

# RAID y Más...

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Sistemas Operativos

# Introducción

## RAID

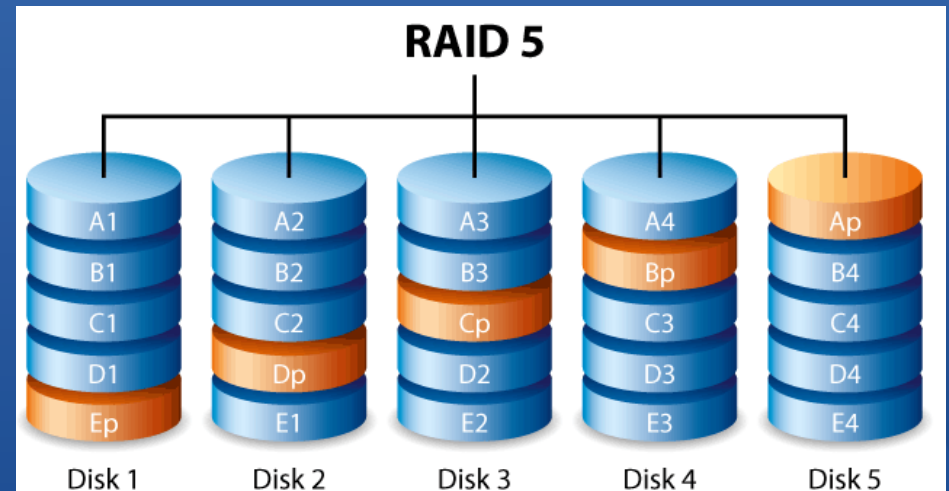
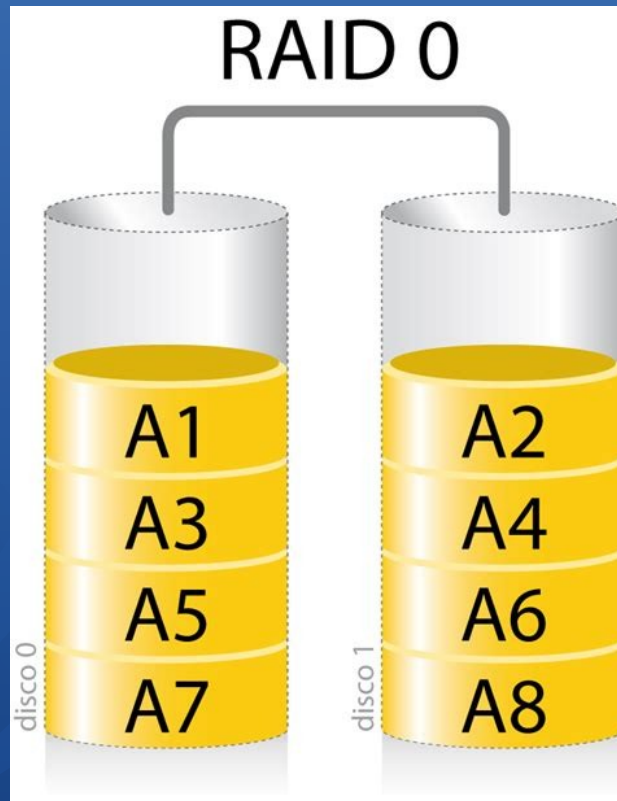
- Arreglo Redundante de Discos Independientes.
- Asegura que siempre habrá una copia de los datos disponible para recuperar en caso de algún fallo.

## RAID 5

- Permite una utilización del 80% del almacenamiento disponible.
- Calculo de paridad.
- Se puede recuperar la información en caso de un daño en tiempo real sin la necesidad de parar el servidor.

