

## **Pràctica 2: Implementació d'un sistema redundant en un CPD**

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## INDEX

<b>Introducció.....</b>	<b>3</b>
<b>1. Configuració del sistema.....</b>	<b>4</b>
1. Crea dues màquines virtuals:.....	4
2. Configurar RAID 1 al Servidor-Principal:.....	4
3. Configurar RAID 1 al Servidor-Principal:.....	5
○ Usa mdadm per unir els dos discos de dades.....	5
○ Munta el RAID a /mnt/dades/.....	6
4. Configura sincronització automàtica amb rsync:.....	7
○ Copia /mnt/dades/ del Servidor-Principal al Servidor-Backup cada 6 hores.....	7
<b>2. Seguretat i protecció de xarxa.....</b>	<b>11</b>
1. Firewall (iptables o ufw):.....	11
2. Protecció contra atacs:.....	12
<b>3. Monitorització bàsica i consulta SNMP.....</b>	<b>14</b>
3.1 Instal·lació i configuració de SNMP.....	14
3.2 Consulta d'informació del sistema.....	17
3.3 Validació de la monitorització.....	19
<b>4. Simulació de fallades i recuperació.....</b>	<b>20</b>

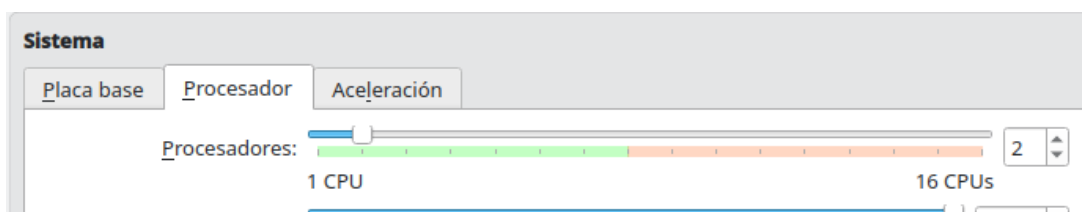
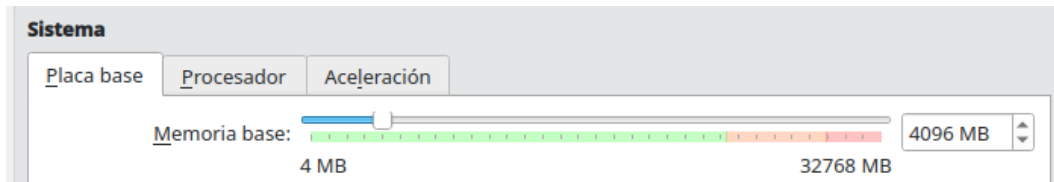
# Introducció

Dissenyar un sistema mínimament redundant dins d'un CPD virtualitzat, configurant servidors amb tolerància a fallades, seguretat de xarxa i mecanismes bàsics de monitorització.

# 1. Configuració del sistema

## 1. Crea dues màquines virtuals:

- **SO:** Ubuntu Server.
- **Servidor-Principal:** 2 CPU, 4 GB RAM, 2 discos (40 GB SO, 20 GB dades).

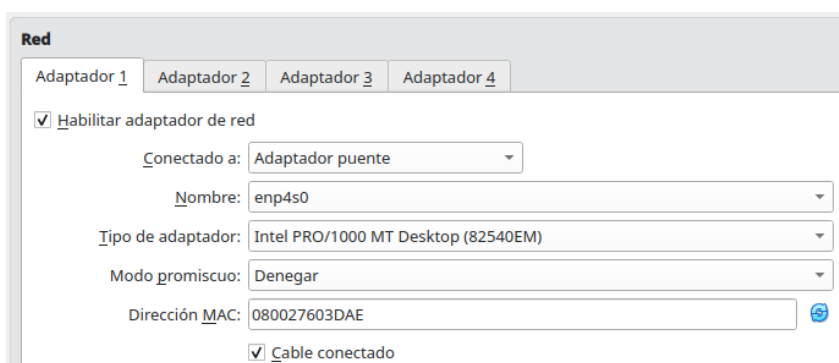


- **Servidor-Backup:** 1 CPU, 2 GB RAM, 2 discos (40 GB SO, 20 GB dades).



## 2. Configurar RAID 1 al Servidor-Principal:

- Xarxa en mode "Bridged".
- Si tens problemes amb mode Bridge: [Nat and host only connection](#)



### 3. Configurar RAID 1 al Servidor-Principal:

- Usa mdadm per unir els dos discos de dades.

PASOS: en el server principal

primer actualitza , per que no et doni errors amb incompatibilitats

```
rosi@ser-principal:~$ sudo apt-get upgrade
```

ubica el disc

```
rosi@ser-principal:~$ lsblk
NAME                                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda                                  8:0      0   25G  0 disk
├─sda1                              8:1      0    1M  0 part
├─sda2                              8:2      0    2G  0 part /boot
├─sda3                              8:3      0   23G  0 part
└─ubuntu--vg-ubuntu--lv 252:0    0  11,5G  0 lvm  /
sdb                                  8:16     0   40G  0 disk
sr0                                  11:0     1 1024M  0 rom
rosi@ser-principal:~$
```

primer has de crear amb mdadm el raid amb el disc del server-principal

*missing indica que falta el 2 disc*

```
rosi@ser-principal:~$ sudo mdadm --create --verbose /dev/md0 --level=1 --raid-devices=2 /dev/sdb missing
[sudo] password for rosi:
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
mdadm: size set to 41909248K
Continue creating array? yes
mdadm: Defaulting to version 1.2 metadata
mdadm: array /dev/md0 started.
```

```
rosi@ser-principal:~$ lsblk
NAME                                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda                                  8:0      0   25G  0 disk
├─sda1                              8:1      0    1M  0 part
├─sda2                              8:2      0    2G  0 part /boot
├─sda3                              8:3      0   23G  0 part
└─ubuntu--vg-ubuntu--lv 252:0    0  11,5G  0 lvm  /
sdb                                  8:16     0   40G  0 disk
└─md0                               9:0      0   40G  0 raid1
sr0                                  11:0     1 1024M  0 rom
```

