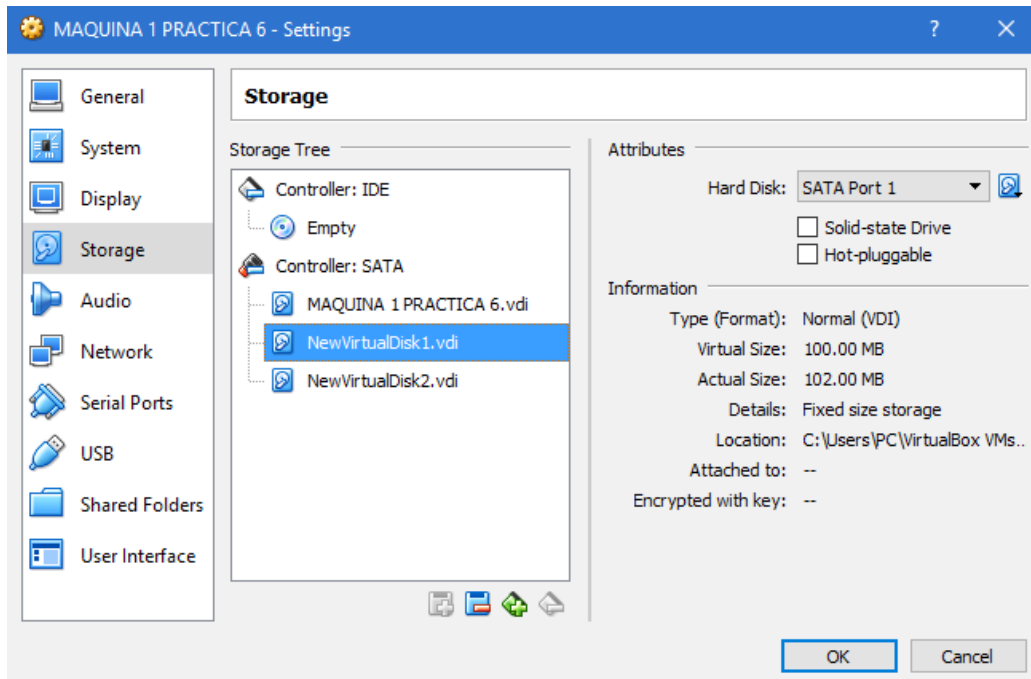


Práctica 6.

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Configuración del RAID por software Como se ha indicado, partimos de una máquina virtual ya instalada y configurada a la que, estando apagada, añadiremos dos discos del mismo tipo y capacidad.



Ahora arrancamos la máquina y entramos para instalar el software necesario para configurar el RAID:

```
sudo apt-get install mdadm
```

Y Debemos buscar la información (identificación asignada por Linux) de ambos discos:

```
sudo fdisk -l
```

```
MAQUINA 1 PRACTICA 6 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Run 'do-release-upgrade' to upgrade to it.

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

swapi@swapi:~$ sudo apt-get install mdadm
[sudo] password for swapi:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following extra packages will be installed:
  postfix
Suggested packages:
  procmail postfix-mysql postfix-pgsql postfix-ldap postfix-pcre sasl2-bin
  dovecot-common postfix-cdb mail-reader postfix-doc
Recommended packages:
  default-mta mail-transport-agent
The following NEW packages will be installed
  mdadm postfix
0 to upgrade, 2 to newly install, 0 to remove and 198 not to upgrade.
Need to get 1,805 kB of archives.
After this operation, 4,407 kB of additional disk space will be used.
Do you want to continue [Y/n]? ^\swapi@swapi:~$ y
```

```
Partition table entries are not in disk order

Disk /dev/sdb: 104 MB, 104857600 bytes
255 heads, 63 sectors/track, 12 cylinders, total 204800 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000

Disk /dev/sdb doesn't contain a valid partition table

Disk /dev/sdc: 104 MB, 104857600 bytes
255 heads, 63 sectors/track, 12 cylinders, total 204800 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000

Disk /dev/sdc doesn't contain a valid partition table

Disk /dev/mapper/cryptswap1: 1071 MB, 1071644672 bytes
255 heads, 63 sectors/track, 130 cylinders, total 2093056 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0xf451968d

Disk /dev/mapper/cryptswap1 doesn't contain a valid partition table
swapi@swapi:~$
```

Ahora ya podemos crear el RAID 1, usando el dispositivo /dev/md0, indicando el número de dispositivos a utilizar (2), así como su ubicación:

```
sudo mdadm -C /dev/md0 --level=raid1 --raid-devices=2 /dev/sdb /dev/sdc
```

```
swap1@swap1:~$ sudo mdadm -C /dev/md0 --level=raid1 --raid-devices=2 /dev/sdb /dev/sdc
mdadm: unrecognized option '--level=raid1'
Usage: mdadm --help
       for help
swap1@swap1:~$ sudo mdadm -C /dev/md0 --level=raid1 --raid-devices=2 /dev/sdb /dev/sdc
mdadm: Note: this array has metadata at the start and
       may not be suitable as a boot device.  If you plan to
       store '/boot' on this device please ensure that
       your boot-loader understands md/v1.x metadata, or use
       --metadata=0.90
Continue creating array? yes
mdadm: Defaulting to version 1.2 metadata
mdadm: array /dev/md0 started.
swap1@swap1:~$
```

En este punto, el dispositivo se habrá creado con el nombre /dev/md0, sin embargo, en cuanto reiniciemos la máquina, Linux lo renombrará y pasará a llamarlo /dev/md127.

