230405-1 icu-72.1-2 iproute2-6.3.0-2 iptables-1.8.9-1 iputils-20221126-2 jansso
kbd-2.6.0-1 keyutils-1.6.3-2 kmod-30-3 krb5-1.20.1-1 less-1.633-1 libarchive-3.6.2-2 libassuan-2.5.5-2 lib
libcap-ng-0.8.3-2 libelf-0.189-1 libevent-2.1.12-4 libffi-3.4.4-1 libgcrypt-1.10.2-1 libgpg-error-1.47-1 li
libksba-1.6.3-1 libldap-2.6.4-2 libmnl-1.0.5-1 libmpc-1.3.1-1 libnetfilter_conntrack-1.0.9-1 libnftnl-1.1
libnftnl-1.54.0-1 libnl-3.7.0-3 libp11-kit-0.24.1-1 libpcap-1.10.4-1 libpsl-0.21.2-1 libsasl-2.1.28-4 lib
libsecret-0.20.5-2 libssh2-1.10.0-3 libsysprof-capture-3.48.0-2 libtasn1-4.19.0-1 libtirpc-1.3.3-2 libtool-2
libunistring-1.1-2 libutempter-1.2.1-3 libveto-0.3.2-4 libxcrypt-4.4.35-1 libxml2-2.10.4-4 licenses-2022012
lz4-1.1.9.4-1 m4-1.4.19-3 make-4.4.1-2 mpfr-4.2.0-p9-1 ncurses-6.4-20230520-1 nettle-3.9.1-1 nptl-1.6-4 op
pacman-6.0.2-7 pacman-mirrorlist-20230410-1 pam-1.5.3-3 pambase-20221020-1 patch-2.7.6-10 pciutils-3.10.0-1
pinentry-1.2.1-1 pkgconf-1.8.1-1 popt-1.19-1 procs-ng-3.3.17-1 psnisc-23.6-1 readline-8.2.001-2 sed-4.9-3
sudo-1.9.13-p3-1 systemd-253.5-1 systemd-libs-253.5-1 systemd-sysucompat-253.5-1 tar-1.34-2 texinfo-7.0.3-1
tzdata-2023c-2 util-linux-2.39-9 util-linux-libs-2.39-9 which-2.41-1

Total Download Size: 221.88 MiB
Total Installed Size: 912.90 MiB

:: Proceed with installation? [Y/n]
:: Retrieving packages...
gcc-13.1.1-1-x86_64                46.7 MiB
gcc-libs-13.1.1-1-x86_64           35.2 MiB
perl-5.36.1-2-x86_64               20.0 MiB
icu-72.1-2-x86_64                  11.0 MiB
glibc-2.37-3-x86_64                 9.9 MiB
guile-3.0.9-1-x86_64                8.1 MiB
binutils-2.40-6-x86_64              7.5 MiB
systemd-253.5-1-x86_64              7.3 MiB
openssl-3.1.1-1-x86_64             2.9 MiB
Total ( 8/141)                    148.6 MiB

~ : zsh — Konsole
File Edit View Bookmarks Plugins Settings Help
New Tab Split View Split View Top/Bottom
(droid@kali)-[~]
$ echo "GRUPO 18"
GRUPO 18
(droid@kali)-[~]
$
```

```
genfstab -U /mnt >> /mnt/etc/fstab
arch-chroot /mnt
```

Ahora cambiamos la zona horaria a la mas cercana que es la de Mexico

Hay varias regiones pero elegimos la de Mexico:

In -sf /usr/share/zoneinfo/Mexico/BajaSur /etc/localtime

```
root@archiso /#  
root@archiso /#  
root@archiso /# ln -sf /usr/share/zoneinfo/Mexico/BajaSur /etc/localtime  
root@archiso /#
```

Luego se instala Nano con el comando <<pacman -S nano>>
si surge problema con el <enter> se ejecuta stty sane:

```
[root@archiso /]# stty sane
[root@archiso /]# pacman -S nano
resolving dependencies...
looking for conflicting packages...

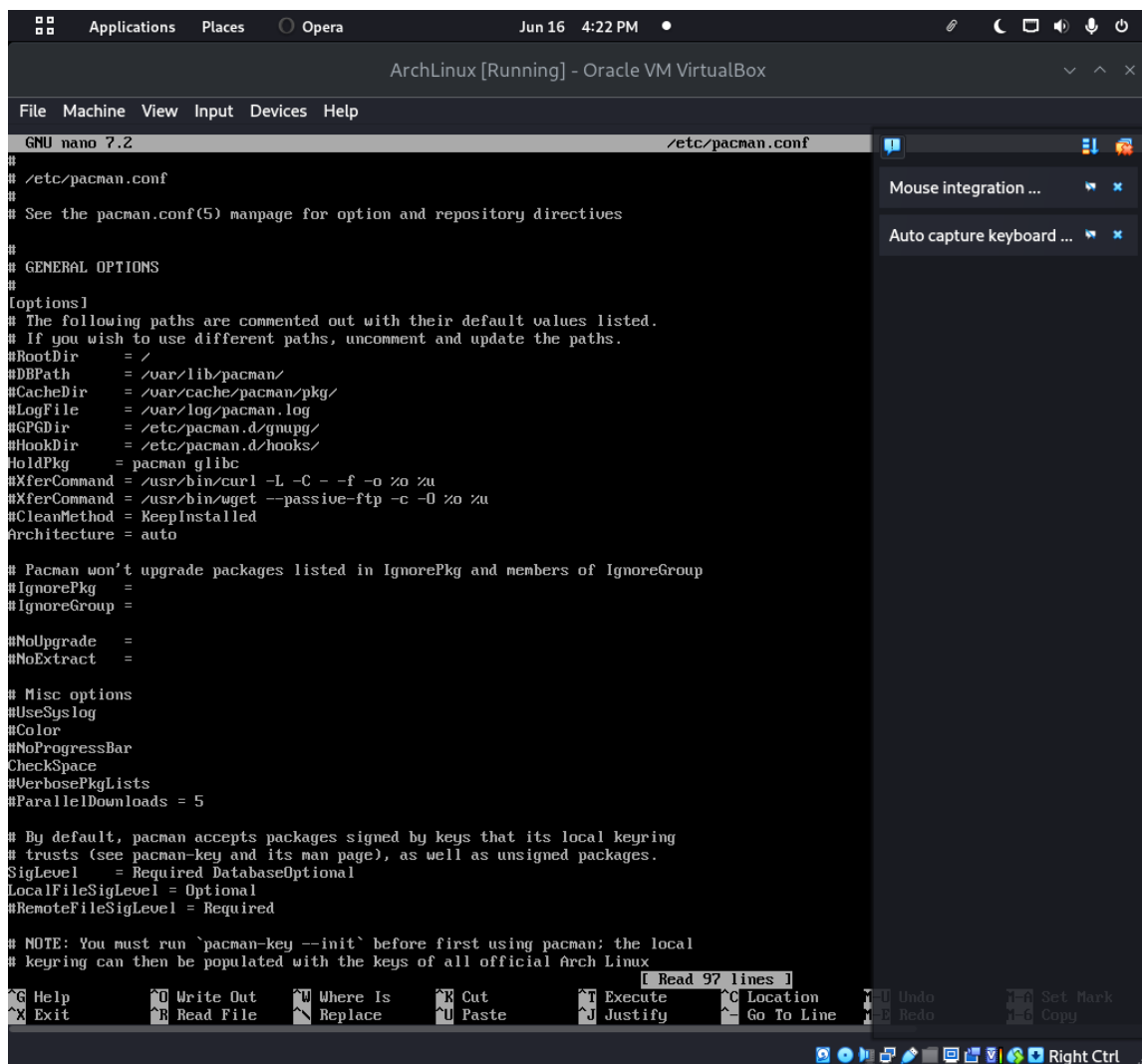
Packages (1) nano-7.2-1

Total Download Size:   0.58 MiB
Total Installed Size: 2.51 MiB

:: Proceed with installation? [Y/n] Y
:: Retrieving packages...
   nano-7.2-1-x86_64                    598.6 KiB   207 KiB/s 00:03 [#####]
(1/1) checking keys in keyring          [#####]
(1/1) checking package integrity         [#####]
(1/1) loading package files              [#####]
(1/1) checking for file conflicts        [#####]
(1/1) checking available disk space      [#####]
:: Processing package changes...
(1/1) installing nano                    [#####]
:: Running post-transaction hooks...
(1/2) Arming ConditionNeedsUpdate...
(2/2) Updating the info directory file...
[root@archiso /]# _
```

INSTALACIÓN DEL KERNEL:

Como no tenemos una versión anterior ejecutamos: `nano /etc/pacman.conf`



```
GNU nano 7.2 /etc/pacman.conf
#
# /etc/pacman.conf
#
# See the pacman.conf(5) manpage for option and repository directives
#
# GENERAL OPTIONS
#
[options]
# The following paths are commented out with their default values listed.
# If you wish to use different paths, uncomment and update the paths.
#RootDir      = /
#DBPath       = /var/lib/pacman/
#CacheDir     = /var/cache/pacman/pkg/
#LogFile      = /var/log/pacman.log
#GPGDir       = /etc/pacman.d/gnupg/
#HookDir      = /etc/pacman.d/hooks/
#HoldPkg      = pacman glibc
#XferCommand  = /usr/bin/curl -L -C - -f -o %o %u
#XferCommand  = /usr/bin/wget --passive-ftp -c -O %o %u
#CleanMethod  = KeepInstalled
Architecture = auto