Raid correcta

```
rosi@ser-principal:~$ cat /proc/mdstat
Personalities : [raid0] [raid1] [raid6] [raid5] [raid4] [raid10]
md0 : active raid1 sdb[0]
      41909248 blocks super 1.2 [2/1] [U_]

unused devices: <none>
rosi@ser-principal:~$
```

- Munta el RAID a /mnt/dades/.

primer formatea el RAID a ext4

```
rosi@ser-principal:~$ sudo mkfs.ext4 /dev/md0
mke2fs 1.47.0 (5-Feb-2023)
Creating filesystem with 10477312 4k blocks and 2621440 inodes
Filesystem UUID: 5ff078c8-886e-48f6-9b91-3e7e0aafe085
Superblock backups stored on blocks:
      32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
      4096000, 7962624

Allocating group tables: done
Writing inode tables: done
Creating journal (65536 blocks): done
Writing superblocks and filesystem accounting information: done
```

crea la carpeta pero muntar el raid

```
rosi@ser-principal:~$ sudo mkdir -p /mnt/dades
```

amb mount muntar el raid

```
rosi@ser-principal:~$ sudo mount /dev/md0 /mnt/dades/
rosi@ser-principal:~$
```

df -h per veure els dispositius muntats

```
rosi@ser-principal:~$ df -h
Filesystem                Size      Used Avail Use% Mounted on
tmpfs                      392M    1,1M   391M   1% /run
/dev/mapper/ubuntu--vg-ubuntu--lv 12G    5,2G    5,5G  49% /
tmpfs                      2,0G       0    2,0G   0% /dev/shm
tmpfs                      5,0M       0    5,0M   0% /run/lock
/dev/sda2                  2,0G    96M    1,7G   6% /boot
tmpfs                      392M    12K   392M   1% /run/user/1000
/dev/md0                   40G     24K    38G   1% /mnt/dades
```

#### 4. Configura sincronització automàtica amb **rsync**:

- Copia /mnt/dades/ del Servidor-Principal al Servidor-Backup cada 6 hores.

per que funcioni rsync verifica que les màquines esten bé actualitzades i és necessari tenir ssh instal·lat i configurat en les dues màquines

```
rsync error: unexplained error: read error at 10.0.0.1 (code 255) [sender=OVERFLOW]
rosi@ser-backup:~$ sudo apt install openssh-server
```

inicia el servidor

```
rosi@ser-backup:~$ sudo systemctl start ssh
rosi@ser-backup:~$ sudo systemctl enable ssh
Synchronizing state of ssh.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable ssh
Created symlink /etc/systemd/system/ssh.service → /usr/lib/systemd/system/ssh.service.
Created symlink /etc/systemd/system/multi-user.target.wants/ssh.service → /usr/lib/systemd/system/ssh.service.
```

verifica que el port este escoltant

```
rsync error: unexplained error: read error at 10.0.0.1 (code 255) [sender=OVERFLOW]
rosi@ser-backup:~$ sudo netstat -tuln | grep :22
tcp6      0      0 :::22          :::*            LISTEN
rosi@ser-backup:~$
```

ssh funcionant

```

rosi@ser-principal:~$ ssh rosi@192.168.56.113
The authenticity of host '192.168.56.113 (192.168.56.113)' can't be established.
ED25519 key fingerprint is SHA256:/Vag0JNFsXb68pPj/EEeoD4RJfLnI3sG/3Q2V6rvl6k.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.56.113' (ED25519) to the list of known hosts.
rosi@192.168.56.113's password:
Welcome to Ubuntu 24.04.2 LTS (GNU/Linux 6.8.0-52-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of mar 11 mar 2025 11:45:51 UTC

System load:            0.03
Usage of /:             54.9% of 11.21GB
Memory usage:          11%
Swap usage:             0%
Processes:             104
Users logged in:        1
IPv4 address for enp0s3: 10.0.2.15
IPv6 address for enp0s3: fd00::a00:27ff:fe8a:ffb9

 * Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
   just raised the bar for easy, resilient and secure K8s cluster deployment.

   https://ubuntu.com/engage/secure-kubernetes-at-the-edge

El mantenimiento de seguridad expandido para Applications está desactivado
Se pueden aplicar 0 actualizaciones de forma inmediata.

Active ESM Apps para recibir futuras actualizaciones de seguridad adicionales.
Vea https://ubuntu.com/esm o ejecute «sudo pro status»

*** Es necesario reiniciar el sistema ***
rosi@ser-backup:~$ exit
logout
Connection to 192.168.56.113 closed.
rosi@ser-principal:~$

```

**en les dues màquines donali password a root perquè dóna errors de permís denegat quan executes rsync**

```

rosi@ser-principal:~$ sudo passwd root
New password:
Retype new password:
passwd: password updated successfully
rosi@ser-principal:~$

```



Per que ssh accepti connexions amb root activa aquest paràmetre, ho has de fer perquè les carpetes tenen com propietari el root, doncs si fas el rsync amb altre usuari et sortirà error de permisos

**carpeta server principal**

```
rosi@ser-principal:~$ ls -ld /mnt/dades/  
drwxr-xr-x 3 root root 4096 mar 11 10:55 /mnt/dades/  
rosi@ser-principal:~$
```

**carpeta server backup**

```
rosi@ser-backup:~$ ls -ld /mnt/backup-dades/  
drwxr-xr-x 3 root root 4096 mar 11 10:55 /mnt/backup-dades/  
rosi@ser-backup:~$
```