# RAID

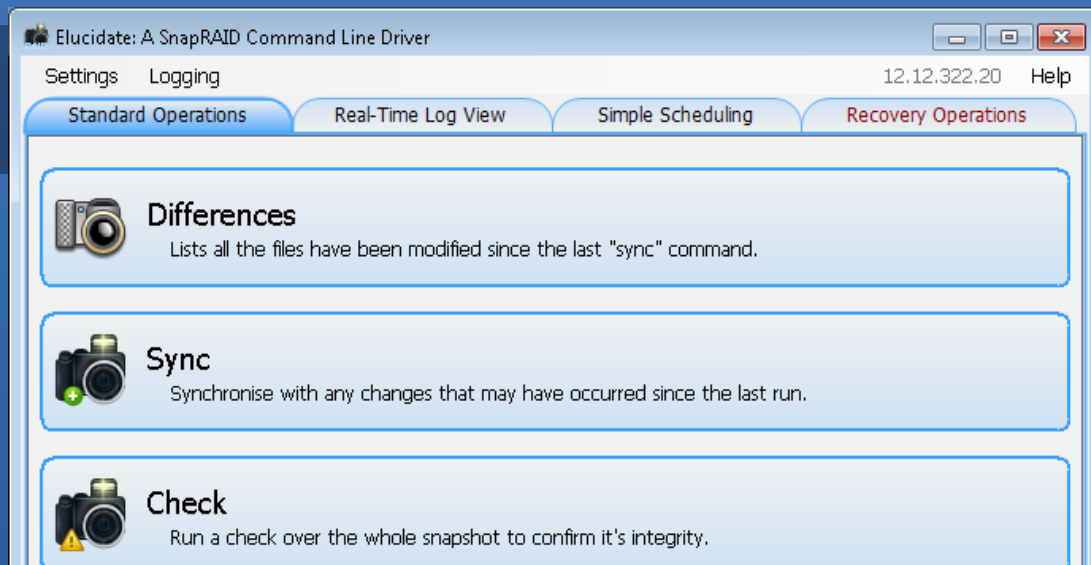
# RAID 5



# SnapRAID

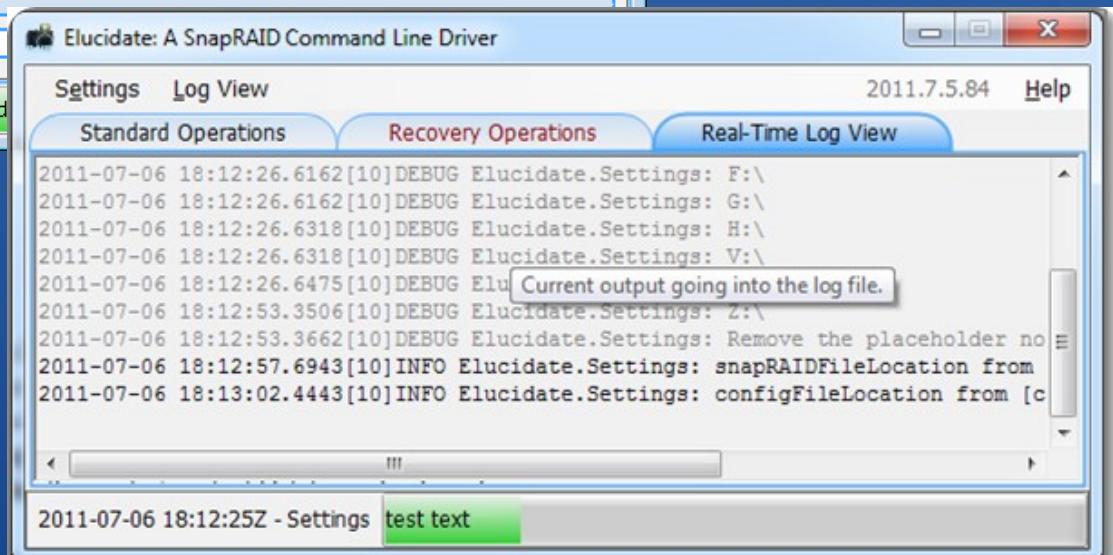
## Solución por software

- No recomendable si se requiere fiabilidad en tiempo real.
- Realiza copias de seguridad por intervalos de tiempo.
- A diferencia de una copia de seguridad tradicional no requiere el doble del almacenamiento.
- Calculo de paridad.
- Se requiere de un disco extra para almacenar el calculo de paridad.
- Permite regresar a un estado anterior.



Administrator: C:\Windows\system32\cmd.exe - snapraid.exe sync

```
C:\Users\Administrator>cd \SnapRAID
C:\SnapRAID>snapraid.exe sync
Self test...
Loading state from E:/SnapRAID.content...
Scanning disk d0...
Scanning disk d1...
Scanning disk d2...
Using 471 MiB of memory.
Initializing...
Syncing...
6%, 170543 MiB, 257 MiB/s, 2:31 ETA
Autosaving...
Saving state to E:/SnapRAID.content...
Saving state to F:/SnapRAID.content...
Saving state to G:/SnapRAID.content...
Saving state to H:/SnapRAID/SnapRAID.content...
13%, 341246 MiB, 256 MiB/s, 2:21 ETA
Autosaving...
Saving state to E:/SnapRAID.content...
Saving state to F:/SnapRAID.content...
Saving state to G:/SnapRAID.content...
Saving state to H:/SnapRAID/SnapRAID.content...
14%, 365326 MiB, 257 MiB/s, 2:19 ETA
```



Common SnapRaid Logs Coverage Schedule Recover Files

**Differences**

Lists all the files have been modified since the last "sync" command.

**Scrub**

Scrubs the array, checking for silent and input/output errors

**Status**

A summary of the state of the disk array, upto the last sync time.

**Sync**

Synchronise with any changes that may have occurred since the last run.

**Check**

Check the snapshot to confirm it's integrity. (use -a for hash only)

**Fix**

Will default to using "-e", fix errors set by the scrub command.

**Duplicate Finder**

Lists all the duplicate files. Two files are assumed equal if their hashes are matc...

**Force Full Sync**

Force a full synchronization of all content.

