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Getting Started with



Openmediavault 5

January 12th, 2021 - Rev 2.2

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Version History:

December 12th, 2019 - Rev 0.1 (The first draft for OMV5)

December 18th, 2019 - Rev 0.2 (Installing Docker, Portainer. Added a section on R-PI under powering.)

December 21rst, 2019 - Rev 0.3 (i386 install removed and linked to an independent document.)

December 30th, 2019 - Rev 1.0 (Minor clean up edits.)

January 25th, 2020 – Rev 1.1 (Cleaned up TOC errors, minor reorder, minor edits)

January 26th, 2020 – Rev 1.2 (Updated notes on Transcoding and Quick Sync)

February 9th, 2020 – Rev 1.3 (Updated note on plugin's, other minor edits. Added notes and references RE hard drives and SMART attributes.)

November 13th, 2020 – Rev 1.4 (Updated external links, removed dual USB thumbdrive install note, added para and link RE bootable ISO thumb-drives, added note RE alternate 64bit install by script, added project Wiki link. Link for mitigating R-PI WinSCP root restrictions. Notes updated RE cloning SD-cards and Thumb-drives. Minor edits.)

December 12th, 2020 – Rev 2.0 Rebasing for integration into OMV's wiki.

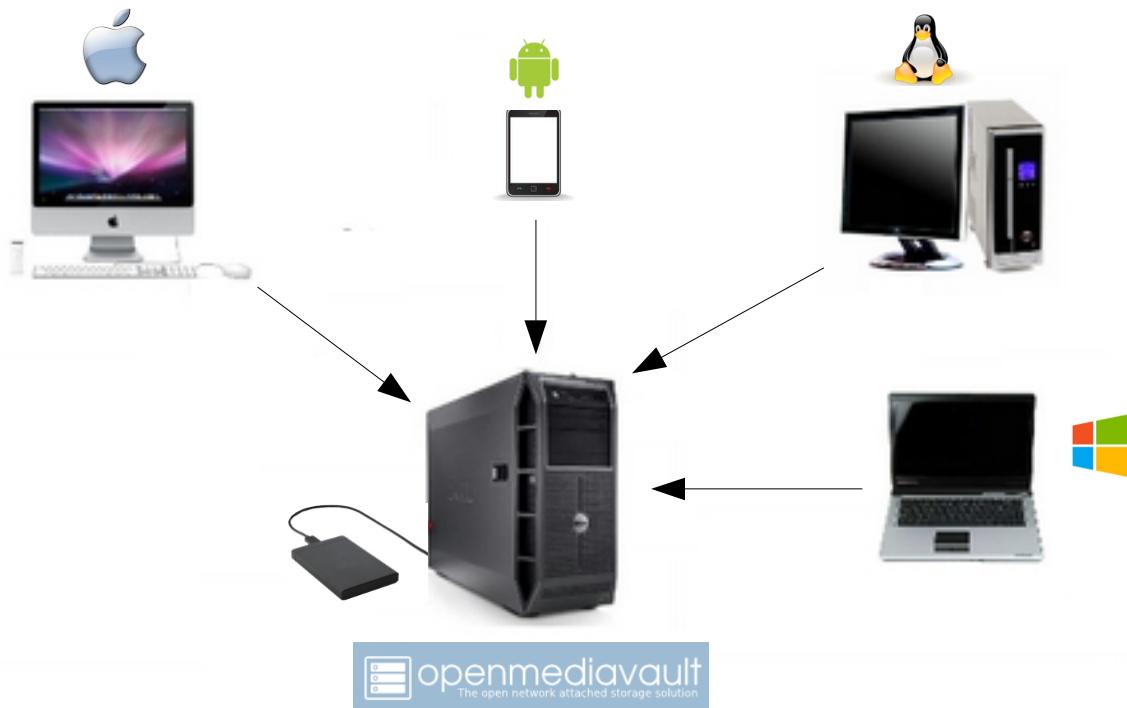
December 31rst, 2020 – Rev 2.1 (Note regarding extended instructions for the Flash memory plugin. Various edits.)

January 12th, 2021 -- Rev 2.2 (Section reordered. Various edits.)

Introduction to Openmediavault

Openmediavault is a File Server / NAS system designed to work on most modern IBM compatible PC systems, to include typical amd64 or i386 PC's and select ARM devices. Openmediavault (OMV) can be thought of as filling a role similar to Microsoft's Server Essentials, but extends far beyond the role of a basic File Server with additional functionality added VIA plugin's and Dockers. OMV is designed to work with popular client operating systems and multiple filesystem types, utilizing proven data sharing techniques on small and medium sized Local Area Networks.

In meeting the needs of it's intended users, individuals and small-to-medium-sized businesses, Openmediavault is designed for flexibility.



History

Openmediavault's history began with Volker Theile, who was the only active developer of the FreeNAS project by the end of 2009. Volker became interested in completely rewriting FreeNAS, for use on Linux. Initially, he named the rewritten package **coreNAS**. Shortly thereafter, Volker discarded the name **coreNAS** in favor of **Openmediavault**. Openmediavault's initial release was on 17 October 2011. It's built upon very mature and proven software layers and is under constant development. Openmediavault relies on the Debian project and uses their system and repositories as a base. The project focus is on creating and maintaining a stable and extensible NAS system that is intuitive and easy to use.

Purpose

The purpose of Openmediavault (hereafter referred to as “OMV”), is to provide a NAS system that is highly “extensible” with value added plugin’s and access to numerous Dockers that are desirable and beneficial to home users and small businesses at little to no cost.

One of the ambitions of the OMV project is to make advanced NAS technologies and features available to inexperienced users in an easy to use WEB GUI, thereby making it possible for people, without extensive knowledge of Linux, to gain easy access to advanced technologies.

Getting Involved

If businesses and home users find OMV to be beneficial, please consider supporting the project with a modest donation. While OMV is free, donations to cover Web site costs, hardware for testing, and other unavoidable expenses are needed and very much appreciated.

[Donate to OMV](#) (Main project development) and

[Donate to omv-extras.org](#) (Support for Single Board Computers and Development of Plugins.)

The OMV project is looking for coding talent and contributors. If one has developer experience, (BASH, PHP, Python, Javascript) the project would like to hear from you. Users with Linux experience are invited to help out on the [openmediavault Forum](#).

About this Guide

In computing, generally speaking, there are several ways to do the same thing. By extension, methods and methodology become progressively more advanced as a user's skill level increases. With these notes in mind, methods found in this guide may not be considered as “Best Practice”, especially from a hardened security perspective. The purpose and intent of this guide is to provide a walk-through to get users up and running as quickly and easily as possible.

- This guide contains links to external sources of information and software. It's best used on a PC connected to the Internet.
- This is a community document and a work in progress. Input and feedback are welcome and can be sent to: omvguide@gmail.com

Beginners:

This document is intended for beginners who will, primarily, be using the OMV's GUI. Beginners are assumed to have basic knowledge of computers and their LAN systems, and a Windows or Apple PC.

The focus of this guide will be to take a technically easy route, for the widest possible cross section of new users, toward accomplishing basic tasks using methods and processes that are easy to understand and duplicate.

Advanced Users:

OMV was designed to be intuitive for advanced users and beginners alike.

After the installation is complete, for a streamlined setup, see the [Quick Start Guide](#).

A Cautionary Note for Advanced Users:

Many of the configuration files traditionally used to customize Debian Linux are controlled by the OMV system database. As a result, manual edits of configuration files may be overwritten as of the next, “on-demand”, configuration change in the OMV GUI. Further, it is possible to “break” OMV with alterations and permissions changes to the files of the boot drive, on the command line.

In the beginning it's best to rely, primarily, on the GUI for configuration and control. Otherwise, before attempting to customize the operating system, backing up the boot drive is highly recommended.

Linux Experts, Admin's, and Developers:

Users in this category may prefer the information available on the [Project's Wiki](#).

Hardware

Hardware requirements to run OMV are very modest, however, actual hardware requirements for specific “use cases” vary widely. The following is intended only as general guidance.

Compatibility:

OMV 5.X is currently supported by Debian 10, “Buster”.

Compatible hardware and other requirements of Debian Linux are available at Debian.org

64 bit hardware (amd64):

The OMV project maintains convenient, fully integrated, OMV/Debian installation ISO's. This is the best method for getting OMV up and running quickly.

32 bit Hardware (i386):

While OMV is supported by 32 bit Debian installations, it's a two step scripted process referenced in; [**“Installing on i386 32-bit Platforms”**](#). The OMV project does not provide integrated 32 bit installation ISO's.

ARM Hardware:

The OMV project provides scripted installation support for ARM Single Board Computer (SBC) platforms. Supported platforms are the Raspberry Pi, models 2B and higher, and the various ARM platforms supported by the [**Armbian Project**](#).

Minimum Hardware requirements

OMV/Debian will run on I386, AMD64, and select ARM platforms with 1GB of ram or less, but performance expectations should be adjusted accordingly. The system boot drive should have a minimum of 8GB capacity.

Recommended Minimum requirements

For basic File Server operations - 1 or 2 users:

- Intel Core 2 Duo or equivalent AMD processor and 1GB of RAM.
- Any of the ARM Single Board Computers supported by OMV.

If flash media is used, (USB thumb-drives, SD-cards, etc.) the system boot drive should have at least 16GB capacity, for longer life.

Recommended Hardware and Considerations for a good use experience

amd64

- Intel i3 (or equivalent AMD processor), 4GB ram or better (ECC preferred) and a 16GB system boot drive will provide good performance in home or small business use cases.
- As the number of NAS users increase and server processes are added, processing power and memory requirements increase.
- For file caching, in support of normal file system operations, performance is better with more RAM.
- The number of a Motherboard's SATA or SAS ports can be a factor if future storage expansion is needed.
- A case design that accommodates the physical installation of additional hard drives can be helpful.
- Integrated video is preferred over add-on Video cards. With OMV's headless server design, add-on Video cards are an excessive and unnecessary power drain with no performance benefit. Installing a high end, high powered Video card in a headless server is analogous to installing a 65 to 200 watt light bulb in a closet, without a switch, and closing the door.

ARM - Single Board Computers:

Performance levels vary greatly among the various models of **Single Board Computer** (hereafter referred to as an “**SBC**”) that are supported by Armbian, Raspbian, and OMV. While most will support file server operations for a few users, if running server add-on's or Dockers is a requirement, research supported SBC's carefully before buying. [Armbian's](#) or [OMV's](#) forums may be of assistance, along with Internet product reviews.

When considering an SBC as a primary NAS server for home use, note that support for SBC's is for **the current OMV release only. Accordingly, SBC users should read the ending cautionary note in [Operating System Backup](#).*

Raspberry PI's

(Hereafter referred to as “R-PI's”.)

Given the current market for SBC's, the majority of SBC users will likely be owners of R-PI's.

OMV runs well on the R-PI 4. While OMV will run on an R-PI model 2B and the various models of the R-PI 3, performance is poor. What exactly does “poor performance” mean? In this context, if the R-PI's CPU is running at 100%, OMV may not show up on the network and / or network shares may not open. This may give the false impression that there's a software or permissions problem. In other instances, the WEB GUI login page may not respond.

These issues may appear to be software related, but that's not always the case. Older R-PI's are very easily overstressed and, during periods where the CPU is running at 100%, they may not respond to external input. With this performance limitation in mind, earlier versions of the R-PI (2B and 3X models) should be used only as a basic file server for 1 or 2 user home environments, where multitasking is less likely. If running automated tasks, it's best to schedule them to run in the early morning hours when user access would not be affected.

In addition, R-PI's suffer from USB under powering in models 2B and 3X. See notes regarding this issue in [USB Power - A Common Raspberry PI problem](#)

Where CPU Power may be Needed – “Transcoding”

If a users' primary consideration in setting up a media server, CPU selection or identification may need to be carefully considered.

Transcoding is a process for translating media file formats into types that mobile devices understand. Since mobile devices are low powered, they're not capable of re-processing high resolution media files smoothly so the processing burden is often transferred to the media server.

Pre-2011 Intel and AMD CPU's

Plex, a popular media server, recommends at least 2000 on the CPU's PassMark score for each concurrent 1080p transcoded stream. (See the advice article here) However note that this advice applies to pre-2011 Intel and AMD CPU's.

Look up an older CPU here → [PassMark CPU Benchmarks](#)

2011 and Newer Intel CPU's

As of the beginning of the Sandy Bridge CPU series in 2011 and later, a core has been added to **Intel** CPU's for the sole purpose of video transcoding. CPU's with Quick Sync, to include Celeron and Atom models that are relatively low powered, do a good job of transcoding for portable devices.

If NAS administrators have numerous smart phone users, in their homes or businesses, who will be watching transcoded video on the small screen, CPU loading and Video processing features may require some additional thought and research.

Additional reading → [Intel Quick Sync versus similar AMD technology](#).

Selecting a Boot Drive

Nearly any type of hard drive, SSD, or flash device (USB thumb-drives and SD-cards) 8GB or larger, will function as an OMV boot drive.

However, some notions of achieving a “Faster” or a “Better Performing NAS server” by using certain types of fast boot media should be dispelled.

Server booting requirements and considerations are different when compared to desktop and business workstation requirements.

- Given OMV's lean configuration, boot times can be fast. Boot times of 1 minute and Shutdown times of 20 seconds are common, even when using relatively slow flash media such as USB thumb-drives and SD-cards. (Recent models can be quite fast – check their benchmarks.)
- Typically servers are rebooted no more than once a week. When automated, a reboot event is usually scheduled after-hours when users are not affected.
- After the boot process is complete, most of OMV's file server functions are running from RAM.

Conclusion – for Linux file server operations, fast boot media is not important.

- “The WEB/GUI is more responsive with fast media.”

This is the single instance where an SSD or a spinning hard drive may create the illusion of higher performance. In the traditional role of a NAS as a File Server, when the server boots, the Linux kernel and most of the necessary processes required to act as a File Server are loaded into RAM - the fastest possible media for execution.

Navigating OMV's WEB/GUI interface is another matter. Loading WEB pages may call files from the boot drive, which may make the server appear to be slower, when using slow media. However, the speed of the boot drive has little impact on overall file server function and actual NAS performance.

The above assumes that adequate RAM has been provisioned.

Final Notes on Choosing a Boot Drive

OMV's boot requirements are very modest:

While some users prefer traditional hard drives or SSD's, the boot requirement can be served with USB thumb-drives and SD-cards, 8GB or larger.

With USB connections on the ***outside*** of a PC case, cloning USB drives for operating system backup is an easy process. Given this consideration, some users prefer USB thumb-drives and other external flash media to internal drives. Further, given the ease of operating system recovery in the event of a boot drive failure, beginners are encouraged to consider using flash media.

If flash media is used:

New name brand drives are recommended such as Samsung, SanDisk, etc. While not absolutely essential for the purpose; **USB3** thumb-drives are preferred, due to their more advanced controllers, and SD-cards branded **A1** for their improved random read/write performance. **USB3** thumb-drives and **A1** spec'ed SD-cards are faster and, generally speaking, more reliable than similar items with older specifications.

While boot drive size matters, bigger is not always better. An acceptable size trade off for wear leveling and speed of cloning is between 16 and 32GB. (“**Wear leveling**” will be explained during the installation and configuration of the flash-memory plugin.)

The **flash-memory plugin** is required for flash media. It's purpose and installation is detailed in [The Flash Memory Plugin](#).

Use-case exceptions where boot media larger than 32GB may be useful:

- Running applications that utilize WEB interfaces, such as Plex, Emby, etc.
- Hosting Web or Media Servers with extensive content.
- Hosting Virtualized Guest operating systems with desktops. (Does not apply to ARM platforms. ARM platforms can not virtualize i386 or amd64 platforms.)

(There's no penalty for starting with a smaller boot drive. Moving to a larger drive, if needed, can be done later.)

**** Note:** Buying flash devices on-line, even from reputable retailers, comes with the substantial risk of buying fakes. Buying flash drives, in sealed packaging, from walk-in retail stores with liberal return policies is recommended. The use of cheap generics, fakes or knockoffs is highly discouraged. They tend to have a short life and they're known to cause problems, even if they initially test error-free.

In addition, to detect fakes or defective media even when new; all SD-cards and USB thumb-drives, should be formatted and tested in accordance with the process outlined under [Format and Testing Flash Media](#). If they fail error testing, return them for a refund.**

Hardware - The Bottom Line

Again, OMV/Debian's hardware requirements are modest. Nearly any IBM compatible PC or Laptop produced in the last 10 years could be re-purposed as an OMV server.

However, it should be noted that newer hardware is, generally speaking, more power efficient and it's higher performing. The power costs of running older equipment that is on-line, 24 hours a day, can easily pay for newer, more power efficient equipment over time.

Further, the supported ARM platforms are both power efficient and capable of providing file server functions in a home environment. (Again, performance expectations should be adjusted in accordance with the capabilities of the hardware.)

Installing on Single Board Computers (SBC's)

Installation guides for SBC installations are available ➔ [here](#).

Installing on i386 32-bit Platforms

An installation guide for 32-bit installations is available ➔ [here](#).

amd64 (64-bit) Platforms

This guide assumes the user will be installing from a CD, burned from an image found in [OMV's files repository](#), using 64 bit hardware.

Downloading

Beginners should download **the latest stable version** from [Sourceforge.net](#) and copy or download the SHA or MD5 checksums for the ISO. The checksum value will be used with the MD5 SHA checksum utility. (Windows Notepad can open MD5 files by selecting “All Files”, next to the file name drop down.)

****Warning**:**

If users install Beta versions of OMV, they are agreeing to be a “tester”. As part of being a tester, users may experience issues or bugs that can not be resolved which may result in lost data. Plan accordingly, with full data backup.**

Verify the download

After the download is complete, verify the download with a [MD5 & SHA checksum utility](#). MD5 and SHA hashes check for image corruption that may have occurred during the download.

****Note****

Beginners - DO NOT SKIP THIS STEP. The chance of image corruption is high when downloading and it's pointless to build a server with flawed software. Even the **slightest** corruption of the installation ISO may ruin your installation and the effects may not be noticed until well after your server is built and in use. Headaches can be avoided by checking the image.

Installing - amd64 Platforms

Burning a source CD

Assuming a CD/DVD drive is installed; in most cases, double clicking an installation file, with an “.ISO” extension, will trigger a CD burning utility on a Windows Computer or a MAC. If help is needed for this process, see the following link.

[How to burn an ISO image in Windows 7, 8, 10](#)

Creating a Bootable ISO Thumb-drive

For PC's without an Optical drive; the OMV ISO can be installed using a Thumbdrive as the ISO source, and install the Debian/OMV system to a second thumb drive.

**Before creating an ISO thumb-drive consider checking the thumbdrive using the utilities and process described below in, [Preparing Flash Media](#). **

For assistance in creating a bootable ISO thumb-drive, see the following link.

[How to install an ISO file on a USB drive](#)

** If installing to a standard hard drive or SSD, skip to ➔ [Installing Openmediavault](#). **

Preparing Flash Media

To use flash media as a boot drive, a couple utilities are recommended:

[SDFormatter](#) (get the latest version), and [h2testw1.4](#) .

- [SDFormatter](#) installs in the same manner as a typical Windows program.
- [h2testw1.4](#) is stand-alone “portable” application. Simply unzip h2testw_1.4 onto the desktop, open the folder, and double click the executable.

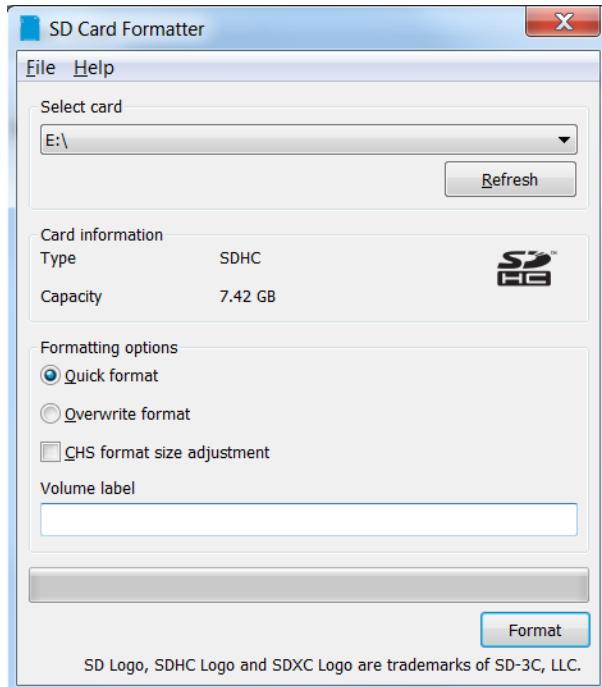
Due to the rise in counterfeit media and media that reports a fake size, it's recommended that all USB thumb-drives, new or used, be formatted with **SDFormatter** and tested with **h2testw1.4** before using them.