**edita el fitxer /etc/ssh/sshd\_config**

```
# This is the sshd server system-wide configuration file. See  
# sshd_config(5) for more information.  
  
# This sshd was compiled with PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/  
  
# The strategy used for options in the default sshd_config shipped with  
# OpenSSH is to specify options with their default value where  
# possible, but leave them commented. Uncommented options override the  
# default value.  
  
Include /etc/ssh/sshd_config.d/*.conf  
  
#Port 22  
#AddressFamily any  
#ListenAddress 0.0.0.0  
#ListenAddress ::  
  
#HostKey /etc/ssh/ssh_host_rsa_key  
#HostKey /etc/ssh/ssh_host_ecdsa_key  
#HostKey /etc/ssh/ssh_host_ed25519_key  
  
# Ciphers and keying  
#RekeyLimit default none  
  
# Logging  
#SyslogFacility AUTH  
#LogLevel INFO  
  
# Authentication:  
#LoginGraceTime 2m  
PermitRootLogin yes  
#StrictModes yes  
#MaxAuthTries 6  
#MaxSessions 10  
  
#PubkeyAuthentication yes  
  
# Expect .ssh/authorized_keys2 to be disregarded by default in future.  
#AuthorizedKeysFile .ssh/authorized_keys .ssh/authorized_keys2  
  
#AuthorizedPrincipalsFile none  
  
#AuthorizedKeysCommand none  
#AuthorizedKeysCommandUser nobody
```

**primer crea la carpeta de desti en el server backup**

```
rosi@ser-backup:~$ sudo mkdir /mnt/backup-dades
```

en el server principal executa

**sudo rsync -avz /mnt/dades/ usuari\_root@ip\_backup:/ruta/destinació\_backup**

```
rosi@ser-principal:~$ sudo rsync -avz --delete /mnt/dades/ root@192.168.56.113:/mnt/backup-dades
root@192.168.56.113's password:
sending incremental file list
./
lost+found/

sent 93 bytes  received 23 bytes  33,14 bytes/sec
total size is 0  speedup is 0,00
rosi@ser-principal:~$
```

copiat en el backup

```
rosi@ser-backup:~$ ls -l /mnt/backup-dades/
total 4
drwx----- 2 root root 4096 mar 11 10:55 lost+found
```

edita el crontab -e porque sigui cada 6 hores

```
rosi@ser-principal:~$ crontab -e
```

```
rosi@ser-principal:~$ crontab -e
no crontab for rosi - using an empty one

Select an editor. To change later, run 'select-editor'.
 1. /bin/nano      <---- easiest
 2. /usr/bin/vim.basic
 3. /usr/bin/vim.tiny
 4. /bin/ed

Choose 1-4 [1]: 1
```

afegeix aquesta linia, min 0 hora 6 qualsevol dia mes i any

```
# Edit this file to introduce tasks to be run by cron.
#
# Each task to run has to be defined through a single line
# indicating with different fields when the task will be run
# and what command to run for the task
#
# To define the time you can provide concrete values for
# minute (m), hour (h), day of month (dom), month (mon),
# and day of week (dow) or use '*' in these fields (for 'any').
#
# Notice that tasks will be started based on the cron's system
# daemon's notion of time and timezones.
#
# Output of the crontab jobs (including errors) is sent through
# email to the user the crontab file belongs to (unless redirected).
#
# For example, you can run a backup of all your user accounts
# at 5 a.m every week with:
# 0 5 * * * 1 tar -zcf /var/backups/home.tgz /home/
#
# For more information see the manual pages of crontab(5) and cron(8)
#
# m h  dom mon dow   command
0 6 * * * rsync -avz /mnt/dades/ root@192.168.56.113:/mnt/backup-dades
```

## 2. Seguretat i protecció de xarxa

### 1. Firewall (**iptables** o **ufw**):

- Permet només trànsit intern entre servidors.

en els dos servers has d'afegir una rule per la xarxa

activa el ufw

```
rosi@ser-backup:~$ sudo ufw enable
```

```
rosi@ser-backup:~$ sudo ufw allow from 192.168.56.112
```

```
rosi@ser-principal:~$ sudo ufw allow from 192.168.56.113
Rule added
```

i reload

```
rosi@ser-backup:~$ sudo ufw reload
Firewall reloaded
rosi@ser-backup:~$
```

- Bloqueja tot excepte SSH des d'una IP autoritzada.

```
rosi@ser-principal:~$ sudo ufw allow from 192.168.56.113 to any port ssh
```

```
rosi@ser-backup:~$ sudo ufw allow from 192.168.56.112 to any port ssh
Rule added
rosi@ser-backup:~$
```

estat final

```
rosi@ser-backup:~$ sudo ufw status
Status: active

To Action From
--
22/tcp ALLOW 192.168.56.112
Anywhere ALLOW 192.168.56.112
rosi@ser-backup:~$
```

```
rosi@ser-principal:~$ sudo ufw status
Status: active

To Action From
--
22/tcp ALLOW 192.168.56.113
Anywhere ALLOW 192.168.56.113

rosi@ser-principal:~$
```

## 2. Protecció contra atacs:

- Instal·la **fail2ban** per bloquejar intents de força bruta a SSH.

en els dues servers

```
rosi@ser-backup:~$ sudo apt install fail2ban
```

copia el fitxer de config per que no perdis els canvis en un futur

```
rosi@ser-backup:~$ sudo cp /etc/fail2ban/jail.conf /etc/fail2ban/jail.backup
rosi@ser-backup:~$
```

edita el fitxer .backup

maxretry = intents que el el client pot intentar connectar-se

bandtime = Temps de bloqueig en segons (10 minuts)

findtime=Temps en què es comptabilitzen els intents fallits

```
[sshd]
# To use more aggressive sshd modes set filter parameter "mode" in jail.local:
# normal (default), ddos, extra or aggressive (combines all).
# See "tests/files/logs/sshd" or "filter.d/sshd.conf" for usage example and details.
#mode = normal
enabled = true
port = ssh
logpath = %(sshd_log)s
backend = %(sshd_backend)s
maxretry = 3
bantime = 600
findtime = 600
```

activa

```
rosi@ser-backup:~$ sudo systemctl start fail2ban
rosi@ser-backup:~$ sudo systemctl enable fail2ban
```

veure l'estat del jail sshd

`sudo fail2ban-client status sshd`

```
rosi@ser-backup:~$ sudo fail2ban-client status sshd
Status for the jail: sshd
|- Filter
|   |- Currently failed: 0
|   |- Total failed:    0
|   \- Journal matches: _SYSTEMD_UNIT=sshd.service + _COMM=sshd
- Actions
  |- Currently banned: 0
  |- Total banned:    0
  \- Banned IP list:
rosi@ser-backup:~$
```