# Pacman won't upgrade packages listed in IgnorePkg and members of IgnoreGroup
#IgnorePkg    =
#IgnoreGroup  =

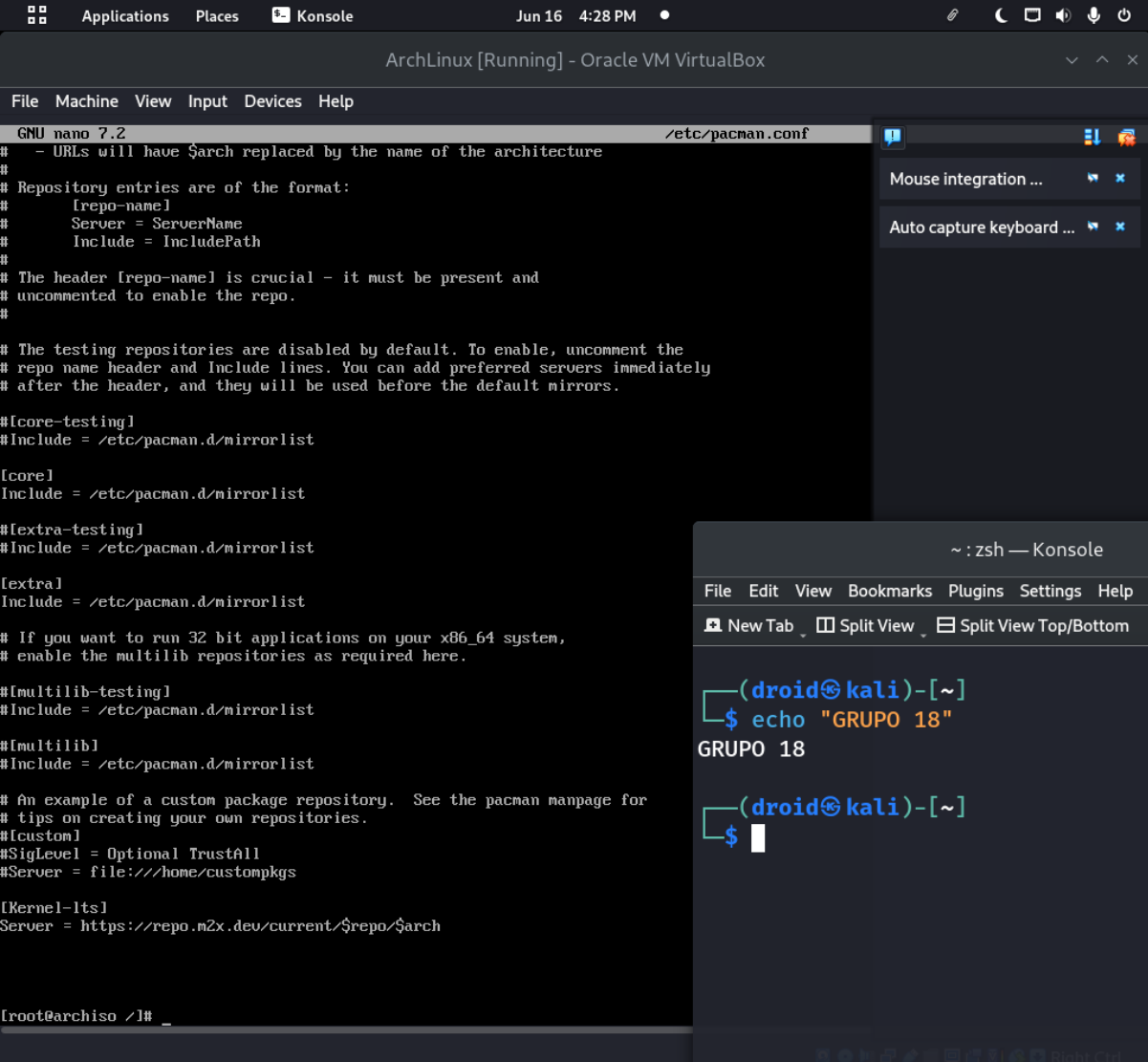
#NoUpgrade    =
#NoExtract    =

# Misc options
#UseSyslog
#Color
#NoProgressBar
#CheckSpace
#VerbosePkgLists
#ParallelDownloads = 5

# By default, pacman accepts packages signed by keys that its local keyring
# trusts (see pacman-key and its man page), as well as unsigned packages.
SigLevel      = Required DatabaseOptional
LocalFileSigLevel = Optional
RemoteFileSigLevel = Required

# NOTE: You must run `pacman-key --init` before first using pacman; the local
# keyring can then be populated with the keys of all official Arch Linux
```

Se agrega el repositorio dentro de ese archivo:



The screenshot shows a virtual machine window titled "ArchLinux [Running] - Oracle VM VirtualBox". Inside the VM, the `/etc/pacman.conf` file is open in the `nano` text editor. The file contains configuration for pacman repositories, including sections for `core-testing`, `core`, `extra-testing`, `extra`, `multilib-testing`, `multilib`, `custom`, and `kernel-lts`. The `Server` line for `kernel-lts` is set to `https://repo.m2x.dev/current/$repo/$arch`. The prompt at the bottom of the editor is `[root@archiso /]#`.

Overlaid on the right side of the VM window is a terminal window titled `~: zsh — Konsole`. It shows the execution of the command `echo "GRUPO 18"`, which outputs `GRUPO 18`. The terminal prompt is `(droid@kali)-[~]`.

```
GNU nano 2.2 /etc/pacman.conf
# - URLs will have $arch replaced by the name of the architecture
#
# Repository entries are of the format:
# [repo-name]
#   Server = ServerName
#   Include = IncludePath
#
# The header [repo-name] is crucial - it must be present and
# uncommented to enable the repo.
#
# The testing repositories are disabled by default. To enable, uncomment the
# repo name header and Include lines. You can add preferred servers immediately
# after the header, and they will be used before the default mirrors.
#
#[core-testing]
#Include = /etc/pacman.d/mirrorlist
#
[core]
Include = /etc/pacman.d/mirrorlist
#
#[extra-testing]
#Include = /etc/pacman.d/mirrorlist
#
[extra]
Include = /etc/pacman.d/mirrorlist
#
# If you want to run 32 bit applications on your x86_64 system,
# enable the multilib repositories as required here.
#
#[multilib-testing]
#Include = /etc/pacman.d/mirrorlist
#
#[multilib]
#Include = /etc/pacman.d/mirrorlist
#
# An example of a custom package repository. See the pacman manpage for
# tips on creating your own repositories.
#[custom]
#SigLevel = Optional TrustAll
#Server = file:///home/custompkgs
#
[Kernel-lts]
Server = https://repo.m2x.dev/current/$repo/$arch

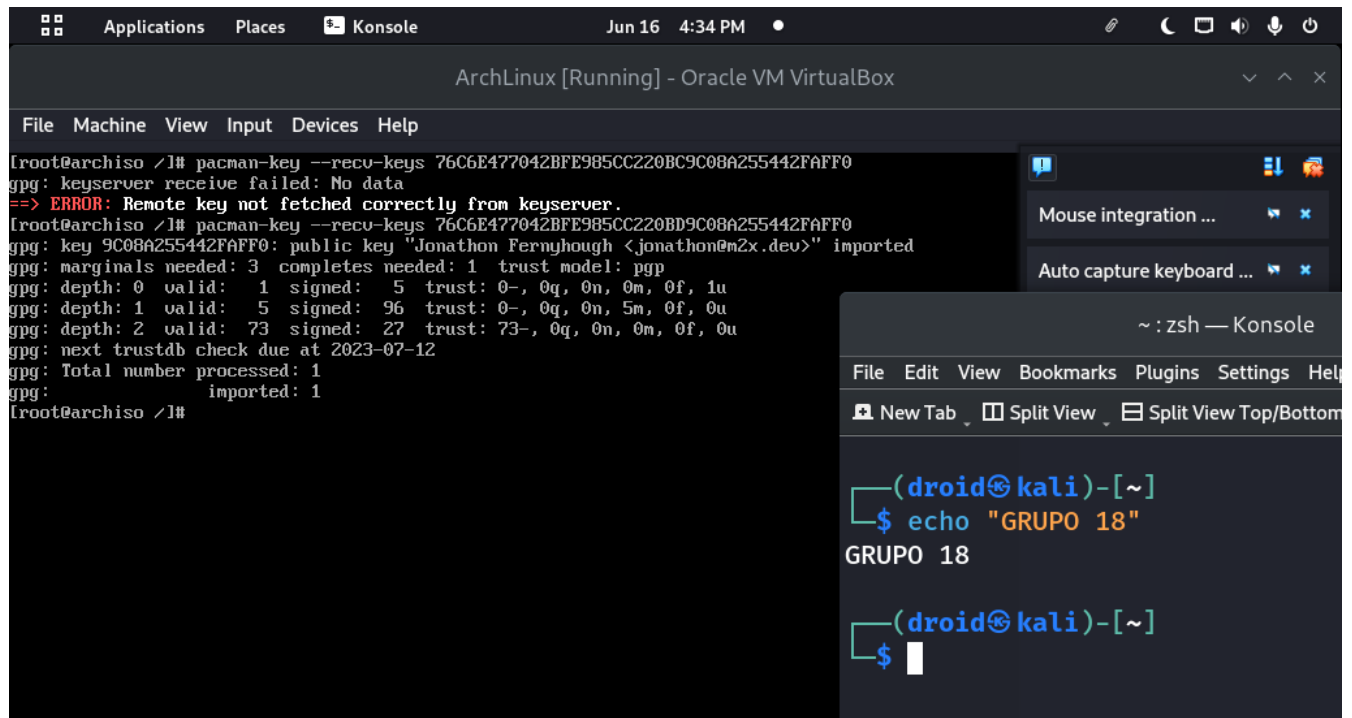
[root@archiso /]#
```

```
(droid@kali)-[~]
$ echo "GRUPO 18"
GRUPO 18

(droid@kali)-[~]
$
```

AGREGAR LAS LLAVES

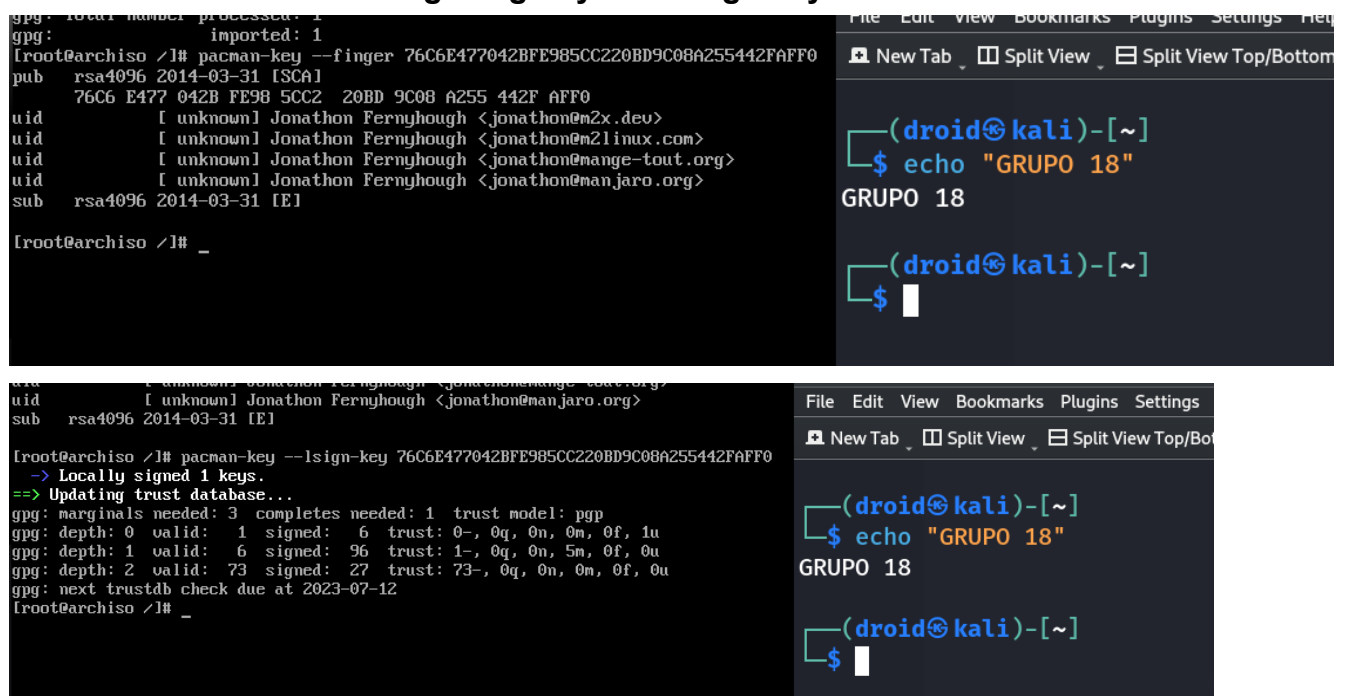
pacman-key --recv-keys 76C6E477042BFE985CC220BC9C08A255442FAFF0



```
[root@archiso /]# pacman-key --recv-keys 76C6E477042BFE985CC220BC9C08A255442FAFF0
gpg: keyserver receive failed: No data
==> ERROR: Remote key not fetched correctly from keyserver.
[root@archiso /]# pacman-key --recv-keys 76C6E477042BFE985CC220BD9C08A255442FAFF0
gpg: key 9C08A255442FAFF0: public key "Jonathon Fernyhough <jonathon@m2x.dev>" imported
gpg: marginals needed: 3 completes needed: 1 trust model: pgp
gpg: depth: 0 valid: 1 signed: 5 trust: 0-, 0q, 0n, 0m, 0f, 1u
gpg: depth: 1 valid: 5 signed: 96 trust: 0-, 0q, 0n, 5m, 0f, 0u
gpg: depth: 2 valid: 73 signed: 27 trust: 73-, 0q, 0n, 0m, 0f, 0u
gpg: next trustdb check due at 2023-07-12
gpg: Total number processed: 1
gpg: imported: 1
[root@archiso /]#
```