Format and Test Flash Media

Using SDFormatter, do a clean format:

(While SDFormatter was designed for SD-cards, it can format USB thumb-drives for error testing. For those who would prefer a formatter specifically for a USB thumb-drive; ➔ [HPUSBDISK.EXE](#))

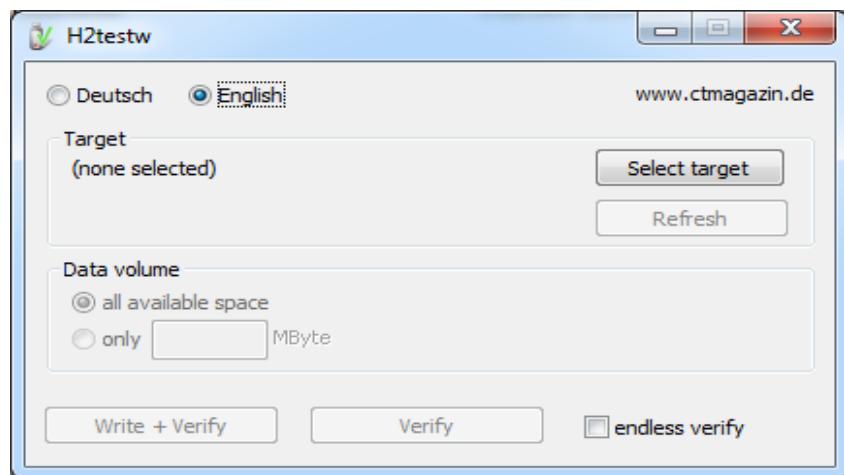
SDFormatter will detect a USB thumb-drive. A volume label is optional and the default options are fine.



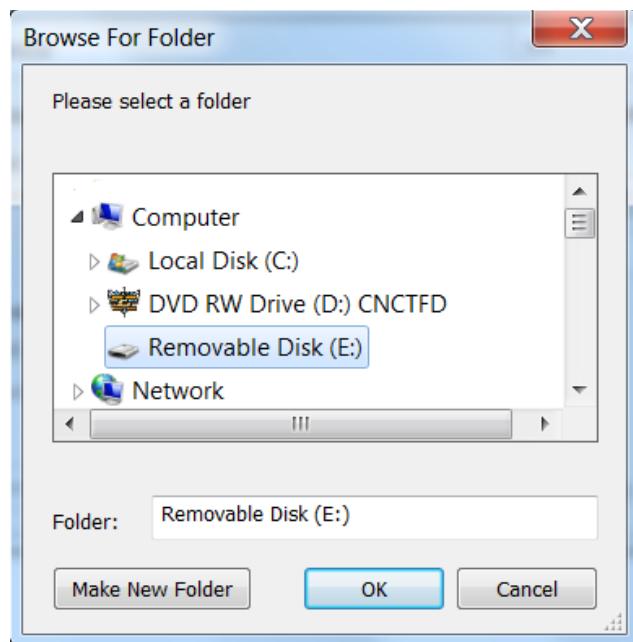
Click on Format

After the drive format is completed, open **h2testw** and select your language.

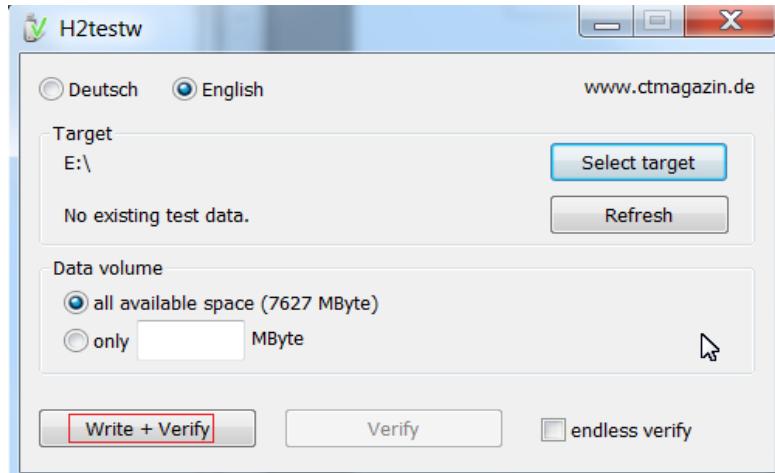
Then, click on **Select target**



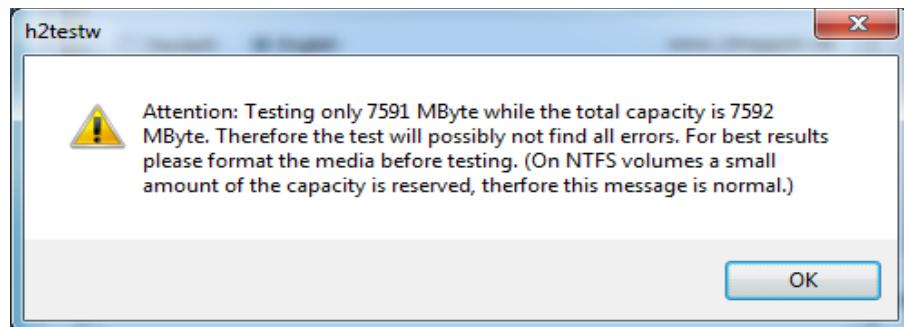
Under **Computer**, select the flash media previously formatted.



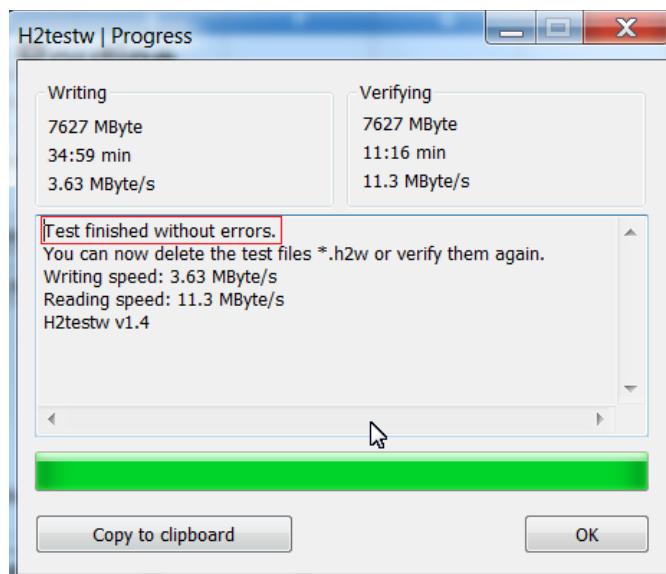
Select **Write+Verify**. (Do not check endless verify)



A dialog box similar to the following may pop up, drawing attention to a 1MB difference.
Ignore it and click on **OK**.



“**Without errors**” is the desired outcome.
(If media tests with errors or is much smaller than is indicated by its labeled size, don't use it.)



After H2testw verifies the USB thumb-drive, do one more clean format, using SDFormatter, before using the thumb-drive.

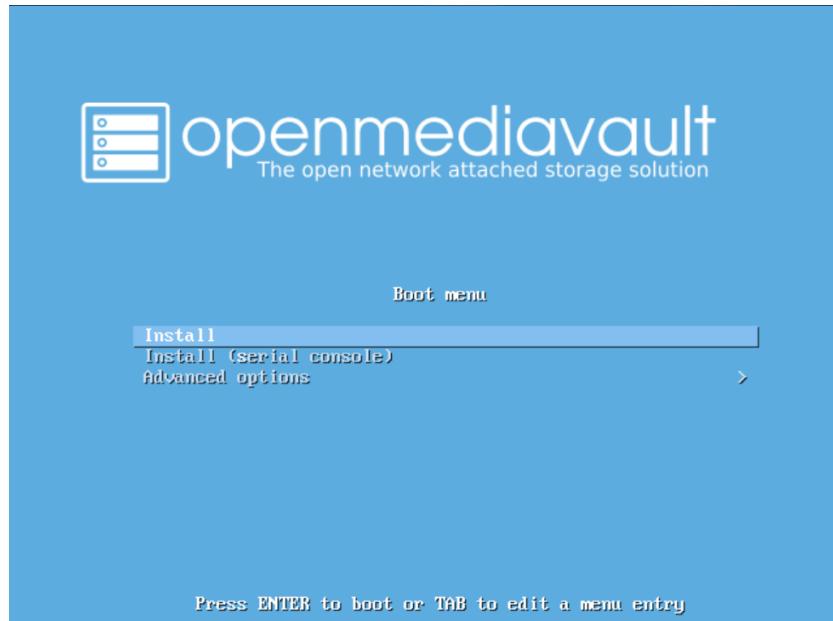
amd64 – Openmediavault Installation

If your PC platform won't boot onto a CD or USB thumb-drive with the installation ISO, it may be necessary to change the boot order in BIOS, to set the CD/DVD drive or USB boot to the top of the boot order. This link may provide assistance on this topic. → [How To Enter BIOS](#)

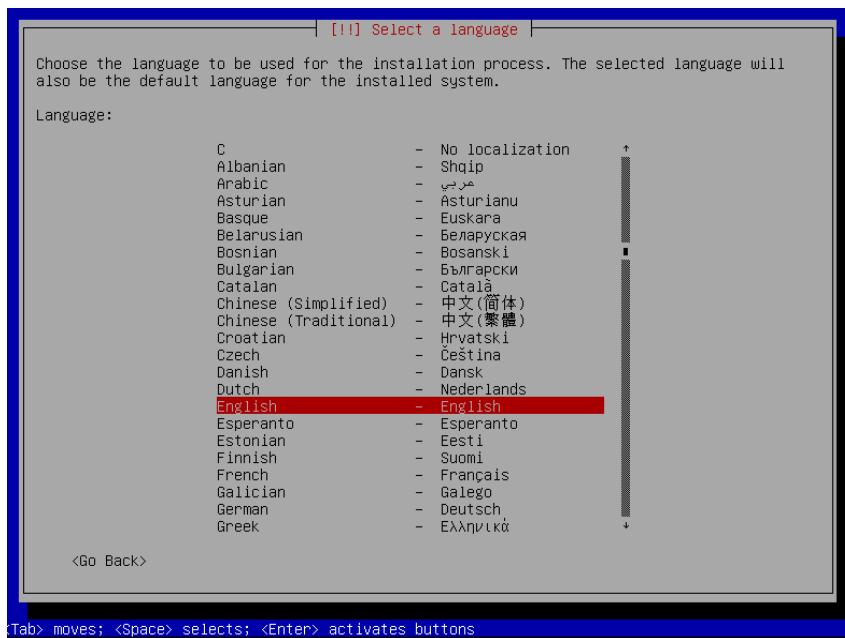
If difficulties are encountered during the ISO installation, consider the ➔ [Alternate 64bit installation](#) guide.

An install walk-through:

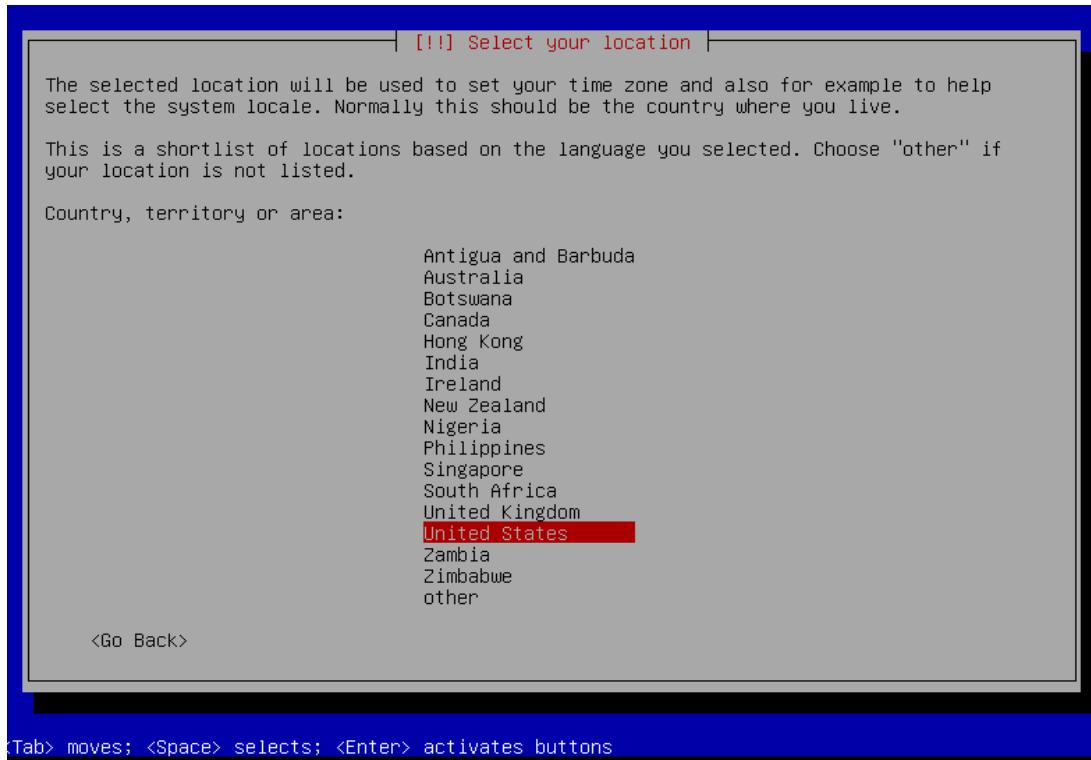
Boot Menu: Select Install



Select a Language: (As needed)

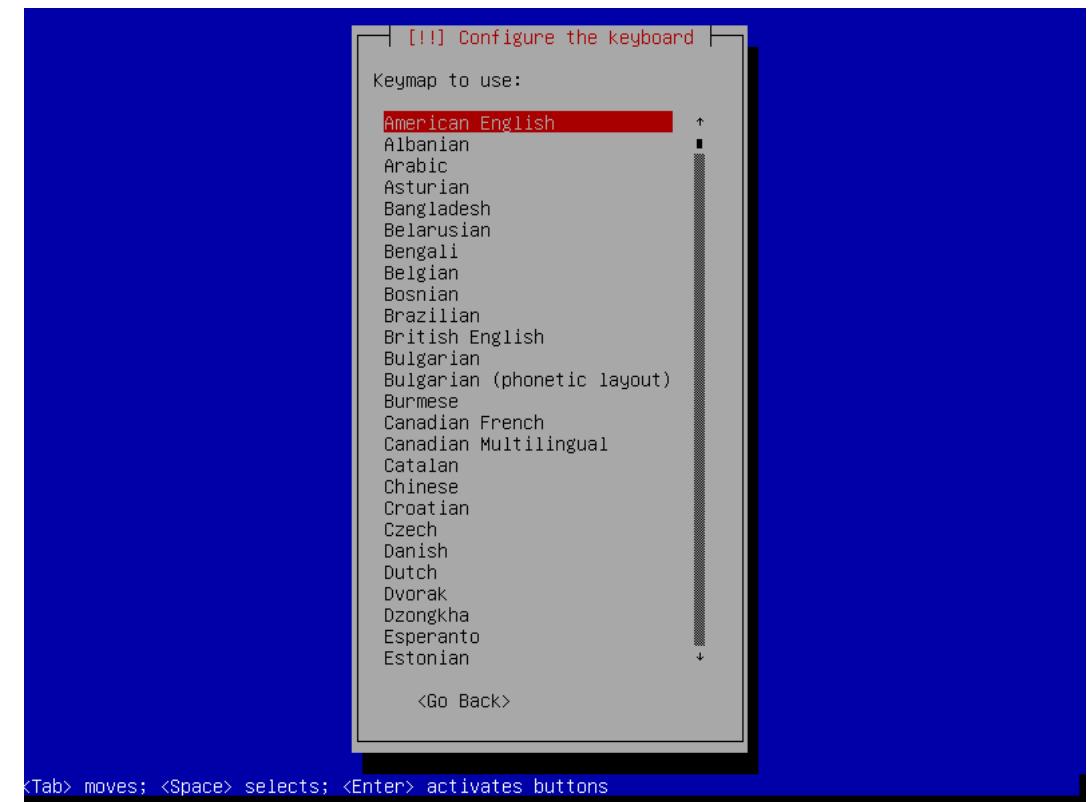


Select your Location: (As appropriate.)



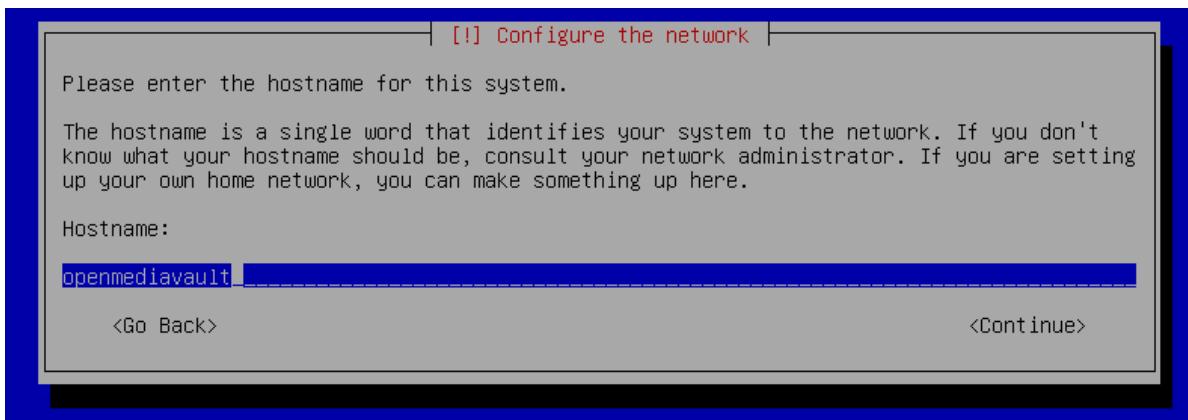
<Tab> moves; <Space> selects; <Enter> activates buttons

Configure the Keyboard: (Select as appropriate)



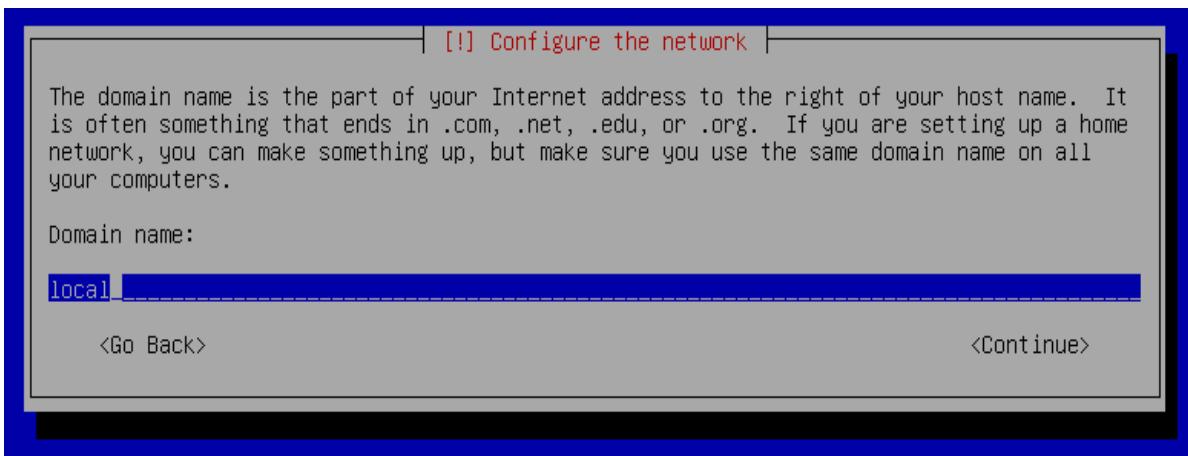
<Tab> moves; <Space> selects; <Enter> activates buttons

Configure the Network: While the default hostname is fine, a server name that is a bit shorter might be easier to work with later on. (Something like **OMV1**).



Configure the Network:

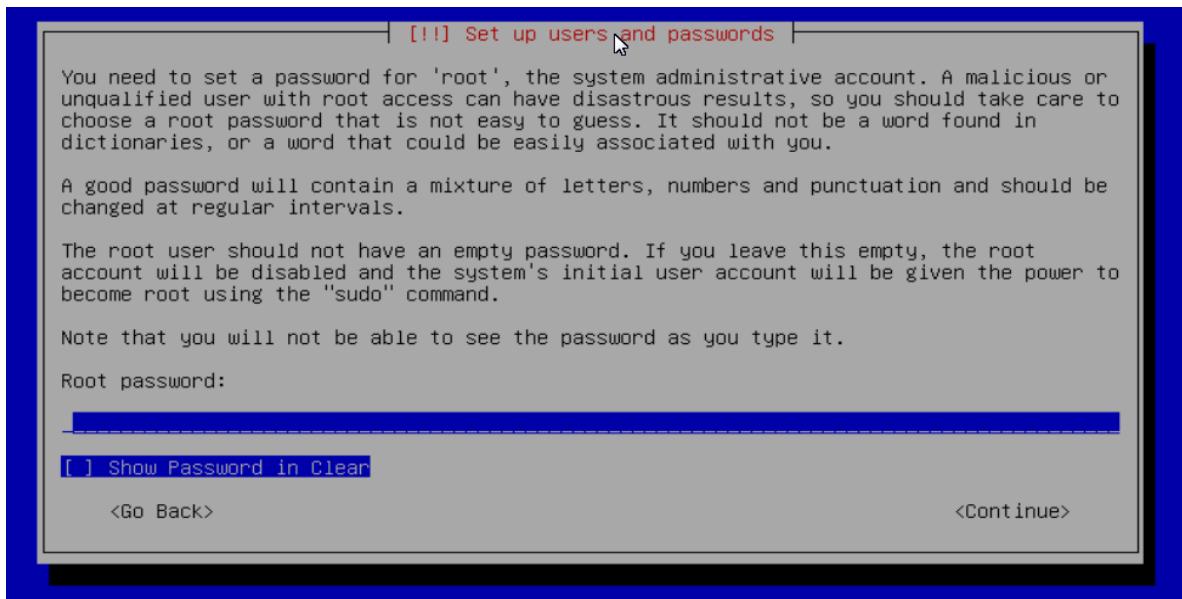
If applicable, enter your domain name suffix. Otherwise, for home users and businesses with peer to peer networks, the default entry is fine.



