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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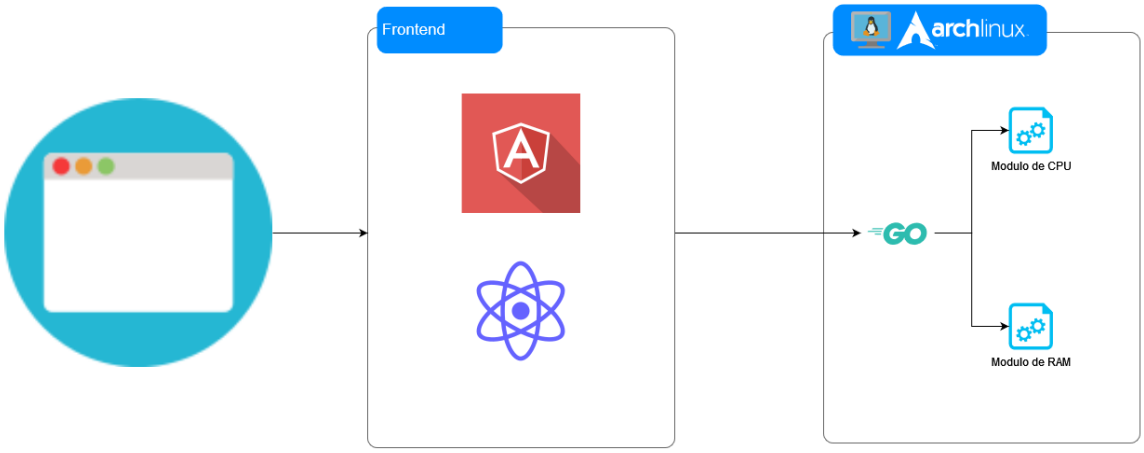
INTRODUCCIÓN

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**

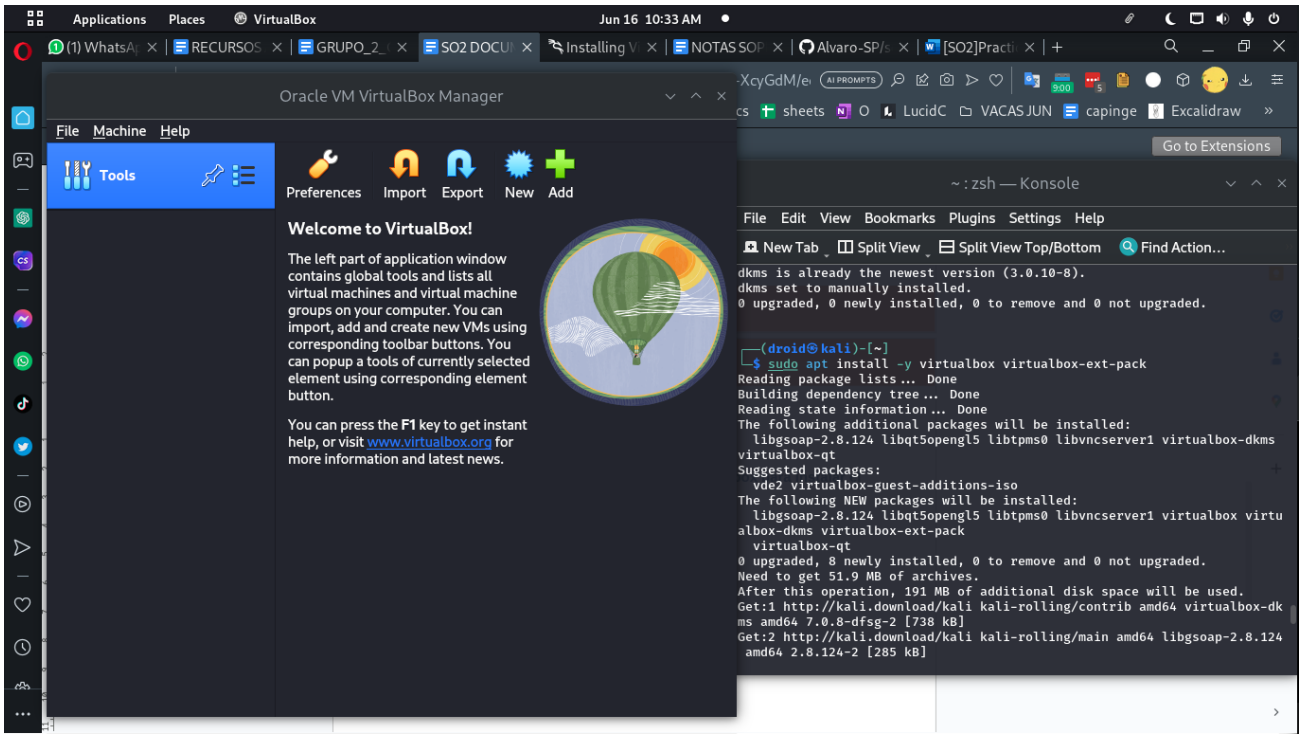
```
sudo apt install golang
go version
```

- **Git**

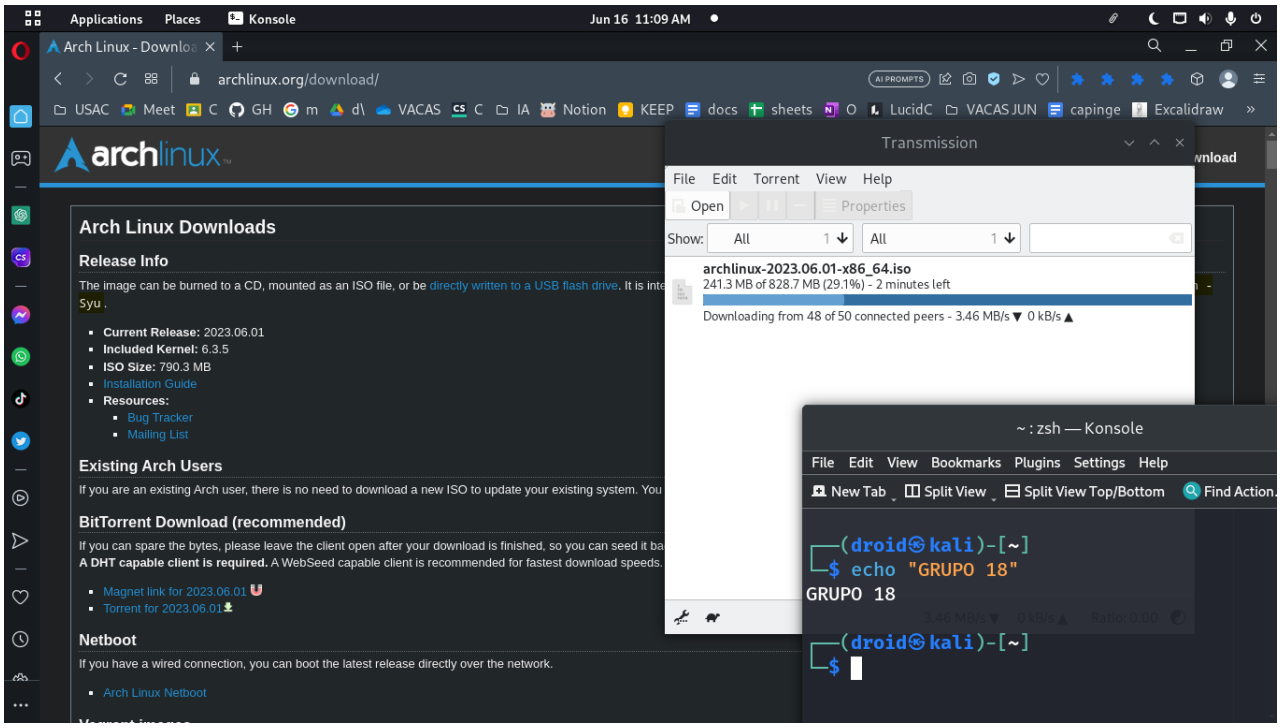
```
sudo apt install git
git -version
```