- Simula un atac (intents fallits d'accés) i comprova el bloqueig.

connectat des de l'altre server fes un ssh i posa claus erroneas, fins que surti el missatge de permis denegat

```
rosi@ser-principal:~$ ssh rosi@192.168.56.113
rosi@192.168.56.113's password:
Permission denied, please try again.
rosi@192.168.56.113's password:
Permission denied, please try again.
rosi@192.168.56.113's password:
rosi@192.168.56.113: Permission denied (publickey,password).
rosi@ser-principal:~$
```

si tornas a fer un status sshd del jail en el server veures que ha sumat un failed i els intents

```
rosi@ser-backup:~$ sudo fail2ban-client status sshd
Status for the jail: sshd
|- Filter
|   |- Currently failed: 1
|   |- Total failed:    3
|   \- Journal matches: _SYSTEMD_UNIT=sshd.service + _COMM=sshd
- Actions
  |- Currently banned: 0
  |- Total banned:    0
  \- Banned IP list:
rosi@ser-backup:~$
```

### 3. Monitorització bàsica i consulta SNMP

Per garantir el monitoratge dels servidors dins del CPD, s'ha d'implementar un sistema bàsic de supervisió mitjançant el protocol **SNMP (Simple Network Management Protocol)**. Aquest sistema permet obtenir informació en temps real sobre l'estat del **Servidor-Principal**.

#### 3.1 Instal·lació i configuració de SNMP

1. Instal·la i configura el servei **SNMP (snmpd)** al **Servidor-Principal**.

```
rosi@ser-principal:~$ sudo apt install snmp snmpd -y
```

2. Configura una comunitat SNMP segura que permeti només consultes des de la xarxa interna.

```
rosi@ser-principal:~$ sudo nano /etc/snmp/snmpd.conf
```

```
agentaddress udp:161
rocommunity secretcommunity 192.168.56.0/24
sysLocation "ser-principal"
sysContact "rosi"
```

```
rosi@ser-principal:~$ sudo systemctl restart snmpd
rosi@ser-principal:~$ sudo systemctl enable snmpd
Synchronizing state of snmpd.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable snmpd
rosi@ser-principal:~$
```

firewall

```
rosi@ser-principal:~$ sudo ufw allow from 192.168.56.0/24 to any port 161 proto udp
```

3. Comprova que el servei està funcionant correctament.

amb `sudo systemctl status snmpd` en el principal

```
rosi@ser-principal:~$ sudo systemctl status snmpd
[sudo] password for rosi:
● snmpd.service - Simple Network Management Protocol (SNMP) Daemon.
   Loaded: loaded (/usr/lib/systemd/system/snmpd.service; enabled; preset: enabled)
   Active: active (running) since Wed 2025-03-12 18:51:29 UTC; 24min ago
     Main PID: 1657 (snmpd)
       Tasks: 1 (limit: 4612)
      Memory: 4.0M (peak: 7.9M)
         CPU: 3.529s
        CGroup: /system.slice/snmpd.service
                └─1657 /usr/sbin/snmpd -L0w -u Debian-snmp -g Debian-snmp -I -smux mteTrigger mteTriggerConf -f

mar 12 19:06:29 ser-principal snmpd[1657]: systemstats_linux: unexpected header length in /proc/net/snmp. 237 != 224
mar 12 19:07:29 ser-principal snmpd[1657]: systemstats_linux: unexpected header length in /proc/net/snmp. 237 != 224
mar 12 19:08:29 ser-principal snmpd[1657]: systemstats_linux: unexpected header length in /proc/net/snmp. 237 != 224
mar 12 19:09:29 ser-principal snmpd[1657]: systemstats_linux: unexpected header length in /proc/net/snmp. 237 != 224
mar 12 19:10:29 ser-principal snmpd[1657]: systemstats_linux: unexpected header length in /proc/net/snmp. 237 != 224
mar 12 19:11:29 ser-principal snmpd[1657]: systemstats_linux: unexpected header length in /proc/net/snmp. 237 != 224
mar 12 19:12:29 ser-principal snmpd[1657]: systemstats_linux: unexpected header length in /proc/net/snmp. 237 != 224
mar 12 19:13:29 ser-principal snmpd[1657]: systemstats_linux: unexpected header length in /proc/net/snmp. 237 != 224
mar 12 19:14:29 ser-principal snmpd[1657]: systemstats_linux: unexpected header length in /proc/net/snmp. 237 != 224
mar 12 19:15:29 ser-principal snmpd[1657]: systemstats_linux: unexpected header length in /proc/net/snmp. 237 != 224
rosi@ser-principal:~$
```

en el backup

```
rosi@ser-backup:~$ sudo apt install snmp
```

activa el firewall

```
rosi@ser-backup:~$ sudo ufw allow from 192.168.56.0/24 to any port 161 proto udp
```

al hora de comprovar dona errors per falta de mibs

descarregals

```
rosi@ser-backup:~$ sudo apt install snmp-mibs-downloader -y
```

```
rosi@ser-backup:~$ sudo download-mibs
```

edita el fitxer

```
rosi@ser-backup:~$ sudo nano /etc/snmp/snmp.conf
```

comenta el mibs per que accepti tots

```
# As the snmp packages come without MIB files due to license reasons, loading
# of MIBs is disabled by default. If you added the MIBs you can reenale
# loading them by commenting out the following line.
#mibs :

# If you want to globally change where snmp libraries, commands and daemons
# look for MIBS, change the line below. Note you can set this for individual
# tools with the -M option or MIBDIRS environment variable.
#
# mibdirs /usr/share/snmp/mibs:/usr/share/snmp/mibs/iana:/usr/share/snmp/mibs/ietf
```