Set up users and passwords:

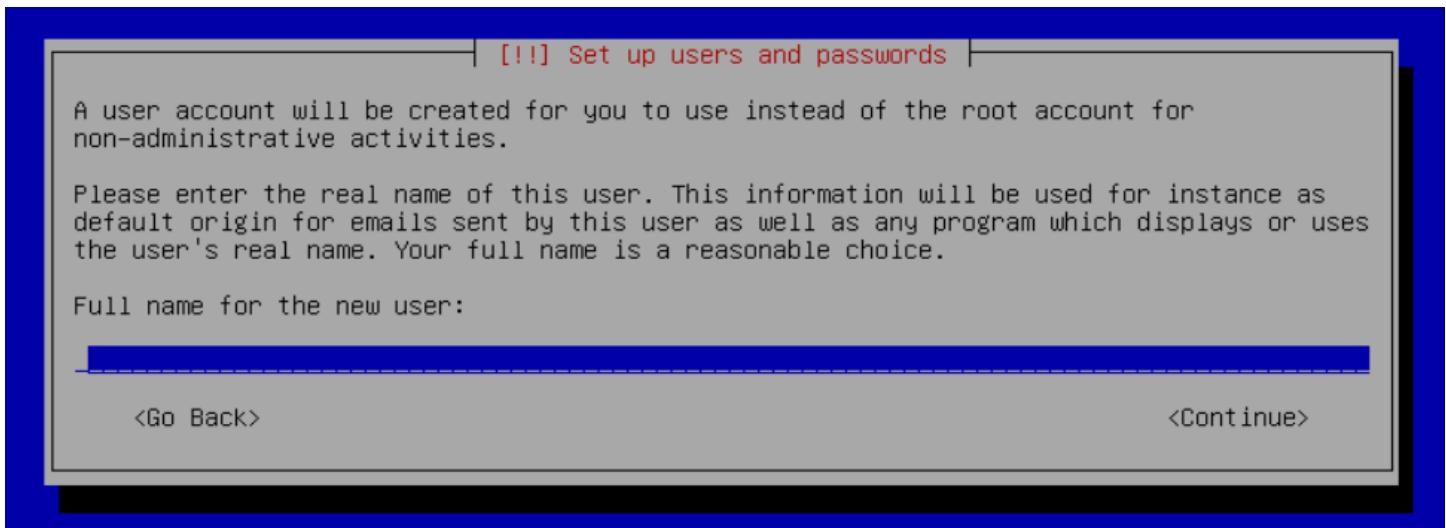
Follow the on screen guidance for setting the **root password**.

While not recommended, it would be better to write down the root password, then to forget it.



Set up users and passwords:

Follow the on screen guidance for setting up a new admin user and password.



Configure the Clock:

Select your time zone.

(NO PIC)

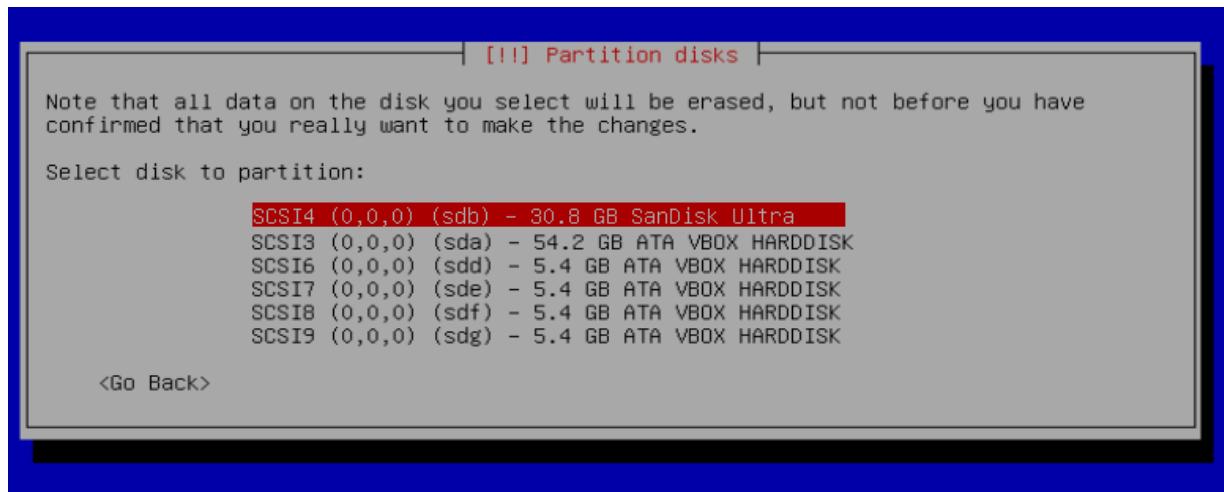
Partition Disks 1:

If two storage devices are available for installation, this screen is displayed.



Partition Disks 2:

If installing to a single internal drive, there will be only one selection available. In this particular example, the installation is placed on a USB thumb-drive



Partition Disks 3:

(No Pic)

A 3rd window asks for confirmation of partition selections. Select Yes.

If installing to a USB drive, at this point, it is possible to an error may pop-up regarding partitioning the drive, and recommend a reboot. Follow the recommendation. After the reboot, the partition operation should succeed the 2nd time around.

The system installs.....

**Configure the Package Manager:
Debian Archive Mirror Country
(NO PIC)**

While the advice given in this screen is true, without testing, there's no way to know which Debian archive mirror is best. Without testing, picking your country or the closest location to your country would be the logical choice.

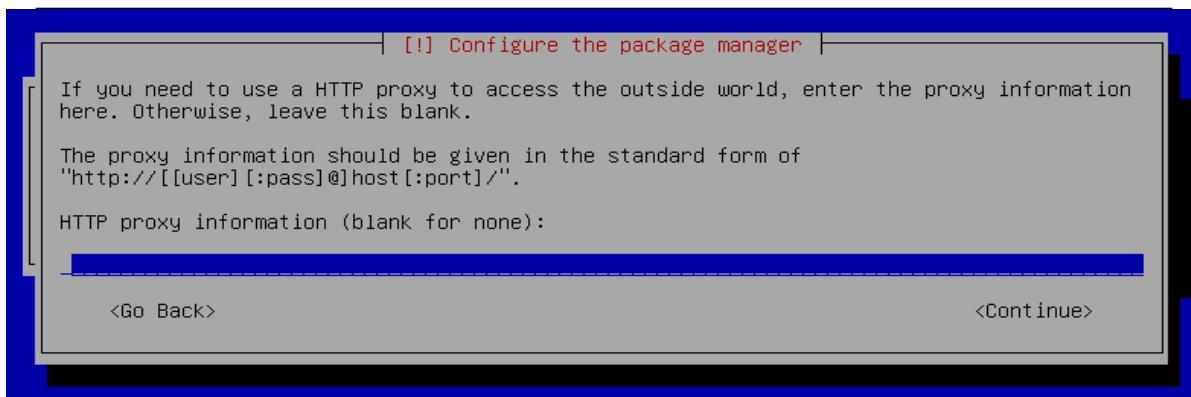
**Configure the Package Manager:
Debian Archive Mirror
(NO PIC)**

The default choice is usually best.

**Configure the Package Manager:
HTTP proxy**

In most cases this entry will be blank.

(If a proxy is required, note the form of entry required in the dialog box.)

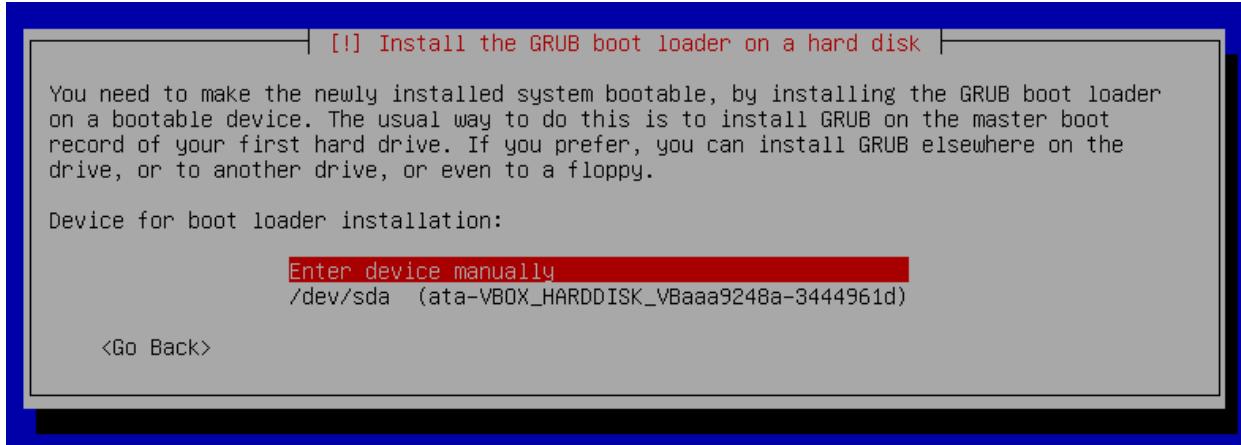


** If installing to a hard drive, the following screen may or may not appear. **

Install the GRUB Boot Loader on a Hard Disk:

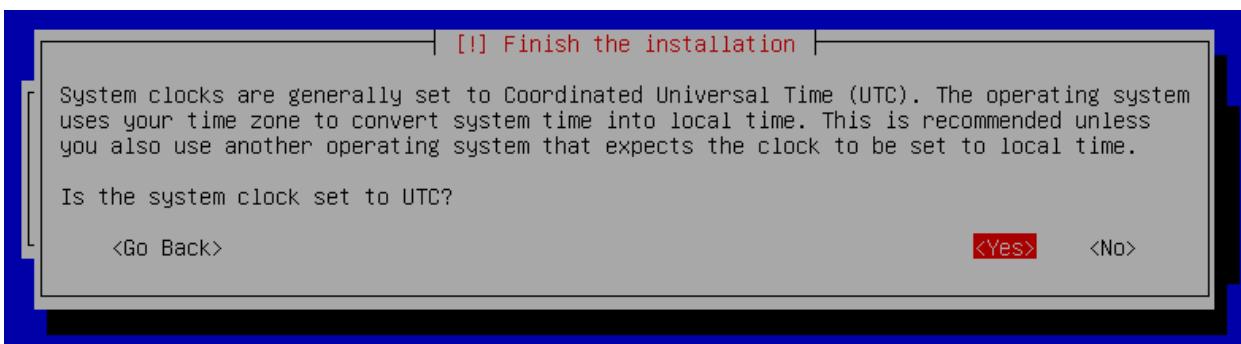
Select the appropriate boot disk in your server.

(Generally the boot drive will be **/dev/sda** which is, in most cases, the first sata port.)



Finish the Installation:

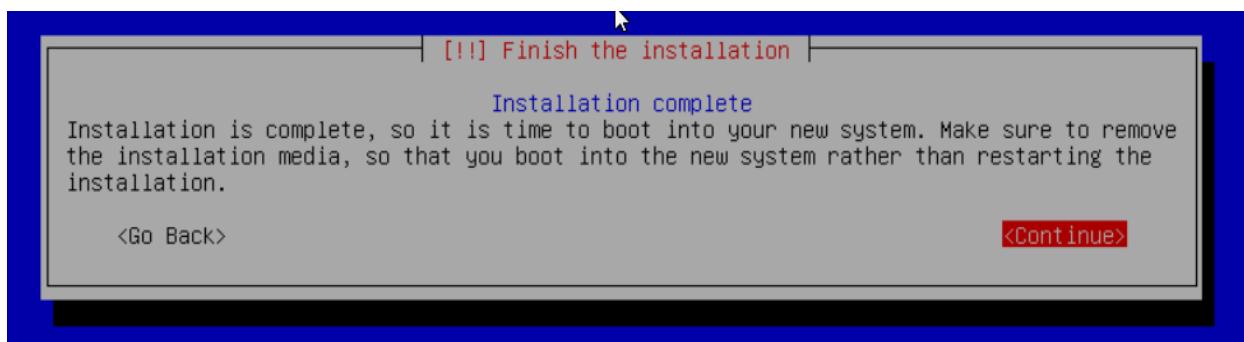
Accept the default.



Installation Complete:

Remove the CD or USB installation source, then hit ENTER.

(Otherwise, the installation process may re-start.)



First Boot

Allow the installation to boot. Normally, the text above the login prompt will provide an **IP address** to be used for opening the console in a web browser. If an IP address is available, skip the following and proceed to [**Initial Configuration.**](#)

There are two exception cases on the first boot that users should be aware of.

1.) No address from the DHCP server:

Normally, DHCP will assign an IP address to OMV and the address will be printed to the screen. However, on odd occasions the following issue may be observed.

```
openmediavault 3.0.94 (Erasmus) openmediavault tty1
Copyright (C) 2009-2017 by Volker Theile. All rights reserved.

To manage the system visit the openmediavault web control panel:

No network interface(s) available

By default the web control panel administrator account has the
username 'admin' and password 'openmediavault'.
It is recommended that you change the password for this account
within the web control panel or using the 'omv-firstaid' CLI
command.

For more information regarding this appliance, please visit the
web site: http://www.openmediavault.org

openmediavault login: _
```

This is usually due to a slow response from your DHCP server, during a fast boot process.

An easy method of finding the IP address is:

At the login prompt type **root**

Enter your previously set root **password**.

At the # prompt type: **ip addr**

```
root@OMV-Server:~# ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group def
t qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eno1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP
oup default qlen 1000
    link/ether 6c:0b:84:de:b4:59 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.55/24 brd 192.168.1.255 scope global eno1
        valid_lft forever preferred_lft forever
```

To access the WEB control panel, the IP address for the wired Ethernet interface is needed. In this case it's

192.168.1.55 (/24, the subnet mask, can be ignored.)

2. An odd IP address is assigned, that is not in the user's network:

In the following example, the actual network is 192.168.1.0/24

```
openmediavault 5.0.5-1 (Usul) openmediavault tty1
Copyright (C) 2009-2019 by Volker Theile. All rights reserved.

To manage the system visit the openmediavault web control panel:

enp5s0: 192.168.178.4
enp5s0: fe80::d99e:4b57:61a8:b72
virbr0: 192.168.122.1

By default the web control panel administrator account has the
username 'admin' and password 'openmediavault').
It is recommended that you change the password for this account
within the web control panel or using the 'omv-firstaid' CLI
command.

For more information regarding this appliance, please visit the
web site: https://www.openmediavault.org
openmediavault login:
```

This is usually a one time event where the fix is simple – simply login as root and type **reboot** on the command line. The address will be correct the second time around.

** With a known IP address, proceed to [**OMV - Initial Configuration.**](#) **

(Continued)

Initial Configuration

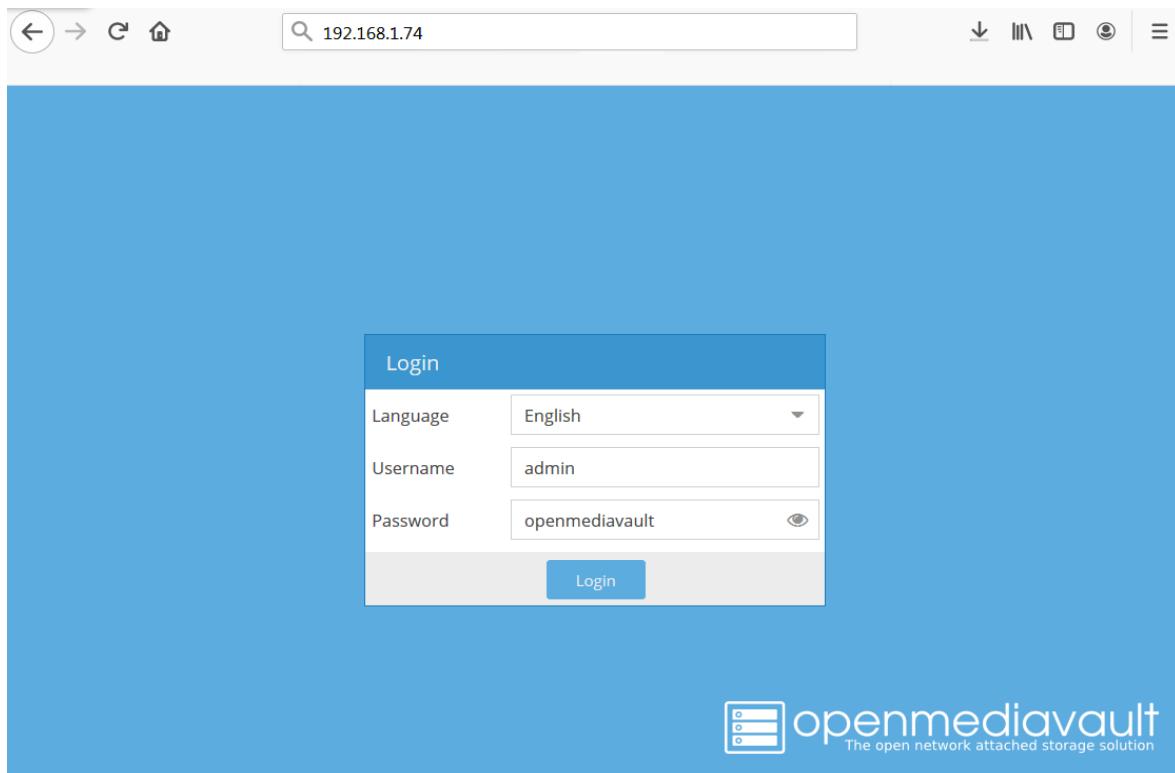
Web console login

In a web browser, type in the IP address provided by the first boot screen:

Set the language of your choice.

The user name is **admin** and default password is **openmediavault**

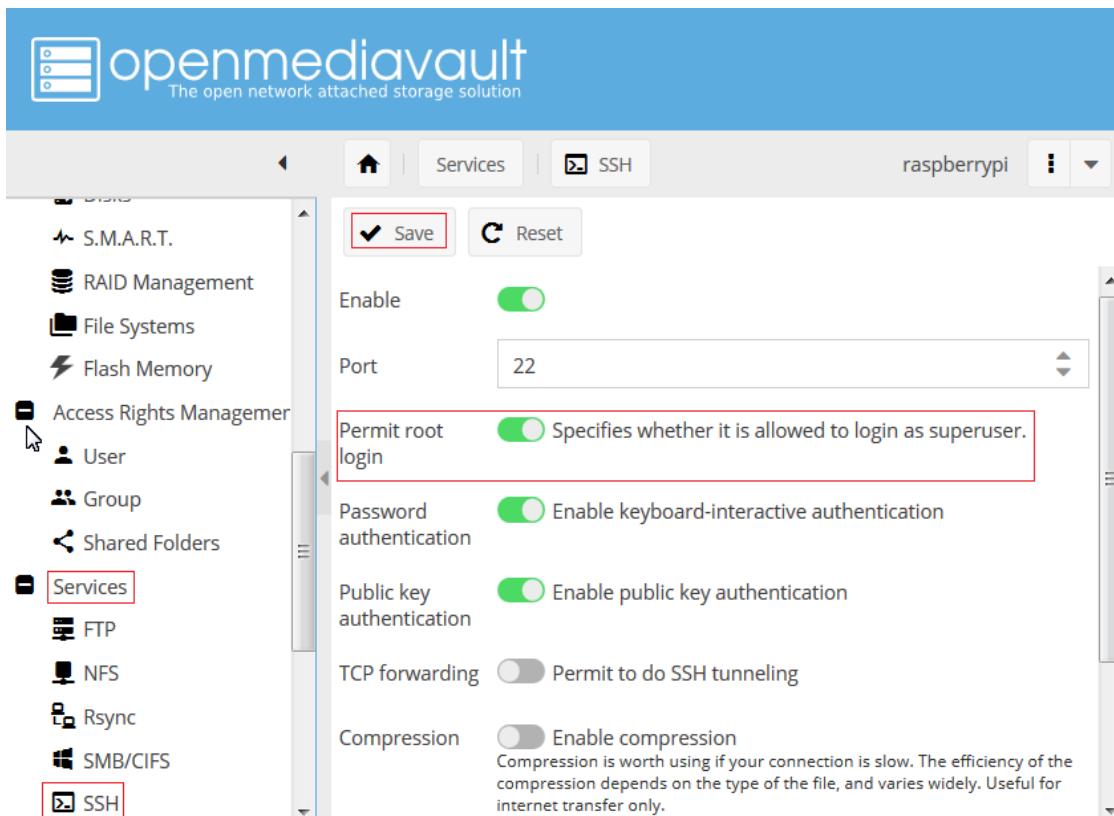
(In the following, by clicking on the **eye icon**, the default password is shown unmasked.)