INSTALACIÓN DE ARCH LINUX

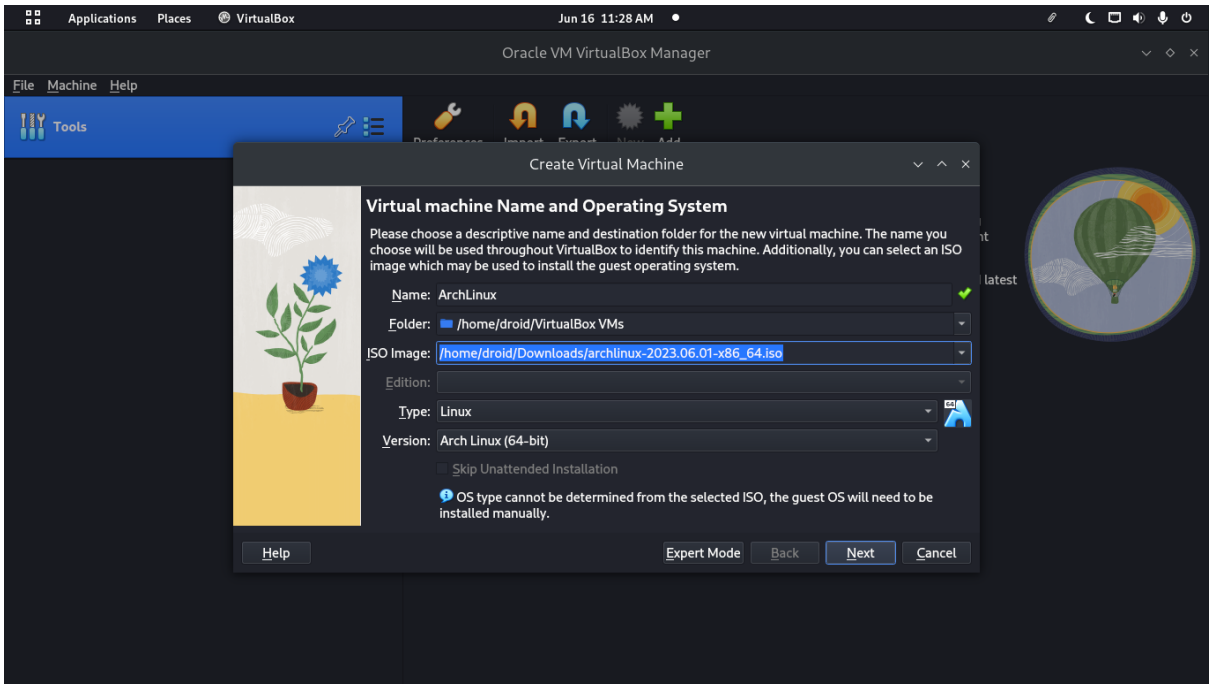
Primero se ha descargado el software de Virtualbox para instalar el ISO