☐ Include Additional Command Line Options: -v2018-11-09 17:31:01Z Stopped ☒ Display Output

# NAS

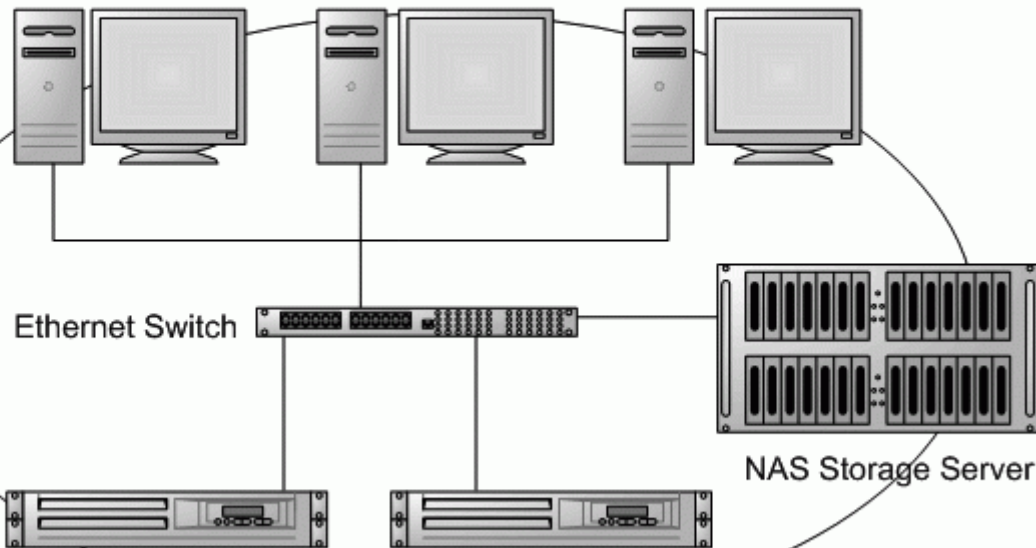
Network Attached Storage (Almacenamiento conectado a la red)

- Dispositivo de almacenamiento con varios discos conectado a la red.
- Ideales para uso domestico, pequeñas y medianas empresas.
- Copias de seguridad disponibles desde cualquier punto con acceso a la red.
- Instalación sencilla.
- Los disco que contiene pueden estar en un arreglo RAID.

# Network Attached Storage

Clients

LAN





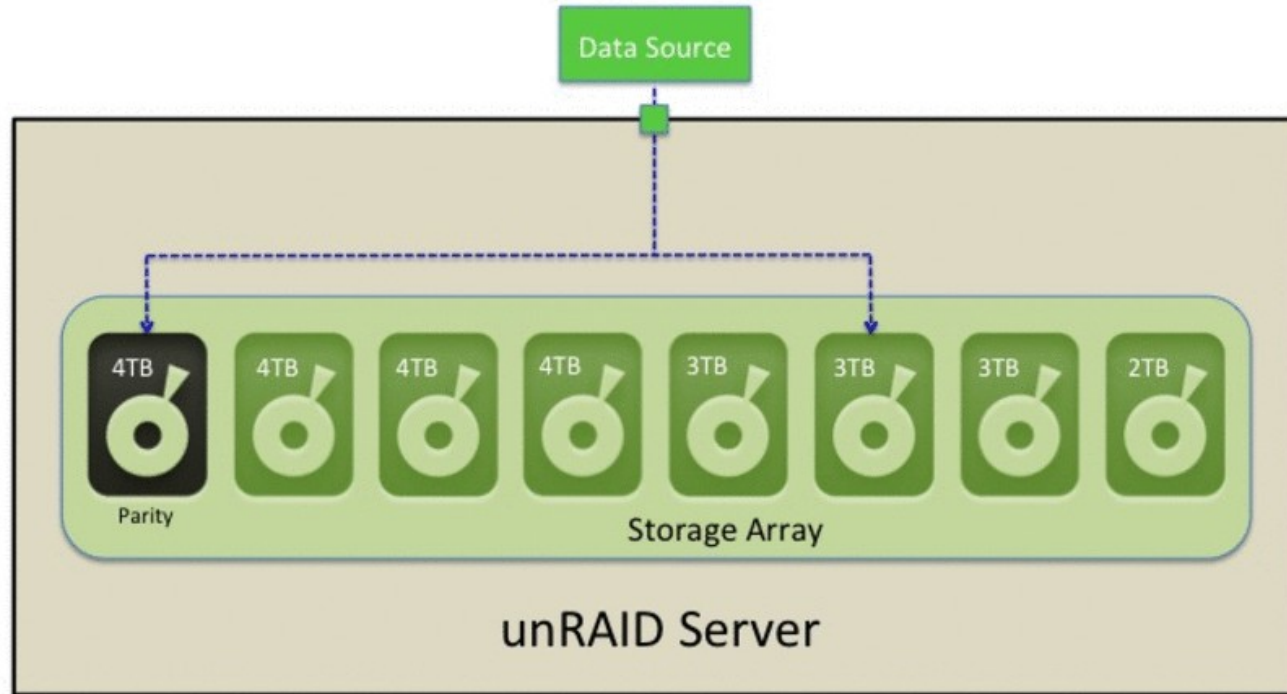


# unRAID

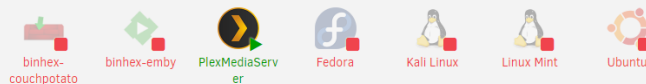
Sistema Operativo embebido diseñado para obtener el máximo control sobre el hardware.