SSH Login:

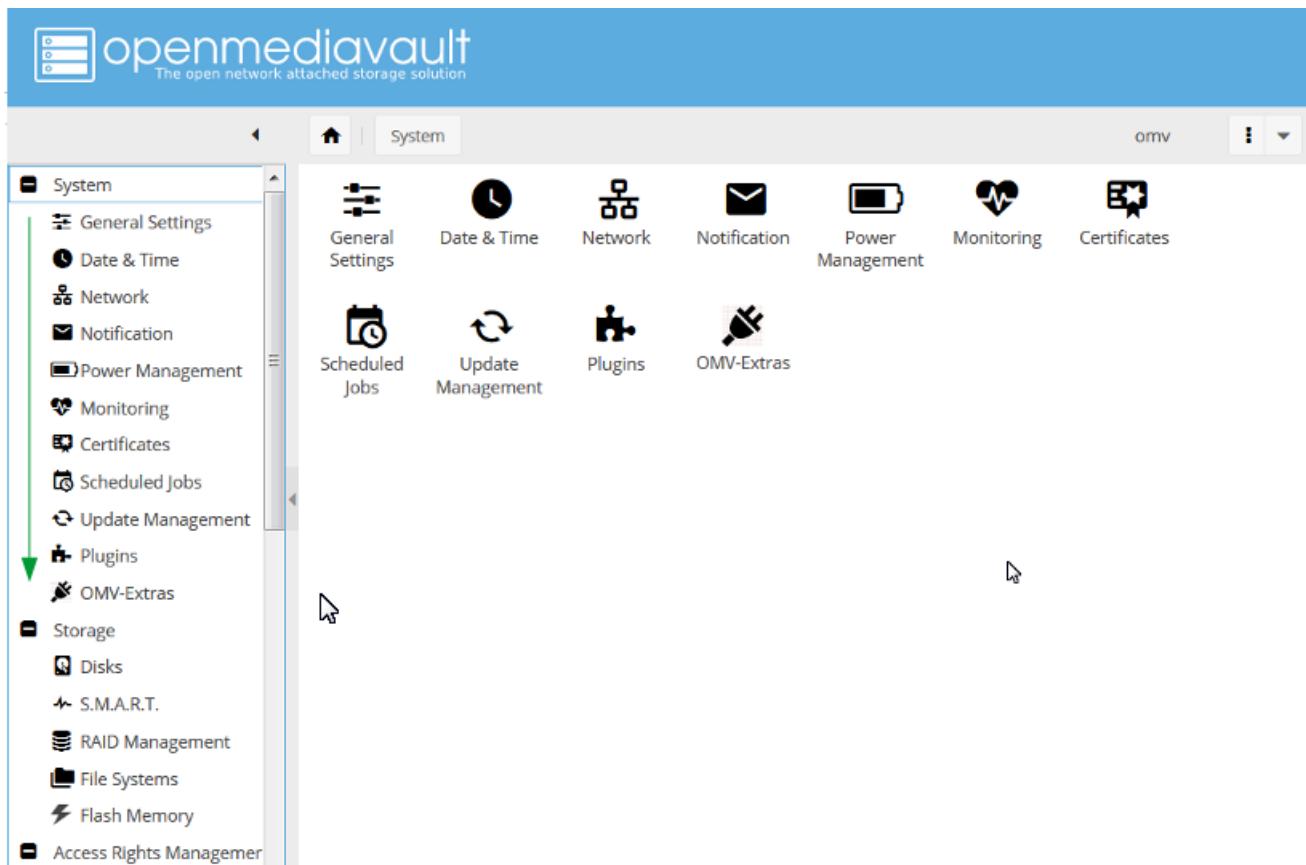
Under Services, SSH, check that the toggle switch for “Permit root login” is **ON** (Green) . If necessary make the change and Save. After clicking on “Save” a yellow banner “**The configuration has been changed**” will appear. For the change to be applied, the **Apply** button must be clicked.

(Note: The yellow confirmation banner is a final “SANITY” check and, in most cases, is required to finalize changes.)



Quick Start Guide for Advanced Users:

- In the left hand column, start at the top with **General Settings**, and work your way down, choosing and activating the services and features you need for your use case.
- For amd64 and i386 users, a static address for the OMV server and setting the address of a [public DNS server](#) is recommended. (*SBC users, see the section, [Network Interfaces – SBC Users](#).*)
As an example: Googles servers 8.8.8.8 and 8.8.4.4 support **DNSSEC** for better security, and **“Anycast”** which will direct DNS queries to a nearby server with low network latency. There are several choices for Public servers that support these features. [List of Public DNS Servers](#) .
- For a browseable network share, a minimum of one shared folder would need to be configured and that folder would need to be added to SMB/CIF to be visible on the network.



Basic OMV Configuration

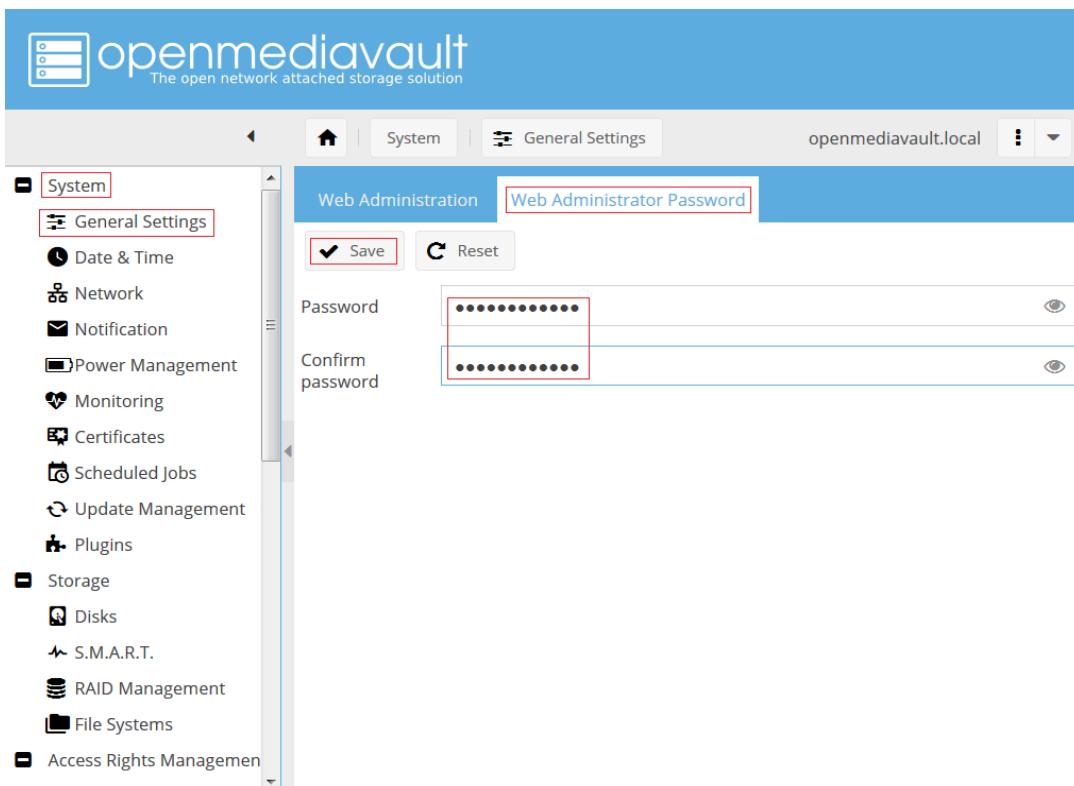
This section will guide new users through the initial setup of OMV. It addresses how to add a plugin, enabling OMV-Extras, how to setup a shared folder and make it browseable on the network with an SMB/CIF share.

System Settings

Under System, General Settings, in the Web Administration tab:

To allow a bit more time for configuration in the GUI, **beginners should consider lengthening the automatic log out time**. When the yellow banner appears, click **Apply**.

In the Web Administrator Password tab, enter a **strong password**, confirm it and **Save**. (This is one of a few instances where the yellow “confirmation” banner does not appear.) This setting changes the GUI login password. The user “**admin**” will remain the same.



Under System, Date & Time (No Pic)

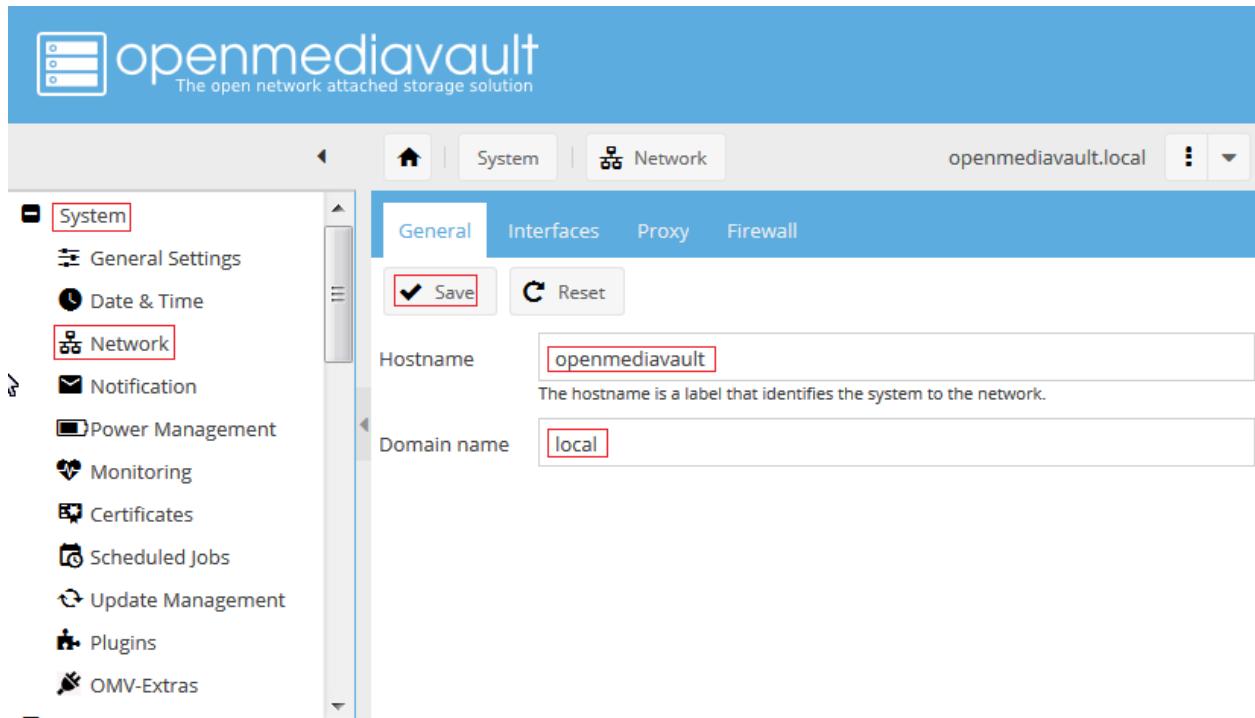
Select your **Time Zone** and “toggle ON” **Use NTP Server**. When OMV toggle switches are **ON**, they're **green**. **OFF** is gray.

Under, **System, Network, General** tab.

Hostname: The hostname is the name that will appear on your network and on the command line. While the default is fine, the hostname can be changed here.

Domain name:

If needed, the Domain suffix can be changed here. (Very few users will use Fully Qualified Domain Names.)



Network Interfaces – SBC Users

Part of the SBC installation process was setting the wired interface to DHCP. SBC users should consider leaving their wired network interface set to DHCP, until [Docker](#) and [Portainer](#) are installed.

If a static IP address is needed:

Note that your SBC has been assigned an IP address by your LAN's DHCP server. (Typically, a router.) See your router's documentation for information on setting a “Static”, or “Reserved” DHCP lease.

Network Interfaces – i386/amd64 Users

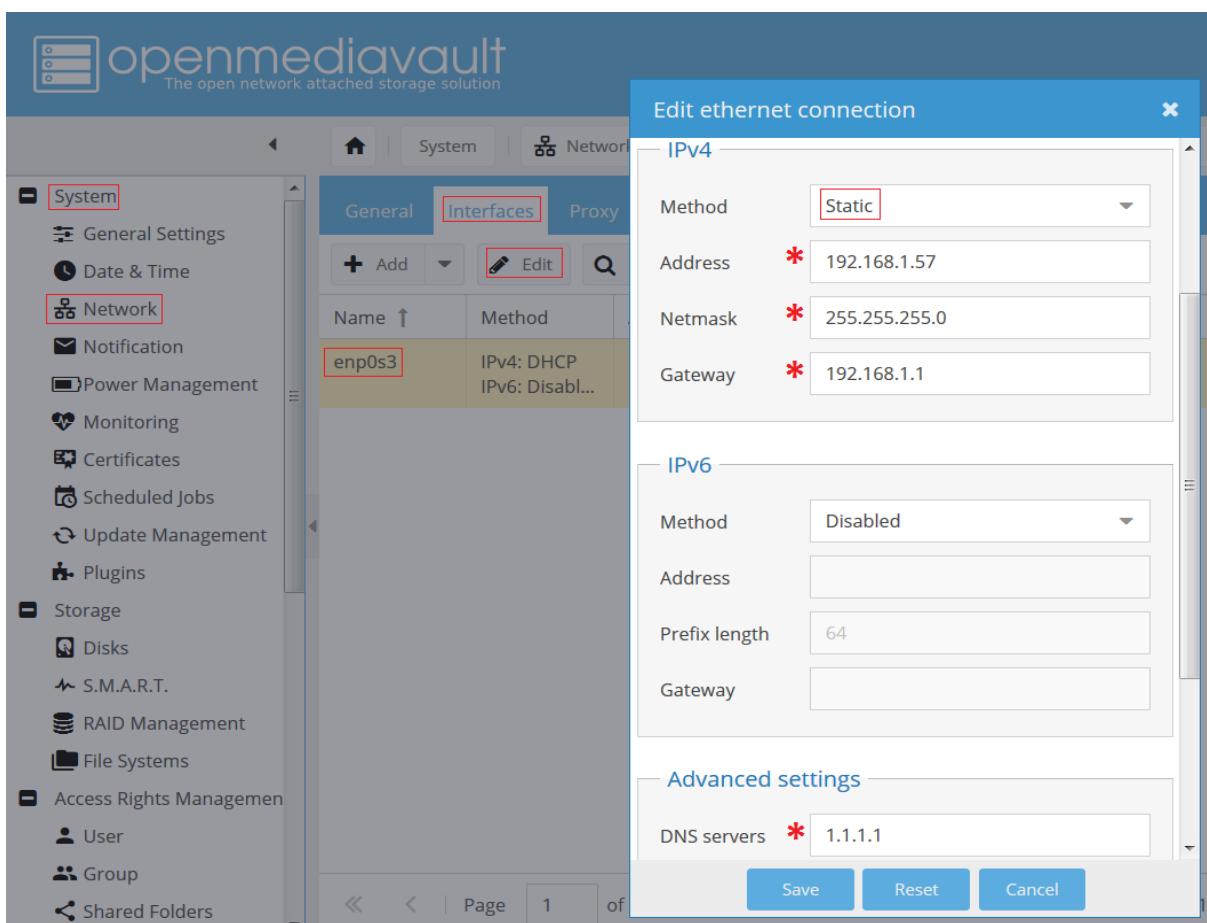
Under, System, Network, Interfaces tab:

Highlight / click on the **interface** found under the **Name** column, and click the **Edit** button.

(**As of the release of **Debian 9/OMV4**, the interface name may not be the traditional **eth0**. A variety of names may be found, such as **eno1** or others. Use the first interface line/name found.**)

- It is recommended that users assign a **static IP address** to the new OMV server that is outside the range of the network's DHCP server.
- It is also recommended that users consider using a public DNS address.
A list of public DNS servers is available → [here](#). Use a server that supports **DNSSEC**, for better security, and **Anycast**, for low latency end point servers that are closer to user locations.
- The Netmask will be as shown, in most cases, and the Gateway address will be the address of the user's router.

Note When saving a new static IP address, the user will be “**going out on a limb and cutting it off**”. Since the address provided by the network DHCP server is different from the static IP address chosen by the user, when the new address is changed, saved and applied, the GUI web page will stop responding. This is normal and expected. Type the new address, entered in the dialog box, into the URL line of your Web browser to reconnect.



Server Notifications

Under System, Notification, Settings:

If enabled, E-mail entries in the **Settings** Tab are required if users want to take advantage of automated server notifications and reports. Other actions and scripts, in **Scheduled Jobs** for example, can use this information to E-mail a report of task execution or status, as users may deem necessary.

To gather the required information for entry in the **Settings** Tab, users should refer to the settings for their E-mail clients. Note that most ISP's are using **SSL/TLS** secured E-mail connections.

Fill in * fields with user E-mail requirements and settings.

The screenshot shows the openmediavault web interface with the following details:

- Header:** openmediavault - The open network attached storage solution
- Top Bar:** Home, System, Notification (selected), openmediavault.local, navigation icons
- Left Sidebar:** System (selected), General Settings, Date & Time, Network, **Notification** (selected), Power Management, Monitoring, Certificates, Scheduled Jobs, Update Management, Plugins, Storage, Disks, S.M.A.R.T., RAID Management, File Systems, Access Rights Management, User, Group, Shared Folders, Services, FTP, NFS, Rsync, SMB/CIFS, SSH, Diagnostics.
- Central Content:**
 - General settings:** Enable (switch)
 - SMTP settings:**
 - SMTP server: smtp.googlemail.com (marked with a red asterisk)
 - Outgoing SMTP mail server address, e.g. smtp.mycorp.com.
 - SMTP port: 587 (marked with a red asterisk)
 - The default SMTP mail server port, e.g. 25 or 587.
 - Use SSL/TLS (switch)
 - secure connection
 - Sender email: omvuser@gmail.com (marked with a red asterisk)
 - Authentication (switch) required
 - Username: omvuser (marked with a red asterisk)
 - Password: (redacted)
 - Recipient:** Primary email: omvuser@gmail.com (marked with a red asterisk)

The **Notifications** tab allows the selection of various functions for monitoring and error reporting. If using a minimalist platform, such as older hardware or SBC's, E-mail's regarding system resources, memory, etc., may become bothersome. Unchecking **Enabled** boxes under **System** would eliminate excess E-mails, while maintaining **Storage reports** on hard drive health and file system errors.

Notification	Enabled
Storage	<input checked="" type="checkbox"/>
Filesystems	<input checked="" type="checkbox"/>
S.M.A.R.T.	<input checked="" type="checkbox"/>
Software RAID	<input type="checkbox"/>
System	
CPU usage	<input type="checkbox"/>
Load average	<input type="checkbox"/>
Memory usage	<input type="checkbox"/>
Process monitoring	<input type="checkbox"/>
Software updates	<input checked="" type="checkbox"/>

Note

Using **Storage** Notifications is **highly** recommended. If SMART is **enabled**, under **Storage**, **SMART**, and short drive self-tests are enabled on spinning drives in the **Scheduled Tests** tab, the system may notify the user of hard drive errors **before** a hard drive fails completely.

For an explanation of drive self-tests and an example of how to set up a drive self-test, see the section; [Drive Self-Tests](#)

(Optional)

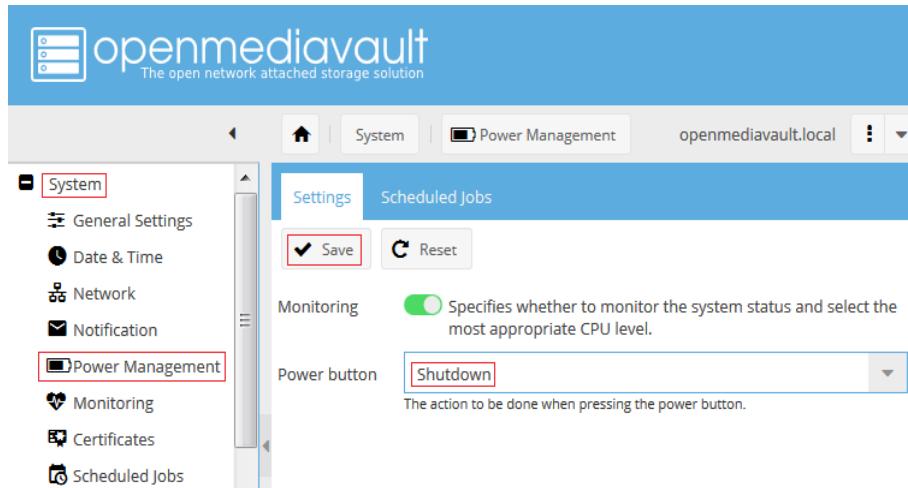
Under System, Power Management

- In the **Settings** Tab, toggle **monitoring on** (recommended)

In the **Power button** drop down, amd64 and i386 users should select the action preferred.

Since power buttons are not available on some SBC installations, SBB users may chose to select “Nothing”.

- The **Scheduled Jobs** tab allows for the automation of a various power related tasks, such as an scheduled reboot.