```
(droid@kali)-[~]
$ echo "GRUPO 18"
GRUPO 18
(droid@kali)-[~]
$
```

AHORA firmamos con el flag -finger y con -lsign-key



```
gpg: Total number processed: 1
gpg: imported: 1
[root@archiso /]# pacman-key --finger 76C6E477042BFE985CC220BD9C08A255442FAFF0
pub   rsa4096 2014-03-31 [SCA]
       76C6 E477 042B FE98 5CC2 20BD 9C08 A255 442F AFF0
uid     [ unknown] Jonathon Fernyhough <jonathon@m2x.dev>
uid     [ unknown] Jonathon Fernyhough <jonathon@m2linux.com>
uid     [ unknown] Jonathon Fernyhough <jonathon@engage-tout.org>
uid     [ unknown] Jonathon Fernyhough <jonathon@manjaro.org>
sub   rsa4096 2014-03-31 [E]

[root@archiso /]# _
```

```
(droid@kali)-[~]
$ echo "GRUPO 18"
GRUPO 18
(droid@kali)-[~]
$
```

```
uid     [ unknown] Jonathon Fernyhough <jonathon@manjaro.org>
sub   rsa4096 2014-03-31 [E]

[root@archiso /]# pacman-key --lsign-key 76C6E477042BFE985CC220BD9C08A255442FAFF0
-> Locally signed 1 keys.
==> Updating trust database...
gpg: marginals needed: 3 completes needed: 1 trust model: pgp
gpg: depth: 0 valid: 1 signed: 6 trust: 0-, 0q, 0n, 0m, 0f, 1u
gpg: depth: 1 valid: 6 signed: 96 trust: 1-, 0q, 0n, 5m, 0f, 0u
gpg: depth: 2 valid: 73 signed: 27 trust: 73-, 0q, 0n, 0m, 0f, 0u
gpg: next trustdb check due at 2023-07-12
[root@archiso /]# _
```

```
(droid@kali)-[~]
$ echo "GRUPO 18"
GRUPO 18
(droid@kali)-[~]
$
```


Se instala el siguiente repositorio: pacman -Syu linux-lts54 linux-lts54-headers

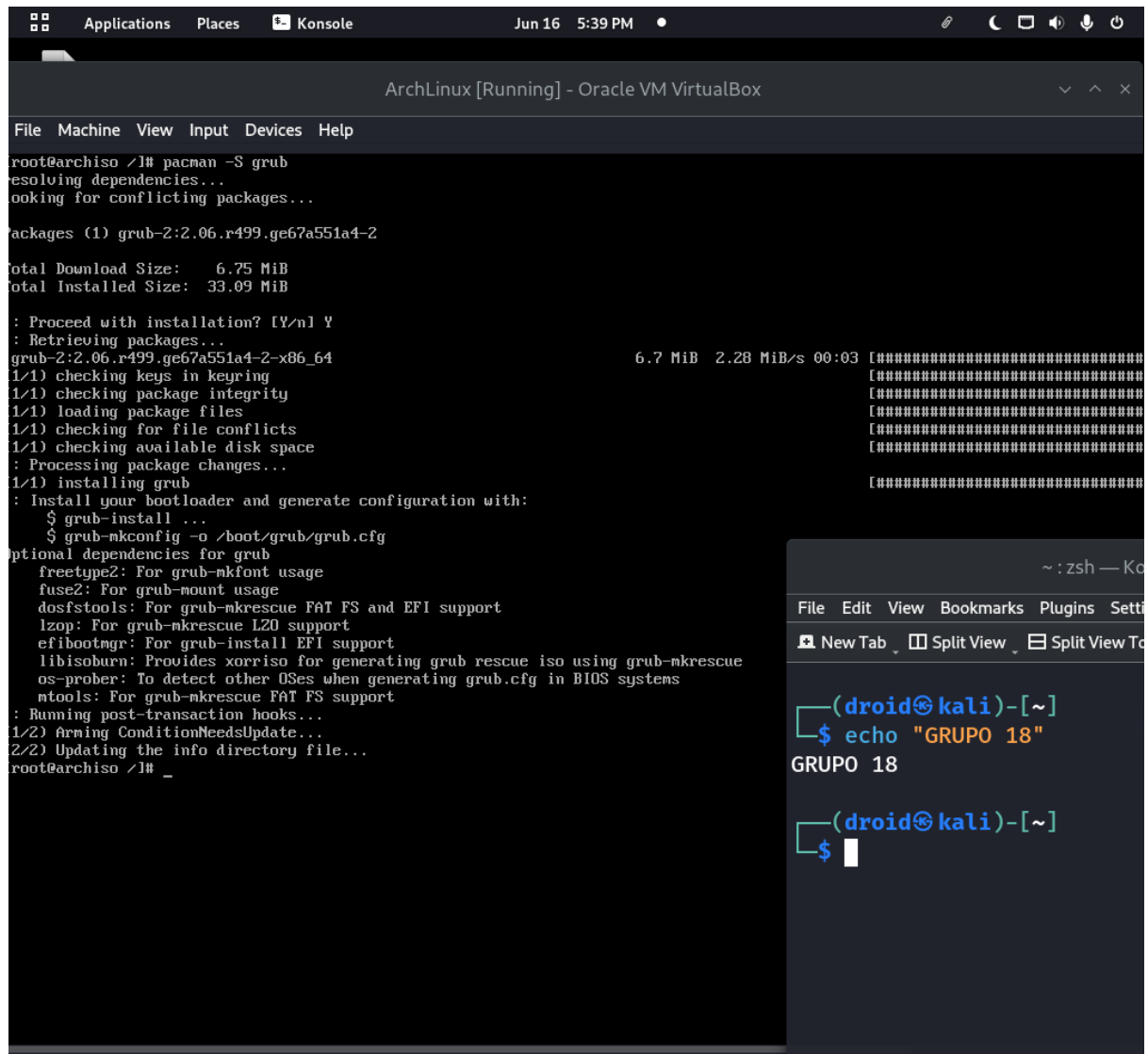
```
[kernel-lts]
Server = https://repo.n2x.dev/current/$repo/$arch
[root@archiso /]# pacman -Syu linux-lts54 linux-lts54-headers
:: Synchronizing package databases...
core is up to date
extra is up to date
kernel-lts                               33.8 KiB  56.4 KiB/s
:: Starting full system upgrade...
resolving dependencies...
:: There are 3 providers available for initramfs:
:: Repository core
   1) mkinitcpio
:: Repository extra
   2) booster  3) dracut
```

Entonces dejamos todo por defecto y seguimos:

```
1/4) installing mkinitcpio-busybox
2/4) installing mkinitcpio
optional dependencies for mkinitcpio
  gzip: Use gzip compression for the initramfs image [installed]
  xz: Use lzma or xz compression for the initramfs image [installed]
  bzip2: Use bzip2 compression for the initramfs image [installed]
  lzop: Use lzop compression for the initramfs image
  lz4: Use lz4 compression for the initramfs image [installed]
  mkinitcpio-nfs-utils: Support for root filesystem on NFS
3/4) installing linux-lts54
optional dependencies for linux-lts54
  crda: to set the correct wireless channels of your country
  linux-firmware: firmware images needed for some devices
4/4) installing linux-lts54-headers
: Running post-transaction hooks...
1/5) Reloading system manager configuration...
   Skipped: Running in chroot.
2/5) Creating temporary files...
3/5) Arming ConditionNeedsUpdate...
4/5) Updating module dependencies...
5/5) Updating linux initcpio...
=> Building image from preset: /etc/mkinitcpio.d/linux-lts54.preset: 'default'
=> Using default configuration file: '/etc/mkinitcpio.conf'
   -> -k /boot/vmlinuz-linux-lts54 -g /boot/initramfs-linux-lts54.img --microcode /boot/*-ucode.img
=> Starting build: '5.4.223-1-lts54'
   -> Running build hook: [base]
   -> Running build hook: [udev]
   -> Running build hook: [autodetect]
   -> Running build hook: [modconf]
   -> Running build hook: [kms]
   -> Running build hook: [keyboard]
   -> Running build hook: [keymap]
   -> Running build hook: [consolefont]
=> WARNING: consolefont: no font found in configuration
   -> Running build hook: [block]
   -> Running build hook: [filesystems]
   -> Running build hook: [fsck]
=> Generating module dependencies
=> Creating zstd-compressed initcpio image: '/boot/initramfs-linux-lts54.img'
=> Image generation successful
=> Building image from preset: /etc/mkinitcpio.d/linux-lts54.preset: 'fallback'
=> Using default configuration file: '/etc/mkinitcpio.conf'
   -> -k /boot/vmlinuz-linux-lts54 -g /boot/initramfs-linux-lts54-fallback.img -S autodetect --microcode /boot/*-ucode.img
=> Starting build: '5.4.223-1-lts54'
   -> Running build hook: [base]
   -> Running build hook: [udev]
   -> Running build hook: [modconf]
   -> Running build hook: [kms]
=> WARNING: Possibly missing firmware for module: 'ast'
```

INSTALACION DE GRUB

pacman -S grub



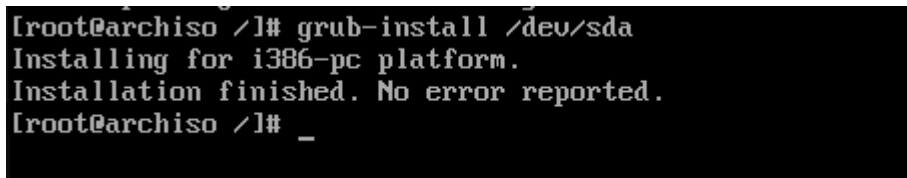
```
root@archiso /]# pacman -S grub
resolving dependencies...
looking for conflicting packages...

packages (1) grub-2:2.06.r499.ge67a551a4-2

total Download Size:    6.75 MiB
total Installed Size:  33.09 MiB

: Proceed with installation? [Y/n] Y
: Retrieving packages...
grub-2:2.06.r499.ge67a551a4-2-x86_64           6.7 MiB   2.28 MiB/s   00:03 [#####]
1/1) checking keys in keyring [#####]
1/1) checking package integrity [#####]
1/1) loading package files [#####]
1/1) checking for file conflicts [#####]
1/1) checking available disk space [#####]
: Processing package changes...
1/1) installing grub [#####]
: Install your bootloader and generate configuration with:
  $ grub-install ...
  $ grub-mkconfig -o /boot/grub/grub.cfg
optional dependencies for grub
  freetype2: For grub-mkfont usage
  fuse2: For grub-mount usage
  dosfstools: For grub-mkrescue FAT FS and EFI support
  lzop: For grub-mkrescue LZO support
  efibootmgr: For grub-install EFI support
  libisoburn: Provides xorriso for generating grub rescue iso using grub-mkrescue
  os-prober: To detect other OSes when generating grub.cfg in BIOS systems
  mtools: For grub-mkrescue FAT FS support
: Running post-transaction hooks...
1/2) Arming ConditionNeedsUpdate...
2/2) Updating the info directory file...
root@archiso /]# _
```

grub-install /dev/sda ← ponemos el disco entero