- Puede correr y ser configurado desde una USB Flash.
- Administración a través de una interfaz web muy intuitiva.
- Puede convertir prácticamente cualquier arquitectura de 64bits en una NAS.
- Manejo de arreglo de disco de diferentes características.
- NAS a través de arreglo de paridad.

### Data Capture in unRAID Array with Parity



## Apps

All Apps ☐

## Statistics

| Array Status | Parity         | Disk 1         | Disk 2         | Cache          | Cache 2        |
|--------------|----------------|----------------|----------------|----------------|----------------|
| Encrypted    |                |                |                |                |                |
| Active       | <span>●</span> | <span>●</span> | <span>●</span> | <span>●</span> | <span>●</span> |
| Inactive     |                |                |                |                |                |
| Unassigned   |                |                |                |                |                |
| Faulty       |                |                |                |                |                |
| Heat alarm   | 37 C           | 37 C           | 39 C           |                |                |
| SMART status | <span>■</span> | <span>■</span> | <span>■</span> | <span>■</span> | <span>■</span> |
| Utilization  | -              | 47%            | 8%             | 64%            | -              |

## Parity Status

Parity is valid

Last checked on **Mon 24 Sep 2018 01:17:03 PM MDT (three days ago)**, finding **0** errors.  
⌚ Duration: 15 hours, 54 minutes, 9 seconds. Average speed: 139.8 MB/sec

Next check scheduled on **Mon 01 Oct 2018 12:00:00 AM MDT**  
⌚ Due in: 3 days, 1 hour, 29 minutes

## System Status

General

| Load Statistics  |                                 |                                           |
|------------------|---------------------------------|-------------------------------------------|
| Avg. CPU load *  | 2%                              |                                           |
| Per CPU load     | cpu 0 / 2                       | 1%                                        |
|                  | cpu 1 / 3                       | 1%                                        |
| Memory usage     | 18%                             |                                           |
| flash log docker | 2%                              | 1%                                        |
|                  | 15%                             |                                           |
| Memory size      | total usable                    | 7.753 GB                                  |
|                  | installed                       | 8 GB                                      |
|                  | max. installable capacity 32 GB |                                           |
|                  | bond0                           | fault-tolerance (active-backup), mtu 1500 |

## Users List

| Name     | Description                      | Write | Read |
|----------|----------------------------------|-------|------|
| root     | Console and webGui login account | -     | -    |
| egeisler | Me                               | 0     | 0    |

## Shares List

SMB

| Name         | Description        | Security | Streams |
|--------------|--------------------|----------|---------|
| Everything   |                    | Public   | 0       |
| Plex         |                    | Public   | 0       |
| appdata      | application data   | -        | 0       |
| cache        |                    | Public   | 0       |
| config       |                    | Public   | 0       |
| data         |                    | Public   | 0       |
| domains      | saved VM instances | -        | 0       |
| isos         | ISO Images         | Public   | 0       |
| localization |                    | Public   | 0       |
| logs         |                    | Public   | 0       |
| metadata     |                    | Public   | 0       |

## Array Devices

| DEVICE               | IDENTIFICATION                                    | TEMP. | READS   | WRITES  | ERRORS | FS    | SIZE  | USED    | FREE    | VIEW |
|----------------------|---------------------------------------------------|-------|---------|---------|--------|-------|-------|---------|---------|------|
| Parity               | ST2000DM008-2FR102_ZFL0HLND - 2 TB (sdg)          | 31 C  | 56,004  | 65,749  | 0      |       |       |         |         |      |
| Disk 1               | ST2000DM001-9YN164_S1E07VR8 - 2 TB (sdb)          | 32 C  | 56,677  | 65,598  | 0      | btrfs | 2 TB  | 1.04 TB | 959 GB  |      |
| Disk 2               | WDC_WD20EZR-00D8PB0_WD-WCC4M1579029 - 2 TB (sdc)  | 29 C  | 221     | 133     | 0      | btrfs | 2 TB  | 17.5 MB | 2 TB    |      |
| Disk 3               | ST2000DM001-1ER164_Z4Z18H86 - 2 TB (sdd)          | 29 C  | 134     | 13      | 0      | btrfs | 2 TB  | 17.3 MB | 2 TB    |      |
| Disk 4               | WDC_WD20EARX-00PASB0_WD-WMAZA9443771 - 2 TB (sde) | 30 C  | 133     | 13      | 0      | btrfs | 2 TB  | 17.3 MB | 2 TB    |      |
| Disk 5               | ST2000DM001-1CH164_W1E6W3R1 - 2 TB (sdf)          | 29 C  | 133     | 13      | 0      | btrfs | 2 TB  | 17.3 MB | 2 TB    |      |
| Array of six devices |                                                   | 30 C  | 113,302 | 131,519 | 0      |       | 10 TB | 1.04 TB | 8.96 TB |      |