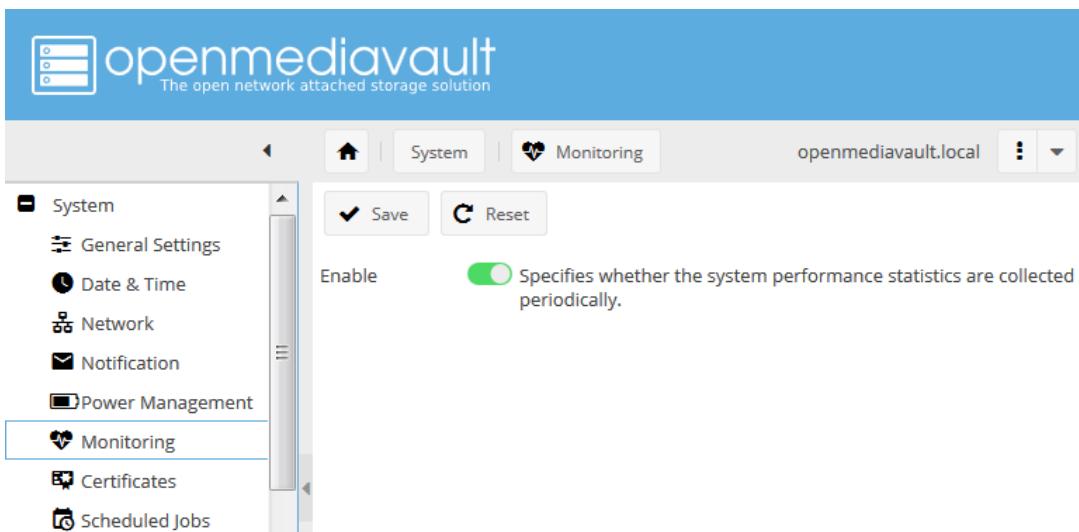


(Optional)

Under System, Monitoring:

The initial recommended setting is **Enabled**.

(Information gathered may be of use in diagnosing potential problems.)



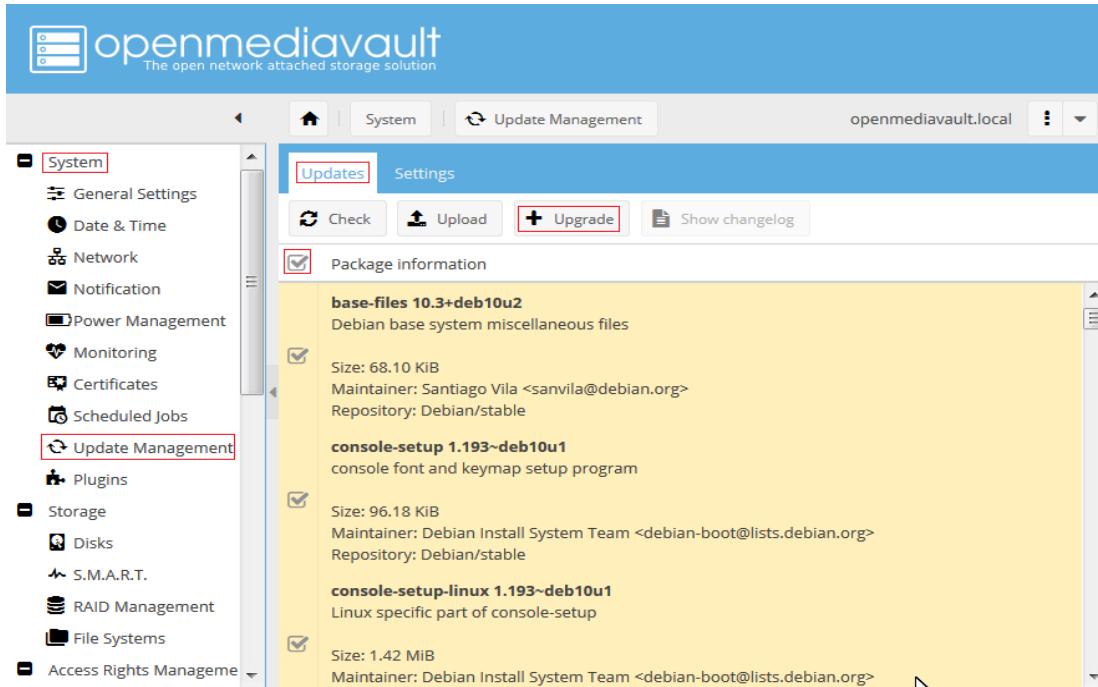
Under System, Update Management:

First, click on the **Check** button, to refresh available updates for your platform.
(This may take a few minutes)

Checking the box by **Package information** will update all packages at once. (Recommended for beginners.) Otherwise, individual packages may be selected as desired or needed.

amd64 and **i386** users may be offered a list of “firmware updates”. Select firmware updates that apply to your specific hardware. However, there's no “penalty” for selecting firmware updates that do not apply.

Beginners should leave the 2nd Tab, **Settings**, with default settings.



OMV-Extras

((The following does not apply to **SBC** or **i386** users. When using the scripted install, OMV-Extras is installed with OMV by default.))

amd64 users will have a basic set of plugin's appropriate for a basic NAS / File Server. To enable the full range of plugin's available on OMV, the installation of OMV-Extras is required. For a preview of what is available visit <http://omv-extras.org> and select the version of OMV that's being installed.

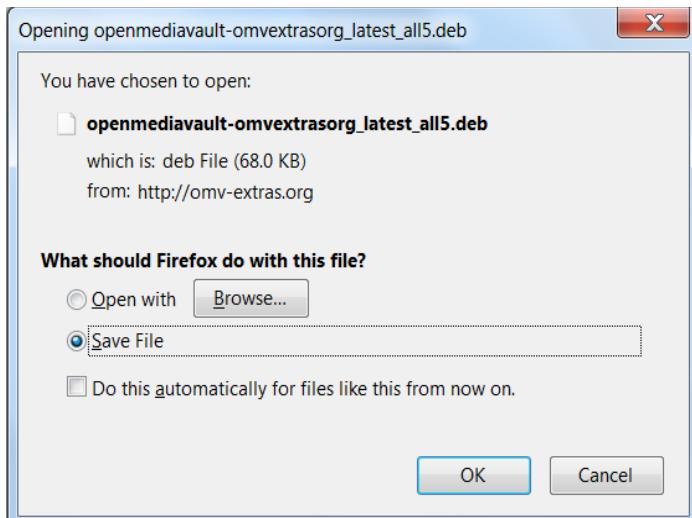
** For **amd64** users who installed OMV on **SD-cards or USB thumb-drives**; installing OMV-Extras is a prerequisite for installing the **flash-memory plugin**. The flash-memory plugin is **required** for flash media boot drives.**

(Continued)

Installing OMV-Extras

To enable OMV-Extras, a file is downloaded that will be used in the server console. Select the following link and download the associated file for OMV5.

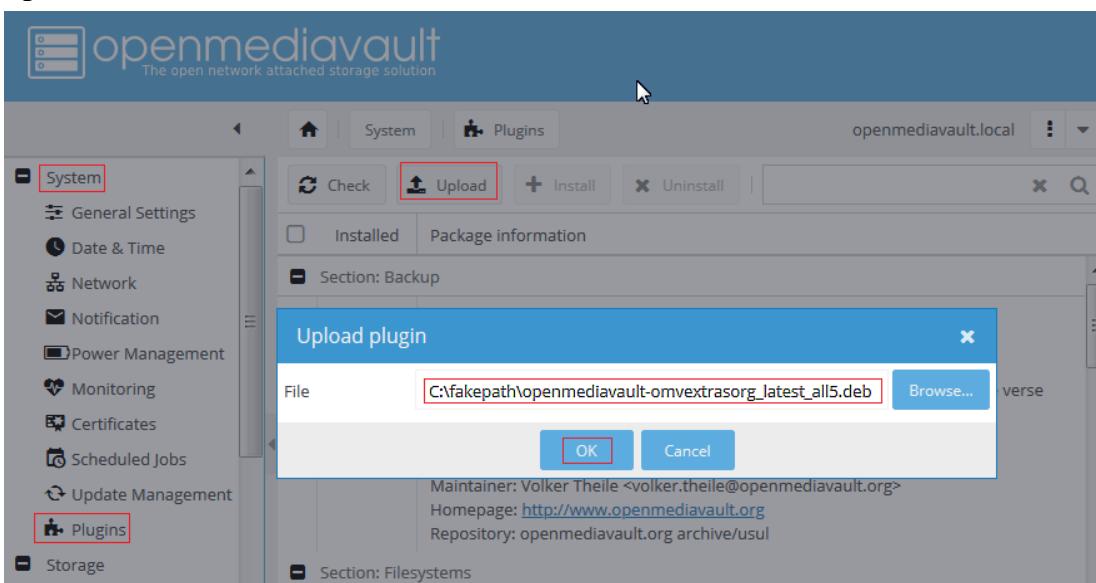
omv-extras.org/openmediavault-omvextrasorg_latest_all5.deb



Save the file.

Under System, Plugins:

Click on the **Upload** button. **Browse** to the file downloaded, above. Select it and click **OK**.



A dialog window will popup that says, “Checking for Plugins”. (OMV-Extras is being added to the default plugin list.)

In the same window (**System, Plugins**) scroll to the bottom.
Select **openmediavault-omvextrasorg** and click the **Install** button.

The screenshot shows the OpenMediaVault control panel. The left sidebar has 'System' selected. In the main area, there's a table with two columns: 'Installed' and 'Package information'. One row is highlighted with a yellow background, corresponding to the package 'openmediavault-omvextrasorg 5.1.11'. The 'Install' button at the top right of the main area is also highlighted with a red box.

(Optional, but recommended)

Under System, OMV-Extras:

In the **Settings** Tab, highlight **OMV-Extras.org Testing** and click **Edit**. **Enable** and **Save**.

The screenshot shows the 'OMV-Extras' settings page. The left sidebar has 'OMV-Extras' selected. The main area has the 'Settings' tab active. Under 'General settings', the 'Testing repo' and 'Extras repo' checkboxes are checked (green). The 'Backports' dropdown is set to 'enabled'. A red box highlights the 'Save' button at the top left of the settings area.

To insure that all plugins are available, go back to **System, Plugins**, and click the **Check** button. This will refresh the page and fully populate it with plugins that may be missing.

A Basic Data Drive

General

OMV is capable of setting up basic Linux file systems in the GUI, up to, and including, modern “Copy on Write” file systems such as ZFS which combine check summed files, RAID functions, and Logical Volume Management into a single package. However, advanced file systems add complexity which can make administration of a NAS server more challenging for a beginner.

Until some experience is gained, it is recommended that Linux/NAS beginners use single disks with a native Linux file system. In the processes described in the following, EXT4 will be used with a single data drive.

Some Windows users will want to use USB attached hard drives that are formatted NTFS by Windows. While this is possible, there are technical limitations to consider that are beyond the scope of this guide.

A far easier and better approach would be to format all server connected drives, using openmediavault's GUI, and create a Samba share (SMB/CIF) for Windows clients, as described in [Setting up a Shared Folder](#) and [Creating a SMB/CIF “Samba” share](#). A Samba (SMB/CIF) network share understands the Windows file format and can be configured to accommodate DOS and extended file attributes. Samba serves as a transparent “translator” for Windows data storage.

RAID+USB = Potential Problems

Setting up RAID of any type using “USB to drive” connections is discouraged. RAID over USB has known problems. The USB interface (there are several flavors) may filter some the characteristics of hard drives, fail to pass SMART stat's and ATA drive commands, delay the assembly of a RAID array, etc. While USB may work in some RAID cases, it's not as reliable as using a standard hard drive interface. If RAID of any type is considered to be a requirement, drives should be connected with SATA or SAS ports.

If users choose to use RAID over USB connections, it is done at their own risk with the potential for the total loss of stored data. RAID issues involving SBC's, USB connected hard drives, or USB RAID enclosures are not supported on the forum.

RAID is often confused with **backup** which is far more important. For more information, see the explanation of backup, in [Backups and Backup-strategy](#).

Data Storage - Size matters

In general terms, beginners should do a rough calculation of their storage requirement. When selecting a data drive, the initial fill rate should be between 25 and 50%. As an example, if the calculated data to be stored on the NAS is 1TB, the selected drive should be between 2 and 4TB. With 50%+ drive free space (2 to 3TB) additional data can be accommodated, without the need to expand in the immediate future. When the fill percentage reaches 75%, it's time to plan for more storage.

Data Drive Set Up

Note for Beginners and SBC users

OMV is designed to separate the Operating System (the boot drive) from data storage. This is “best practice” when setting up a server. Accordingly, OMV reserves the drive it is installed on exclusively for the OS. By default, the GUI will not allow the boot drive to be selected when creating a data share. A second hard drive or SSD is required for data storage.

With a data drive installed or connected.

Under Storage, Disks:

Highlight the data disk and click on Wipe. When prompted, click **Quick and Yes**.

Wiping a disk with GPT formatting present may result in an error. Simply re-run the wipe operation a 2nd time.

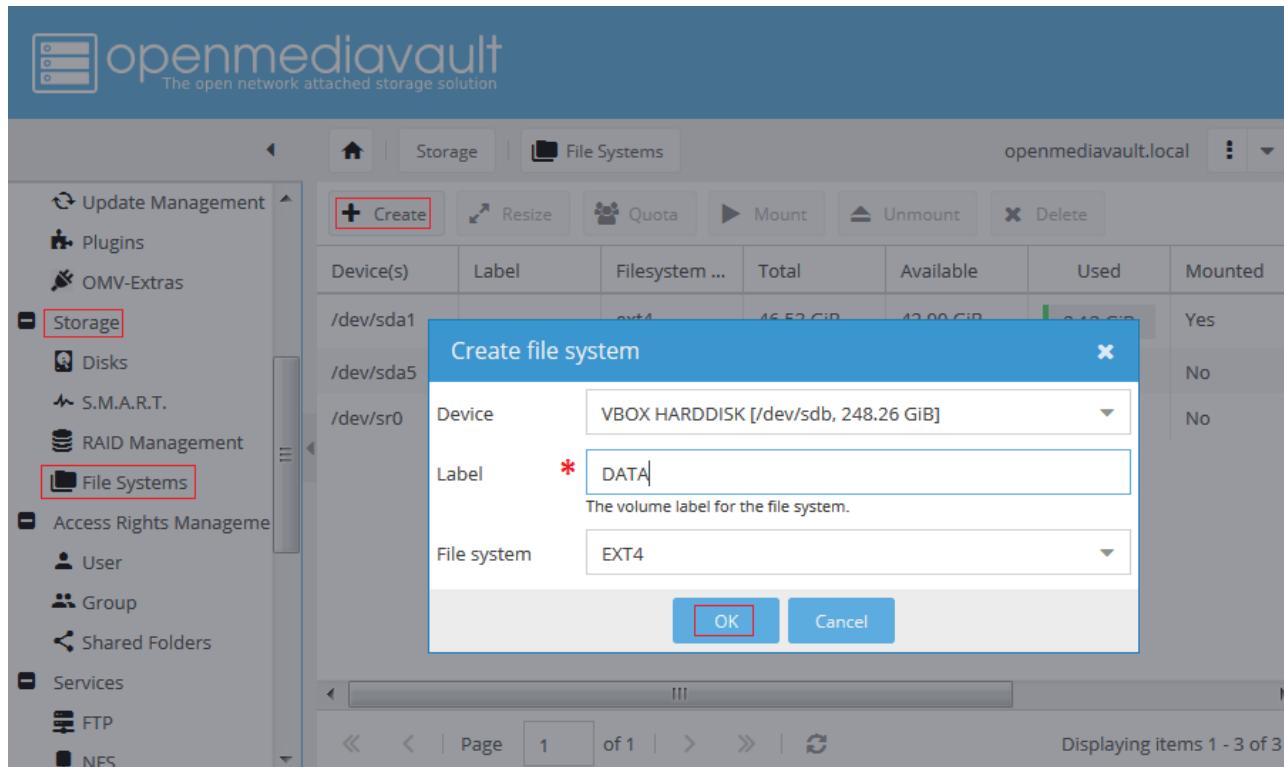
Device	Model	Serial Num...	Vendor	Capacity
/dev/sda	VBOX HARDDI...	VB4c04b07...	n/a	50.52 GiB
/dev/sdb	VBOX HARDDI...	VBea74a38...	n/a	248.27 GiB
/dev/sr0	CD-ROM	VB2-01700...	n/a	7.70 GiB

((The first device in the above list **/dev/sda** is the boot drive.))

Under Storage, File Systems:

Click on **Create**. In the Popup Window use the **drop down** to select the drive previously wiped. Provide a **Label** of your choice, accept the default File System **EXT4** and click on **OK**. Confirm the “format device” warning.

Allow a few minutes for the format to complete. When the message “**File system creation has completed successfully**” is displayed, click on **Close**.



In the same Window:

Click on the newly created file system line, and click on the **Mount** button.

When the yellow confirmation banner appears, click on **Apply**.

The Data Drive is now prepared for a shared folder.

Creating A Network Share

Network shares are the primary reason for setting up and running a NAS. While easy access to data provides convenience to users, storing and backing up data in a centralized location makes it much more manageable.

Setting up a Shared Folder

The majority of the files and folders in a new OMV installation are controlled by the root user. One of the purposes of a **Shared Folder** is to set permissions that will allow regular users access to folders and files used for data storage. A shared folder could also be called a “base share”. The shared folder created in the following will be the foundation for creating a “**Network Share**”, covered later.

Under **Access Rights Management**, click on **Shared Folders**, then click on the **Add** button.

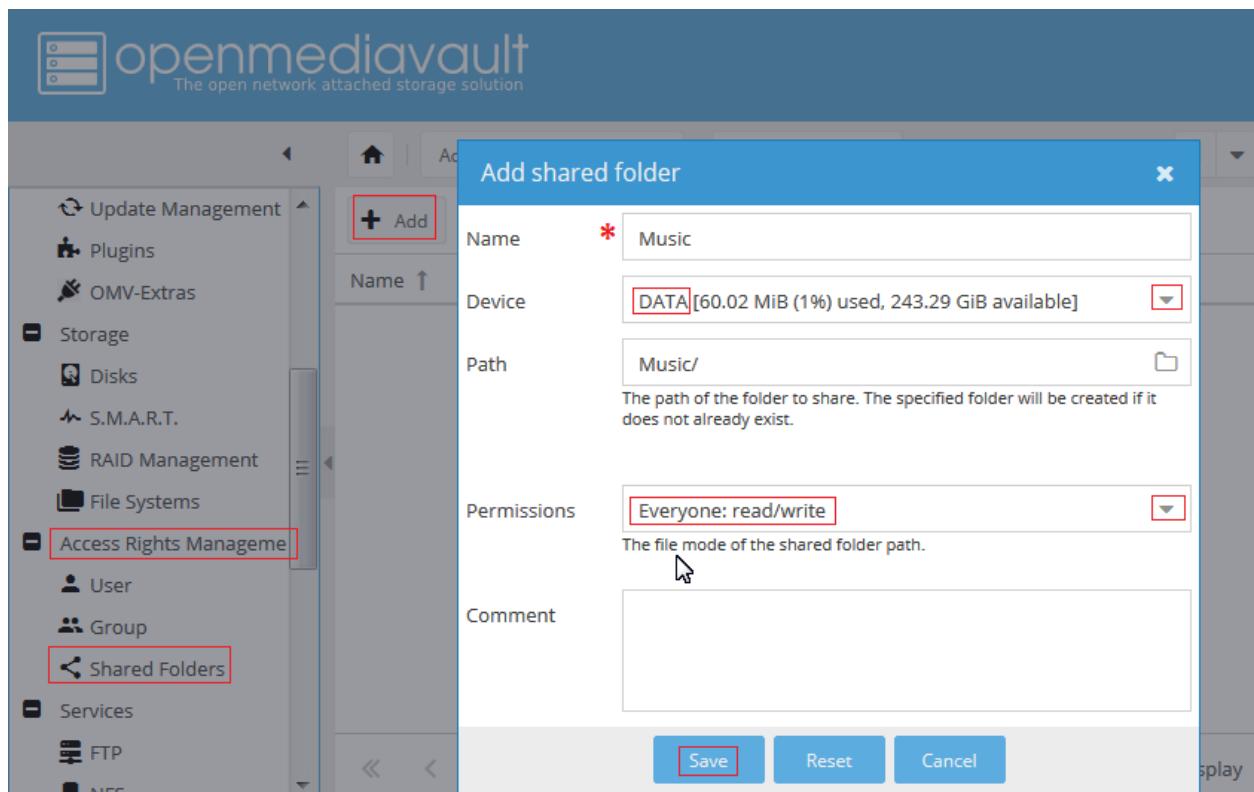
In the following example, next to;

Name: Add your new shared folder's **name**.

Device: Click on the drop down and select the drive that was previously added and formatted.

Path: Accept the default

Permissions: Click on the drop down and select **Everyone: read/write**



Click the **Save** button.

The End Result:

The screenshot shows the OpenMediaVault web interface. The left sidebar has a tree view with 'RAID Management', 'File Systems', 'Access Rights Management' (highlighted with a red box), 'User', 'Group', 'Shared Folders' (highlighted with a red box), 'Services', and 'FTP'. The main content area is titled 'Access Rights Management' with tabs for 'Shared Folders' and 'openmediavault.local'. It shows a table with one item:

Name	Device	Relative Pa...	Comment	Referenced
Music	DATA	Music/		No

At the bottom, it says 'Displaying items 1 - 1 of 1'.

Creating a SMB/CIF “Samba” Network Share

In order to make your shared folder viewable in **Windows Explorer**, under **Network**, it's necessary to make it a Samba share using the SMB (Server Messaging Block) protocol. OMV makes setting up a Samba network share an easy task.

Under **Services**, click on **SMB/CIF**. In the **Settings** tab toggle **Enable** to **On** (green) and set your workgroup name. (In Windows, the default workgroup name is, WORKGROUP.) Leave the remainder of settings in this tab at their defaults, and click on **Save**. (Confirm with “**Apply**” when the yellow banner pops up.)