```
[root@archiso /]# grub-install /dev/sda
Installing for i386-pc platform.
Installation finished. No error reported.
[root@archiso /]# _
```

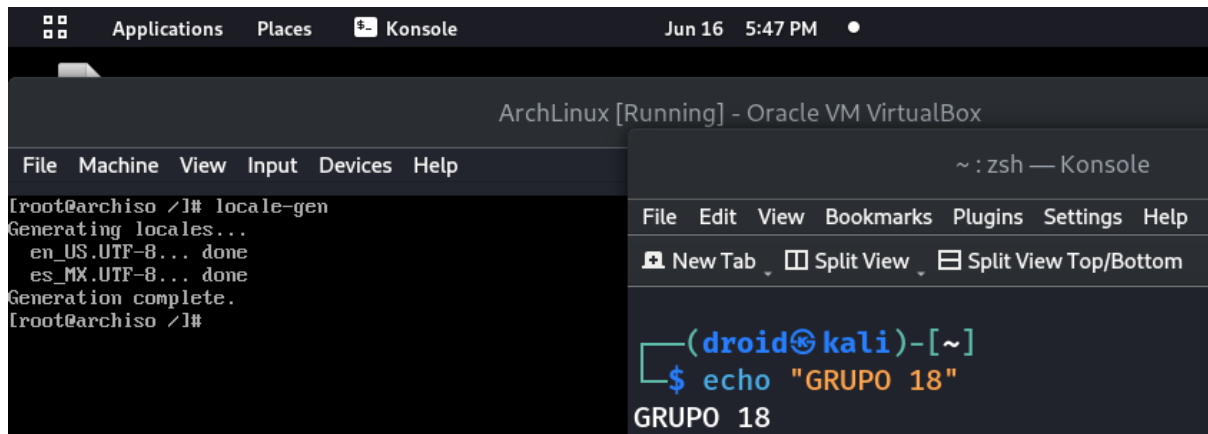
grub-mkconfig -o /boot/grub/grub.cfg

```
[root@archiso /]# grub-mkconfig -o /boot/grub/grub.cfg
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-linux-lts54
Found initrd image: /boot/initramfs-linux-lts54.img
Found fallback initrd image(s) in /boot: initramfs-linux-lts54-fallback.img
Warning: os-prober will not be executed to detect other bootable partitions.
Systems on them will not be added to the GRUB boot configuration.
Check GRUB_DISABLE_OS_PROBER documentation entry.
Adding boot menu entry for UEFI Firmware Settings ...
done
[root@archiso /]# _
```

AGREGANDO LOS IDIOMAS:

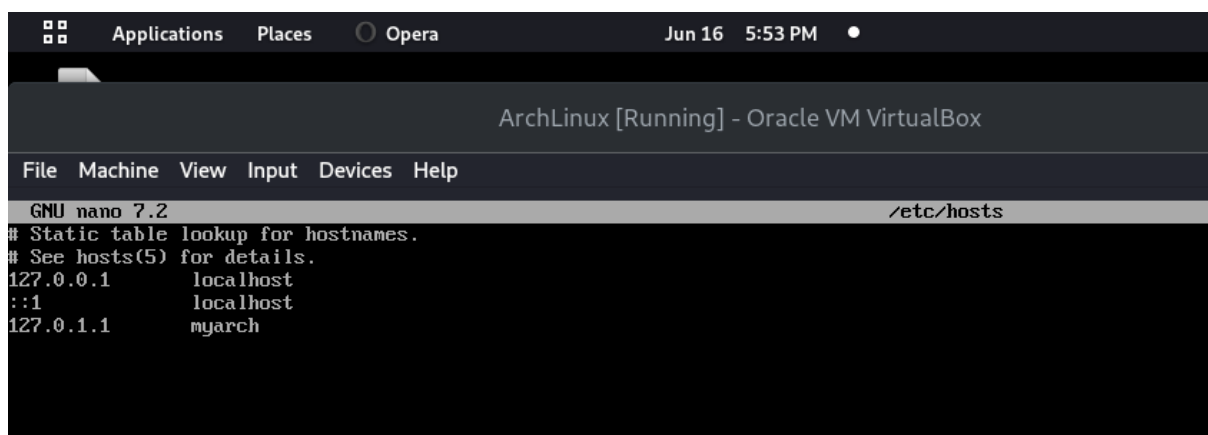
nano /etc/locale.gen

```
#en_US ISO-8859-1      #es_MX ISO-8859-1
en_US.UTF-8 UTF-8      es_MX.UTF-8 UTF-8
#en_US ISO-8859-1      #es_MX ISO-8859-1
```

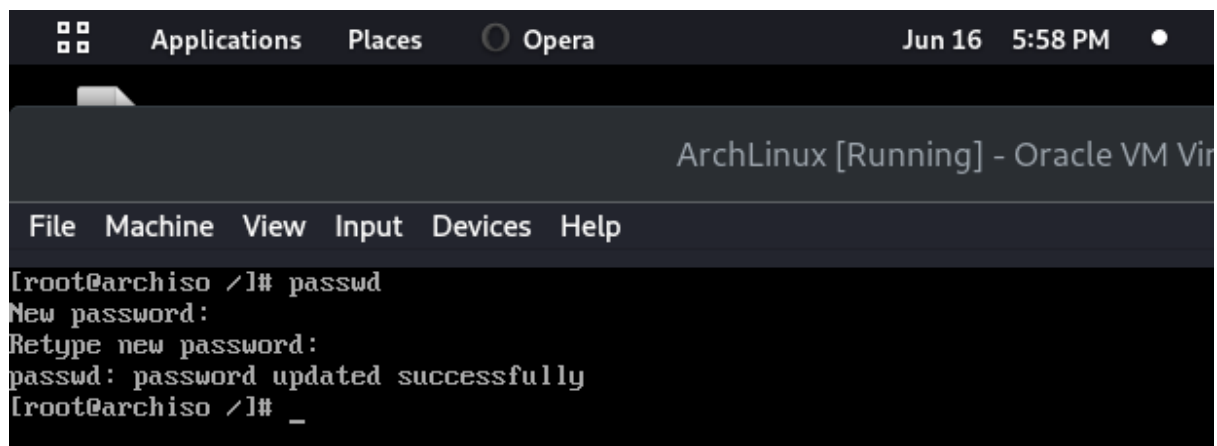


AGREGO LA RED:

```
[root@archiso /]# echo LANG=en_US.UTF-8 > /etc/locale.conf
[root@archiso /]# export LANG=en_US.UTF-8
[root@archiso /]# echo myarch > /etc/hostname
[root@archiso /]# touch /etc/hosts
[root@archiso /]# nano /etc/hosts
```



passwd 123

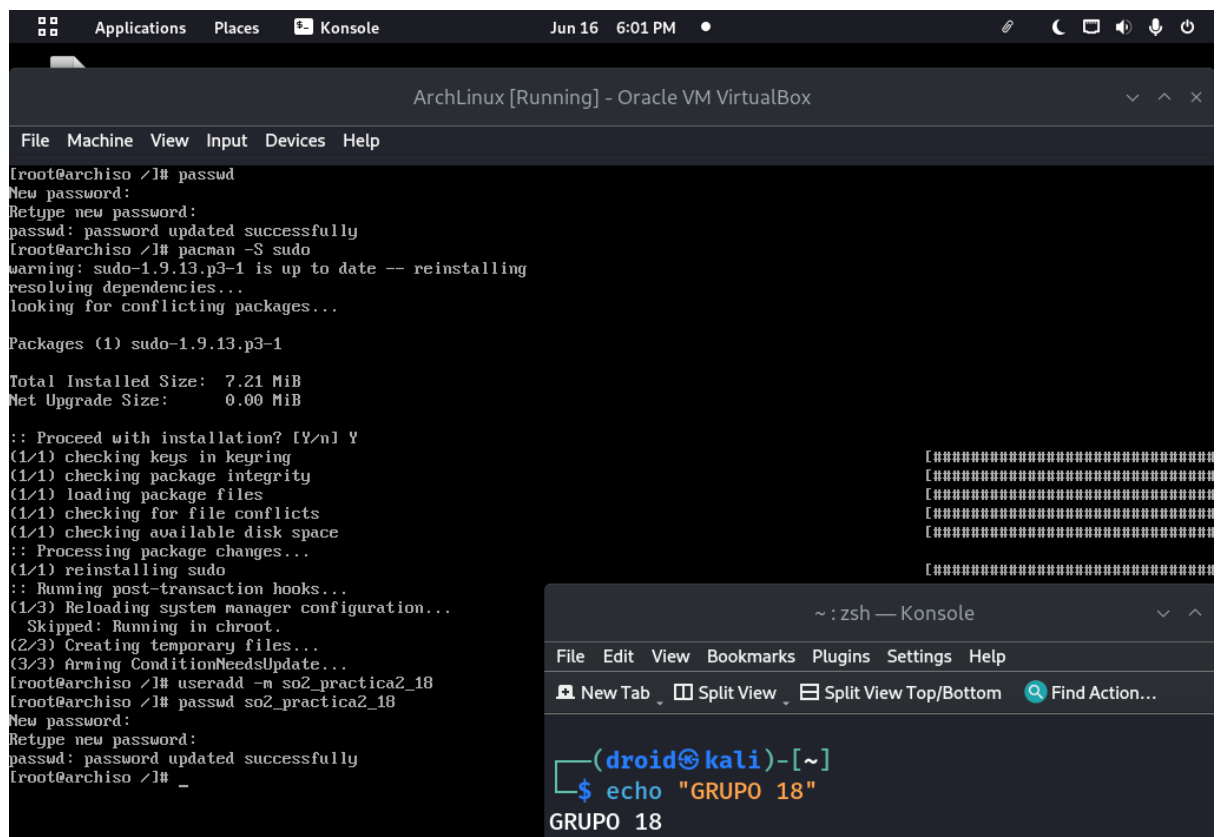


```
Applications Places Opera Jun 16 5:58 PM
ArchLinux [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
[root@archiso /]# passwd
New password:
Retype new password:
passwd: password updated successfully
[root@archiso /]# _
```

CREACIÓN DE USUARIO:

pacman -S sudo

se agrega el usuario so2_practica2_18



```
Applications Places Konsole Jun 16 6:01 PM
ArchLinux [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
[root@archiso /]# passwd
New password:
Retype new password:
passwd: password updated successfully
[root@archiso /]# pacman -S sudo
warning: sudo-1.9.13.p3-1 is up to date -- reinstalling
resolving dependencies...
looking for conflicting packages...