## Boot Device

| DEVICE | IDENTIFICATION           | TEMP. | READS | WRITES | ERRORS | FS   | SIZE  | USED   | FREE    | VIEW |
|--------|--------------------------|-------|-------|--------|--------|------|-------|--------|---------|------|
| Flash  | USB_2.0_FD - 31 GB (sda) | *     | 94    | 428    | 0      | vfat | 31 GB | 196 MB | 30.8 GB |      |

## Array Operation

Started

STOP

Stop will take the array off-line.

Parity is valid.

CHECK

Check will start Parity-Check. [\(Schedule\)](#)☒ Write corrections to parity

HISTORY

Last check completed on **Thu 18 Jul 2019 04:38:16 AM PDT (yesterday)**, finding **0** errors.

Duration: 9 hours, 34 minutes, 24 seconds. Average speed: 58.0 MB/sec

SPIN DOWN

SPIN UP

Spin Down will immediately spin down all disks.

Spin Up will immediately spin up all disks.

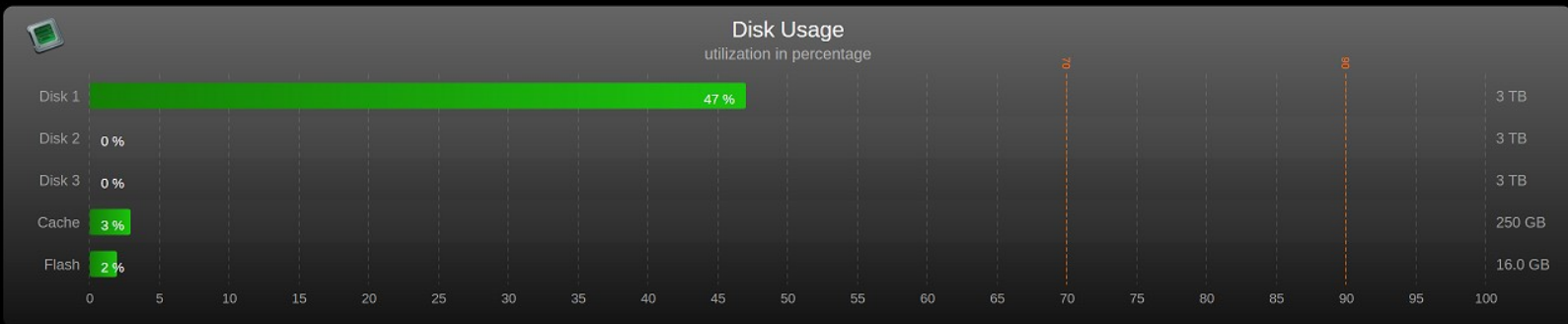
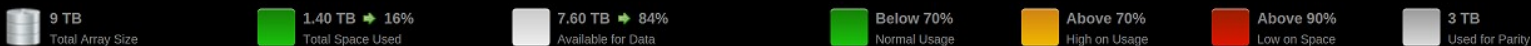
## 🗄️ Array Devices