The screenshot shows the OpenMediaVault web interface. The left sidebar has a tree view with 'Shared Folders', 'Services' (highlighted with a red box), 'FTP', 'NFS', 'Rsync', 'SMB/CIFS' (highlighted with a red box), 'SSH', 'Diagnostics', 'Dashboard', 'System Information', 'System Logs', 'Services', 'Information', 'Donate', and 'Support'. The main content area is titled 'Services' with tabs for 'SMB/CIFS' and 'Shares'. It shows the 'Settings' tab with the following configuration:

- General settings**:
 - Enable:
 - Workgroup: WORKGROUP
 - Description: %h server
 - Time server: Allow this server to advertise itself as a time server to Windows clients
- Shares**: This tab is shown as active.

At the bottom, there are 'Save' and 'Reset' buttons.

Click on the **Shares** Tab and the **+Add** button.

In the popup dialog box, set the following:

Shared folder: Click on the drop down and select **Music** (or the name for the shared folder previously created.)

Public: Click on the drop down and select the **Guests Allowed**

Scroll down with the right scroll bar and toggle **ON** (green), **Extended attributes** and **Store DOS attributes**.
(Leave the remaining settings at defaults.)

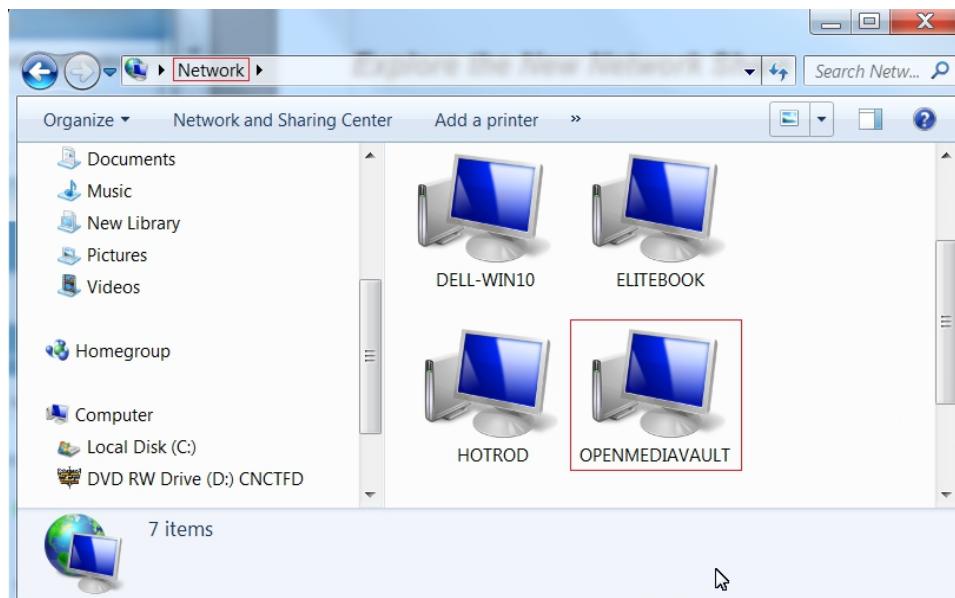
Click **Save** and confirm with “**Apply**” when the yellow banner appears. The final result should appear as follows.

The screenshot shows the openmediavault web interface. The left sidebar has a tree view with 'Shared Folders', 'Services' (selected and highlighted with a red box), 'Diagnostics', 'Dashboard', 'System Information', 'System Logs', and 'Services'. The main content area has tabs for 'Settings' and 'Shares' (also highlighted with a red box). Below the tabs are buttons for '+ Add', 'Edit', and 'Delete'. A table lists shares: 'Enabled' (green circle), 'Shared fol...', 'Comment', 'Public', 'Read only', and 'Browseable'. A new share named 'Music' is listed with 'Guest allowed' checked, 'No' under 'Read only', and 'Yes' under 'Browseable'. The bottom of the page shows pagination from 'Page 1 of 1' and a note 'Displaying items 1 - 1 of 1'.

Explore the New Network Share

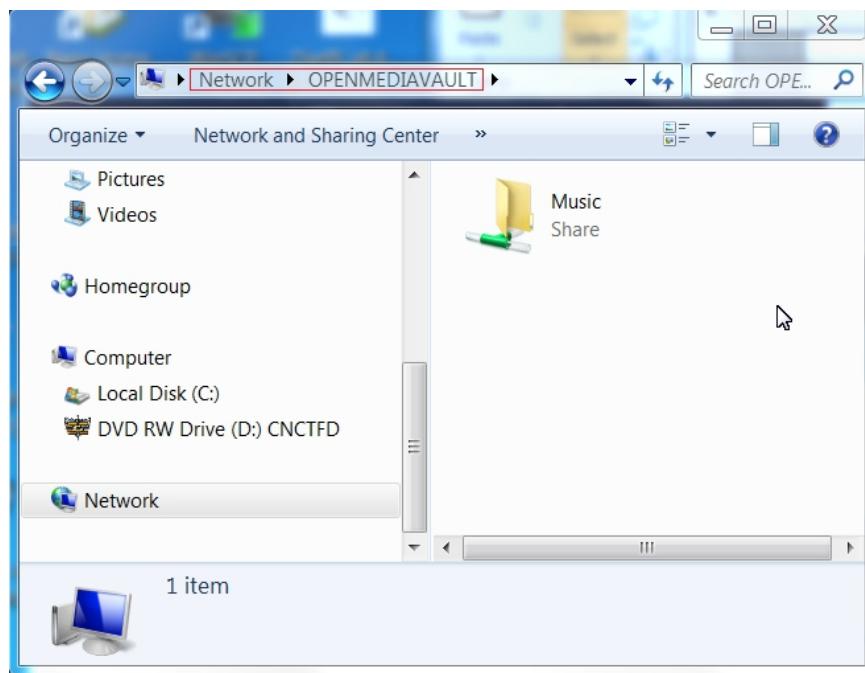
You should now have a browseable Server with a Network share named Music, so let's take a look.

Open Windows explorer, scroll down to Network and click on it. There's the new server OPENMEDIAVAULT.

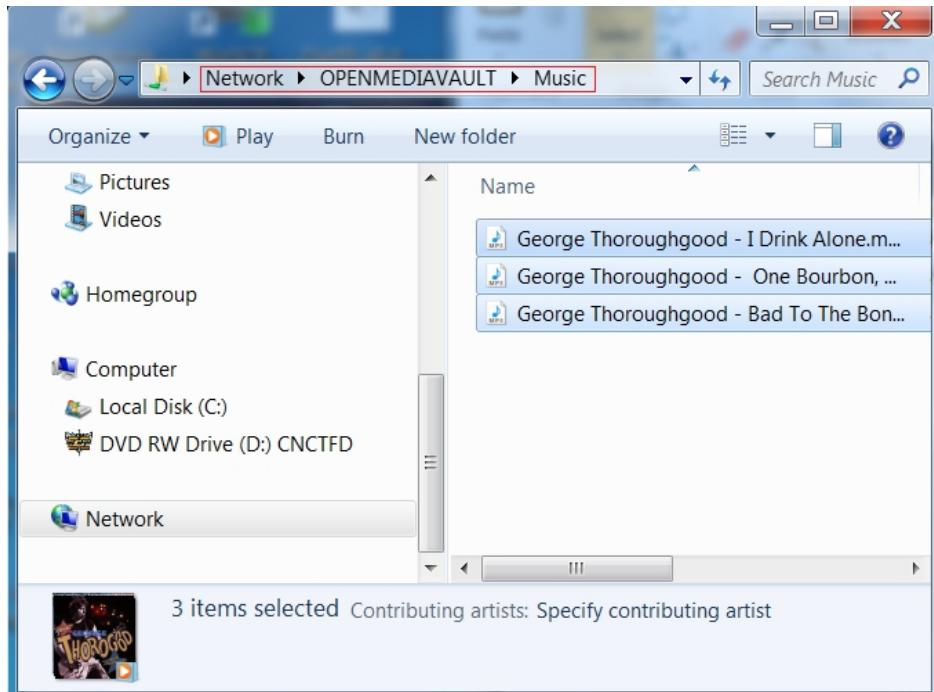


Note: A few minutes may be required for the Windows Network to “Discover” the new server. If users are using **Windows 10** PC's and the server and share does not appear as a client, see this networking [How To](#).

Now let's look at the server's new Samba share. It's there and browseable.



This share is “writable” with a standard “Copy and Paste”, from a client PC.



Congratulations! You now have a functional NAS that can be expanded to accommodate additional network shares. Simply repeat the processes in [Creating A Network Share](#) to create and make additional shares visible on your network.

The Flash Memory Plugin - amd64 users only

amd64 users who installed OMV **on flash media** will need to install the flash memory plugin.

Flash Media and Wear Leveling

While modern flash media drive is solid state, it's life is limited by the number of write cycles it can withstand before it goes "read only". When a specified number of flash memory blocks refuse to erase, the device's controller will set it "read only". At that point, the device's useful life is over.

To extend the life of flash media, most modern flash devices have **wear leveling** built into their controllers. If blocks are written, but not erased, they experience no wear. If blocks are erased, the next new write is set on adjacent blocks that have never been written before. As data is erased and written, blocks are used starting at the beginning of the device's addressable storage range and proceeding, in sequence, working toward the end. When the end of the range is reached, the process starts at the beginning and cycles through again. This wear leveling process avoids writing a single location to failure, and spreads wear evenly throughout.

With wear leveling and two drives of the same type, a drive that is twice the size will last roughly two times longer than the smaller drive. This may seem like is a strong vote for using a larger flash drive. However, when backups are considered, drives of twice the size also take twice as long to image and their image files are twice as large. (When using flash media as a boot drive, a practical trade-off should be considered in the suggested 16 to 32GB range.)

The Purpose of the Plugin

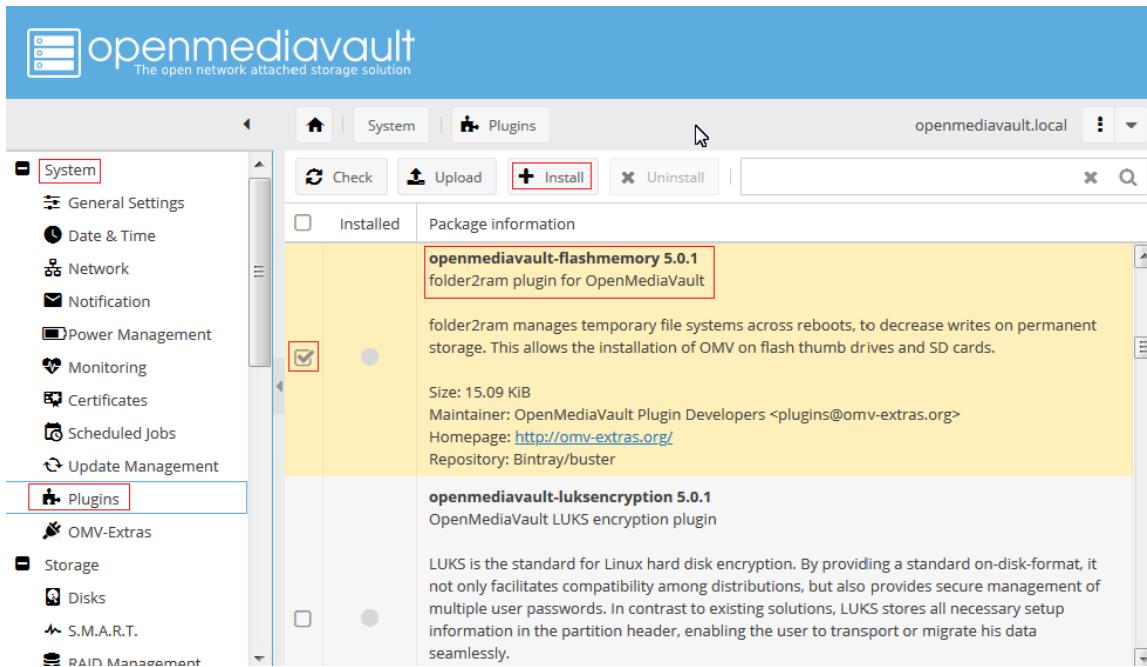
The primary purpose of the Flash Memory Plugin is to reduce the frequency of writes to flash media by consolidating very small writes into one, larger, bulk write. This reduces the number of blocks physically written to the Flash Device being used as the boot drive. The plugin can reduce the number of blocks written to the Flash drive by an order of magnitude or, potentially, 1/10th the amount that would otherwise be written. By extension, a drive of a given size might last up to 10 times longer than it would without the Flash Media plugin.

Installing the Plugin

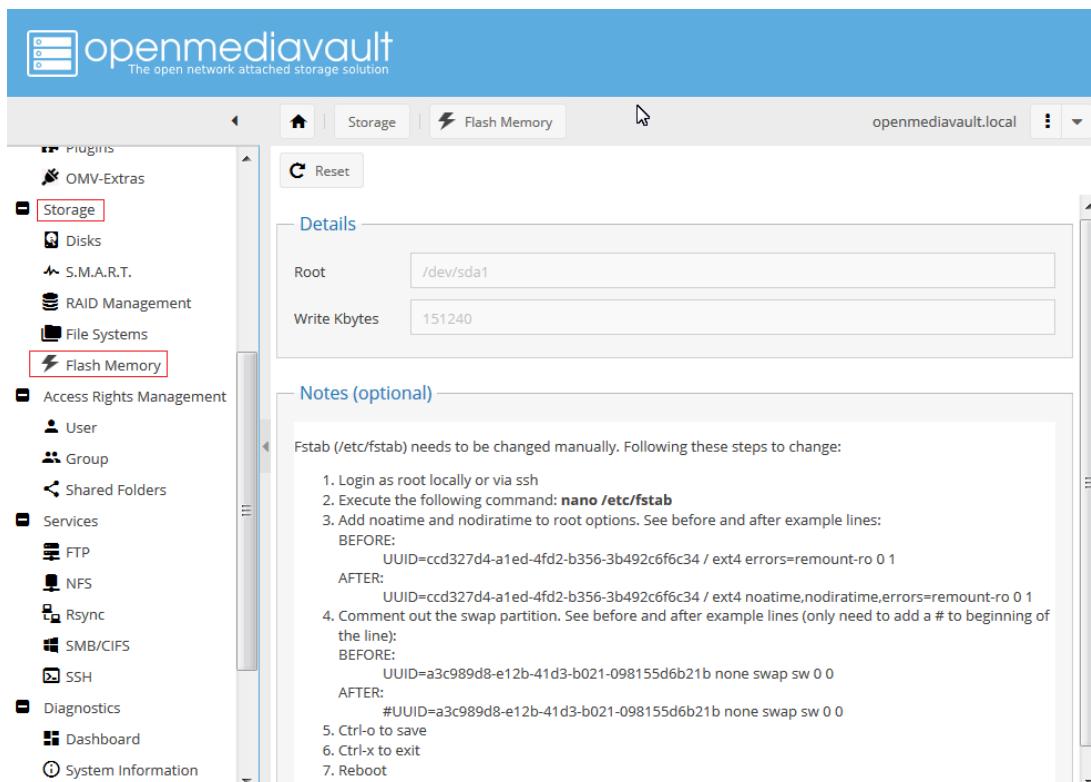
The prerequisite for installing this plugin is the installation of [OMV-Extras](#). If OMV-Extras is not installed, it is required to proceed.

Under System, Plugins, scroll down to Section: **Filesystems**.

Select **openmediavault-flashmemory** and click the **Install** button.



Under **Storage, Flash Memory**, the following screen is now available.



The plugin will work as is, but it will be more effective if the guidance under **Notes (optional)** is followed. While this guidance shows steps for nano, following are options, with guidance, that beginners may find easier to implement.

Flash Memory Plugin – Editing /etc/fstab

There are two options for editing /etc/fstab

- (Option1) A Linux command line text editor
- (Option 2) WinSCP and Windows Notepad can be used if [WinSCP](#) is installed

Option 1: Editing /etc/fstab with nano

The first example will use **nano**. This option requires the installation of PuTTY which is detailed [here](#).

Using PuTTY, SSH into the server. Log in as root and enter the root password.

On the command line, type the following and hit enter.

nano /etc/fstab

In **nano, the mouse does not move the cursor. The cursor is moved by the keyboard's arrow keys to the insertion point. Type to insert text and use the backspace key to erase text if need. If a mistake is made, exit without saving and go back in again.**

From the plugin's Notes, Step 3:

First: We're going to add two statements ,**noatime,nodiratime** to the **/** partition (the root partition) exactly as shown. The text addition is highlighted in green.

Second: Note the partition with **swap** in it. Per Step 4, we're going to comment this line out using a **#** at the beginning of the line. The **#** is an addition, and is highlighted in green.

```
192.168.1.88 - PuTTY
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>
# / was on /dev/sdb1 during installation
UUID=5111ffd4-47bd-4586-9077-edd65d21dae7 /           ext4 noatime,nodiratime,errors=remount-ro 0      1
# swap was on /dev/sdb5 during installation
#UUID=c91cfa5d-f4ca-45e8-92f5-6357840f9c54 none
/dev/sr0      /media/cdrom0  udf,iso9660 user,noauto   swap      sw      0      0
tmpfs        /tmp        tmpfs  defaults            0      0
# >>> [openmediavault]
/dev/disk/by-label/data /srv/dev-disk-by-label-data ext4 defaults,nofail,user_xattr,noexec,usrjquota=aquota.user,$
# <<< [openmediavault]

# Use a # to comment out
# this partition
```

Use **Ctrl+o** to save, then **Ctrl+x** to exit

Reboot the server.

On the command line, the following command can be used: **reboot**

Done.

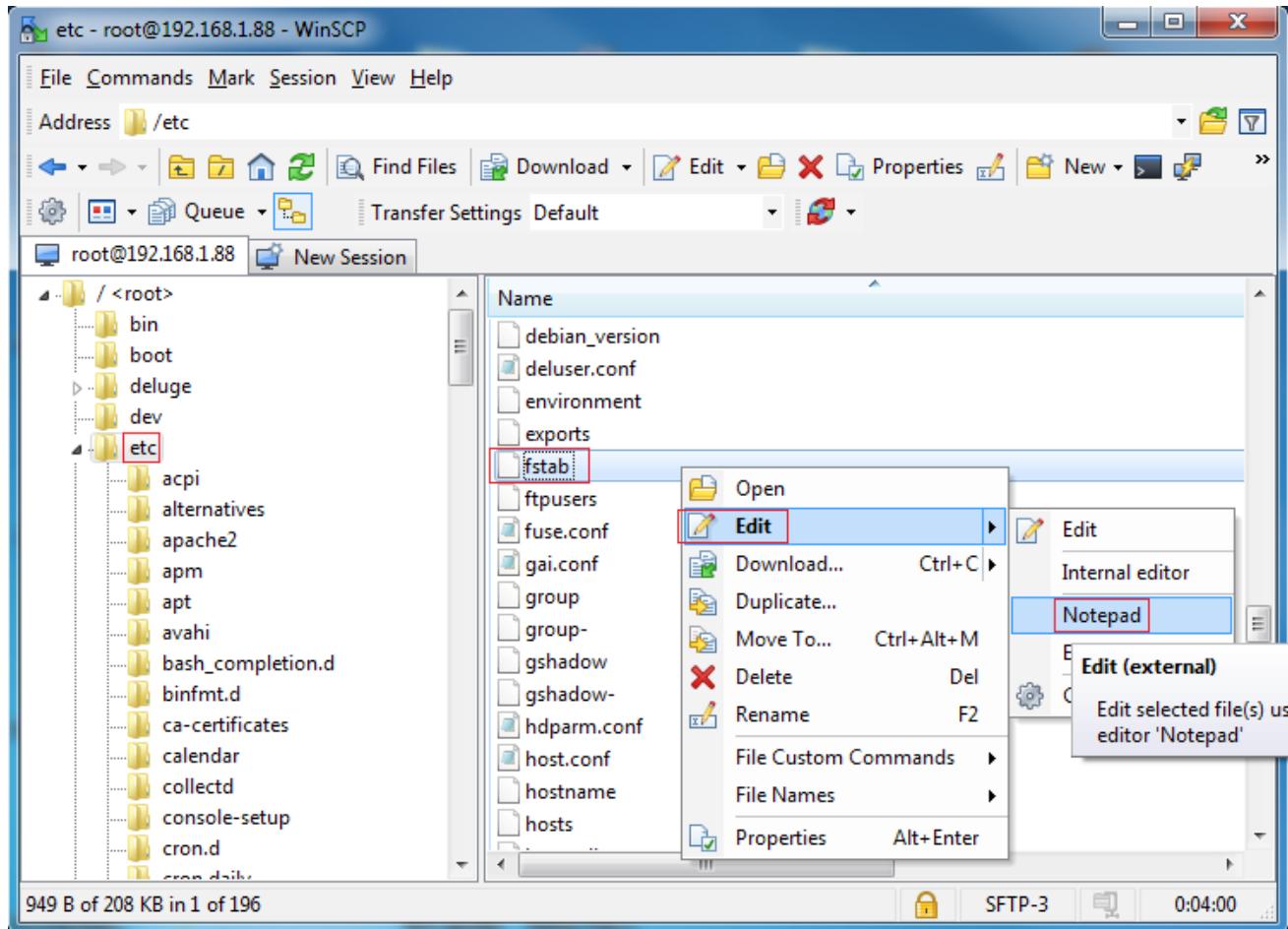
***Note*:** In the latest version of the Flash Memory plugin, there are extended instructions that go beyond editing **etc/fstab**. Those instructions apply to mdadm RAID and are NOT for beginners.