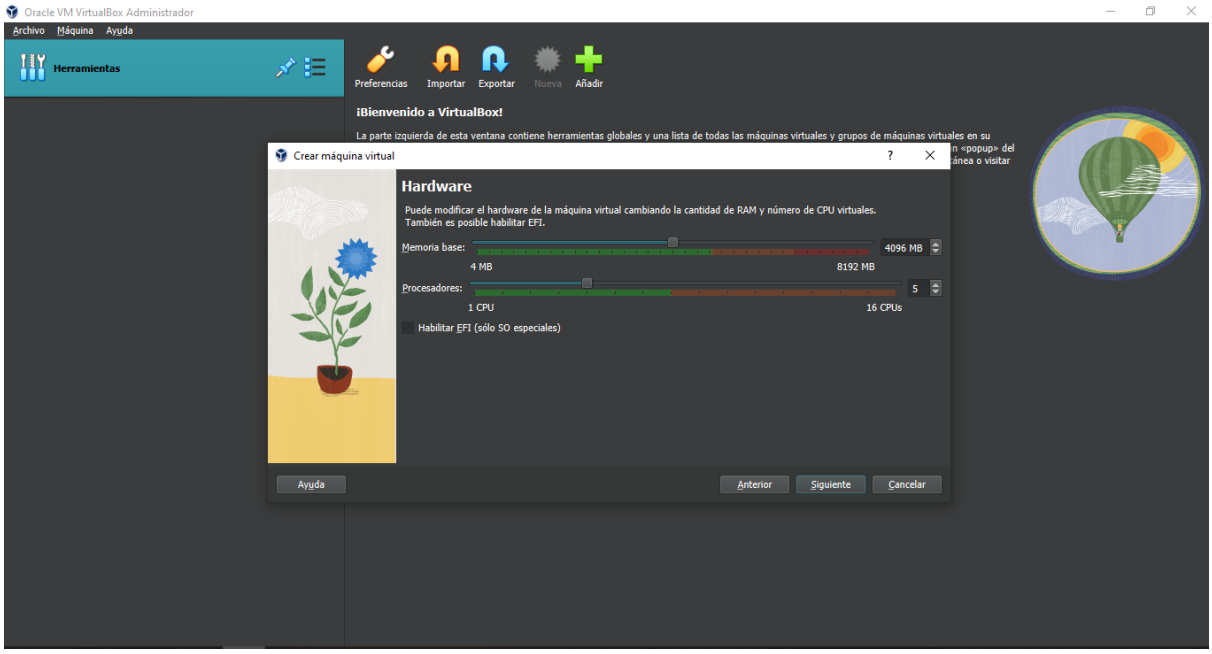


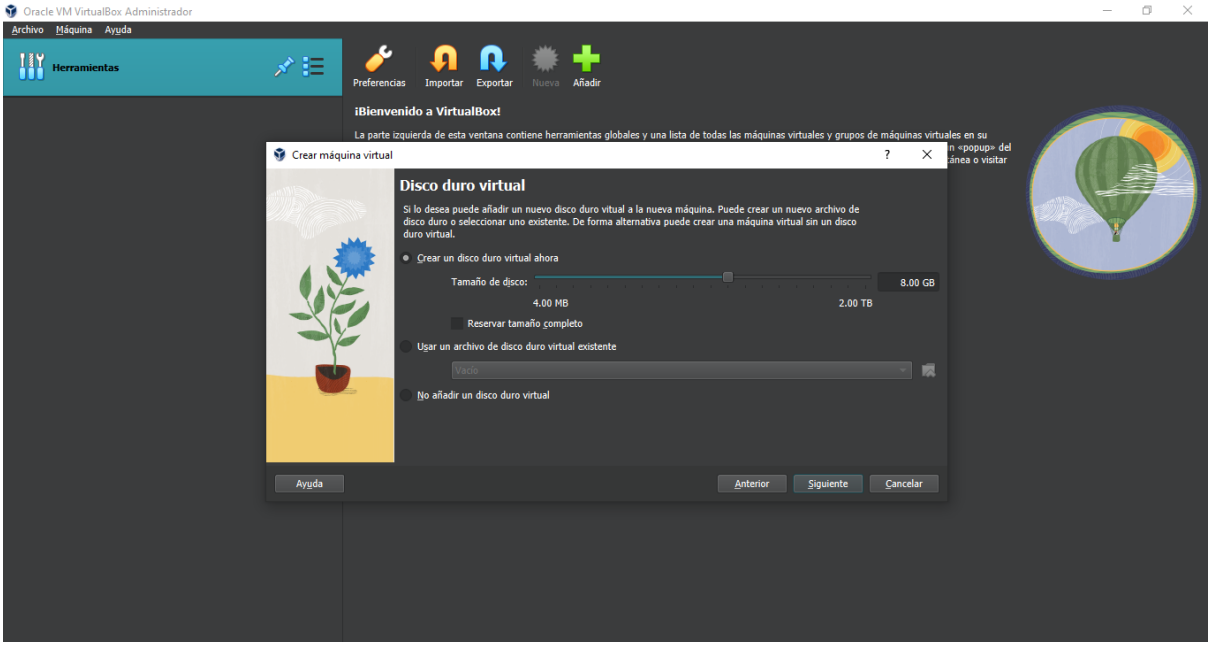
Se ha descargado el iso



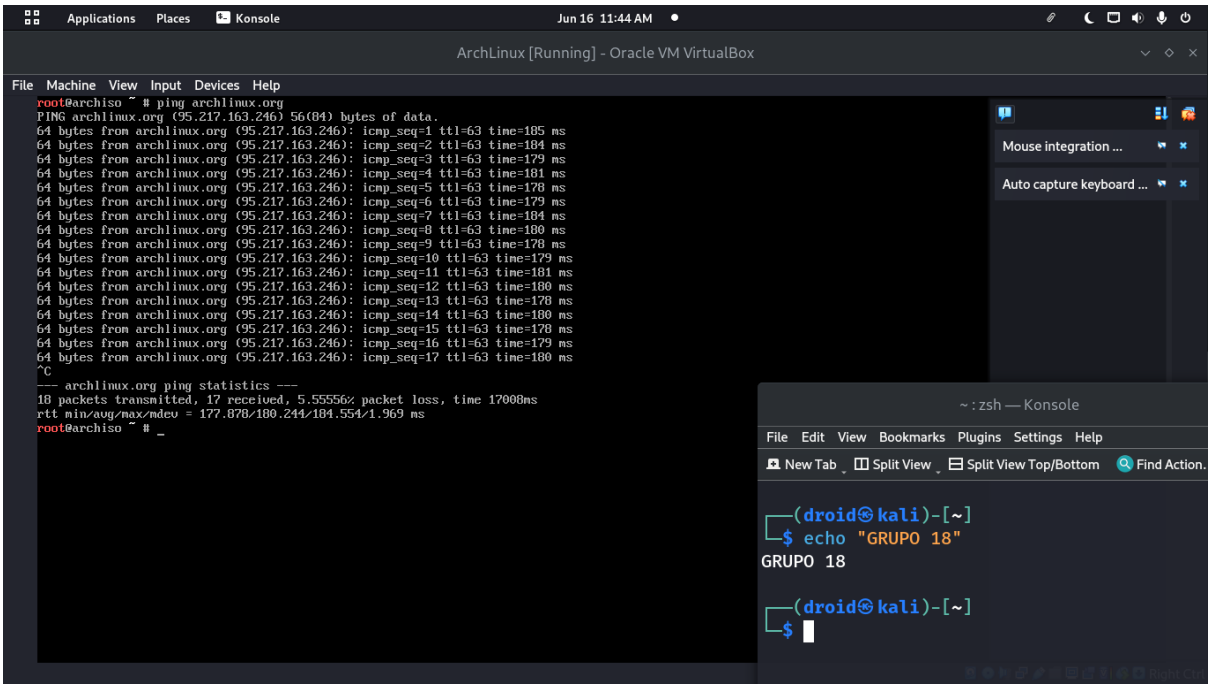
Seleccionamos la imagen y sus recursos:







Antes de seguir al iniciar la maquina verificamos conexión a internet



Posteriormente particionamos el disco:

fdisk -l ⇐ sirve para ver los discos

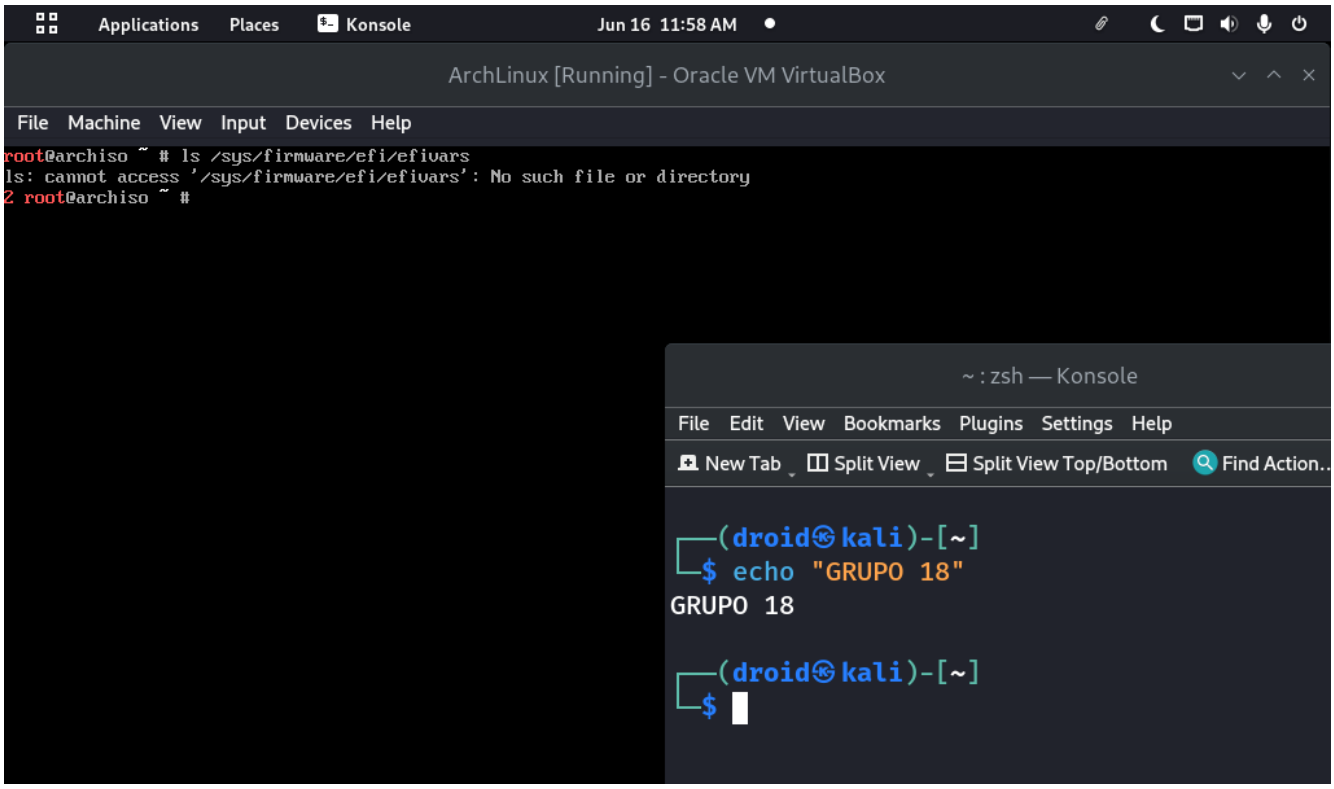
fdisk /dev/sda ⇐ sirve para

```
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  82 Linux swap / So  c1 DRDOS/sec (FAT-
01 FAT12            39 Plan 9           83 Linux            c4 DRDOS/sec (FAT-
02 XENIX root       3c PartitionMagic   84 OS/2 hidden or   c6 DRDOS/sec (FAT-
03 XENIX usr        40 Venix 80286      85 Linux extended   c7 Syrinx
04 FAT16 <32M       41 PPC PReP Boot    86 NTFS volume set  da Non-FS data
05 Extended         42 SFS              87 NTFS volume set  db CP/M / CTOS / .
06 FAT16            4d QNX4.x           88 Linux plaintext  de Dell Utility
07 HPFS/NTFS/exFAT  4e QNX4.x 2nd part  8e Linux LVM        df BootIt
08 AIX              4f QNX4.x 3rd part  93 Amoeba           e1 DOS access
09 AIX bootable     50 OnTrack DM       94 Amoeba 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 OPUS             56 Golden Bow       a8 Darwin UFS       f0 Linux/PA-RISC b
11 Hidden FAT12     5c Priam Edisk      a9 NetBSD           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  fd Linux raid auto
1c Hidden W95 FAT3  80 Old Minix        be Solaris boot     fe LANstep
1e Hidden W95 FAT1  81 Minix / old Lin  bf Solaris          ff BBT
24 NEC DOS
```

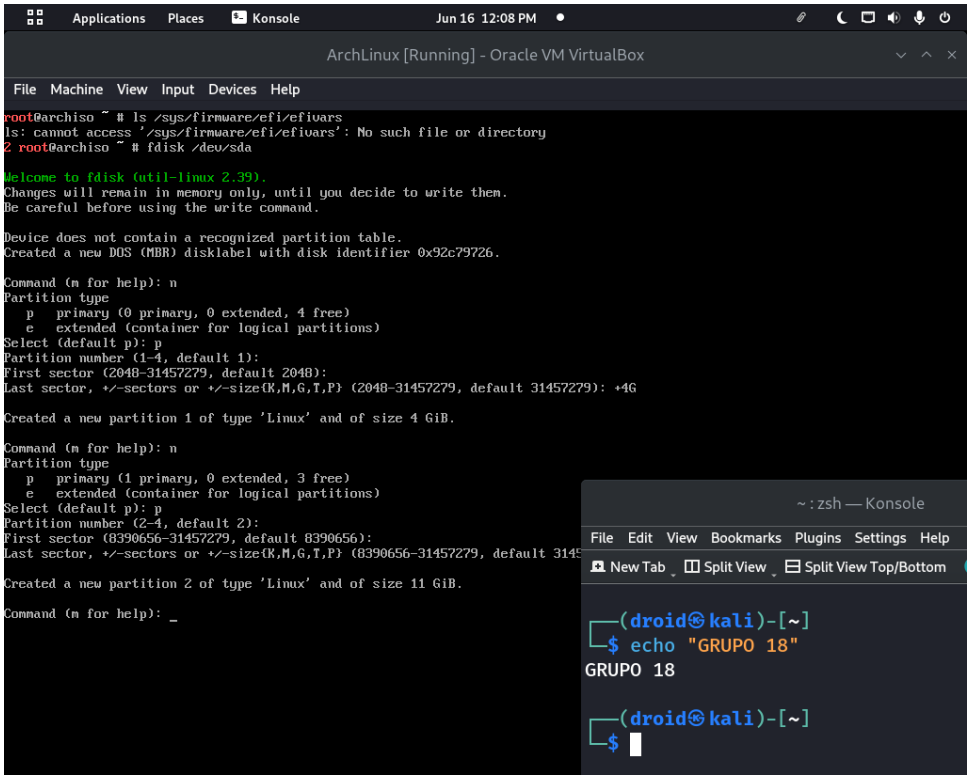
```
(droid㉿kali)-[~]
└$ echo "GRUPO 18"
GRUPO 18

(droid㉿kali)-[~]
└$
```

```
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):



Luego se crea la particion:
SWAP y ROOT



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