per comprovar snmpwalk -v 2c -c secretcommunity 192.168.56.112 system

```
rosi@ser-backup:~$ snmpwalk -v 2c -c secretcommunity 192.168.56.112 system
SNMPv2-MIB::sysDescr.0 = STRING: Linux ser-principal 6.8.0-52-generic #53-Ubuntu SMP PREEMPT_DYNAMIC Sat Jan 11 00:06:25
SNMPv2-MIB::sysObjectID.0 = OID: NET-SNMP-MIB::netSnmpAgent0IDs.10
DISMAN-EVENT-MIB::sysUpTimeInstance = Timeticks: (107801) 0:17:58.01
SNMPv2-MIB::sysContact.0 = STRING: "rosi"
SNMPv2-MIB::sysName.0 = STRING: ser-principal
SNMPv2-MIB::sysLocation.0 = STRING: "ser-principal"
SNMPv2-MIB::sysServices.0 = INTEGER: 72
SNMPv2-MIB::sysORLastChange.0 = Timeticks: (0) 0:00:00.00
SNMPv2-MIB::sysORID.1 = OID: SNMP-FRAMEWORK-MIB::snmpFrameworkMIBCompliance
SNMPv2-MIB::sysORID.2 = OID: SNMP-MPD-MIB::snmpMPDCompliance
SNMPv2-MIB::sysORID.3 = OID: SNMP-USER-BASED-SM-MIB::usmMIBCompliance
SNMPv2-MIB::sysORID.4 = OID: SNMPv2-MIB::snmpMIB
SNMPv2-MIB::sysORID.5 = OID: SNMP-VIEW-BASED-ACM-MIB::vacmBasicGroup
SNMPv2-MIB::sysORID.6 = OID: TCP-MIB::tcpMIB
SNMPv2-MIB::sysORID.7 = OID: UDP-MIB::udpMIB
SNMPv2-MIB::sysORID.8 = OID: IP-MIB::ip
SNMPv2-MIB::sysORID.9 = OID: SNMP-NOTIFICATION-MIB::snmpNotifuFullCompliance
SNMPv2-MIB::sysORID.10 = OID: NOTIFICATION-LOG-MIB::notificationLogMIB
SNMPv2-MIB::sysORDescr.1 = STRING: The SNMP Management Architecture MIB.
SNMPv2-MIB::sysORDescr.2 = STRING: The MIB for Message Processing and Dispatching.
SNMPv2-MIB::sysORDescr.3 = STRING: The management information definitions for the SNMP User-based Security Model.
SNMPv2-MIB::sysORDescr.4 = STRING: The MIB module for SNMPv2 entities
SNMPv2-MIB::sysORDescr.5 = STRING: View-based Access Control Model for SNMP.
SNMPv2-MIB::sysORDescr.6 = STRING: The MIB module for managing TCP implementations
SNMPv2-MIB::sysORDescr.7 = STRING: The MIB module for managing UDP implementations
SNMPv2-MIB::sysORDescr.8 = STRING: The MIB module for managing IP and ICMP implementations
SNMPv2-MIB::sysORDescr.9 = STRING: The MIB modules for managing SNMP Notification, plus filtering.
SNMPv2-MIB::sysORDescr.10 = STRING: The MIB module for logging SNMP Notifications.
SNMPv2-MIB::sysORUpTime.1 = Timeticks: (0) 0:00:00.00
SNMPv2-MIB::sysORUpTime.2 = Timeticks: (0) 0:00:00.00
SNMPv2-MIB::sysORUpTime.3 = Timeticks: (0) 0:00:00.00
SNMPv2-MIB::sysORUpTime.4 = Timeticks: (0) 0:00:00.00
SNMPv2-MIB::sysORUpTime.5 = Timeticks: (0) 0:00:00.00
SNMPv2-MIB::sysORUpTime.6 = Timeticks: (0) 0:00:00.00
SNMPv2-MIB::sysORUpTime.7 = Timeticks: (0) 0:00:00.00
SNMPv2-MIB::sysORUpTime.8 = Timeticks: (0) 0:00:00.00
SNMPv2-MIB::sysORUpTime.9 = Timeticks: (0) 0:00:00.00
SNMPv2-MIB::sysORUpTime.10 = Timeticks: (0) 0:00:00.00
rosi@ser-backup:~$
```



## 3.2 Consulta d'informació del sistema

Des del **Servidor-Backup**, fes una consulta SNMP per obtenir informació del **Servidor-Principal**. La consulta ha de recuperar almenys:

- L'ús actual de CPU.

```
rosi@ser-backup:~$ snmpwalk -v 2c -c secretcommunity 192.168.56.112 1.3.6.1.4.1.2021.11
UCD-SNMP-MIB::ssIndex.0 = INTEGER: 1
UCD-SNMP-MIB::ssErrorName.0 = STRING: systemStats
UCD-SNMP-MIB::ssSwapIn.0 = INTEGER: 0 kB
UCD-SNMP-MIB::ssSwapOut.0 = INTEGER: 0 kB
UCD-SNMP-MIB::ssIOSent.0 = INTEGER: 2 blocks/s
UCD-SNMP-MIB::ssIOReceive.0 = INTEGER: 0 blocks/s
UCD-SNMP-MIB::ssSysInterrupts.0 = INTEGER: 951 interrupts/s
UCD-SNMP-MIB::ssSysContext.0 = INTEGER: 65 switches/s
UCD-SNMP-MIB::ssCpuUser.0 = INTEGER: 0
UCD-SNMP-MIB::ssCpuSystem.0 = INTEGER: 0
UCD-SNMP-MIB::ssCpuIdle.0 = INTEGER: 99
UCD-SNMP-MIB::ssCpuRawUser.0 = Counter32: 1276
UCD-SNMP-MIB::ssCpuRawNice.0 = Counter32: 139
UCD-SNMP-MIB::ssCpuRawSystem.0 = Counter32: 3216
UCD-SNMP-MIB::ssCpuRawIdle.0 = Counter32: 571387
UCD-SNMP-MIB::ssCpuRawWait.0 = Counter32: 27952
UCD-SNMP-MIB::ssCpuRawKernel.0 = Counter32: 0
UCD-SNMP-MIB::ssCpuRawInterrupt.0 = Counter32: 0
UCD-SNMP-MIB::ssIORawSent.0 = Counter32: 1904792
UCD-SNMP-MIB::ssIORawReceived.0 = Counter32: 935436
UCD-SNMP-MIB::ssRawInterrupts.0 = Counter32: 3794833
UCD-SNMP-MIB::ssRawContexts.0 = Counter32: 1108549
UCD-SNMP-MIB::ssCpuRawSoftIRQ.0 = Counter32: 185
UCD-SNMP-MIB::ssRawSwapIn.0 = Counter32: 0
UCD-SNMP-MIB::ssRawSwapOut.0 = Counter32: 0
UCD-SNMP-MIB::ssCpuRawSteal.0 = Counter32: 0
UCD-SNMP-MIB::ssCpuRawGuest.0 = Counter32: 0
UCD-SNMP-MIB::ssCpuRawGuestNice.0 = Counter32: 0
UCD-SNMP-MIB::ssCpuNumCpus.0 = INTEGER: 2
rosi@ser-backup:~$
```