| Device     | Identification                                   | Temp. | Reads  | Writes | Errors | FS  | Size  | Used    | Free    |
|------------|--------------------------------------------------|-------|--------|--------|--------|-----|-------|---------|---------|
| ▼ Parity   | ST8000VN0022-2EL112_ZA15Q627 - 8 TB (sdq)        | 90 F  | 45     | 124    | 0      |     |       |         |         |
| ▼ Parity 2 | ST8000VN0022-2EL112_ZA15RG65 - 8 TB (sdd)        | 97 F  | 45     | 124    | 0      |     |       |         |         |
| ▼ Disk 1   | ST3000DM001-1CH166_W1F3X376 - 3 TB (sdo)         | 81 F  | 6487   | 14     | 0      | xfs | 3 TB  | 2.82 TB | 184 GB  |
| ▼ Disk 2   | TOSHIBA_DT01ACA300_Y44TLOSGS - 3 TB (sdn)        | 84 F  | 1926   | 12     | 0      | xfs | 3 TB  | 2.74 TB | 260 GB  |
| ▼ Disk 3   | TOSHIBA_DT01ACA300_Y44TLORGS - 3 TB (sdp)        | 86 F  | 601    | 12     | 0      | xfs | 3 TB  | 2.63 TB | 373 GB  |
| ▼ Disk 4   | ST3000DM001-1CH166_W1F3WXV0 - 3 TB (sdm)         | 82 F  | 245    | 5      | 0      | xfs | 3 TB  | 2.68 TB | 317 GB  |
| ▼ Disk 5   | TOSHIBA_DT01ACA300_54G0E13GS - 3 TB (sdl)        | 88 F  | 424    | 10     | 0      | xfs | 3 TB  | 2.23 TB | 768 GB  |
| ▼ Disk 6   | WDC_WD30EZR-00D8PBO_WD-WCC4N1229543 - 3 TB (sdk) | 84 F  | 334    | 11     | 0      | xfs | 3 TB  | 2.63 TB | 370 GB  |
| ▼ Disk 7   | ST8000AS0002-1NA17Z_Z840MM2Q - 8 TB (sdj)        | 88 F  | 30,962 | 11     | 0      | xfs | 8 TB  | 4.53 TB | 3.47 TB |
| ▼ Disk 8   | TOSHIBA_DT01ACA300_45AS963GS - 3 TB (sdi)        | 86 F  | 437    | 11     | 0      | xfs | 3 TB  | 2.60 TB | 400 GB  |
| ▼ Disk 9   | TOSHIBA_DT01ACA300_Y37AV61GS - 3 TB (sdh)        | 90 F  | 340    | 11     | 0      | xfs | 3 TB  | 2.62 TB | 375 GB  |
| ▼ Disk 10  | TOSHIBA_DT01ACA300_54G0MNTGS - 3 TB (sdf)        | 88 F  | 291    | 5      | 0      | xfs | 3 TB  | 2.50 TB | 498 GB  |
| ▼ Disk 11  | ST8000AS0002-1NA17Z_Z840PXVB - 8 TB (sdg)        | 93 F  | 430    | 12     | 0      | xfs | 8 TB  | 4.01 TB | 3.99 TB |
| ▼ Disk 12  | ST8000AS0002-1NA17Z_Z840PRJW - 8 TB (sdb)        | 90 F  | 255    | 5      | 0      | xfs | 8 TB  | 6.93 TB | 1.07 TB |
| ▼ Disk 13  | ST8000AS0002-1NA17Z_Z840PJ9W - 8 TB (sde)        | 93 F  | 253    | 5      | 0      | xfs | 8 TB  | 5.93 TB | 2.07 TB |
| Total      | Array of fifteen devices                         | 88 F  | 43,075 | 372    | 0      |     | 59 TB | 44.8 TB | 14.2 TB |

## 🗄️ Cache Devices

| Device  | Identification                                           | Temp. | Reads  | Writes | Errors | FS    | Size   | Used   | Free   |
|---------|----------------------------------------------------------|-------|--------|--------|--------|-------|--------|--------|--------|
| ▼ Cache | Samsung_SSD_850_EVO_500GB_S21HNSAG142765B - 500 GB (sdr) | 81 F  | 21,163 | 10,447 | 0      | btrfs | 500 GB | 206 GB | 294 GB |

🟢 Array Started





root



Dashboard



Accounts



System



Tasks



Network



Storage



Directory Services



Sharing



Services



Plugins



Jails



Reporting



Virtual Machines



Display System Processes

FreeNAS  
System Information

CHECK FOR UPDATES

OS Version:

FreeNAS-11.2-RELEASE-U1

(Build Date: Dec 20, 2018 22:41)

Processor:

AMD Athlon(tm) II X4 645 Processor (4 cores)

Memory:

4 GiB

HostName:

testnas.local

Uptime:

3:03PM up 17 days, 23:40, 0 users

HEALTHY ✓

459.33 GiB

Available

pool1

ZFS Pool

REPORTS

Disks in Use



ada0

Disk:  
ada0 (465.76 GiB)Serial:  
[REDACTED]Description:  
N/A

Temperature:

36.0

°C

0 100

BANDWIDTH

Network Info

Primary NIC

EDIT INTERFACES



Memory Usage

of 4GiB total

REPORTS



Storage

Attached volumes

▶ manydrives 54.38TB

Volumes

▶ manydrives >

Import volumes >

Import media >

< tank

Name \*

tank

Encryption Settings



Select a profile

● Performance

5

● Capacity

1

● Redundancy

3

Data



38.21TB

Parity 38.21TB

Usable 38.21TB

● mirror ⊗

● mirror ⊗

● mirror ⊗

● mirror ⊗



● mirror ⊗

● mirror ⊗

● mirror ⊗



Spare



0

Cache



0

Log



0

Revert

Save

Drag disks to the left

▶ Hard Drives

▼ Solid State Drives



745GB  
da1

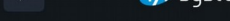
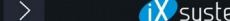
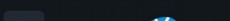
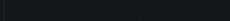
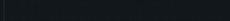
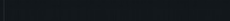
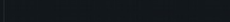
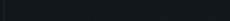
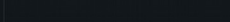
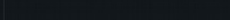
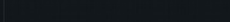
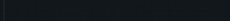
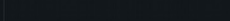
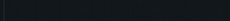
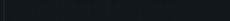
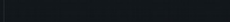
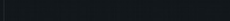
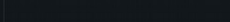
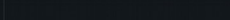
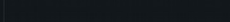
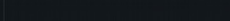
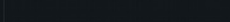
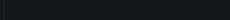
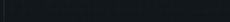
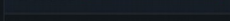
! Alerts