```
Applications  Places  Konsole  Jun 16 12:11 PM
ArchLinux [Running] - Oracle VM VirtualBox
File  Machine  View  Input  Devices  Help
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 ~ # _
```

```
~ : zsh — Kons
File  Edit  View  Bookmarks  Plugins  Setting
New Tab  Split View  Split View Top/

┌──(droid㉿kali)-[~]
└─$ echo "GRUPO 18"
GRUPO 18

┌──(droid㉿kali)-[~]
└─$
```

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

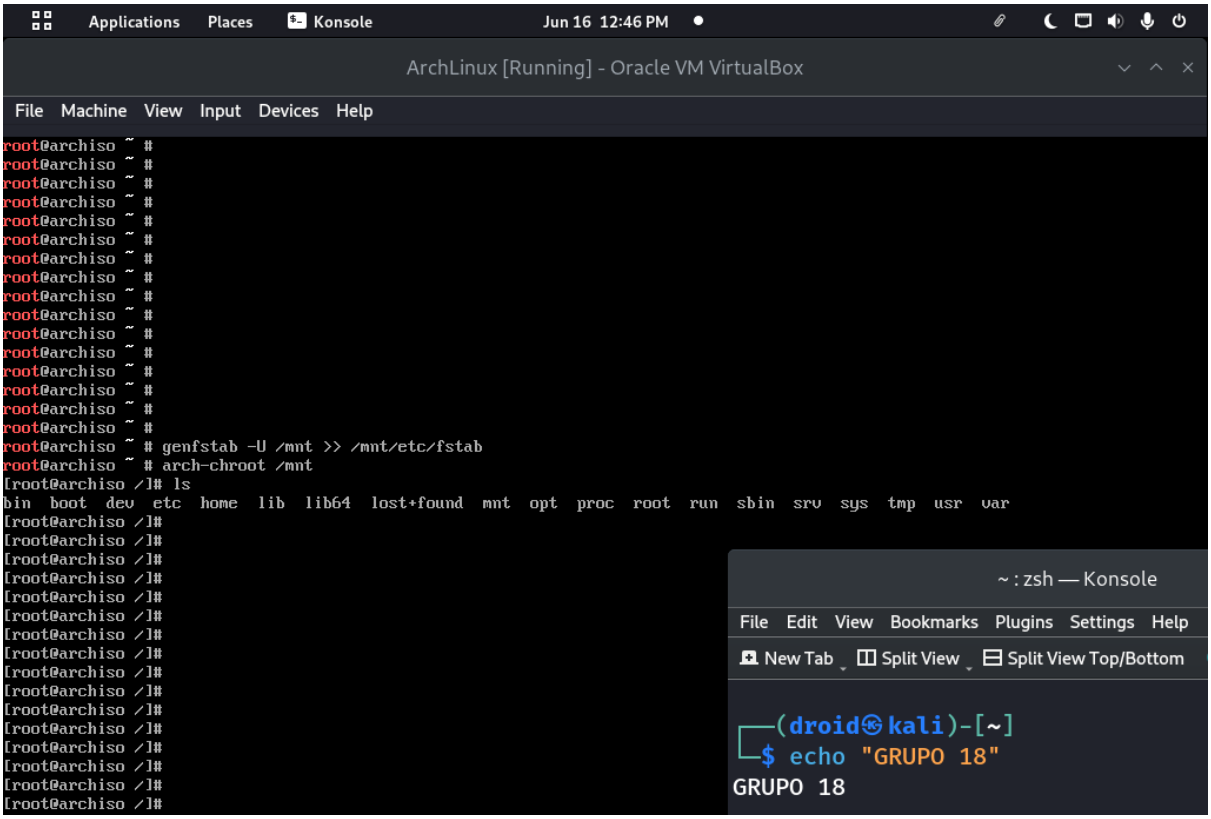
```
riting superblocks and filesystem accounting inform

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.
               hwdata-0.371-1  iana-etc-20230405-1  icu-72.1-2  iproute2-6.3.0-2  iptables-1:1.8.9-1  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  libnfnetlink-1.
               libnghttp2-1.54.0-1  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  libverto-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  npth-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  procps-ng-3.3.17-1  psmisc-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-sysvcompat-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  whic

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:
ln -sf /usr/share/zoneinfo/Mexico/BajaSur /etc/localtime

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

```
Applications  Places  Opera                Jun 16  4:22 PM
ArchLinux [Running] - Oracle VM VirtualBox
File  Machine  View  Input  Devices  Help
  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
                                        [ Read 97 lines ]
^G Help      ^O Write Out  ^W Where Is   ^K Cut       ^T Execute   ^C Location   M-U Undo      M-A Set Mark
^X Exit      ^R Read File  ^\ Replace    ^U Paste     ^J Justify   ^_ Go To Line M-E Redo      M-6 Copy
Mouse integration ...
Auto capture keyboard ...
Right Ctrl
```

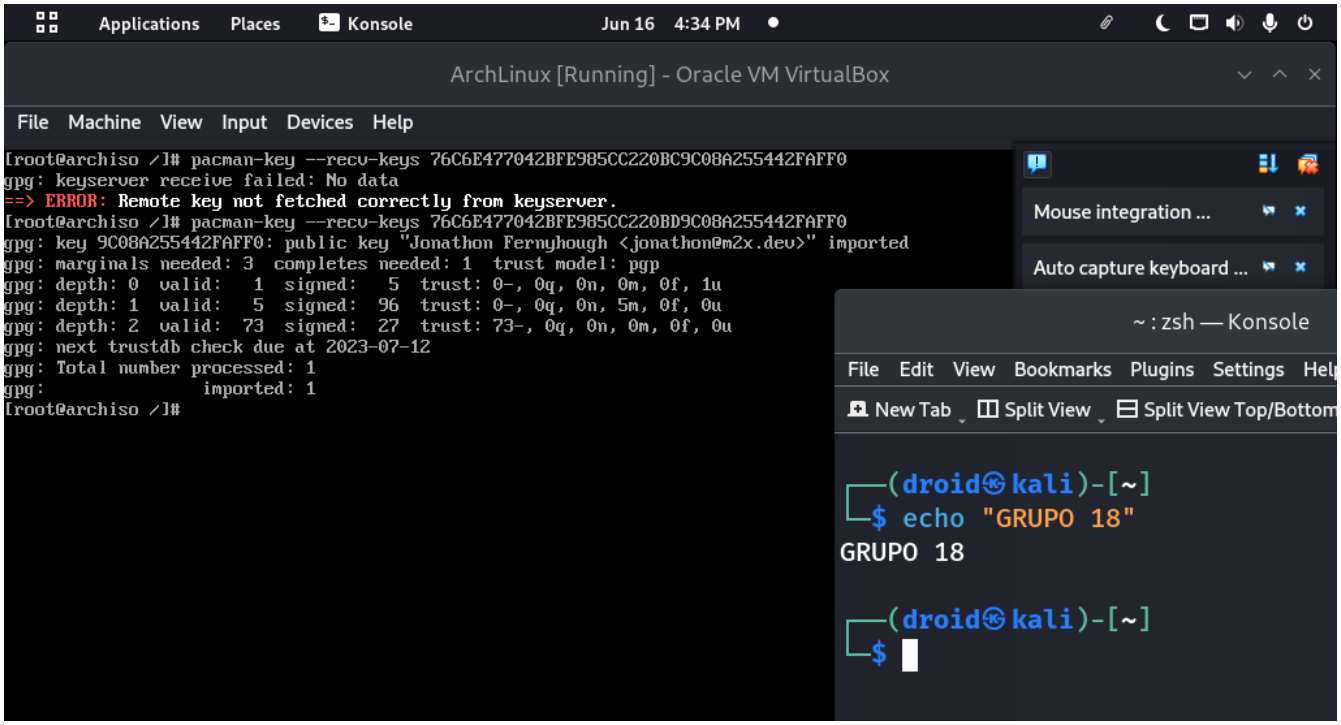
Se agrega el repositorio dentro de ese archivo:

```
GNU nano 7.2                                                    /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 /]#
```