Una vez creado el dispositivo RAID, y como aún no habremos reiniciado la máquina, usaremos /dev/md0 para darle formato:

```
sudo mkfs /dev/md0
```

```
mdadm: Note: this array has metadata at the start and
       may not be suitable as a boot device.  If you plan to
       store '/boot' on this device please ensure that
       your boot-loader understands md/v1.x metadata, or use
       --metadata=0.90
Continue creating array? yes
mdadm: Defaulting to version 1.2 metadata
mdadm: array /dev/md0 started.
swap1@swap1:~$ sudo mkfs /dev/md0
mke2fs 1.42 (29-Nov-2011)
Filesystem label=
OS type: Linux
Block size=1024 (log=0)
Fragment size=1024 (log=0)
Stride=0 blocks, Stripe width=0 blocks
25584 inodes, 102272 blocks
5113 blocks (5.00%) reserved for the super user
First data block=1
Maximum filesystem blocks=67371008
13 block groups
8192 blocks per group, 8192 fragments per group
1968 inodes per group
Superblock backups stored on blocks:
    8193, 24577, 40961, 57345, 73729

Allocating group tables: done
Writing inode tables: done
Writing superblocks and filesystem accounting information: done
```

Por defecto, mkfs inicializa un dispositivo de almacenamiento con formato ext2. Ahora ya podemos crear el directorio en el que se montará la unidad del RAID:

```
sudo mkdir /dat sudo mount /dev/md0 /dat
```

```

swap1@swap1:~$ sudo mkdir /dat
swap1@swap1:~$ sudo mount /dev/md0 /dat
swap1@swap1:~$ sudo mount
/dev/sda6 on / type ext4 (rw,errors=remount-ro)
proc on /proc type proc (rw,noexec,nosuid,nodev)
sysfs on /sys type sysfs (rw,noexec,nosuid,nodev)
none on /sys/fs/fuse/connections type fusectl (rw)
none on /sys/kernel/debug type debugfs (rw)
none on /sys/kernel/security type securityfs (rw)
udev on /dev type devtmpfs (rw,mode=0755)
devpts on /dev/pts type devpts (rw,noexec,nosuid,gid=5,mode=0620)
tmpfs on /run type tmpfs (rw,noexec,nosuid,size=10%,mode=0755)
none on /run/lock type tmpfs (rw,noexec,nosuid,nodev,size=5242880)
none on /run/shm type tmpfs (rw,nosuid,nodev)
/home/swap1/.Private on /home/swap1 type ecryptfs (ecryptfs_check_dev_ruid,ecryp
tfs_cipher=aes,ecryptfs_key_bytes=16,ecryptfs_unlink_sigs,ecryptfs_sig=0f7c400fb
798478e,ecryptfs_fnek_sig=29bbbd03b5c0fe1b)
/dev/md0 on /dat type ext2 (rw)
swap1@swap1:~$ _

```

Podemos comprobar que el proceso se ha realizado adecuadamente, y también los parámetros con los que Linux ha conseguido montarlo usando la orden:

```
sudo mount
```

Para comprobar el estado del RAID, ejecutaremos: `sudo mdadm --detail /dev/md0` Para finalizar el proceso, conviene configurar el sistema para que monte el dispositivo RAID creado al arrancar el sistema. Para ello debemos editar el archivo `/etc/fstab` y añadir la línea correspondiente para montar automáticamente dicho dispositivo. Conviene utilizar el identificador único de cada dispositivo de almacenamiento en lugar de simplemente el nombre del dispositivo (aunque ambas opciones son válidas). Para obtener los UUID de todos los dispositivos de almacenamiento que tenemos, debemos ejecutar la orden:

```
ls -l /dev/disk/by-uuid/
```

```

swap1@swap1:~$ ls -l /dev/disk/by-uuid
total 0
lrwxrwxrwx 1 root root 10 May 28 11:02 3db5aa25-956d-40cc-bca5-0d370f226134 -> .
./../dm-0
lrwxrwxrwx 1 root root 10 May 28 11:02 7fcda728-c0bb-408a-80c3-a68442afc953 -> .
./../sda1
lrwxrwxrwx 1 root root 10 May 28 11:02 bc46ccf9-6c71-44ac-98b9-000c42f2a7a8 -> .
./../sda6
lrwxrwxrwx 1 root root 9 May 28 11:13 f5e49871-815e-4155-9d89-97bef700f08f -> .
./../md0
swap1@swap1:~$ _