Packages (1) sudo-1.9.13.p3-1

Total Installed Size: 7.21 MiB
Net Upgrade Size: 0.00 MiB

:: Proceed with installation? [Y/n] Y
(1/1) checking keys in keyring
(1/1) checking package integrity
(1/1) loading package files
(1/1) checking for file conflicts
(1/1) checking available disk space
:: Processing package changes...
(1/1) reinstalling sudo
:: Running post-transaction hooks...
(1/3) Reloading system manager configuration...
  Skipped: Running in chroot.
(2/3) Creating temporary files...
(3/3) Arming ConditionNeedsUpdate...
[root@archiso /]# useradd -m so2_practica2_18
[root@archiso /]# passwd so2_practica2_18
New password:
Retype new password:
passwd: password updated successfully
[root@archiso /]# _
```

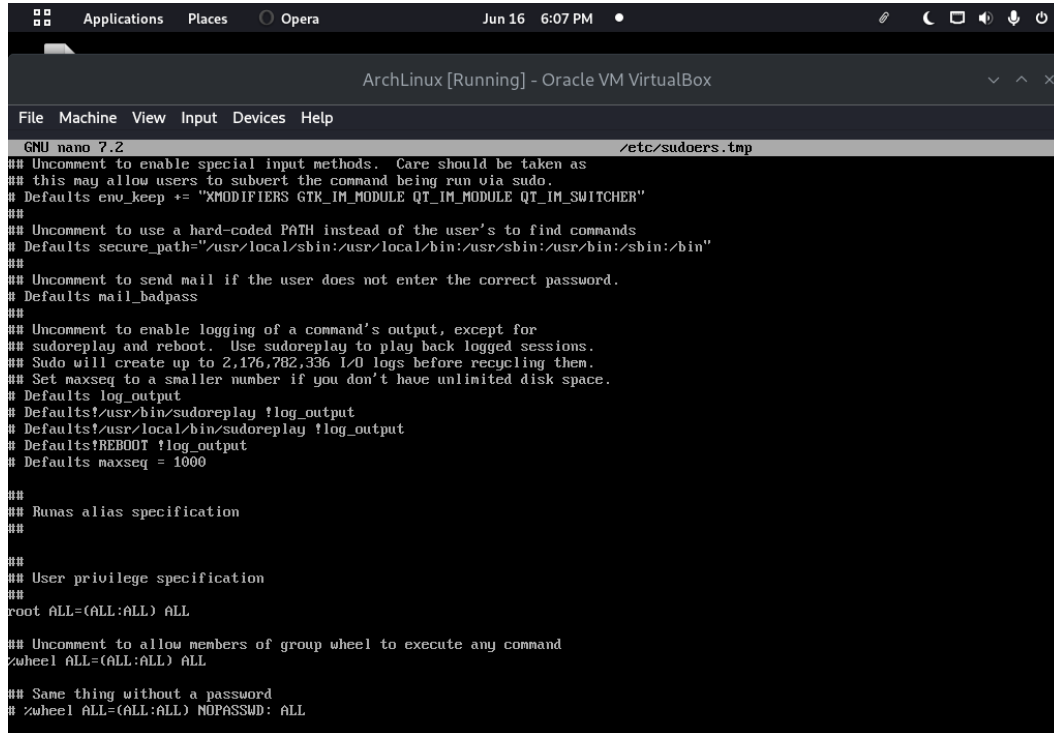
```
~ : zsh — Konsole
File Edit View Bookmarks Plugins Settings Help
New Tab Split View Split View Top/Bottom Find Action...
(droid@kali)-[~]
$ echo "GRUPO 18"
GRUPO 18
```

damos permisos

usermod -aG wheel,audio,video,storage so2_practica2_18

EDITOR=nano visudo

luego en nano descomentamos la linea Uncomment to allow memnbers of group...



```
GNU nano 7.2 /etc/sudoers.tmp
## Uncomment to enable special input methods. Care should be taken as
## this may allow users to subvert the command being run via sudo.
## Defaults env_keep += "XMODIFIERS GTK_IM_MODULE QT_IM_MODULE QT_IM_SWITCHER"
##
## Uncomment to use a hard-coded PATH instead of the user's to find commands
## Defaults secure_path="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin"
##
## Uncomment to send mail if the user does not enter the correct password.
## Defaults mail_badpass
##
## Uncomment to enable logging of a command's output, except for
## sudoreplay and reboot. Use sudoreplay to play back logged sessions.
## Sudo will create up to 2,176,782,336 I/O logs before recycling them.
## Set maxseq to a smaller number if you don't have unlimited disk space.
## Defaults log_output
## Defaults!usr/bin/sudoreplay !log_output
## Defaults!usr/local/bin/sudoreplay !log_output
## Defaults!REBOOT !log_output
## Defaults maxseq = 1000
##
## Runas alias specification
##
##
## User privilege specification
root ALL=(ALL:ALL) ALL

## Uncomment to allow members of group wheel to execute any command
wheel ALL=(ALL:ALL) ALL

## Same thing without a password
wheel ALL=(ALL:ALL) NOPASSWD: ALL
```

INSTALACIÓN GRÁFICA:

pacman -S xorg networkmanager

```
Applications Places Konsole Jun 16 6:08 PM
ArchLinux [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

24) xorg-xdpyinfo 25) xorg-xdriinfo 26) xorg-xev 27) xorg-xgamma 28) xorg-xhost 29) xorg-xinput 30) xorg-xkbcomp 31) x
33) xorg-xkill 34) xorg-xlsatoms 35) xorg-xlscilents 36) xorg-xmodmap 37) xorg-xpr 38) xorg-xprop 39) xorg-xrandr 40)
42) xorg-xset 43) xorg-xsetroot 44) xorg-xuinfo 45) xorg-xwayland 46) xorg-xud 47) xorg-xuinfo 48) xorg-xud

Enter a selection (default=all):
resolving dependencies...
:: There are 2 providers available for man:
:: Repository core
1) man-db
:: Repository extra
2) mandoc

Enter a number (default=1):
looking for conflicting packages...
warning: dependency cycle detected:
warning: harfbuzz will be installed before its freetype2 dependency
warning: dependency cycle detected:
warning: mesa will be installed before its libglnd dependency

Packages (135) bluez-libs-5.66-1 default-cursors-2.1 duktape-2.7.0-6 fontconfi
graphite-1.1.3.14-3 harfbuzz-7.3.0-1 libdaemon-0.14-5 libdrm-2.
libfontenc-1.1.7-1 libglnd-1.6.0-1 libgudev-237-2 libice-1.1.1
libnm-1.42.6-1 libnsl-0.9.3-4 libpciaccess-0.17-1 li
librsodium-1.0.18-2 libteam-1.31-8 libunwind-1.6.2-2 libwacon-2.
libxcomposite-0.4.6-1 libxcursor-1.2.1-3 libxcvt-0.1.2-1 libxda
libxfont-2.0.6-2 libxft-2.3.8-1 libxi-1.8.1-1 libxinerama-1.1.5-1
libxrender-0.9.11-1 libxshmfence-1.3.2-1 libxt-1.3.0-1 libxtst-1.2.4-1 libxv-1.0.12-1 libxxf86vm-1.1.5-1 ll
lm_sensors-1.3.6.0.r41.g3d1df125-2 man-db-2.11.2-1 mesa-23.1.2-1 mobile-broadband-provider-info-20230416-1 mt
nss-3.90-1 pcre-8.45-3 pcsclite-1.9.9-3 pixman-0.42.2-1 polkit-122-1 slang-2.3.3-2 vulkan-icd-loader-1.3.25
wpa_supplicant-2.2.10-8 xcb-proto-1.15.2-3 xcb-util-0.4.1-1 xcb-util-image-0.4.1-2 xcb-util-keysyms-0.4.1-4
xcb-util-vm-0.4.2-1 xf86-input-libinput-1.3.0-1 xkeyboard-config-2.39-1 xorg-fonts-alias-100dpi-1.0.5-1 xorg-
xorg-util-macros-1.20.0-2 xorgproto-2023.1-1 zeromq-4.3.4-4 networkmanager-1.42.6-1 xf86-video-vesa-2.6.0-1
xorg-docs-1.7.2-2 xorg-font-util-1.4.0-1 xorg-fonts-100dpi-1.0.4-2 xorg-fonts-75dpi-1.0.4-1 xorg-fonts-encodi
xorg-iceauth-1.0.9-1 xorg-mkfontscale-1.2.2-1 xorg-server-21.1.8-1 xorg-server-common-21.1.8-1 xorg-server-de
xorg-server-ephyra-21.1.8-1 xorg-server-xnest-21.1.8-1 xorg-server-xfb-21.1.8-1 xorg-sessreg-1.1.3-1 xorg-se
xorg-smproxy-1.0.7-1 xorg-x11perf-1.6.2-1 xorg-xauth-1.1.2-1 xorg-xbacklight-1.2.3-3 xorg-xcmsdb-1.0.6-1 xor
xorg-xdpyinfo-1.3.4-1 xorg-xdriinfo-1.0.7-1 xorg-xev-1.2.5-1 xorg-xgamma-1.0.7-1 xorg-xhost-1.0.9-1 xorg-xin
xorg-xkbcomp-1.4.6-1 xorg-xkbutil-1.1.5-1 xorg-xkbutils-1.0.5-1 xorg-xkill-1.0.6-1 xorg-xlsatoms-1.1.4-1 xorg
xorg-xmodmap-1.0.11-1 xorg-xpr-1.1.0-1 xorg-xprop-1.2.6-1 xorg-xrandr-1.5.2-1 xorg-xrdp-1.2.2-1 xorg-xrefres
xorg-xsetroot-1.1.3-1 xorg-xuinfo-1.1.5-1 xorg-xwayland-23.1.2-1 xorg-xud-1.0.9-1 xorg-xuinfo-1.1.6-1 xorg

Total Download Size: 97.79 MiB
Total Installed Size: 370.36 MiB

:: Proceed with installation? [Y/n] Y
:: Retrieving packages...
llum-libs-15.0.7-3-x86_64 29.3 MiB 2.58 MiB/s 00:11 [#####]
mesa-23.1.2-1-x86_64 9.7 MiB 2.98 MiB/s 00:01 [#####]
Total ( 1/135) 39.0 MiB 2.97 MiB/s 00:19 [#####]
```

luego el comando pacman -S gnome

```
Applications Places Opera Jun 16 6:14 PM
ArchLinux [Running] - Oracle VM VirtualBox