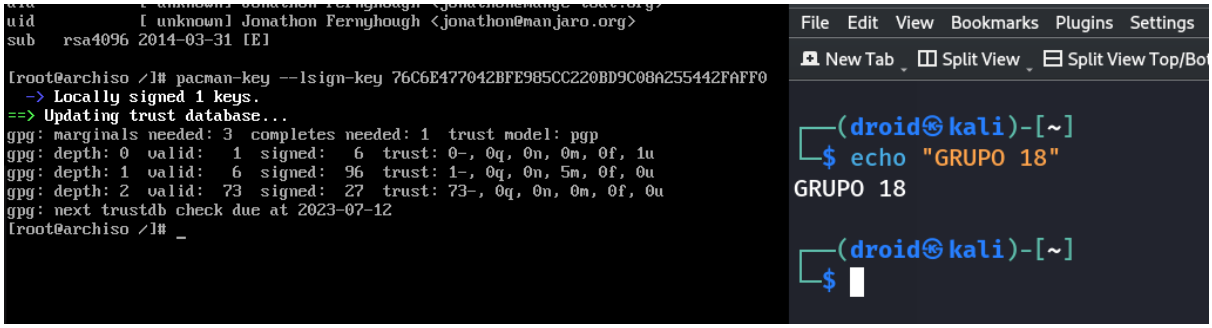
```
┌──(droid㉿kali)-[~]
└─$ echo "GRUPO 18"
GRUPO 18

┌──(droid㉿kali)-[~]
└─$
```

AGREGAR LAS LLAVES

pacman-key –recv-keys 76C6E477042BFE985CC220BC9C08A255442FAFF0



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



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

```
[kernel-lts]
Server = https://repo.m2x.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
```

```
New Tab   Split View   Split Vie
┌──(droid㉿kali)-[~]
└─$ echo "GRUPO 18"
GRUPO 18

┌──(droid㉿kali)-[~]
└─$
```

Entonces dejamos todo por defecto y seguimos:

```
Applications   Places   Opera   Jun 16   5:38 PM
ArchLinux [Running] - Oracle VM VirtualBox
File   Machine   View   Input   Devices   Help
(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 lzo 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 initcpios...
==> 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'
```

```
~ : zsh
File   Edit   View   Bookmarks   Plugin
New Tab   Split View   Split
┌──(droid㉿kali)-[~]
└─$ echo "GRUPO 18"
GRUPO 18
┌──(droid㉿kali)-[~]
└─$
```

INSTALACION DE GRUB

pacman -S grub

```
Applications  Places  Konsole                Jun 16  5:39 PM
ArchLinux [Running] - Oracle VM VirtualBox
File  Machine  View  Input  Devices  Help
root@archiso /]# pacman -S grub
esolving dependencies...
ooking for conflicting packages...

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

otal Download Size:    6.75 MiB
otal 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
ptional 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 /]# _
```

```
~ : zsh — Ko
File  Edit  View  Bookmarks  Plugins  Setti
New Tab  Split View  Split View To

┌──(droid㉿kali)-[~]
└─$ echo "GRUPO 18"
GRUPO 18

┌──(droid㉿kali)-[~]
└─$
```

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

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

Applications Places Konsole Jun 16 5:47 PM

ArchLinux [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

```
[root@archiso /]# locale-gen
Generating locales...
  en_US.UTF-8... done
  es_MX.UTF-8... done
Generation complete.
[root@archiso /]#
```

~ : zsh — Konsole

File Edit View Bookmarks Plugins Settings Help

New Tab Split View Split View Top/Bottom

```
┌──(droid㉿kali)-[~]
└─$ echo "GRUPO 18"
GRUPO 18
```

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
```

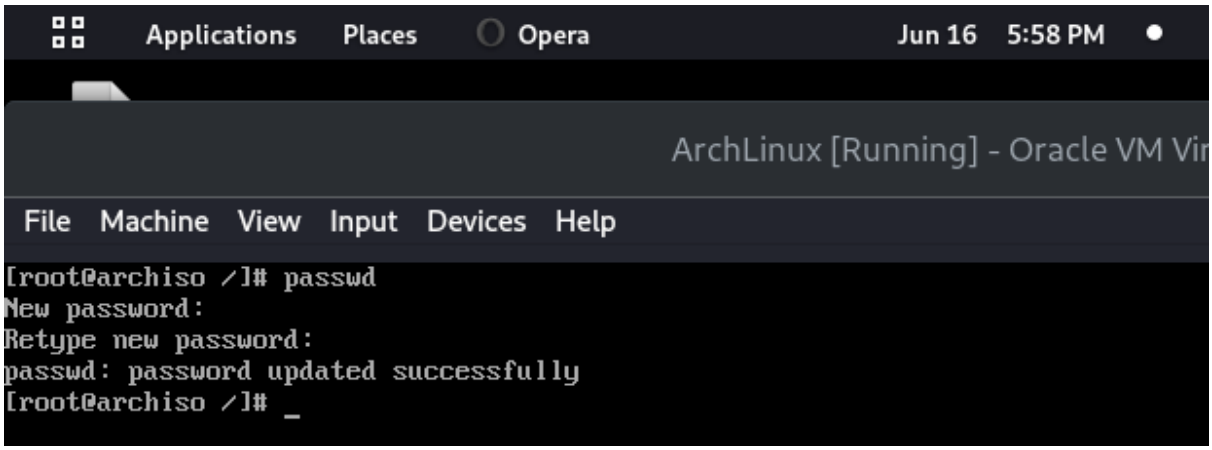
Applications Places Opera Jun 16 5:53 PM

ArchLinux [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