No Alerts Reported

Tasks

Starting command  
/sbin/adjkerntz -a as root

08:00:00





## System Information


|                       |                                                                                               |  |  |  |  |  |  |  |
|-----------------------|-----------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|
| Hostname              | giganas.local                                                                                 |  |  |  |  |  |  |  |
| Version               | <b>11.0.0.4 - Sayyadina</b> (revision 3975)                                                   |  |  |  |  |  |  |  |
| Compiled              | Saturday 04 March 2017 00:43:31                                                               |  |  |  |  |  |  |  |
| Platform OS           | FreeBSD 11.0-RELEASE-p8 #0 r314368M: Tue Feb 28 02:49:05 CET 2017                             |  |  |  |  |  |  |  |
| Platform              | x64-embedded on Intel(R) Xeon(R) CPU E3-1241 v3 @ 3.50GHz                                     |  |  |  |  |  |  |  |
| System                | Supermicro X10SL7-F                                                                           |  |  |  |  |  |  |  |
| System BIOS           | American Megatrends Inc. Version: 3.0a 12/17/2015                                             |  |  |  |  |  |  |  |
| System Time           | Sunday 05 March 2017 00:56:35                                                                 |  |  |  |  |  |  |  |
| System Uptime         | 23 Hours 51 Minutes 3 Seconds                                                                 |  |  |  |  |  |  |  |
| System Config Change  | Saturday 04 March 2017 01:08:33                                                               |  |  |  |  |  |  |  |
| CPU Frequency         | 1000MHz                                                                                       |  |  |  |  |  |  |  |
| CPU Usage             | <div><div></div></div> 0%                                                                     |  |  |  |  |  |  |  |
| CPU Core Usage        | <div><div></div> Core 0: 0% Temp: 31.0°C <div><div></div></div> Core 1: 1% Temp: 32.0°C</div> |  |  |  |  |  |  |  |
|                       | <div><div></div> Core 2: 2% Temp: 31.0°C <div><div></div></div> Core 3: 0% Temp: 32.0°C</div> |  |  |  |  |  |  |  |
|                       | <div><div></div> Core 4: 1% Temp: 33.0°C <div><div></div></div> Core 5: 0% Temp: 35.0°C</div> |  |  |  |  |  |  |  |
|                       | <div><div></div> Core 6: 2% Temp: 30.0°C <div><div></div></div> Core 7: 0% Temp: 31.0°C</div> |  |  |  |  |  |  |  |
| Memory Usage          | <div><div></div></div> 72% of 32557MB                                                         |  |  |  |  |  |  |  |
| Swap Usage            | <div><div></div></div> 0% of 2GB                                                              |  |  |  |  |  |  |  |
|                       | Device: <b>/dev/ada0p3</b>   Total: <b>2G</b>   Used: <b>0B</b>   Free: <b>2G</b>             |  |  |  |  |  |  |  |
| Load Averages         | 0.58, 0.48, 0.44 <a href="#">[Show Process Information]</a>                                   |  |  |  |  |  |  |  |
| Disk Space Usage      | <b>Databases</b> <div><div></div></div> 0% of 105GB                                           |  |  |  |  |  |  |  |
|                       | Total: <b>105G</b>   Used: <b>17M</b>   Free: <b>97G</b>                                      |  |  |  |  |  |  |  |
|                       | <b>Data</b> <div><div></div></div> 47% of 13.6TB                                              |  |  |  |  |  |  |  |
|                       | Total: <b>13.6T</b>   Alloc: <b>6.45T</b>   Free: <b>7.18T</b>   State: <b>ONLINE</b>         |  |  |  |  |  |  |  |
| UPS Status APCBK650E1 | <b>Status</b><br>UPS On Line <a href="#">[Show UPS Information]</a>                           |  |  |  |  |  |  |  |
|                       | <b>Load</b> <div><div></div></div> 15.0%                                                      |  |  |  |  |  |  |  |
|                       | <b>Battery Level</b> <div><div></div></div> 100.0%                                            |  |  |  |  |  |  |  |
| Virtual Machine       | VBox: FreeBSD 11 64-bits (1500 MiB) vnc://192.168.1.238:3394/                                 |  |  |  |  |  |  |  |

## Disks | Management

[Management](#) [S.M.A.R.T.](#) [iSCSI Initiator](#)

| Device | Device model  | Size    | Serial number       | Controller | Controller model                 | Standby time | File system | Status |
|--------|---------------|---------|---------------------|------------|----------------------------------|--------------|-------------|--------|
| ada1   | VBOX HARDDISK | 10240MB | VB17570e13-8ba1a1a2 | ahcich1    | Intel ICH8M AHCI SATA controller | Always on    | SoftRaid    | ONLINE |
| ada2   | VBOX HARDDISK | 10240MB | VBccbff814-3a8082b5 | ahcich2    | Intel ICH8M AHCI SATA controller | Always on    | SoftRaid    | ONLINE |