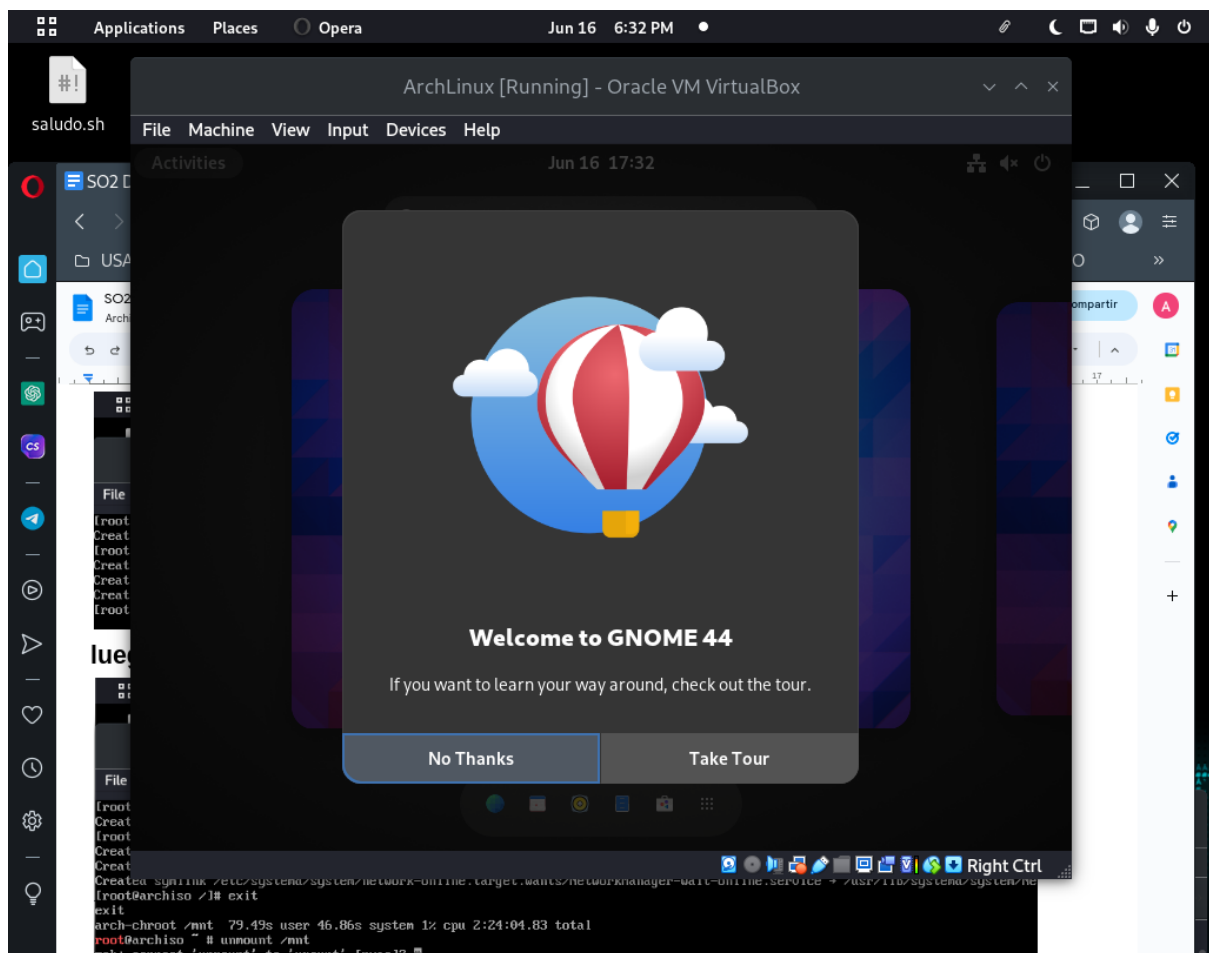
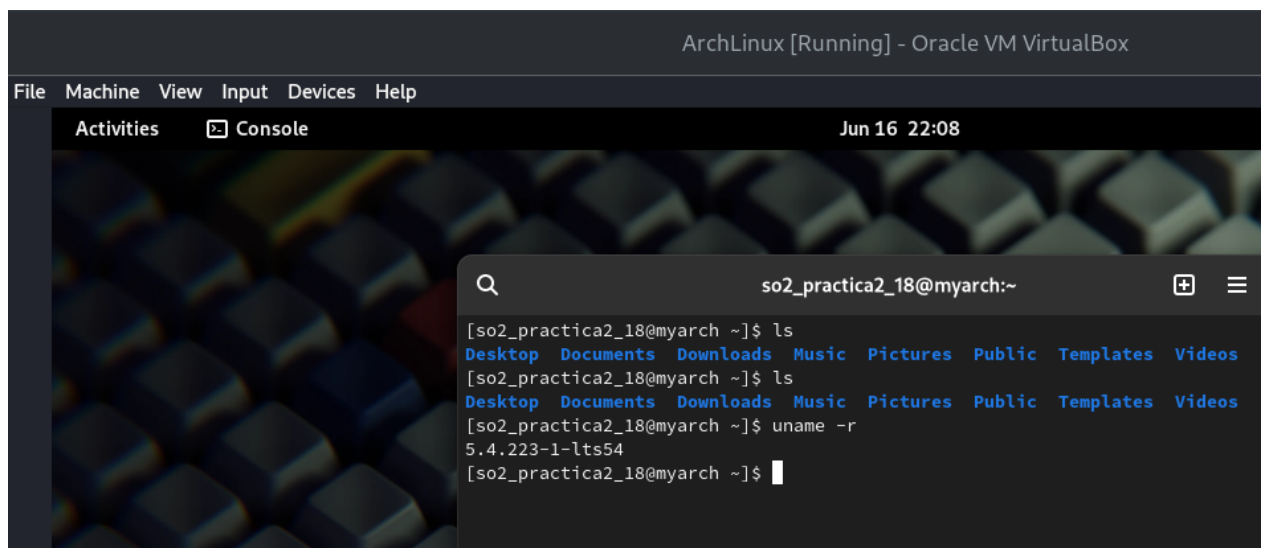
File Machine View Input Devices Help

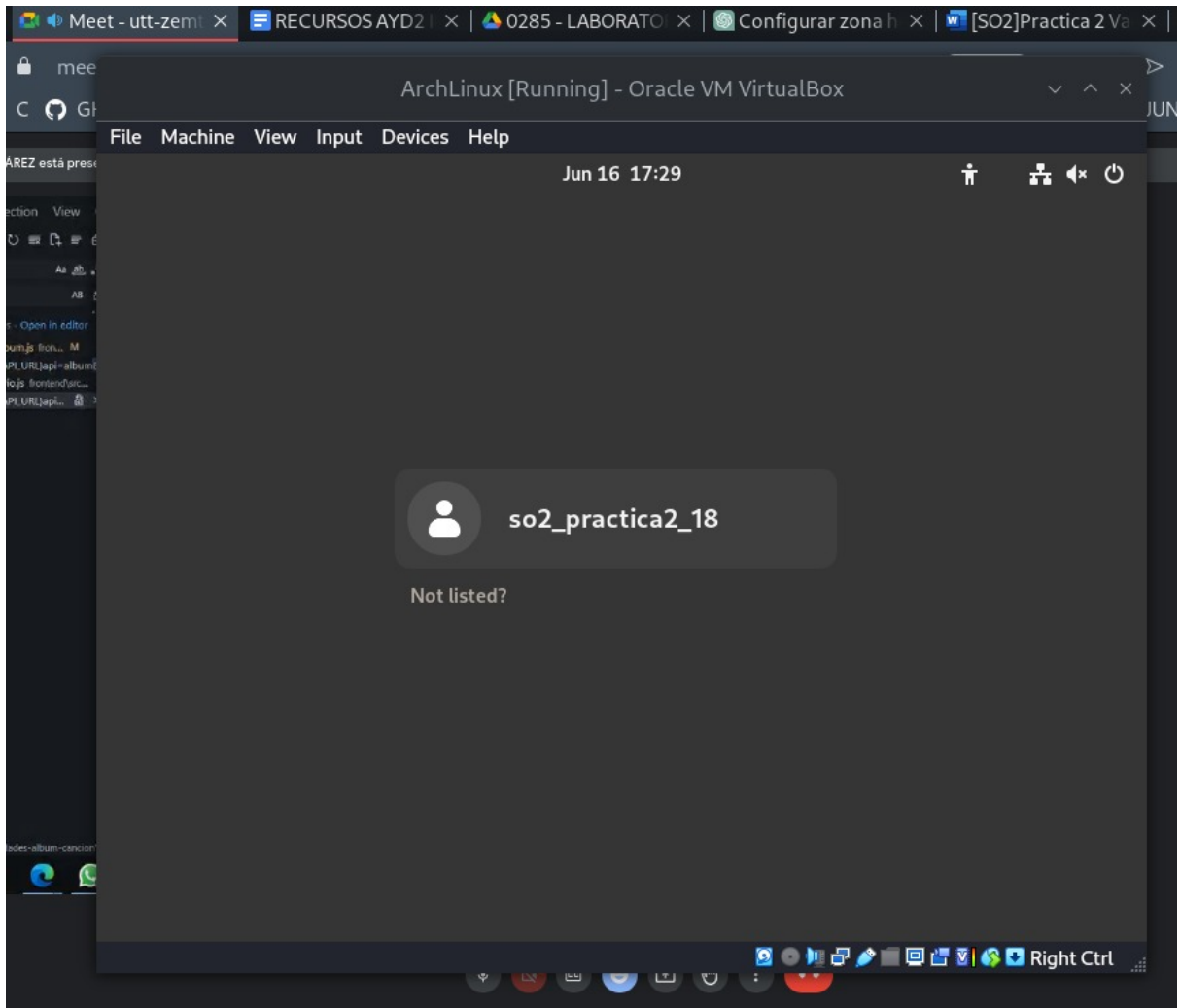
libdudnau-6.1.1-2 libdudread-6.1.3-2 libdataserverui4-3.48.3-1 libexif-0.6.24-2 libfdk-aac-2.0.2-1 libfreea
libgdm-44.1-1 libgee-0.20.6-1 libgexiu2-0.14.1-1 libgirepository-1.76.1-3 libgme-0.6.3-4 libgnonekhd-1.3.28.
libgphoto2-2.5.30-2 libgrss-0.7.0+16.g971c421-3 libgsf-1.14.50-1 libgtop-2.41.1-1 libgusb-0.4.6-1 libgweather
libhandy-1.8.2-1 libheif-1.16.2-1 libibus-1.5.28-4 libical-3.0.16-4 libidn-1.41-1 libiec61883-1.2.0-7 libie
libmbedtls-1.3.0-9 libminih-56-1 libnspatch-1.1.6-2 libpctdata-1.0.5-2 libjpeg-turbo-2.1.5-1 libjx
libltdac-2.0.2-3-1 liblouis-3.26.0-1 liblqr-0.4.2-3 libltdf-0.6.1-4 libltc-1.3.2-1 libltdcontent-0.11.1-2 li
libmediact-1.9.6-2 libmfx-23.2.2-1 libmicrodus-0.2.0-1 libmodplug-0.8.9.0-5 libmpegdec-1.0.1+r475-4 libntp-1
libnautilus-extension-44.2.1-1 libnfs-5.0.2-1 libnice-0.1.21-2 libnma-common-1.10.6-2 libnma-gtk4-1.10.6-2 li
libnsl-2.0.0-3 liboauth-1.1.0.3+r16+gc26f038-1 libogg-1.3.5-1 libopenmpt-0.7.1-1 libosinfo-1.10.0-3 libpaper
libphonenum-1.8.13.4-2 libpipewire-1.0.3.71-2 libplist-2.3.0-2 libportal-0.6-1 libportal-gtk3-0.6-1 libpo
libproxy-0.4.18-3 libpulse-16.1-6 libpulsequality-1.4.5-3 libragn-0.10.1-1 librau-0.21.1-2 librau1394-2.1.2-3
librsync-2.2.56.1-1 libsample-0.2.2-2 libshout-1.2.4.6-2 libshumate-1.0.3-1 libsigc++-2.12.0-1 libsndfile
libsupp-3.4.2-1 libsxr-0.1.3-3 libstret-0.2.12-1 libspeeche-0.11.4-2 libspiro-1.2022101-2 libstrp-1.2.5
libstemmer-2.2.0-2 libstmctex-2023.66994-6 libthai-0.1.29-3 libtheora-1.1.4-6 libtiff-4.5.1-1 libush-1.0.26-
libua-2.10.0-1 libudapau-1.5-1 libunscserver-0.9.14-2 libuorbis-1.3.7-3 libuxp-1.13.0-1 libwbclient-4.18.3-1
libwnc3-43.0-3 libwpe-1.14.1-2 libxkbcommon-1.5.0-1 libxkbcommon-x11-1.5.0-1 libxklavier-5.4.5 libxmb-0.3.
libxslt-1.1.37-3 libyam1-0.2.5-2 libyuv-r2322+3aebf69d-1 libyuv-0.24.20-2 libz-0.9.30-3 lua-5.4.6-1 luajit-2.
lu2-1.18.10-1 lzo-2.10-5 mdadm-4.2-2 njpegtools-2.2.1-2 mod_dnssd-0.6-9 mpj123-1.31.3-1 mutter-44.2-1 neon
noto-fonts-emoji-20220920-1 ocl-icd-2.3.2-1 openal-1.23.1-1 opencore-amr-0.1.6-1 openexr-3.1.8-1 openjpeg2-2
openmex-4.2.3-2 openssh-9.3pl-2 opus-1.4-1 orc-0.4.34-1 osinfo-db-20230518-1 ostree-2023.3-1 pango-1.1.50.
parted-3.6-1 pipewire-1.0.3.71-2 poppler-23.06.0-1 poppler-data-0.4.12-1 poppler-glib-23.06.0-1 portaudio-1.
pulseaudio-16.1-6 pulseaudio-alsa-1.1.2.7.1-2 pulseaudio-bluetooth-16.1-6 python-3.11.3-2 python-atspi-2.46.0
python-gobject-3.44.1-4 python-pyxdg-0.28-2 python-setproctitle-1.3.2-2 greencode-4.1.1-2 raptor-2.0.16-2 rav
rtmpdump-1.2.4.r99.lib3c1-2 sane-1.2.1.4 sbc-2.0-1 sd12-2.26.5-2 serd-0.30.16-1 shared-mime-info-2.2.13+ga2
sord-0.16.14-1 sound-theme-freedesktop-0.8-5 soundtouch-2.3.2-1 spandsp-0.0.6-5 speech-dispatcher-0.11.4-2 s
sratom-0.6.14-1 srt-1.5.1-3 startup-notification-0.12-8 suitesparse-7.0.1-2 sut-avl-1.5.0-1 sut-heuc-1.5.1-2
tdb-1.4.8-2 tencent-10.14.1-2 totem-pl-parser-3.26.6-2 tracker3-3.5.3-1 tuolane-0.4.0-3 udisks2-2.9.4-4 unz
usbmuxd-1.1.1-3 u4l-utils-1.24.1-2 vid.stab-1.1.1-1 vmaf-2.3.1-1 volume_key-0.3.12-8 vte-common-0.72.2-1 vt
wayland-protocols-1.31-1 webkit2gtk-4.1-2.40.2-1 webkitgtk-6.0-2.40.2-1 wecp-pixbuf-loader-0.2.4-1 webkit-aud
wildmidi-0.4.5-2 woff2-1.0.2-4 wpebackend-fdo-1.14.2-1 x264-3.0.164.r3095.baec00-4 x265-3.5-3 xdg-bus-prox
xdg-desktop-portal-1.16.0-3 xdg-desktop-portal-gtk-1.14.1-1 xdg-user-dirs-0.18-1 xuidcore-1.3.7-2 yelp-xsl-42
zing-3.0.4-1 zubi-0.2.41-1 zxing-cpp-2.0.0-2 baobab-44.0-1 cheese-44.0-1 eog-44.2-1 epiphany-44.3-1 evin
gnome-backgrounds-44.0-1 gnome-calculator-44.0-1 gnome-calendar-44.1-1 gnome-characters-44.0-1 gnome-clocks-4
gnome-color-manager-3.36.0+42.g90481514-1 gnome-connections-44.1-2 gnome-console-44.0-1 gnome-contacts-44.0-1
gnome-disk-utility-44.0-1 gnome-font-viewer-44.0-1 gnome-keyring-1.42.1-3 gnome-logs-43.0-1 gnome-maps-44.2-1
gnome-music-1.44.0-2 gnome-photos-1.44.0-3 gnome-remote-desktop-44.2-1 gnome-session-44.0-1 gnome-settings-da
gnome-shell-1.44.2-1 gnome-shell-extensions-44.0-1 gnome-software-44.2-1 gnome-system-monitor-44.0-1 gnome-t
gnome-tour-44.0-2 gnome-user-docs-44.1-1 gnome-user-share-43.0-1 gnome-weather-44.0-1 grilo-plugins-1.0.3.16
gufs-afc-1.50.4-3 gufs-goa-1.50.4-3 gufs-google-1.50.4-3 gufs-gphoto2-1.50.4-3 gufs-mtp-1.50.4-3 gufs-nfs-1
malcontent-0.11.1-2 nautilus-44.2-1 orca-44.1-1 rygel-1.0.42.3-1 simple-scan-44.0-2 sushi-44.2-1 totem-43
xdg-desktop-portal-gnome-44.1-2 xdg-user-dirs-gtk-0.11-2 yelp-42.2-2