Option 2: Editing /etc/fstab with WinSCP and Notepad

This option requires the installation of WinSCP.

Users who are not comfortable with editing fstab using nano can use WinSCP and Windows Notepad to make the needed changes. If WinSCP is not installed, this doc-link to → [\(WinSCP\)](#) will describe the process for installing WinSCP and logging into the OMV server for the first time.

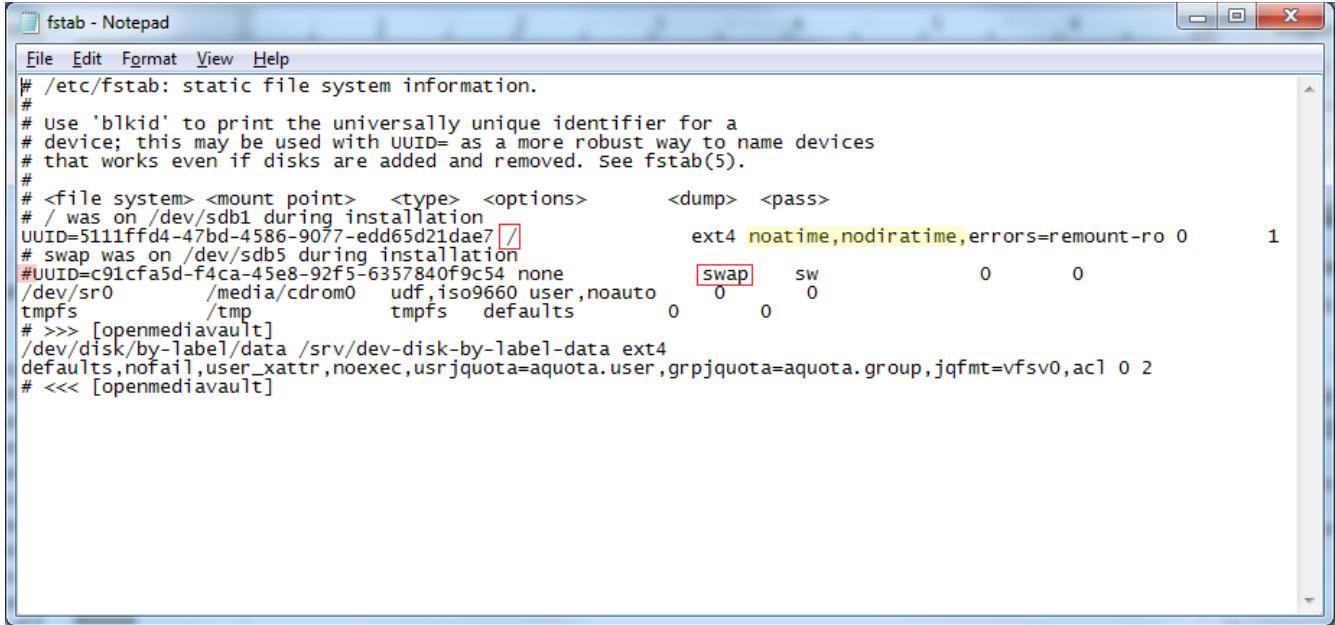
When logged in, click on **/etc** in the left pane. In the right pane, “right” mouse click on **fstab**, select **Edit** and **Notepad**.



Notepad will open the fstab file.

First: Find the root partition - it's the line with `/` and insert **noatime,nodiratime**, after `ext4` and one space as shown below.

Second: Find the swap partition – it's the line with `swap` and insert a `#` at the beginning of the line as shown.



```
fstab - Notepad
File Edit Format View Help
# /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>
# / was on /dev/sdb1 during installation
UUID=5111ffd4-47bd-4586-9077-edd65d21dae7 / ext4 noatime,nodiratime,errors=remount-ro 1
# swap was on /dev/sdb5 during installation
#UUID=c91cfa5d-f4ca-45e8-92f5-6357840f9c54 none swap sw 0 0
/dev/sr0 /media/cdrom0 udf.iso9660 user,noauto 0 0
tmpfs /tmp tmpfs defaults 0 0
# >>> [openmediavault]
/dev/disk/by-label/data /srv/dev-disk-by-label-data ext4
defaults,nofail,user_xattr,noexec,usrjquota=aquota.user,grpjquota=aquota.group,jqfmt=vfsv0,acl 0 2
# <<< [openmediavault]
```

Do **File, Save**. Close Notepad.

Exit WinSCP.

Reboot the server, from the GUI.

Done

Hard Drive Health and SMART

Hard drives are the hardware component most likely to fail, in a server, over time. With continuous use, spinning hard drives last roughly 4 to 7 years, but there are notable exceptions where hard drive life may be significantly shorter or longer.

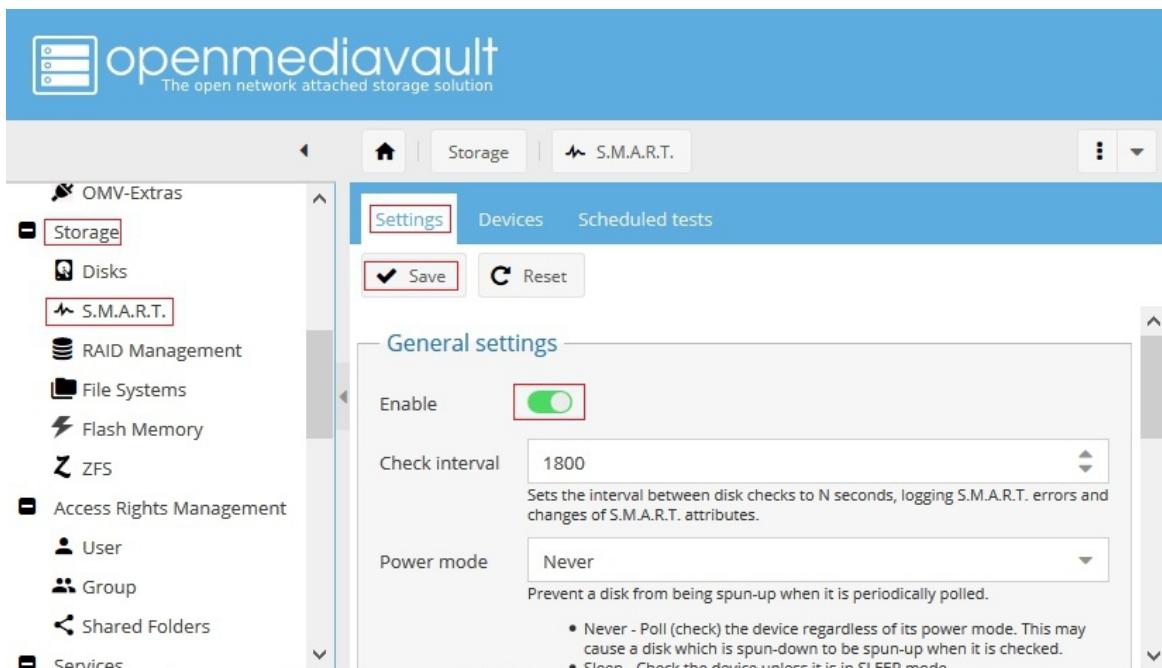
Given that storage failure is inevitable, the best overall strategy to avoid losing data is 100% backup of the entire data store. Further, it is equally important to monitor the condition of a server's storage media to prevent silent data corruption and, unknowingly, replicating corrupted data to a backup device.

Another characteristic of hard drives is that they rarely fail all at once. While it is possible for a drive to fail abruptly, and without notice, it is a fairly rare occurrence. Typically hard drives begin to fail slowly, gradually accelerating toward a point in time where they become unreadable. This unfortunate circumstance, where data lost to a corrupted or completely unreadable hard drive, might be avoidable with automated testing and monitoring.

To protect the server's data, enabling SMART is strongly recommended.

Enable SMART

In Storage, S.M.A.R.T., in the **Settings** tab, enable SMART.



Drive Self-Tests

Drive self-tests are a tool for early discovery of hard drive issues. Periodic testing of hard drives will uncover the majority of hard drive issues as they begin to develop and, hopefully, before a drive fails completely. The following illustration shows the setup for automated short tests, for an individual hard drive. (Each hard drive will require its own scheduled tests.) In this example, a short self-test is run every Saturday at 1:00AM)

The screenshot shows the openmediavault web interface with the 'Storage' section selected in the sidebar. The main page displays three scheduled tests for different drives. A modal dialog is open in the center, titled 'Add scheduled test'. The dialog fields are as follows:

Field	Value
Enable	<input checked="" type="checkbox"/>
Device	* TOSHIBA HDWQ140 [/dev/sda, 3.63] S.M.A.R.T. monitoring must be activated for the selected device.
Type	* Short self-test
Hour	1
Day of month	*
Month	*
Day of week	Saturday
Comment	(empty)

At the bottom of the dialog are 'Save', 'Reset', and 'Cancel' buttons. The main table has columns: Enabled, Device, Type, Hour, Day of month, Month, Day of week, and Comment.

A **Short** self-test runs for a few minutes and is an “on-line” procedure, meaning that drives are still accessible during the test. A **Long** self-test is an “off-line” test, meaning drives are not accessible during the test. While a Short test does a quick check of a drive's components, a Long test does everything in a Short test then checks the media (platters) for bad sectors and other imperfections. Repairs are made, if possible, such as reallocating bad sectors.

The down side of a Long test is that it is L-O-N-G, where drive size and spindle speed are factors in the length of the test. Long tests are off-line and, since entire platter surfaces are scanned, it may push a drive that's beginning to fail closer to an actual failure as the test detects and attempts to repair problems.

There are many opinions on which tests to use and the frequency of testing.

- Some data center admins schedule short self-tests once a week and a long test once every 30 to 60 days.
(Remember, when scheduling a Long self-test, schedule it for after-hours periods where the server is not in use.)
- Some home NAS admin's schedule a short test, once a week, skipping Long tests altogether.

There's no exact right or wrong but the self-test tool should be used as an aid to monitor drive health, in avoiding data corruption and loss.

SMART Attributes

There are numerous SMART attributes to consider. Unfortunately, only a handful are standardized among the various drive OEM's and many have little to no practical meaning to the end user. Given the variation between drive OEM's, the interpretation of a specific SMART stat may require going to the drive OEM's support site.

A good explanation of individual SMART attributes, and a brief explanation for each, can be found ➔ [here](#).

Where spinning drives are concerned, thanks to the ongoing [BackBlaze drive study](#), a correlation has been made between impending drive failure and specific SMART stat's.

SMART stats loosely related to drive failure:

SMART 5 – Reallocated_Sector_Count.

SMART 187 – Reported_Uncorrectable_Errors.

SMART 188 – Command_Timeout.

SMART 197 – Current_Pending_Sector_Count.

SMART 198 – Offline_Uncorrectable

Any one count of the above stats may be meaningless, but it should be noted and closely monitored. If any of the above begin to increment upward, as of the 3rd or 4th count, home or small business admins might want to consider ordering a replacement drive.

SMART 199 - UltraDMA CRC errors

While not directly linked to drive failure, it's worth noting that counts on SMART stat 199 are usually hardware or cable related. This may be due to loose or a bad SATA / SAS cable, a connectivity problem, or an interface issue of some kind with the motherboard or the drive interface board.

Drive Failure - The Bottom Line

When using scheduled drive self-tests in conjunction with SMART E-mail notifications ([see Server Notifications](#)), server admin's and home users will be afforded better protection against the data corruption and data loss due to a failing hard drive.

Final Installation Notes:

1. Permissions for the shared folder created in this guide, and the SMB network share layered on top of it, are completely open. While these permission settings are OK for home environments, the server should not be exposed to the Internet by port forwarding. (Ports 80 or 443, for example.)
As users gain knowledge and experience, they should consider tightening up permissions on the underlying Shared Folders and SMB/CIFS network shares.
2. ***Important*** Put your new server on a good surge suppression power strip, at the absolute minimum. An **UPS** system is **preferred** and is best practice. In consumer electronics, the majority of failures are related to power supplies and adverse conditions created by line power. The prime causes of power issues and failures are short duration surges, high voltage spikes, brown-outs, and sustained over-volt or under-volt conditions. A good UPS system is designed to counteract these problems. Further, the file system on the boot drive is at risk of corruption from sudden (dirty) shutdowns due to power loss. An UPS minimizes these risks.

(Continued)

Utilities to Help With OMV Management

Being able to work from the command line would be very useful to users, who may need to gather detailed information on the OS and platform hardware, for troubleshooting and for an occasional edit to a configuration file. Much can be learned with the following utilities that allow users to look at OMV “under the hood”.

WinSCP

WinSCP allows users, beginners and experienced alike, to visualize the Linux file structure in a manner similar to Windows Explorer. WinSCP installs on a Window Client and connects to Linux servers, allowing users to work with their server remotely.

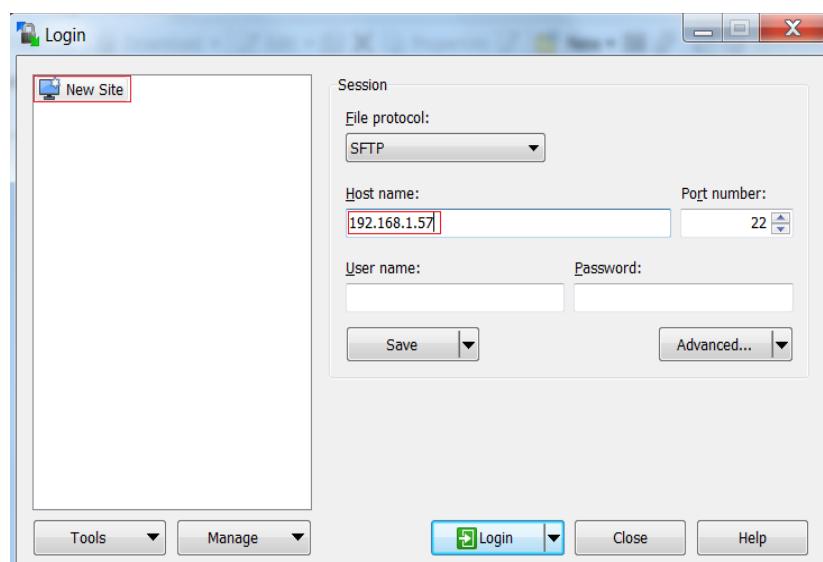
One of the more useful features of WinSCP is that it gives users the ability to edit Linux configuration files with a familiar editor like Notepad. For experienced Linux Desktop users who would like to use WinSCP, it will run from WINE (in Linux Mint, Ubuntu and others).

WinSCP can be downloaded here. -> [WinSCP](#)

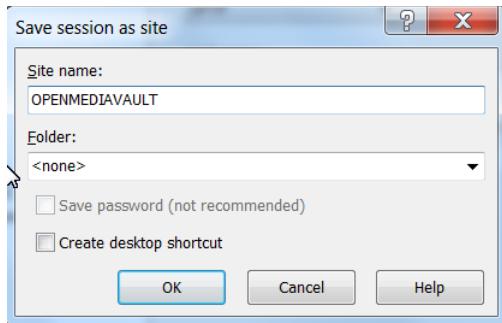
Installing WinSCP

During the installation process, if prompted, select the **Explorer Interface**. This display shows the remote file system only. If the Explorer Interface is not offered it can be selected after the installation, under **View, Preferences, Environment, Interface**.

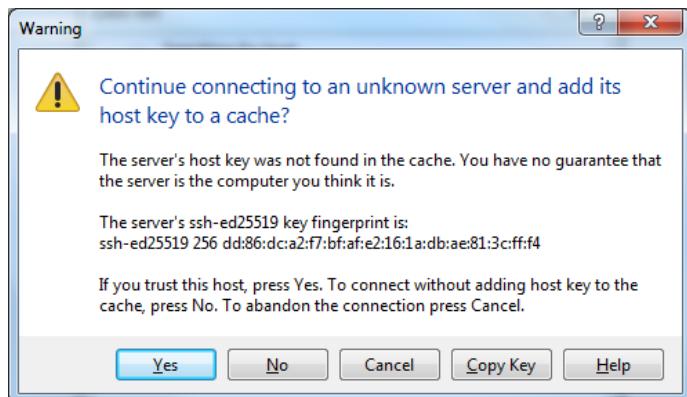
On the first run, the login screen is presented. Click on **New Site** and type in the **IP address** of the new server. Click on **Save**.



In Site name: The server's IP address is displayed. Optionally, the site name can be changed. If using WinSCP for a single server, a desktop short cut may be useful. Click on **OK**.



The **login screen** will come back. Double click on the new site name. The following is normal for the first SSH connection to any client or server. Click **Yes**.



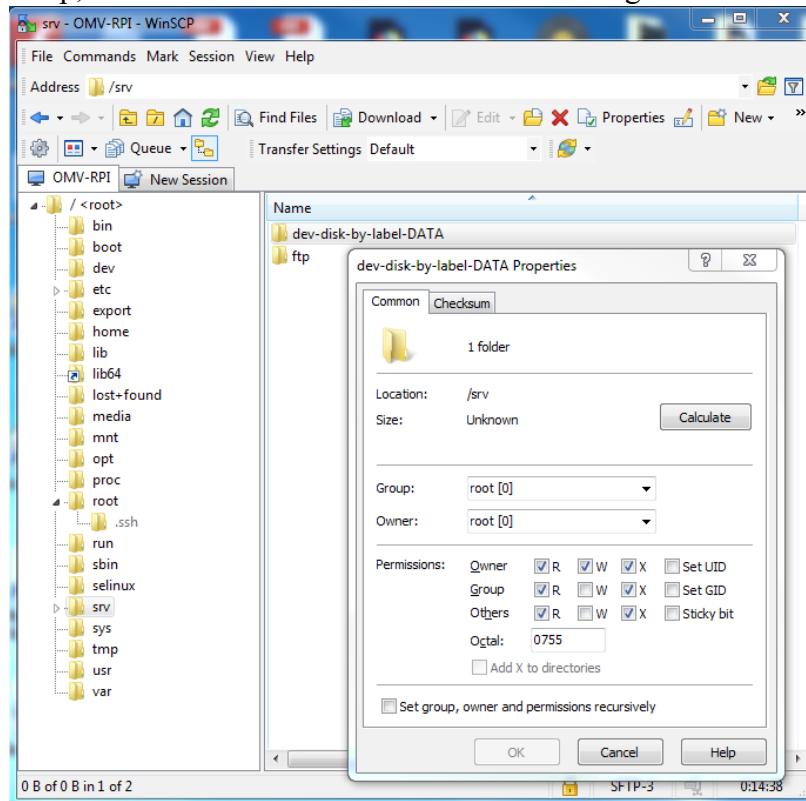
The first prompt is for the username. Enter **root**

The second prompt is for the root password. Enter the root **password**.

** R-PI users would enter the user **pi** and the pi password or a previously added user with admin privileges. Due to the restrictions of a non-root "sudo" environment, WinSCP will be restricted from root functions. This restriction can be mitigated, but it's beyond the scope of this guide. The following link may of assistance:
[Connect as root \(sudo\) using WINSCP **](#)

(Continued)

WinSCP opens with a two pane window. Selections are made in the left pane; operations are done on the right. The folder **srv** was selected on the left. **dev-disk-by-label-DATA** was highlighted on the right. A right click of the mouse brings up an operations menu. **Properties** was selected. In this particular popup, permissions could be changed. (Without backup, this is NOT a recommended action for beginners. **Backup** is covered later.)



In a similar manner, a configuration file can be highlighted in the right pane. A right click of the mouse brings up the menu, select **EDIT** and Windows notepad, or the internal editor can be used for editing configuration files. Beginners will find either choice to be easier than using **nano** or **vi** on the Linux command line.

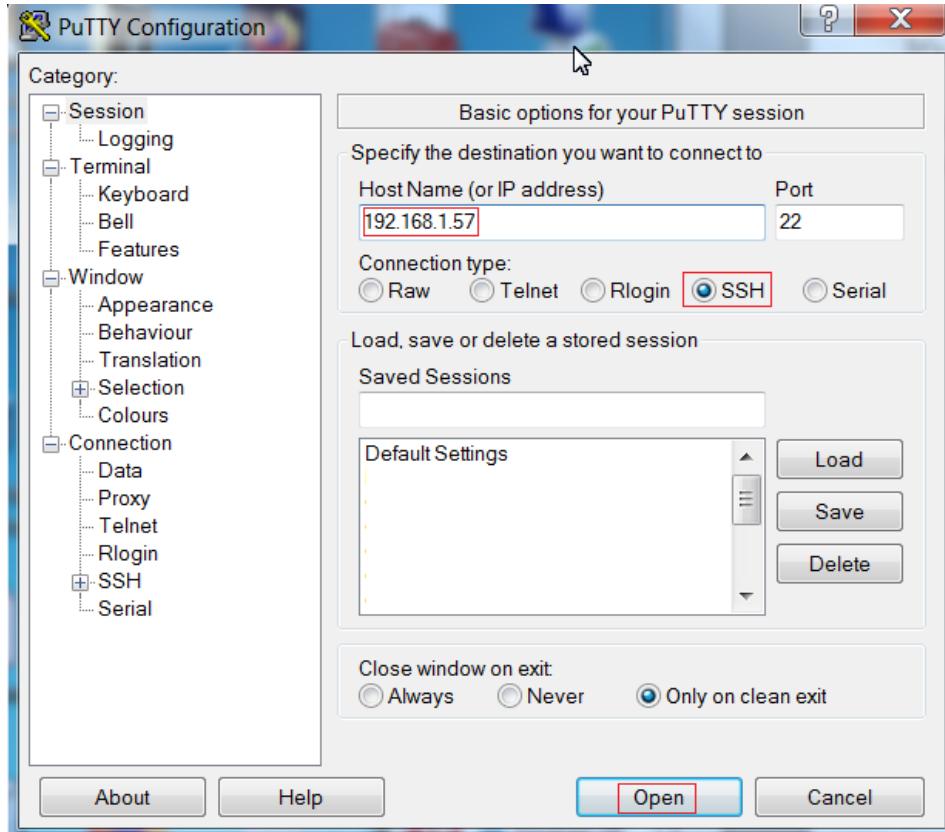
While they can be done in WinSCP, very large file copies, moves, or deletes are best done using [**Midnight Commander**](#).