- La memòria RAM disponible.

```
rosi@ser-backup:~$ snmpwalk -v 2c -c secretcommunity 192.168.56.112 1.3.6.1.4.1.2021.4
UCD-SNMP-MIB::memIndex.0 = INTEGER: 0
UCD-SNMP-MIB::memErrorName.0 = STRING: swap
UCD-SNMP-MIB::memTotalSwap.0 = INTEGER: 2391036 kB
UCD-SNMP-MIB::memAvailSwap.0 = INTEGER: 2391036 kB
UCD-SNMP-MIB::memTotalReal.0 = INTEGER: 4010076 kB
UCD-SNMP-MIB::memAvailReal.0 = INTEGER: 2834396 kB
UCD-SNMP-MIB::memTotalFree.0 = INTEGER: 5225432 kB
UCD-SNMP-MIB::memMinimumSwap.0 = INTEGER: 16000 kB
UCD-SNMP-MIB::memShared.0 = INTEGER: 1140 kB
UCD-SNMP-MIB::memBuffer.0 = INTEGER: 61280 kB
UCD-SNMP-MIB::memCached.0 = INTEGER: 907664 kB
UCD-SNMP-MIB::memTotalSwapX.0 = Counter64: 2391036 kB
UCD-SNMP-MIB::memAvailSwapX.0 = Counter64: 2391036 kB
UCD-SNMP-MIB::memTotalRealX.0 = Counter64: 4010076 kB
UCD-SNMP-MIB::memAvailRealX.0 = Counter64: 2834396 kB
UCD-SNMP-MIB::memTotalFreeX.0 = Counter64: 5225432 kB
UCD-SNMP-MIB::memMinimumSwapX.0 = Counter64: 16000 kB
UCD-SNMP-MIB::memSharedX.0 = Counter64: 1140 kB
UCD-SNMP-MIB::memBufferX.0 = Counter64: 61280 kB
UCD-SNMP-MIB::memCachedX.0 = Counter64: 907664 kB
UCD-SNMP-MIB::memSysAvail.0 = Counter64: 3532876 kB
UCD-SNMP-MIB::memSwapError.0 = INTEGER: noError(0)
UCD-SNMP-MIB::memSwapErrorMsg.0 = STRING:
rosi@ser-backup:~$
```

- L'espai lliure al sistema de fitxers.

```
rosi@ser-backup:~$ snmpwalk -v 2c -c secretcommunity 192.168.56.112 1.3.6.1.2.1.25.2.3
```

```

HOST-RESOURCES-MIB::hrStorageDescr.7 = STRING: Cached memory
HOST-RESOURCES-MIB::hrStorageDescr.8 = STRING: Shared memory
HOST-RESOURCES-MIB::hrStorageDescr.10 = STRING: Swap space
HOST-RESOURCES-MIB::hrStorageDescr.11 = STRING: Available memory
HOST-RESOURCES-MIB::hrStorageDescr.35 = STRING: /run
HOST-RESOURCES-MIB::hrStorageDescr.36 = STRING: /
HOST-RESOURCES-MIB::hrStorageDescr.38 = STRING: /dev/shm
HOST-RESOURCES-MIB::hrStorageDescr.39 = STRING: /run/lock
HOST-RESOURCES-MIB::hrStorageDescr.50 = STRING: /boot
HOST-RESOURCES-MIB::hrStorageDescr.51 = STRING: /run/user/1000
HOST-RESOURCES-MIB::hrStorageAllocationUnits.1 = INTEGER: 1024 Bytes
HOST-RESOURCES-MIB::hrStorageAllocationUnits.3 = INTEGER: 1024 Bytes
HOST-RESOURCES-MIB::hrStorageAllocationUnits.6 = INTEGER: 1024 Bytes
HOST-RESOURCES-MIB::hrStorageAllocationUnits.7 = INTEGER: 1024 Bytes
HOST-RESOURCES-MIB::hrStorageAllocationUnits.8 = INTEGER: 1024 Bytes
HOST-RESOURCES-MIB::hrStorageAllocationUnits.10 = INTEGER: 1024 Bytes
HOST-RESOURCES-MIB::hrStorageAllocationUnits.11 = INTEGER: 1024 Bytes
HOST-RESOURCES-MIB::hrStorageAllocationUnits.35 = INTEGER: 4096 Bytes
HOST-RESOURCES-MIB::hrStorageAllocationUnits.36 = INTEGER: 4096 Bytes
HOST-RESOURCES-MIB::hrStorageAllocationUnits.38 = INTEGER: 4096 Bytes
HOST-RESOURCES-MIB::hrStorageAllocationUnits.39 = INTEGER: 4096 Bytes
HOST-RESOURCES-MIB::hrStorageAllocationUnits.50 = INTEGER: 4096 Bytes
HOST-RESOURCES-MIB::hrStorageAllocationUnits.51 = INTEGER: 4096 Bytes
HOST-RESOURCES-MIB::hrStorageSize.1 = INTEGER: 4010076
HOST-RESOURCES-MIB::hrStorageSize.3 = INTEGER: 6401112
HOST-RESOURCES-MIB::hrStorageSize.6 = INTEGER: 4010076
HOST-RESOURCES-MIB::hrStorageSize.7 = INTEGER: 907664
HOST-RESOURCES-MIB::hrStorageSize.8 = INTEGER: 1140
HOST-RESOURCES-MIB::hrStorageSize.10 = INTEGER: 2391036
HOST-RESOURCES-MIB::hrStorageSize.11 = INTEGER: 3531856
HOST-RESOURCES-MIB::hrStorageSize.35 = INTEGER: 100252
HOST-RESOURCES-MIB::hrStorageSize.36 = INTEGER: 2939690
HOST-RESOURCES-MIB::hrStorageSize.38 = INTEGER: 501259
HOST-RESOURCES-MIB::hrStorageSize.39 = INTEGER: 1280
HOST-RESOURCES-MIB::hrStorageSize.50 = INTEGER: 498138
HOST-RESOURCES-MIB::hrStorageSize.51 = INTEGER: 100251
HOST-RESOURCES-MIB::hrStorageUsed.1 = INTEGER: 1176876
HOST-RESOURCES-MIB::hrStorageUsed.3 = INTEGER: 1176876
HOST-RESOURCES-MIB::hrStorageUsed.6 = INTEGER: 61448
HOST-RESOURCES-MIB::hrStorageUsed.7 = INTEGER: 907664
HOST-RESOURCES-MIB::hrStorageUsed.8 = INTEGER: 1140
HOST-RESOURCES-MIB::hrStorageUsed.10 = INTEGER: 0
HOST-RESOURCES-MIB::hrStorageUsed.11 = INTEGER: 0
HOST-RESOURCES-MIB::hrStorageUsed.35 = INTEGER: 283
HOST-RESOURCES-MIB::hrStorageUsed.36 = INTEGER: 1419437
HOST-RESOURCES-MIB::hrStorageUsed.38 = INTEGER: 0
HOST-RESOURCES-MIB::hrStorageUsed.39 = INTEGER: 0
HOST-RESOURCES-MIB::hrStorageUsed.50 = INTEGER: 47288
HOST-RESOURCES-MIB::hrStorageUsed.51 = INTEGER: 2