Total Download Size: 379.19 MiB
Total Installed Size: 2023.79 MiB

:: Proceed with installation? [Y/n] Y
:: Retrieving packages...
webkitgtk-6.0-2.40.2-1-x86_64 11.1 MiB 3.26 MiB/s 00:04 [#####]
Total ( 0/445) 11.1 MiB 3.26 MiB/s 01:52 [#####]
```


shutdown now





LÓGICA DEL PROGRAMA (MÉTODOS PRINCIPALES)

Módulos de Kernel

Módulo de memoria RAM

Para lograr obtener el porcentaje de memoria RAM utilizado por la máquina virtual se requirió leer "sysinfo", de donde se obtuvo la memoria total y la libre, para que más adelante sea calculado el porcentaje en el backend de Golang.

```
static void getMemoria(struct seq_file *archivo)
{
    // Total de memoria
    long memorytotal;
    si_meminfo(&infsys);
    memorytotal = infsys.totalram * infsys.mem_unit; // bytes
    seq_printf(archivo, "\t\t\"MEMORIA_TOTAL\":%ld,\n", memorytotal);

    long memorylibre;
    memorylibre = infsys.freeram * 1000; // bytes
    seq_printf(archivo, "\t\t\"MEMORIA_LIBRE\":%ld,\n", memorylibre);

    long memorybuffer;
    memorybuffer = infsys.bufferram * 1000; // bytes
    seq_printf(archivo, "\t\t\"BUFFER\":%ld\n,", memorybuffer);

    seq_printf(archivo, "\t\t\"MEM_UNIT\":%d\n,", infsys.mem_unit);

    long porcentaje;
    porcentaje = (((memorytotal) - (infsys.freeram * infsys.mem_unit) -
    (infsys.bufferram * infsys.mem_unit) - (infsys.sharedram *
    infsys.mem_unit)) * 10000) / (memorytotal);
    seq_printf(archivo, "\t\t\"PORCENTAJE\":%ld\n", porcentaje);
}
```

Módulo de CPU para procesos del sistema

Para lograr obtener los procesos y sus procesos hijos que son utilizados por el sistema se utilizó "task_struct", obteniendo por cada proceso su PID, nombre, usuario, estado y porcentaje de ram utilizado.

```
static int escribir_archivo(struct seq_file *archivo, void *v)
{
    struct task_struct *task;
    struct task_struct *task_hijo;
    struct list_head *children;
    long memproc;
    long memproc2;
    int index = 0; // indice para el nombre de proceso
    struct file *file;
    struct file *file2;
    char *strstate = ""; // variable para guardar el estado del
    proceso
    char buffer[256];
    int len;
    long cpu_usage = 0;
    struct sysinfo info;
    long mem_usage;
    bool first = true; // solo para el primer proceso la coma
    long memoria_total = 0;
    // variables para guardar cantidad de procesos
    long int ejecucion = 0;
    long int suspendido = 0;
    long int detenido = 0;
    long int zombie = 0;
    long int totales = 0;

    //!      -----          CALCULO      DEL      CPU
    -----
    // ? https://www.anshulpatel.in/posts/linux\_cpu\_percentage/
    long total_time_prev = 0;
    long used_time_prev = 0;

    for_each_process(task)
    {
        total_time_prev += get_total_time(task);
        used_time_prev += task->utime + task->stime;
    }
```

```

// Sleep for 1 second
msleep(500);

long total_time = 0;
long used_time = 0;

// Traverse the task list to calculate total and used CPU time
for_each_process(task)
{
    total_time += get_total_time(task);
    used_time += task->utime + task->stime;
}

long total_time_diff; //= total_time - total_time_prev;
long used_time_diff;
// Calculate the CPU percentage
if (total_time > total_time_prev)
{
    if (total_time < total_time_prev)
    {
        total_time_diff = total_time_prev - total_time;
    }
    else
    {
        total_time_diff = total_time - total_time_prev;
    }
    if (used_time < used_time_prev)
    {
        used_time_diff = used_time_prev - used_time;
    }
    else
    {
        used_time_diff = used_time - used_time_prev;
    }
}

cpu_usage = (used_time_diff * 100) / total_time_diff;
}

printk(KERN_INFO "cpu_usage:  %ld%%\n,    total_time:  %ld%%\n
total_time_prev:  %ld%%\n    used_time:  %ld%%\n    used_time_prev:
%ld%%\n",    cpu_usage,    total_time,    total_time_prev,    used_time,
used_time_prev);
printk(KERN_INFO "total_time_diff: %ld%%\n", total_time_diff);

```

```

printk(KERN_INFO "used_time_diff: %ld%%\n", used_time_diff);
// printk(KERN_INFO "CPU Percent: %d%%\n", cpu_usage);

si_meminfo(&info);

// total_mem = (info.totalram * info.mem_unit) >> 10; // ! memoria
total en MB
// printk(KERN_INFO "Total memory: %lu mB\n", total_mem/1000);
memoria_total = (info.totalram * info.mem_unit) >> 10;
//      printk(KERN_INFO      "Total      memory:      %lu      MB\n",
(memoria_total/1000000));
seq_printf(archivo, "{\n");
seq_printf(archivo, "\"cpu_usage\":"); /* "cpu_usage": 25.35,
seq_printf(archivo, "%ld , \n", cpu_usage);
seq_printf(archivo,      "\"data\":      [");      /*      "data":      {
"proceso1":{"pid":      254,      ...      ,      "procesoshijos":      [...]}",
"proceso2":{"...}, ... },
for_each_process(task)
{
if (!first)
{
seq_printf(archivo, ",");
}
//! 0 : ejecutando
//! 4 : zombie
//! 8 : detenido
//! 1 o 1026 : suspendido
if (task->mm)
{
memproc = (get_mm_rss(task->mm) << (PAGE_SHIFT - 10));
// printk(KERN_INFO "Memoria de %s: %lu MB", task->comm, memproc);
mem_usage = ((memproc * 100) / (memoria_total >> 10)); //!
PORCENTAJE CON 2 DECIMALES PARSEAR EN FRONT
// printk(KERN_INFO "Porcentaje de memoria de %s: %lu %%\n",
task->comm, mem_usage);
}
if (task->state == 0 || task->state == 1026 || task->state == 2)
{
ejecucion++;
strstate = "ejecucion";
}
else if (task->state == 4)
{

```

```

zombie++;
strstate = "zombie";
}
else if (task->state == 8 || task->state == 8193)
{
detenido++;
strstate = "detenido";
}
else if (task->state == 1 || task->state == 1026)
{
suspendido++;
strstate = "suspendido";
}
totales++;
/* Get the passwd structure for the UID */
// char *nombre_usuario = get_cred_username(task->real_cred);

seq_printf(archivo, "{\\"id\\": \\"%d%s\\",\\"pid\\": %d, \\"nombre\\": \\"%s\\", \\"usuario\\": \\"%d\\", \\"estado\\": \\"%s\\", \\"ram\\": %lu, \n\\"procesoshijos\\": [",
indext,
task->comm,
task->pid,
task->comm,
task->cred->uid,
strstate, mem_usage);
indext++;
task_lock(task);
children = &(task->children);
list_for_each_entry(task_hijo, children, sibling)
{
if (task_hijo->mm)
{
// memproc2 = (get_mm_rss(task_hijo->mm)<<PAGE_SHIFT)/(1024*1024);
// ! memoria de cada proceso hijo
// mem_usage = (memproc2*10000 / (long)(memoria_total/1000000));

memproc = (get_mm_rss(task_hijo->mm) << (PAGE_SHIFT - 10));
// printk(KERN_INFO "Memoria de %s: %lu MB", task->comm, memproc);
mem_usage = ((memproc * 100) / (memoria_total >> 10));
}

/* Get the passwd structure for the UID */
// pw = getpwuid(task_hijo->cred->uid.val);

```

```
seq_printf(archivo, "{\"pid\": %d, \"nombre\": \"%s\",  
\"usuario\": \"%d\", \"estado\": \"%s\", \"ram\": %lu}\",  
task_hijo->pid,  
task_hijo->comm,  
task_hijo->real_cred->uid,  
strstate,  
mem_usage);  
  
if (task_hijo->sibling.next != &task->children)  
{  
seq_printf(archivo, ",");  
}  
}  
task_unlock(task);  
seq_printf(archivo, "]\n");  
first = false;  
}  
  
seq_printf(archivo, "], \n");  
seq_printf(archivo, "\"ejecucion\":");  
seq_printf(archivo, "%li , \n", ejecucion);  
  
seq_printf(archivo, "\"zombie\":");  
seq_printf(archivo, "%li , \n", zombie);  
  
seq_printf(archivo, "\"detenido\":");  
seq_printf(archivo, "%li , \n", detenido);  
  
seq_printf(archivo, "\"suspendido\":");  
seq_printf(archivo, "%li , \n", suspendido);  
  
seq_printf(archivo, "\"totales\":");  
seq_printf(archivo, "%li \n", totales);  
seq_printf(archivo, "}");  
  
return 0;  
}
```

Backend de Golang

Obtención de la memoria RAM

Con el siguiente código se busca el archivo creado en /proc por el módulo de kernel al obtener los datos de la memoria RAM