```
  GNU nano 7.2                                          /etc/hosts
# Static table lookup for hostnames.
# See hosts(5) for details.
127.0.0.1       localhost
::1             localhost
127.0.1.1       myarch
```

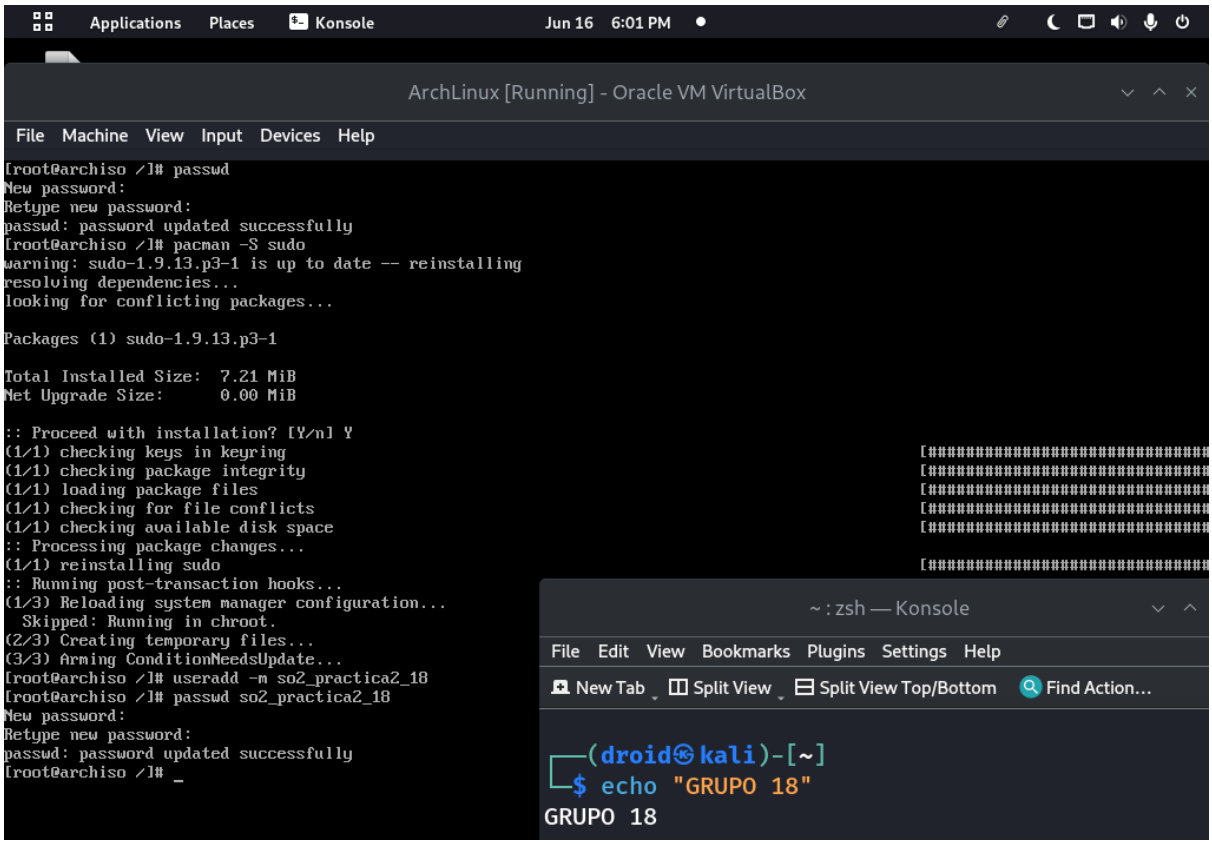
passwd 123



CREACIÓN DE USUARIO:

pacman -S sudo

se agrega el usuario so2_practica2_18

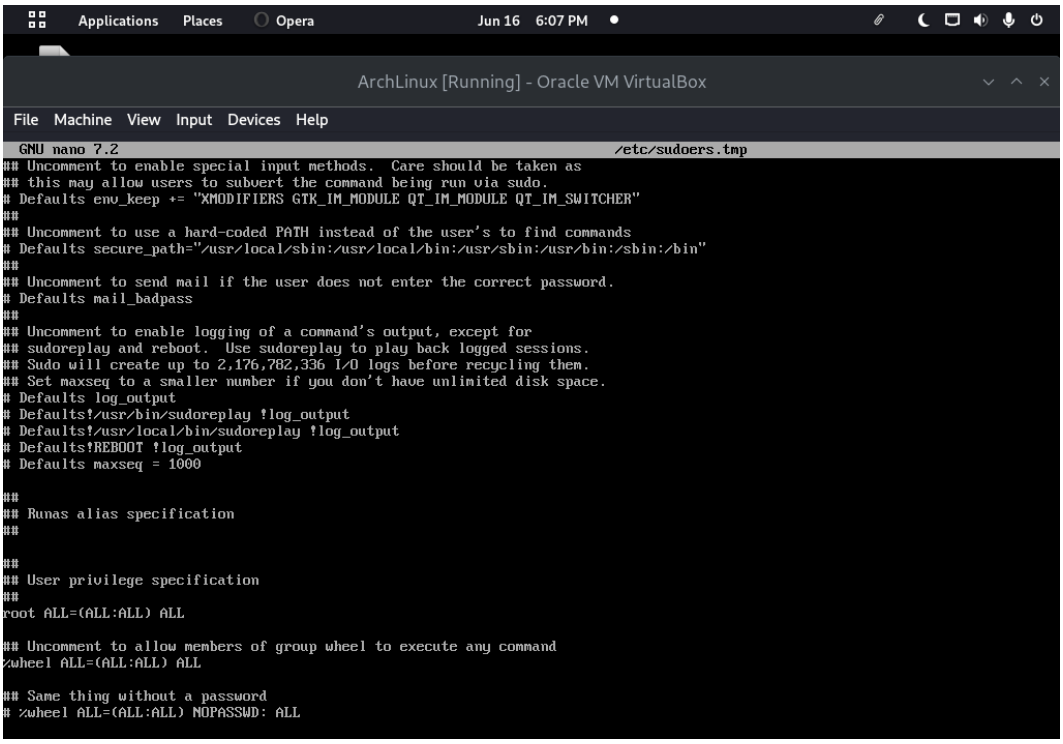


damos permisos

usermod -aG wheel,audio,video,storage so2_practica2_18

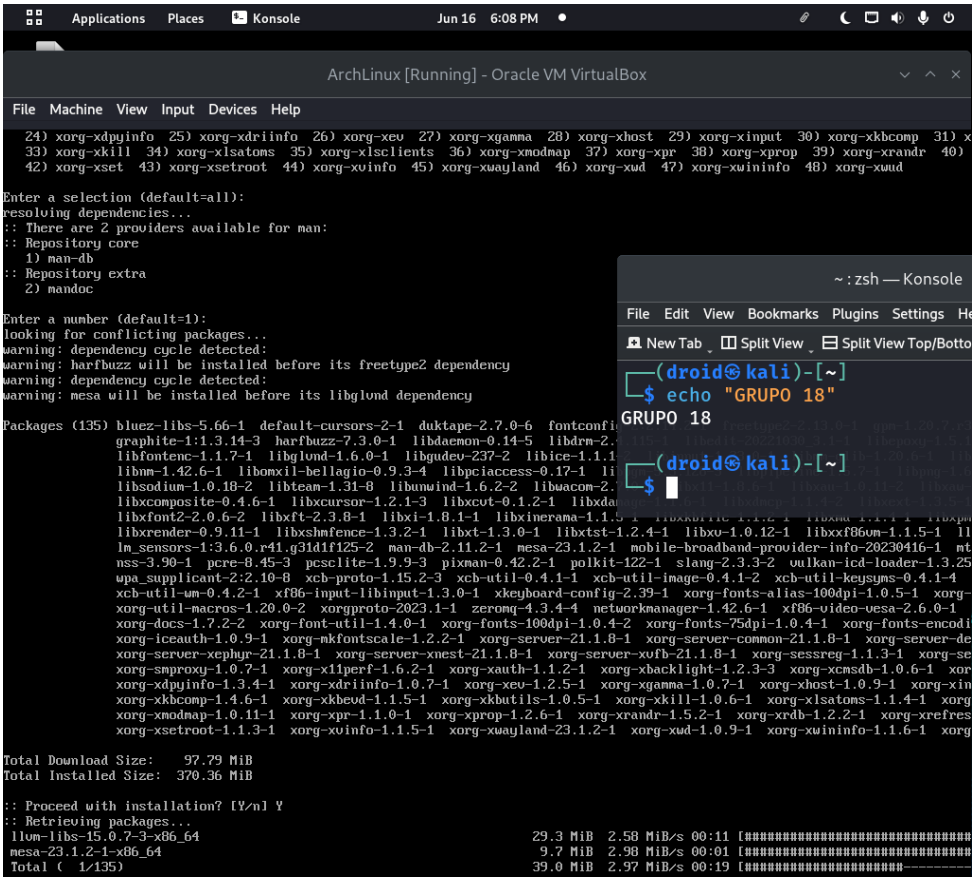
EDITOR=nano visudo

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