```

Anotaremos el correspondiente al dispositivo RAID que hemos creado. Ahora ya podemos añadir al final del archivo `/etc/fstab` la línea para que monte automáticamente el dispositivo RAID, que será similar a:

```
UUID=cbbbbbcc-dddd-eeee-ffff-aaabbbcccd /dat ext2 defaults 0 0
```

```
GNU nano 2.2.6 File: /etc/fstab

# /etc/fstab: static file system information.
#
# Use 'blkid' to print the universally unique identifier for a
# device; this may be used with UUID= as a more robust way to name devices
# that works even if disks are added and removed. See fstab(5).
#
# <file system> <mount point> <type> <options> <dump> <pass>
proc /proc proc nodev,noexec,nosuid 0 0
# / was on /dev/sda6 during installation
UUID=bc46ccf9-6c71-44ac-98b9-000c42f2a7a8 / ext4 errors=remoun$
# swap was on /dev/sda5 during installation
#UUID=38e93a8e-f3a3-4a55-9182-1cc8874df232 none swap sw 0 $
/dev/mapper/cryptswap1 none swap sw 0 0
UUID=f5e49871-815e-4155-9d89-97bef700f08f /dat ext2 defaults 0 0
```

Finalmente, una vez que esté funcionando el dispositivo RAID, podemos simular un fallo en uno de los discos:

`sudo mdadm --manage --set-faulty /dev/md0 /dev/sdb`

```
[ 614.390090] md/raid1:md127: Operation continuing on 1 devices.
mdadm: set /dev/sdb faulty in /dev/md127
swap1@swap1:~$ sudo mdadm --detail /dev/md127
/dev/md127:
    Version : 1.2
  Creation Time : Sun May 28 11:11:45 2017
    Raid Level : raid1
    Array Size : 102272 (99.89 MiB 104.73 MB)
  Used Dev Size : 102272 (99.89 MiB 104.73 MB)
    Raid Devices : 2
  Total Devices : 2
 Persistence : Superblock is persistent

 Update Time : Sun May 28 11:39:50 2017
    State : clean, degraded
Active Devices : 1
Working Devices : 1
Failed Devices : 1
Spare Devices : 0

    Name : swap1:0 (local to host swap1)
    UUID : e3cca73b:c63d64b4:889423d5:f9b0519c
    Events : 18

   Number   Major   Minor   RaidDevice State
     0         0         0         0    removed
     1         8        32         1    active sync /dev/sdc
     0         8        16         -    faulty spare /dev/sdb
swap1@swap1:~$
```

También podemos retirar “en caliente” el disco que está marcado como que ha fallado:

`sudo mdadm --manage --remove /dev/md0 /dev/sdb`

```
swap1@swap1:~$ sudo mdadm --manage --remove /dev/md127 /dev/sdb
mdadm: hot removed /dev/sdb from /dev/md127
swap1@swap1:~$ sudo mdadm --detail /dev/md127
/dev/md127:
    Version : 1.2
  Creation Time : Sun May 28 11:11:45 2017
    Raid Level : raid1
    Array Size : 102272 (99.89 MiB 104.73 MB)
  Used Dev Size : 102272 (99.89 MiB 104.73 MB)
    Raid Devices : 2
  Total Devices : 1
 Persistence : Superblock is persistent

 Update Time : Sun May 28 11:42:54 2017
   State : clean, degraded
 Active Devices : 1
Working Devices : 1
 Failed Devices : 0
  Spare Devices : 0


    Name : swap1:0 (local to host swap1)
   UUID : e3cca73b:c63d64b4:889423d5:f9b0519c
  Events : 21

   Number Major Minor RaidDevice State
    0         0      0        0     removed
    1         8     32        1     active sync  /dev/sdc
swap1@swap1:~$
```

Y por último, podemos añadir, también “en caliente”, un nuevo disco que vendría a reemplazar al disco que hemos retirado: `sudo mdadm --manage --add /dev/md0 /dev/sdb`

En todo momento podemos obtener información detallada del estado del RAID y de los discos que lo componen.

```
boot etc lib mnt root selinux tmp vmlinuz
dat home lost+found opt run srv usr
swap1@swap1:/$ sudo mdadm --manage --add /dev/md127 /dev/sdb
mdadm: added /dev/sdb
swap1@swap1:/$ sudo mdadm --detail /dev/md127
/dev/md127:
    Version : 1.2
  Creation Time : Sun May 28 11:11:45 2017
    Raid Level : raid1
    Array Size : 102272 (99.89 MiB 104.73 MB)
  Used Dev Size : 102272 (99.89 MiB 104.73 MB)
    Raid Devices : 2
  Total Devices : 2
 Persistence : Superblock is persistent

 Update Time : Sun May 28 11:45:43 2017
   State : clean
 Active Devices : 2
Working Devices : 2
 Failed Devices : 0
  Spare Devices : 0


    Name : swap1:0 (local to host swap1)
   UUID : e3cca73b:c63d64b4:889423d5:f9b0519c
  Events : 44

   Number Major Minor RaidDevice State
    2         8     16        0     active sync  /dev/sdb
    1         8     32        1     active sync  /dev/sdc
swap1@swap1:/$
```