```
func RequestMemory() http.HandlerFunc {
    return func(rw http.ResponseWriter, r *http.Request) {
        salida, _, verificar := CMD("cat /proc/mem_grupo18")

        if verificar != nil {
            log.Printf("error: %v\n", verificar)
        } else {
            var dataJson Models.DATAJSONMEMORY
            json.Unmarshal(salida.Bytes(), &dataJson)
            rw.Header().Set("Content-Type", "application/json")
            json.NewEncoder(rw).Encode(dataJson)
        }
    }
}
```

Obtención de procesos del sistema

Con el siguiente código se busca el archivo creado en /proc por el módulo de kernel al obtener los datos de los procesos del sistema

```
func RequestPrincipal() http.HandlerFunc {
    return func(rw http.ResponseWriter, r *http.Request) {
        rw.Header().Set("Content-Type", "application/json")

        salida, _, verificar := CMD("cat /proc/cpu_grupo18")
        if verificar != nil {
            log.Printf("error: %v\n", verificar)
            return
        }

        var dataJson Models.CPUATAJSON
        if err := json.Unmarshal(salida.Bytes(), &dataJson); err != nil {
            log.Printf("error: %v\n", err)
            return
        }

        for i := range dataJson.DATA {
            username, err := getUsername(dataJson.DATA[i].USUARIO)
        }
    }
}
```



```

if err != nil {
log.Printf("Error al obtener el nombre de usuario: %v\n", err)
http.Error(rw, "Error interno del servidor",
http.StatusInternalServerError)
return
}

dataJson.DATA[i].USUARIO = username

for j := range dataJson.DATA[i].PROCESOSHIJOS {
username, err :=
getUsername(dataJson.DATA[i].PROCESOSHIJOS[j].USUARIO)
if err != nil {
log.Printf("Error al obtener el nombre de usuario: %v\n", err)
http.Error(rw, "Error interno del servidor",
http.StatusInternalServerError)
return
}

dataJson.DATA[i].PROCESOSHIJOS[j].USUARIO = username

}
}

if err := json.NewEncoder(rw).Encode(dataJson); err != nil {
log.Printf("error: %v\n", err)
return
}
}
}
}

```

Eliminar procesos

El siguiente código se ejecuta cuando desde la interfaz el usuario desea eliminar uno de los procesos que se están ejecutando, utilizando el comando "sudo kill -9 {PID_proceso}"

```
func RequestKill() http.HandlerFunc {
return func(rw http.ResponseWriter, r *http.Request) {

if r.URL.Path != "/Kill" {
http.NotFound(rw, r)
return
}

if r.Method == "GET" {

id := r.URL.Query().Get("pid")
id = strings.TrimSuffix(id, "/")

_, _, verificar := CMD("sudo kill -9 " + id)

if verificar != nil {
log.Printf("error: %v\n", verificar)
} else {
fmt.Println("Eliminando Proceso: " + id)
}
}else{

rw.WriteHeader(http.StatusNotImplemented)
rw.Write([]byte(http.StatusText(http.StatusNotImplemented)))
}
}
}
```

Maps de los procesos

Las siguientes funciones sirven para leer el archivo de maps del proceso obtenido en la petición post, cuando el usuario solicita la información detallada de cierto proceso. Siendo esta funcionalidad la que se implementó para cumplir con los nuevos requerimientos de la práctica.

```
func RequestMaps() http.HandlerFunc {
return func(rw http.ResponseWriter, r *http.Request) {

if r.URL.Path != "/maps" {
http.NotFound(rw, r)
return
}
if r.Method == "GET" {

id := r.URL.Query().Get("pid")
id = strings.TrimSuffix(id, "/")
num, err := strconv.Atoi(id)
if err != nil {
fmt.Println("Error al convertir el string a int:", err)
return
}

salida, verificar := ObtenerDatosMaps(num)
if verificar != nil {
log.Printf("error: %v\n", verificar)
return
}

rw.Header().Set("Content-Type", "application/json")
json.NewEncoder(rw).Encode(salida)
}else{

rw.WriteHeader(http.StatusNotImplemented)
rw.Write([]byte(http.StatusText(http.StatusNotImplemented)))
}
}
}
```

```
func ObtenerDatosMaps(pid int) ([]Models.MemoryMap, error) {

mapsPath := fmt.Sprintf("/proc/%d/maps", pid)
file, err := os.Open(mapsPath)
```

```
if err != nil {
return nil, err
}
defer file.Close()

var memoryMaps []Models.MemoryMap

reader := bufio.NewReader(file)

for {
line, err := reader.ReadString('\n')
if err != nil && err != io.EOF {
return nil, err
}

if line == "" || err == io.EOF {
break
}

fields := strings.Fields(line)
if len(fields) >= 6 {
addressRange := fields[0]
permissions := fields[1]
device := fields[3]
filePath := fields[5]

rangeFields := strings.Split(addressRange, "-")
if len(rangeFields) != 2 {
continue
}

start, err := strconv.ParseUint(rangeFields[0], 16, 64)
if err != nil {
log.Printf("Error al parsear la dirección de inicio: %v", err)
continue
}

end, err := strconv.ParseUint(rangeFields[1], 16, 64)
if err != nil {
log.Printf("Error al parsear la dirección de fin: %v", err)
continue
}
}
```

```

size := end - start

memoryMap := Models.MemoryMap{
Direccion: addressRange,
Tamanio: size,
Permisos: permissions,
Dispositivo: device,
Archivo: filePath,
}

memoryMaps = append(memoryMaps, memoryMap)
}
}

return memoryMaps, nil
}

```

En lo anterior cabe destacar el cálculo de la memoria que ocupa el proceso que se realiza restando el último espacio en memoria con el primero que ocupa el proceso

```

// Cálculo del tamaño de segmento
size := end - start

```

El siguiente método es el que se agregó para obtener los datos de Rss y Size del archivo “smaps” del proceso que requiera para adjuntarse a la respuesta del procedimiento anterior

```

func ObtenerRSS(pid int) ([]Models.MemResVirtual, error) {
var memResVirtuals []Models.MemResVirtual // variable representa
al Mapa de datos de la Memoria
salida, _, verificar := CMD("cat
/proc/"+strconv.Itoa(pid)+"/smaps | grep 'Rss: '")
if verificar != nil {
log.Printf("error: %v\n", verificar)
return memResVirtuals, nil
}

salida2, _, verificar2 := CMD("cat
/proc/"+strconv.Itoa(pid)+"/smaps | grep '^Size: '")
if verificar2 != nil {

```

```

log.Printf("error: %v\n", verificar2)
return memResVirtuals, nil
}

lines := strings.Split(salida.String(), "\n")
totalRss := 0
lines2 := strings.Split(salida2.String(), "\n")
totalSize := 0
indx := 0

for _, line := range lines {
    // Extraer el valor numérico de la línea
    valueStr := strings.TrimSpace(strings.TrimPrefix(line, "Rss:"))
    valueStr2 := strings.TrimSpace(strings.TrimPrefix(lines2[indx], "Size:"))

    va := strings.Split(valueStr, " ")
    va2 := strings.Split(valueStr2, " ")
    value, err := strconv.Atoi(va[0])
    value2, err := strconv.Atoi(va2[0])
    if err != nil {
        continue
    }

    // Sumar el valor al total
    totalRss += value
    totalSize += value2
    indx += 1

    memResVirtual := Models.MemResVirtual{
        Residente: value,
        Virtual: value2,
    }

    //Añadimos el objeto a la lista
    memResVirtuals = append(memResVirtuals, memResVirtual)
}

fmt.Printf("Rss total: %d\n", totalRss)
fmt.Printf("Size total: %d\n", totalSize)
return memResVirtuals, nil
}

```

INSTALACIÓN DE PAQUETES

GIT

```
ArchLinux [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Console Jun 16 23:13
so2_practica2_18@myarch:~
[so2_practica2_18@myarch ~]$ sudo pacman -S git
resolving dependencies...
looking for conflicting packages...

Packages (4) perl-error-0.17029-4 perl-mailtools-2.21-6 perl-timedate-2.33-4
git-2.41.0-1

Total Download Size: 6.86 MiB
Total Installed Size: 38.80 MiB

:: Proceed with installation? [Y/n] Y
:: Retrieving packages...
git-2.41.0-1-x86_64 6.7 MiB 1951 KiB/s 00:04 [#####] 100%
perl-mailtools-2... 62.2 KiB 366 KiB/s 00:00 [#####] 100%
perl-timedate-2... 35.8 KiB 210 KiB/s 00:00 [#####] 100%
perl-error-0.170... 21.8 KiB 136 KiB/s 00:00 [#####] 100%
Total (4/4) 6.9 MiB 1502 KiB/s 00:05 [#####] 100%
(4/4) checking keys in keyring [#####] 100%
(4/4) checking package integrity [#####] 100%
(4/4) loading package files [#####] 100%
(4/4) checking for file conflicts [#####] 100%
(4/4) checking available disk space [#####] 100%
:: Processing package changes...
(1/4) installing perl-error [#####] 100%
(2/4) installing perl-timedate [#####] 100%
(3/4) installing perl-mailtools [#####] 100%
(4/4) installing git [#####] 100%
Optional dependencies for git
tk: gitk and git gui
```

GOLANG

```
Activities Console Jun 16 23:14
so2_practica2_18@myarch:~
[so2_practica2_18@myarch ~]$ git --version
git version 2.41.0
[so2_practica2_18@myarch ~]$ go --version
bash: go: command not found
[so2_practica2_18@myarch ~]$ go version
bash: go: command not found
[so2_practica2_18@myarch ~]$ sudo pacman -S go
resolving dependencies...
looking for conflicting packages...

Packages (1) go-2:1.20.5-1

Total Download Size: 36.31 MiB
Total Installed Size: 196.09 MiB

:: Proceed with installation? [Y/n] Y
:: Retrieving packages...
go-2:1.20.5-1-x86_64 36.3 MiB 3.38 MiB/s 00:11 [#####] 100%
(1/1) checking keys in keyring [#####] 100%
(1/1) checking package integrity [#####] 100%
(1/1) loading package files [#####] 100%
(1/1) checking for file conflicts [#####] 100%
(1/1) checking available disk space [#####] 100%
:: Processing package changes...
(1/1) installing go [#####] 100%
:: Running post-transaction hooks...
(1/1) Arming ConditionNeedsUpdate...
[so2_practica2_18@myarch ~]$
```

sudo pacman -S linux-headers

Se modificó el código del módulo del cpu y de la memoria ram para que funcionara con la versión antigua del kernel, ya que la que utiliza arch linux es la 5.4 que es menor a la 5.6

```
/**
 * @brief
 *
 */
// Si el kernel es menor al 5.6 usan file_operations
You, 3 days ago | 1 author (You)
static struct file_operations operaciones =
{
    .open = al_abrir,
    .read = seq_read};
/**
```

CAMBIOS PRÁCTICA 3

Memoria residente 12.53125 MB
Memoria virtual 106.84765625 MB
Consumo de Memoria 11.728146821189632 %