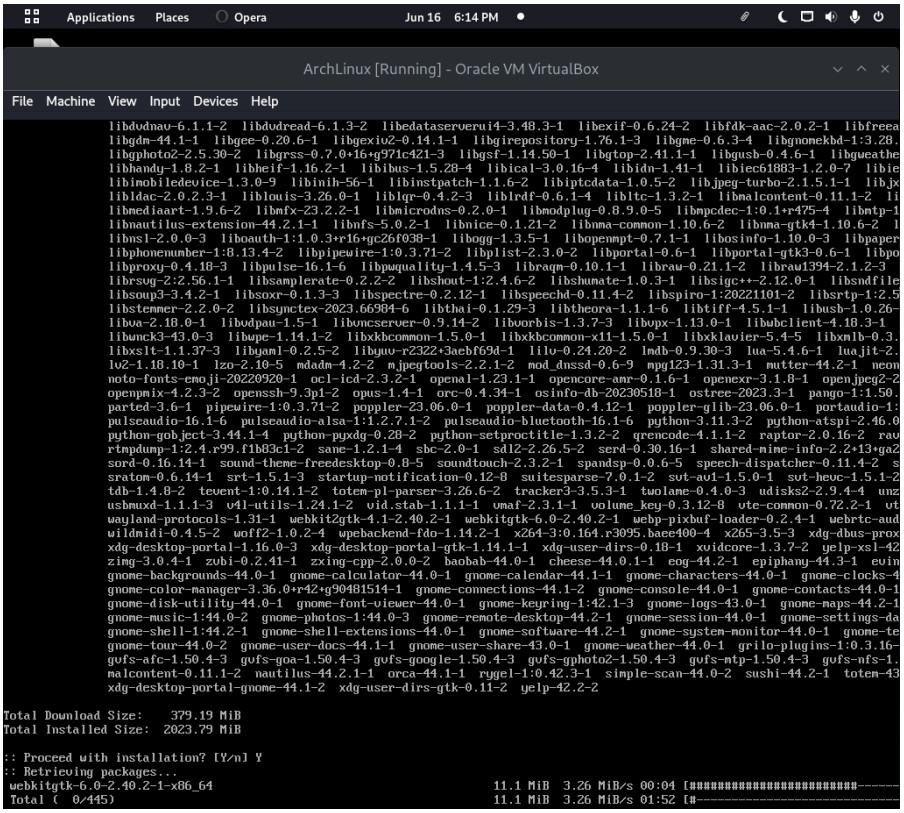


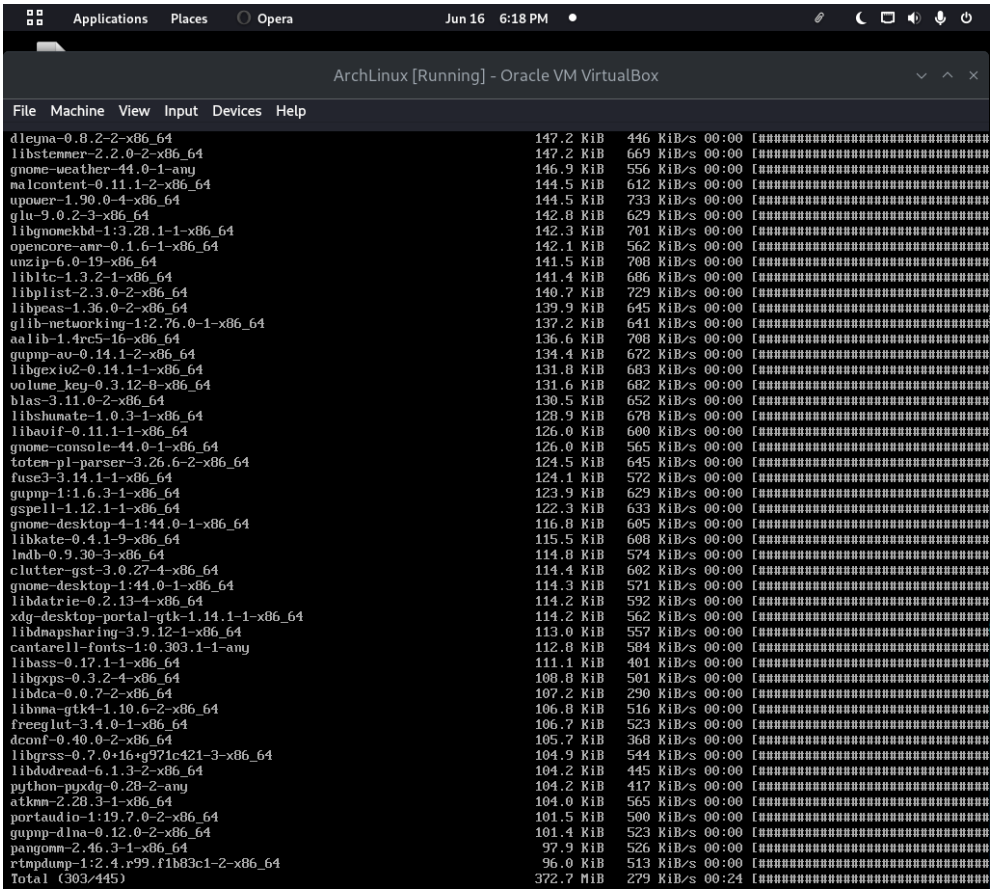
INSTALACIÓN GRÁFICA:

pacman -S xorg networkmanager

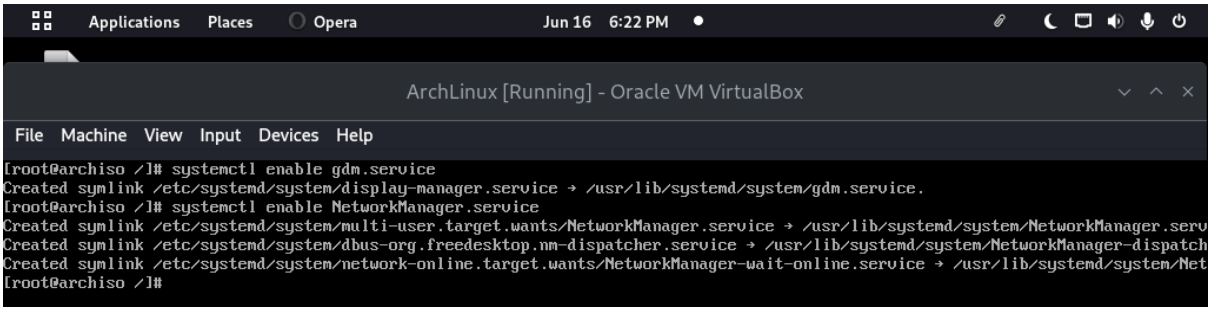


luego el comando pacman -S gnome

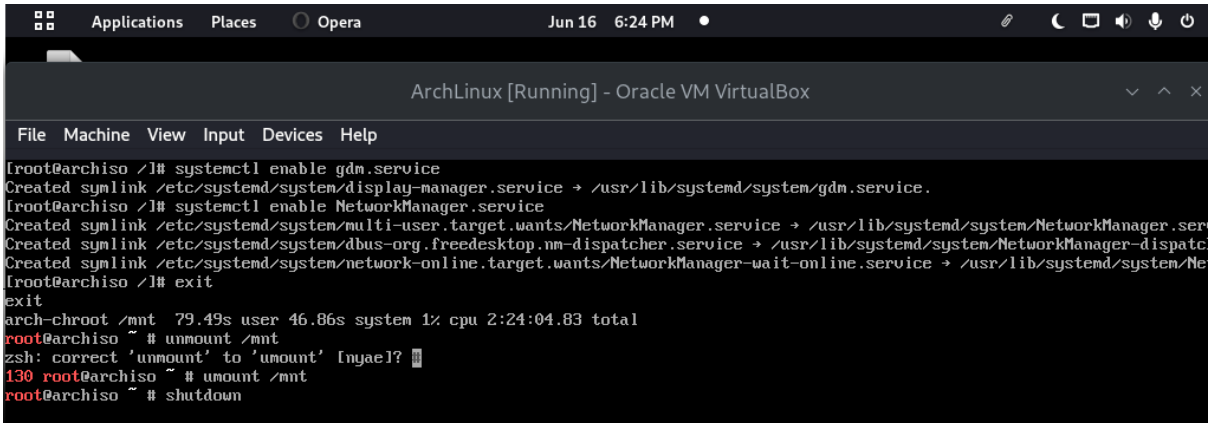




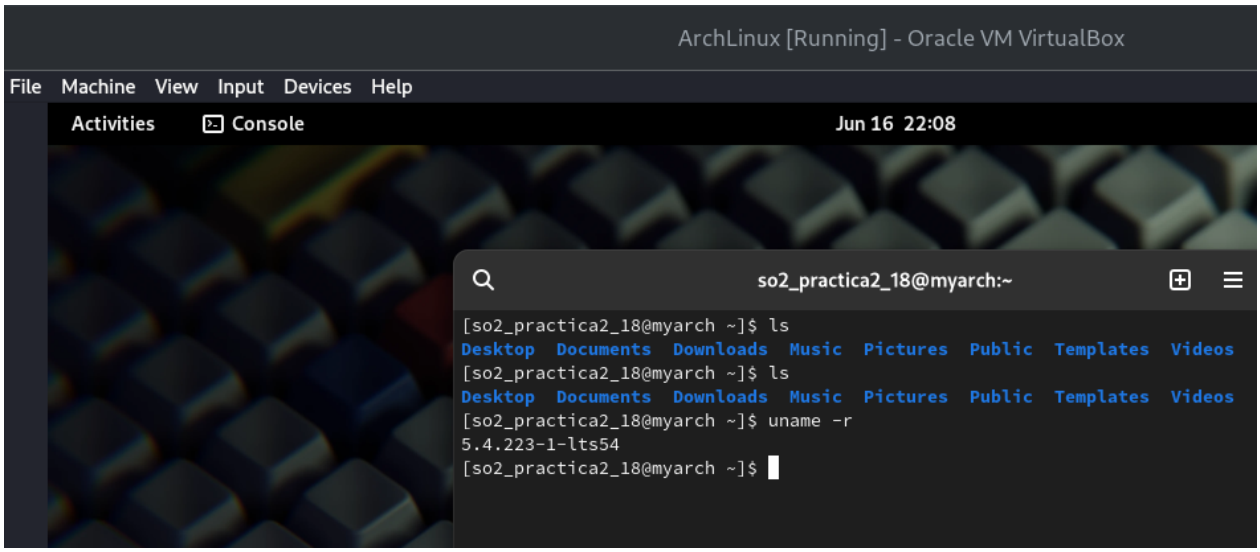
Activar el network manager y el adaptador de arch

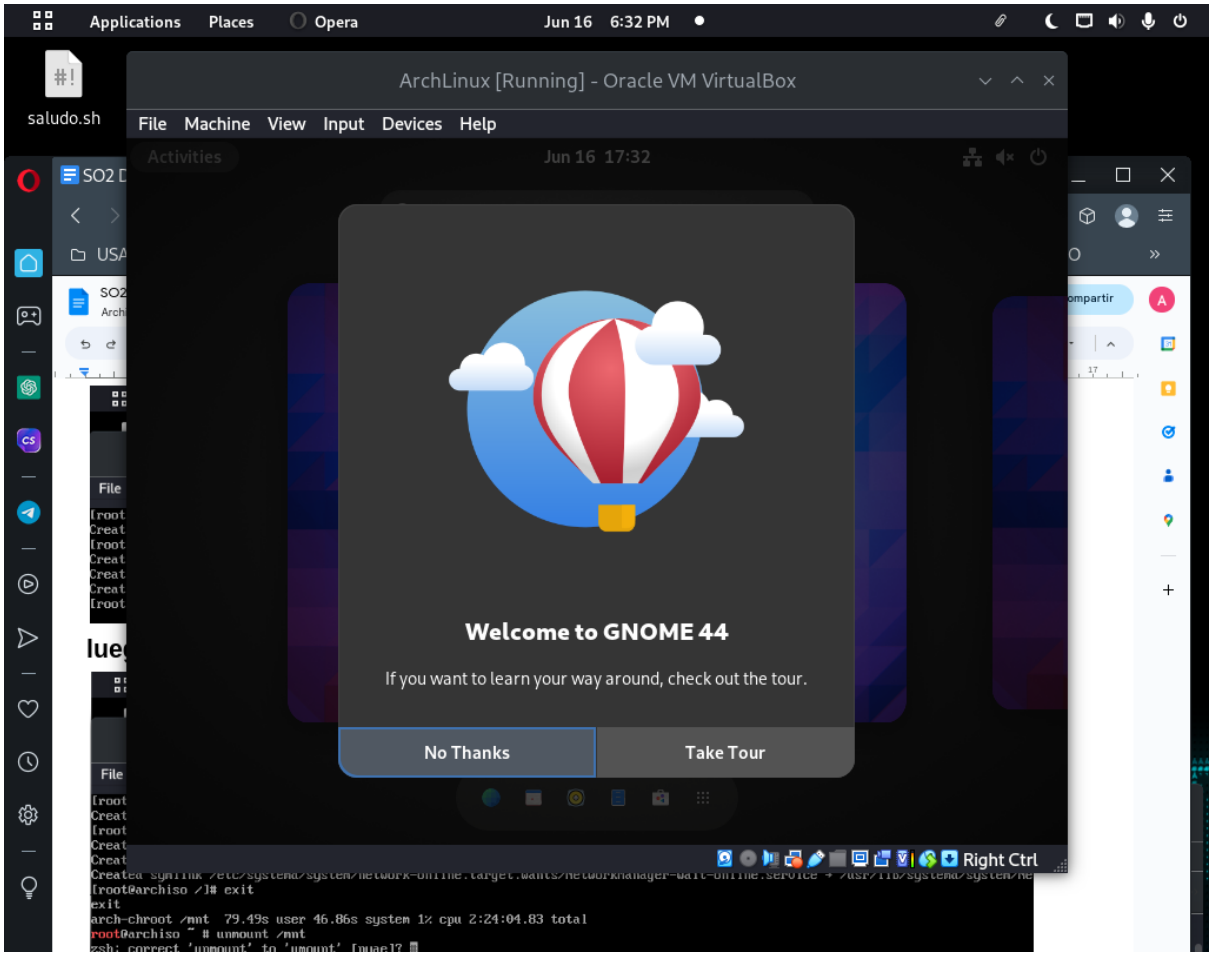


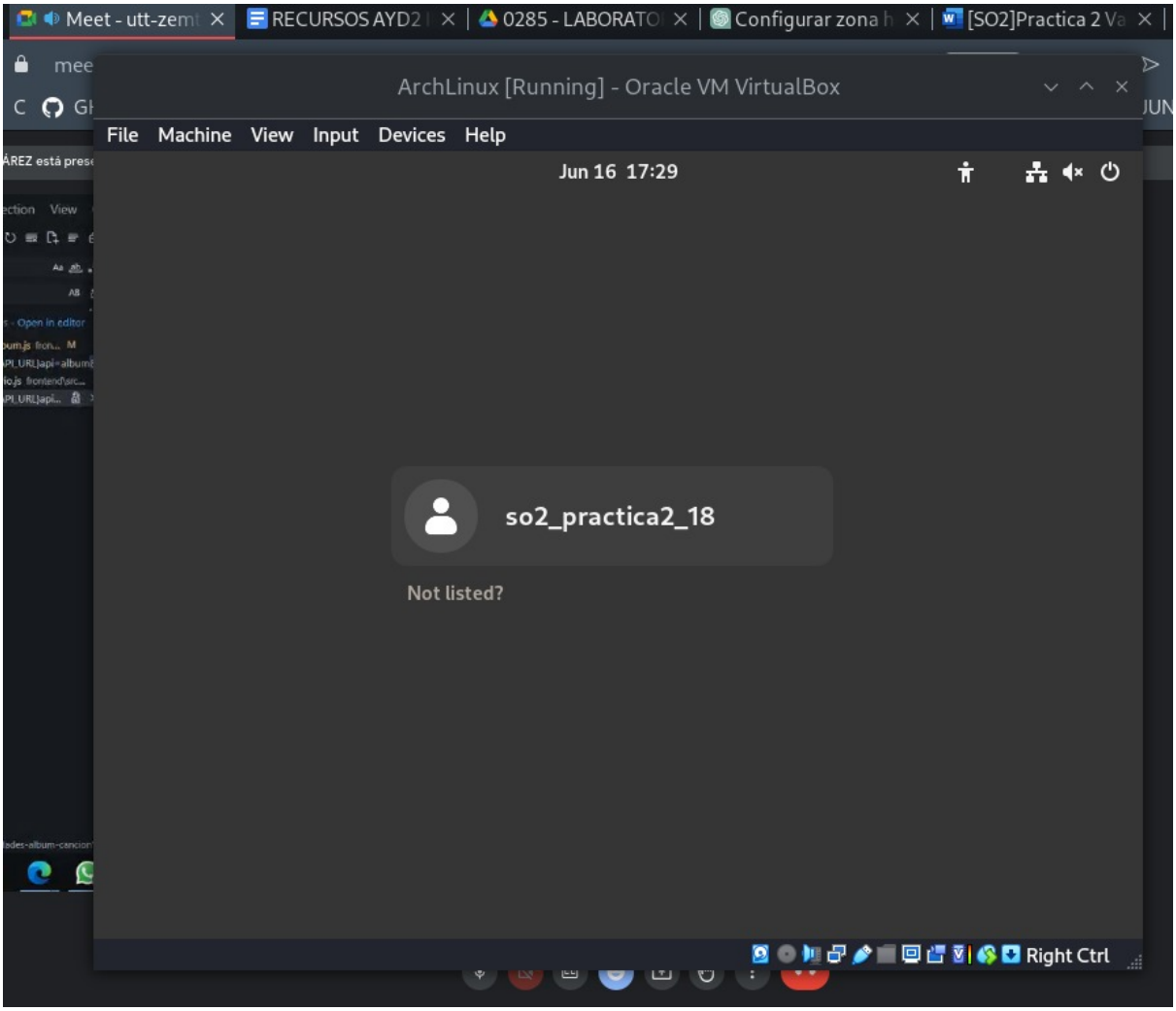
luego desmontamos la instalación y listo



shutdown now






Meet - utt-zemt
RECURSOS AYD2
0285 - LABORATO
Configurar zona h
[SO2]Practica 2 Va
ArchLinux [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Jun 16 17:29
so2_practica2_18
Not listed?
Right Ctrl

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 indext = 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.CPUDATAJSON
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)
```

```go
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
Right Ctrl
```

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 ~]$
Right Ctrl
```

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