```

## 3.3 Validació de la monitorització

1. Compara la informació obtinguda via SNMP amb els valors que es poden veure localment al **Servidor-Principal** amb comandes com **htop** o **df -h**.

**df -h** veure l'espai dels dispositius

```
rosi@ser-principal:~$ df -h
Filesystem                Size      Used Avail Use% Mounted on
tmpfs                     392M        1,2M   391M    1% /run
/dev/mapper/ubuntu--vg-ubuntu--lv 12G        5,5G    5,3G   51% /
tmpfs                     2,0G        0        2,0G    0% /dev/shm
tmpfs                     5,0M        0        5,0M    0% /run/lock
/dev/sda2                 2,0G      185M    1,7G   11% /boot
tmpfs                     392M        8,0K    392M    1% /run/user/1000
rosi@ser-principal:~$
```

**htop** per el cpu

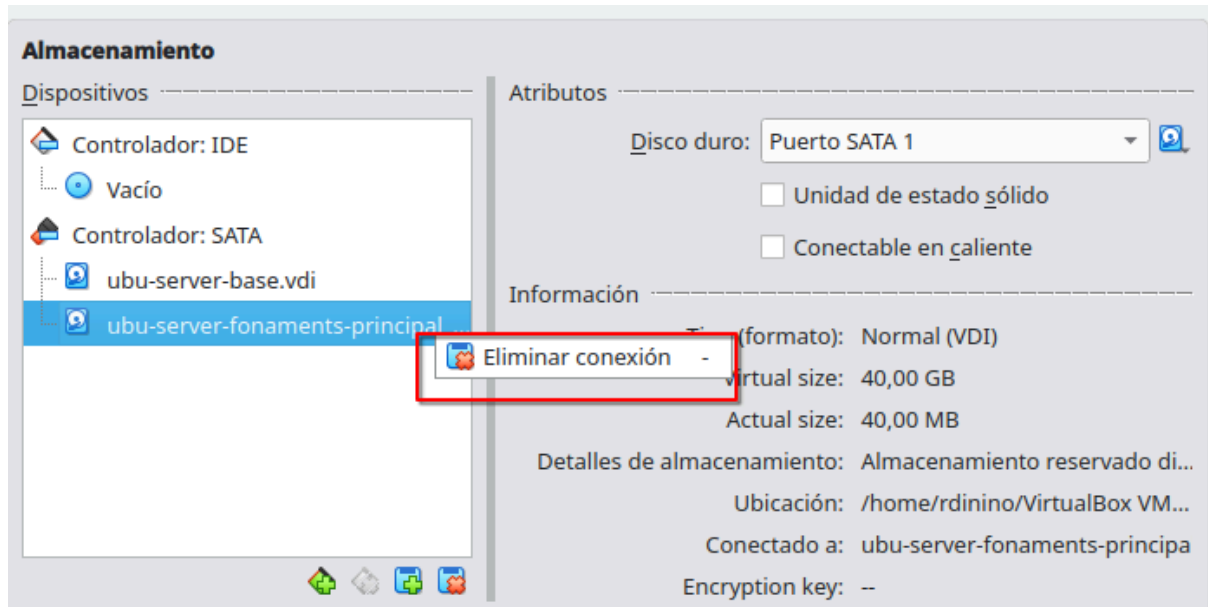
```
0% Tasks: 26, 34 thr, 91 kthr: 1 running
1% Load average: 0.00 0.00 0.00
Mem[|||||] 202M/3.82G Uptime: 01:04:16
Sup[|||||] 0K/2.28G

Main I/O
PID USER      PRI NI  VIRT  RES  SHR S  CPU% MEM%  TIME+ Command
7521 rosi      20  0  8684 4992 3712 R   1.3  0.1  0:00.13 htop
1 root      20  0  22564 13672 9448 S   0.0  0.3  0:01.43 /sbin/init
335 root     19 -1  66836 17580 16428 S   0.0  0.4  0:00.21 /usr/lib/systemd/systemd-journald
384 root     RT  0  282M 27136 8576 S   0.0  0.7  0:00.18 /sbin/multipathd -d -s
402 root     20  0  29120 7876 5060 S   0.0  0.2  0:00.10 /usr/lib/systemd/systemd-udev
403 root     20  0  282M 27136 8576 S   0.0  0.7  0:00.00 /sbin/multipathd -d -s
405 root     RT  0  282M 27136 8576 S   0.0  0.7  0:00.00 /sbin/multipathd -d -s
406 root     RT  0  282M 27136 8576 S   0.0  0.7  0:00.00 /sbin/multipathd -d -s
407 root     RT  0  282M 27136 8576 S   0.0  0.7  0:00.00 /sbin/multipathd -d -s
408 root     RT  0  282M 27136 8576 S   0.0  0.7  0:00.39 /sbin/multipathd -d -s
409 root     RT  0  282M 27136 8576 S   0.0  0.7  0:00.00 /sbin/multipathd -d -s
536 root     20  0  3736 2688 2432 S   0.0  0.1  0:00.04 /sbin/mdadm --monitor --scan
627 systemd-ne 20  0  21584 12800 10624 S   0.0  0.3  0:00.07 /usr/lib/systemd/systemd-resolved
634 systemd-tl 20  0  51020 7800 6912 S   0.0  0.2  0:00.03 /usr/lib/systemd/systemd-timesyncd
674 systemd-tl 20  0  91020 7800 6912 S   0.0  0.2  0:00.00 /usr/lib/systemd/systemd-timesyncd
732 systemd-ne 20  0  19004 9472 8320 S   0.0  0.2  0:00.05 /usr/lib/systemd/systemd-networkd
784 messagebus 20  0  9780 5376 4480 S   0.0  0.1  0:00.12 @dbus-daemon --system --address=systemd: --nofork --nopidfile --systemd-activation --syslog-o
788 root     20  0  457M 34760 16144 S   0.0  0.9  0:00.34 /usr/bin/python3 /usr/bin/fail2ban-server -xf start
796 polkitd   20  0  374M 9604 7296 S   0.0  0.2  0:00.02 /usr/lib/polkit-1/polkitd --no-debug