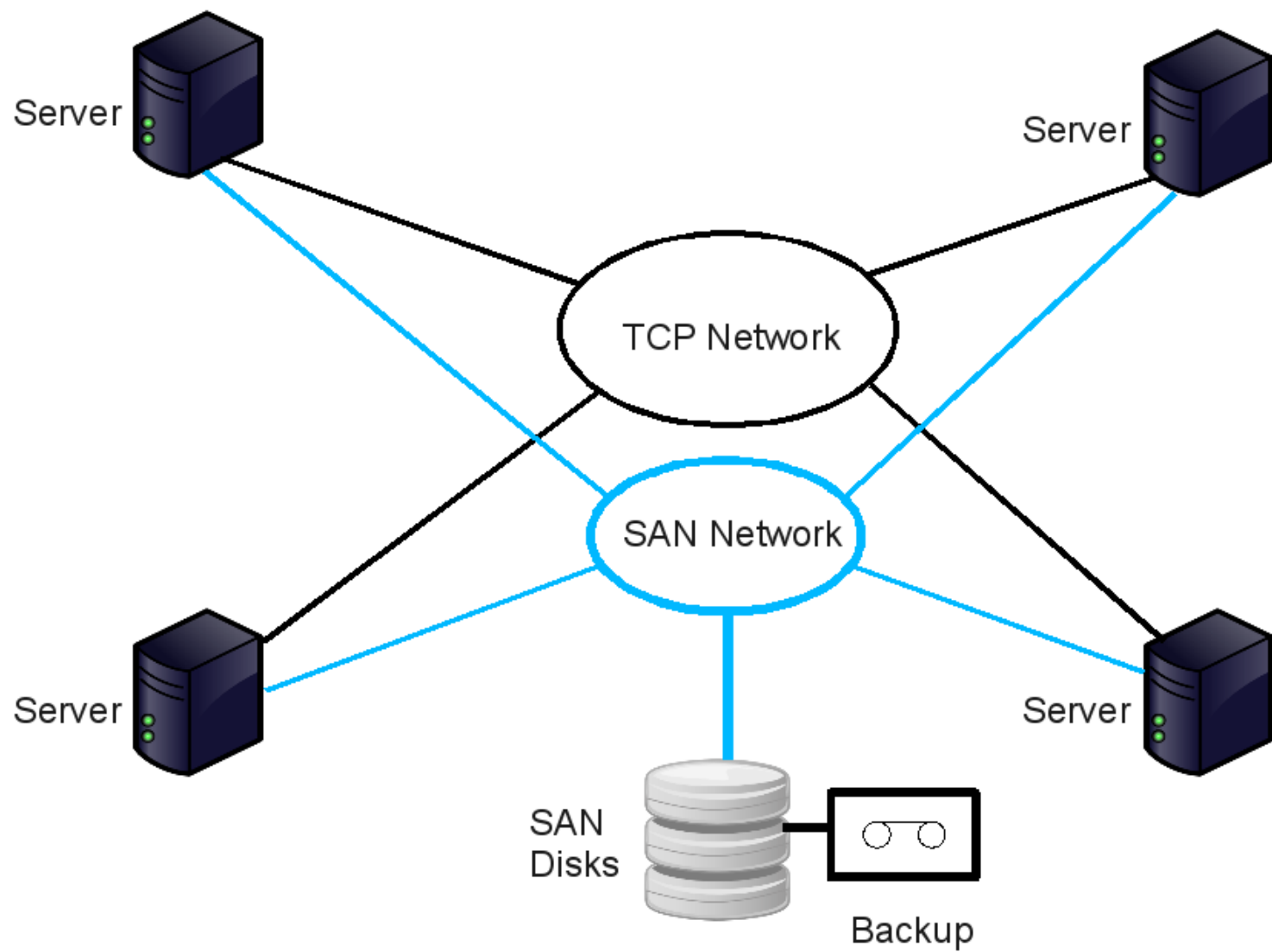
[Import disks](#)[Clear config and Import disks](#)[Rescan disks](#)[Import software raid disks](#)[Clear config and Import software raid disks](#)

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- Podemos encontrar diversas soluciones similares, como NAS4Free, FreeNAS, entre otras.
  - El uso de cada uno de ellos depende del usuario y de las especificaciones del sistema, ya que pueden variar entre ellas.

# SAN

Storage Area Network (Red de área de almacenamiento)

- Arquitectura que agrupa 3 elementos: Red de alta velocidad, equipo de interconexión dedicado y elementos de almacenamiento.
- Los equipos conectados tienen dos interfaces, una para la red y otra para la SAN.
- Relacionado con la red que usa.
- No afecta el rendimiento del trafico de la red.
- Más costosa.
- Generalmente aparece como un disco en red.



# RAID y Más...

¡¡¡Gracias por su atención!!!

Mata Mota Luis Valentín  
Sistemas Operativos