802 root     20  0  18128 8832 7808 S   0.0  0.2  0:00.06 /usr/lib/systemd/systemd-logind
803 root     20  0  458M 13696 11392 S   0.0  0.3  0:00.02 /usr/libexec/udisks2/udisksd
818 syslog    20  0  217M 5888 4480 S   0.0  0.1  0:00.01 /usr/sbin/rsyslogd -n -iNONE
831 root     20  0  107M 22784 13440 S   0.0  0.6  0:00.05 /usr/bin/python3 /usr/share/unattended-upgrades/unattended-upgrade-shutdown --wait-for-signal
853 polkitd   20  0  374M 9604 7296 S   0.0  0.2  0:00.11 /usr/lib/polkit-1/polkitd --no-debug
858 root     20  0  458M 13696 11392 S   0.0  0.3  0:00.06 /usr/libexec/udisks2/udisksd
868 polkitd   20  0  374M 9604 7296 S   0.0  0.2  0:00.00 /usr/lib/polkit-1/polkitd --no-debug
870 root     20  0  458M 13696 11392 S   0.0  0.3  0:00.00 /usr/libexec/udisks2/udisksd
877 polkitd   20  0  374M 9604 7296 S   0.0  0.2  0:00.00 /usr/lib/polkit-1/polkitd --no-debug
878 root     20  0  458M 13696 11392 S   0.0  0.3  0:00.00 /usr/libexec/udisks2/udisksd
887 root     20  0  310M 12800 10880 S   0.0  0.3  0:00.04 /usr/sbin/ModemManager
888 syslog    20  0  217M 5888 4480 S   0.0  0.1  0:00.00 /usr/sbin/rsyslogd -n -iNONE
889 syslog    20  0  217M 5888 4480 S   0.0  0.1  0:00.00 /usr/sbin/rsyslogd -n -iNONE
890 syslog    20  0  217M 5888 4480 S   0.0  0.1  0:00.00 /usr/sbin/rsyslogd -n -iNONE
908 root     20  0  310M 12800 10880 S   0.0  0.3  0:00.00 /usr/sbin/ModemManager
909 root     20  0  310M 12800 10880 S   0.0  0.3  0:00.00 /usr/sbin/ModemManager
911 root     20  0  310M 12800 10880 S   0.0  0.3  0:00.00 /usr/sbin/ModemManager
912 root     20  0  458M 13696 11392 S   0.0  0.3  0:00.00 /usr/libexec/udisks2/udisksd
913 root     20  0  458M 13696 11392 S   0.0  0.3  0:00.00 /usr/libexec/udisks2/udisksd
916 root     20  0  107M 22784 13440 S   0.0  0.6  0:00.00 /usr/bin/python3 /usr/share/unattended-upgrades/unattended-upgrade-shutdown --wait-for-signal
917 root     20  0  457M 34760 16144 S   0.0  0.9  0:00.00 /usr/bin/python3 /usr/bin/fail2ban-server -xf start
923 root     20  0  457M 34760 16144 S   0.0  0.9  0:03.07 /usr/bin/python3 /usr/bin/fail2ban-server -xf start
F1 Help F2 Setup F3 Search F4 Filter F5 Free F6 Sort by F7 Nice F8 Nice + F9 Kill F10 Quit
```

## 4. Simulació de fallades i recuperació

- Reemplaça el disc i reconstrueix el RAID.

elimina el disc i fica un nou



2. Apaga el **Servidor-Principal** i verifica l'accés a les dades des del **Servidor-Backup**.

entra al backup i fes ls de la carpeta

```
rosi@ser-backup:~$ ls -l /mnt/backup-dades/  
total 4  
drwx----- 2 root root 4096 mar 11 10:55 lost+found  
rosi@ser-backup:~$
```

**Comprova la degradació amb:**

cat /proc/mdstat

no existeix

```
rosi@ser-principal:~$ cat /proc/mdstat  
Personalities : [raid0] [raid1] [raid6] [raid5] [raid4] [raid10]  
unused devices: <none>  
rosi@ser-principal:~$
```