(Continued)

PuTTY

PuTTY is similar to a Window's command prompt, but it allows users to work on OMV's command line from a remote PC. If PuTTY was not installed as part of your installation process, install it on a Windows PC. It's available here. ➔ [PuTTY](#)

Using PuTTY is as simple as typing in the server's IP address in the **Host Name** field and clicking on open. There will be a warning for a first time connection – click **OK**. Then, login on the command line.



MC (*Midnight Commander*)

Midnight Commander is a command line file utility that utilizes a very cleverly created graphical interface. It's very useful for navigating through OMV's directory structure. It excels in efficient copying, moving, and deleting folders and files.

The installation process:

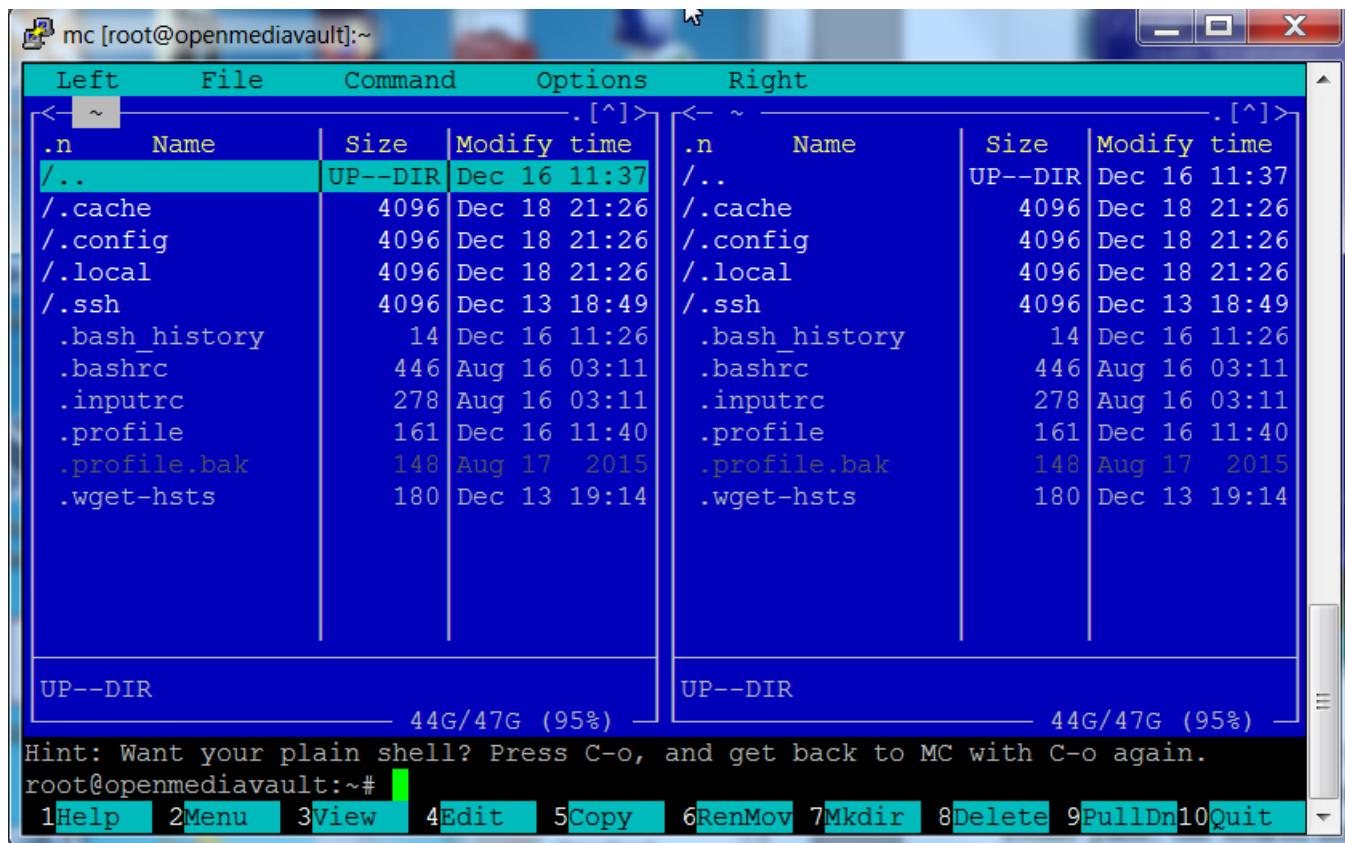
- Use **PuTTY** to get to OMV's command line.
- Log in as **root**.
- On the command line type the following; **apt-get install mc**
- When prompted continue with "**Y**"

(R-PI users will log in as **pi** and use **sudo apt-get install mc**)

When the installation finishes, on the command line, type **mc**

Midnight Command is a two pane window where the source is the left pane and the destination is the right pane. Copies and moves are done, left to right. Since it's possible to navigate to any location on the OMV host, in either pane, the source and destination can be set for any location.

A mouse works in MC. Click on the various menu items at the top and bottom, to select them. Similarly, files or folders can be selected by clicking on them. To level up, click on the **..** at the top left of either window.



****Beginners Note:**** Midnight Commander is powerful and potentially dangerous. MC does not have “**Undo**”. A careless operation on the boot drive, such as accidental file “**Move**” or “**Delete**”, can ruin your installation. Work with MC carefully and before doing anything extensive with it, the appropriate backups are recommended. [Operating System Backup – Data Backup](#).

(Continued)

Win32DiskImager

Win32DiskImager is a utility that's designed to write raw image files to SD-cards and USB drives. What makes it stand out from similar utilities is that it can “read” a flash drive and create an image file from the contents of the device. If users decide to use an SD-card or a USB thumb-drive as a boot drive; the ability to read flash media devices makes [Win32DiskImager](#) useful for cloning flash boot drives.

There is a [known bug](#) in Win32DiskImager V1.0.0

While the exact cause of the bug has yet to be determined, the scope of affected users is very small. However, this bug [requires](#) the use of the **Verify Only** button after every operation. If the Verification hash is successful, the operation is good. If Verification fails, the read or write has failed and the image file or flashed drive cannot be used.**

Details for using Win32DiskImager are found in [Operating System Backup](#), under [Cloning Flash Media](#).

Virtual Box

Virtual Box is a cross platform virtualization platform that will work with both servers and clients. For learning about OMV, there simply is no better tool than working with an OMV Virtual Machine (VM). An OMV VM can be built, configured, and put on the local network complete with shares, in the same manner as real hardware. VM's can be created, cloned, used for test beds, and destroyed without consequence. Many advanced OMV users fully test upgrades, Docker's, plugin's, server add-ons and changes in configuration, in OMV VM's before upgrading or reconfiguring their real-world servers.

If users have a Windows client with at least 6GB RAM and plenty of hard disk space, installing Virtual Box is highly recommended. → [Virtual Box](#)

Backups and Backup-strategy

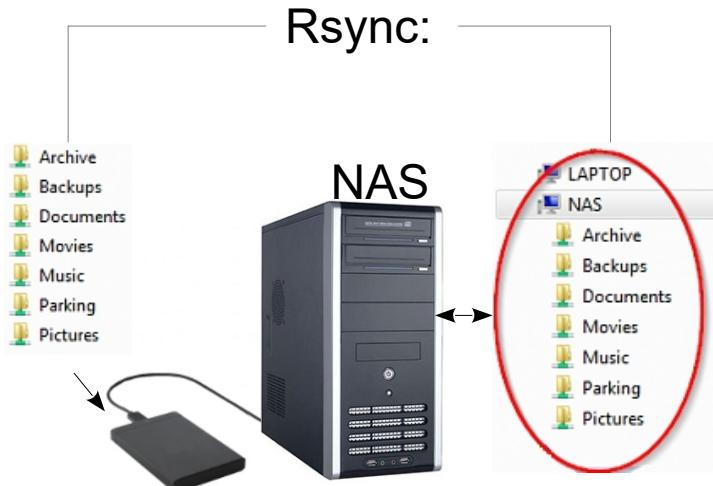
It's important to understand the concept of backup and why backup is important. In understanding the concept of backup, an automotive analogy may be helpful.

If one has a car and that car has a spare tire, is the “car” backed up? The answer is “No”. There are a great number of things that can happen to a car that can disable it, until parts are replaced or the car is otherwise repaired. These items would include the battery, alternator, any component of the ignition system, the transmission, the cooling system, etc., etc. To backup the car, a second car is needed. This is why using RAID of any type is not backup. At best RAID could be thought of as a “spare tire” for a PC.

Where the automotive analogy fails, generally speaking, is that when a car fails it can be repaired. In computing, if a user's personal data is lost without backup, it's permanently lost. There are many possible events where data may be corrupted beyond recovery (viruses, ransomware) or is completely lost due to drive failures, a failing drive controller, or other hardware failures. This is why real data back up is far more important than the computing equivalent of a spare tire (RAID).

Backing Up Data

First Level Backup: Replication To an External Drive



The scenario depicted in this graphic represents true backup. There are two full copies of data. With two separate copies, this backup strategy is superior to traditional RAID1 for home or small business use cases for a couple reasons.

- Rsync can be used with most USB connected hard drives where RAID1, when used with USB connected drives, is notably unreliable.
- If there's a drive error, an accidental deletion, a virus, or other data related issue; in RAID1 the effects are instantly replicated to the second drive. With Rsync, both drives are independent and, in most cases, the second disk will be available after the source disk fails. In any case, the Rsync replication interval allows time for admin intervention before the second disk is affected.

Full Disk Mirroring / Backup with Rsync

While individual shared folders can be replicated using **Services**, **Rsync**, a more efficient approach is using an Rsync Command line, in a scheduled job, under **System**, **Scheduled Jobs** to mirror a drive. This method allows for replicating the file and folder contents of an entire data drive, to an external drive or a second internal drive of adequate size.

- To implement something similar to the following example; it's necessary to add and **mount** a destination drive, in accordance with the section labeled [A Basic Data Drive](#).
 - When formatted, the hard drives used in this example were labeled to indicate their function.
This is a good practice that will help new users to easily identify drives and avoid admin mistakes.
 - Dissimilar sized drives can be used, provide that the destination drive is large enough to hold the source drive's data.
-

The following Rsync command line is an example of how a data drive can be mirrored onto a second drive.

rsync -av --delete /srv/dev-disk-by-label-DATA/ /srv/dev-disk-by-label-RSYNC/

The source drive is on the left (**green**) and the destination is on the right (**blue**). In this example, the entire contents of **dev-disk-by-label-DATA** would be copied to **dev-disk-by-label-RSYNC**

The switches are:

-a Archive Mode. Archive mode adds an array of options to an Rsync command. It's the equivalent of switches -r -l -p -t -g -o and -D which copies files and folders recursively, copies links and devices, preserves permissions, groups, owners and file time stamps.

-v Increase Verbosity. This can be useful when examining Rsync command output or log files.

--delete Deletes files in the destination drive that are not in the source. If accidental deletion protection is desired, this switch could be left out of the command line. However, from time to time, it would necessary to be temporarily re-added the **--delete** switch to purge previously deleted and unwanted files from the destination drive.

To find the appropriate Rsync command line entries for the user's server, under **Storage, File Systems** click on **down arrow** at the top right edge of a column. On the pop down menu, select **Columns** and check the **Mount Point** box.

Under the **Mount Point** column (red boxes) are the full paths needed for the source drive (in this example **/srv/dev-disk-by-label-DATA**) and the destination drive (in this example **/srv/dev-disk-by-label-RSYNC**).

Device(s)	Label	Filesys...	Device	Used	Mounted	Mount Point	Referenced	Status
/dev/mmcb			<input checked="" type="checkbox"/> Device(s)	21.62 MiB	Yes	/boot	No	Online
/dev/mmcb			<input type="checkbox"/> Identify As	1.26 GiB	Yes	/	Yes	Online
/dev/sda1			<input checked="" type="checkbox"/> Label	515.00 MiB	Yes	/srv/dev-disk-by-label-DATA	Yes	Online
/dev/sda2	RSYNC	ext4	<input type="checkbox"/> Parent Device	514.99 MiB	Yes	/srv/dev-disk-by-label-RSYNC	No	Online

Displaying items 1 - 4 of 4

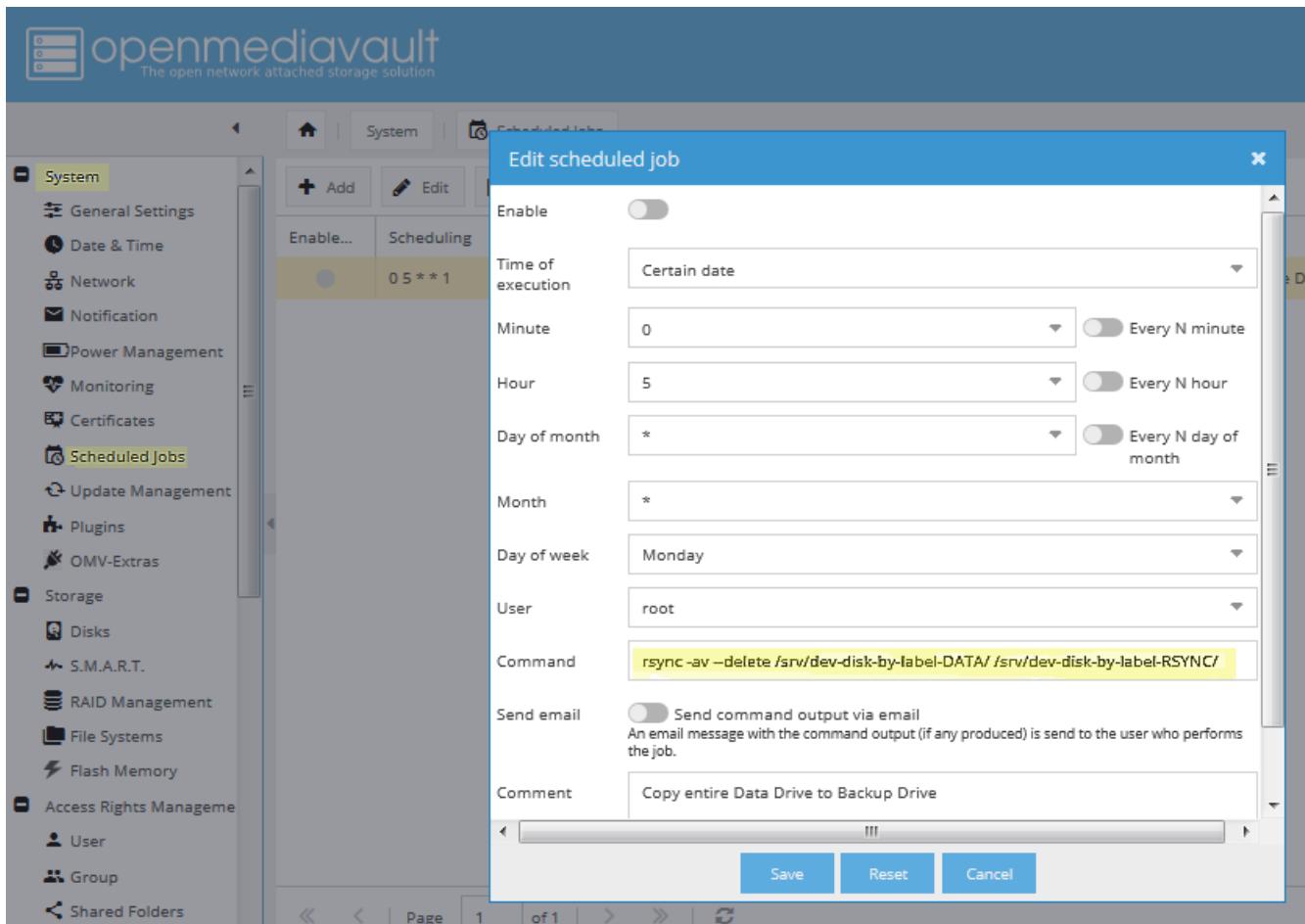
To construct the appropriate command line, add a **slash “/”** after each drive path, in the full command line as follows:

rsync -av --delete /srv/dev-disk-by-label-DATA/ /srv/dev-disk-by-label-RSYNC/

****Beginners Warning, Note and Sanity Check****

- Getting the source (left) and destination (right) in the correct order, in the command line, is **crucial**. If they're accidentally reversed, the empty destination drive will delete all data on the source drive.
- The safest option would be to leave the switch **--delete** out of the command line until it confirmed that two full copies exist.

As previously mentioned, this Rsync operation can be manually run or automated under: **System, Scheduled Jobs**, as shown in the illustration. Copy and paste the Rsync command line into the command box and select scheduling parameters as desired.



User Options for Backup:

- Automated:

As configured above, and **ENABLED** (green), this Scheduled Job will run the Rsync command line once a week, on Monday, at 05:00AM. After the first run of the command, which may take an extended period to complete, a week or more would be a good backup interval. Generally speaking, the backup interval should be long enough to allow for the discovery of a data disaster (drive failure, a virus, accidentally deleted files, etc.), with some time to intervene before the next automated backup replicates the problem to the 2nd drive. This is also a drawback of using automation; if data loss or corruption is not noticed by the user, those problems will be replicated to the back up drive during the next Rsync event. Longer automated backup intervals, such as two weeks or even a month, allow more time to discover issues and disable replication.

- Manual Run:

If the job is **disabled** (the **ENABLED** toggle switch is gray), the job won't run automatically. However, the job can be run manually, at any time, by clicking on the job and the **Run** button. This may be the best option for users who do not check their server regularly.

- Delete Protection:

Removing the **--delete** switch from the command adds delete protection, and may allow the retrieval of files accidentally deleted from the source drive. As previously noted, to clean up the destination drive of intentionally deleted and unwanted files, the **--delete** switch could be manually entered into the command line, from time to time, as may be deemed necessary.

****Keep in mind:** In the event of a failing or failed data drive it is **crucial** that the drive-to-drive Rsync job is turned **OFF**, if automated. Similarly, after noting a drive problem, DO NOT run the job manually.**

The Bottom Line:

The additional cost for full data backup using Rsync is the cost of an external drive, or an additional internal drive, of adequate size. For the insurance provided, the additional cost is very reasonable.

Recovery from a Data Drive failure - Using an Rsync'ed backup

General:

Again, as a reminder, when the NAS primary drive is failing or has failed, it's crucial to turn **OFF an automated drive-to-drive Rsync command line.**

There are two basic options for restoring data with an Rsync'ed backup drive - they are “with” or “without” a replacement for the source data drive.

Restoration Without a Replacement Drive:

Without a replacement drive on site, which would be the most likely case for most home users and small businesses, the backup Rsync'ed “destination” disk can become the data source for network shares. This involves repointing existing shared folders, from the old drive location, to the backup drive. All simple services layered on top of the shared folder, to include SMB/CIF shares and other shared folder services, will follow the shared folder to the new location on the back up drive.

Repointing a Shared Folder:

In the following example, the data drive has failed and it's been determined that it's not repairable. Under **Storage, File Systems** we have a **missing** source drive (labeled DATA) that's **referenced**.

Device(s)	Label	Filesys...	Total	Available	Used	Mounted	Mount Point	Referenced	Status
/dev/disk/by-label/DATA	ext4	n/a	n/a	n/a	No		/srv/dev-disk-by-label-DATA	Yes	Missing
/dev/mmcblk0p1	boot	vfat	62.01 MiB	40.39 M...	21.52 MiB	Yes	/boot	No	Online
/dev/mmcblk0p2		ext4	7.15 GiB	5.77 GiB	1.26 GiB	Yes	/	Yes	Online
/dev/sda2	RSYNC	ext4	83.66 GiB	78.84 GiB	514.99 MiB	Yes	/srv/dev-disk-by-label-RSYNC	No	Online

Note that there may be **Error dialog boxes regarding the failed mount of existing shared folders. With a missing but referenced drive, this is to be expected.** When all shares are redirected, these error messages will stop.

The actual references to the failed DATA drive are the **Shared Folders** assigned to the drive, named **Documents** and **Music** as follows:

The screenshot shows the OpenMediaVault web interface. The left sidebar has a tree view with 'Access Rights Management' selected. The main content area is titled 'Shared Folders' and shows two entries in a table:

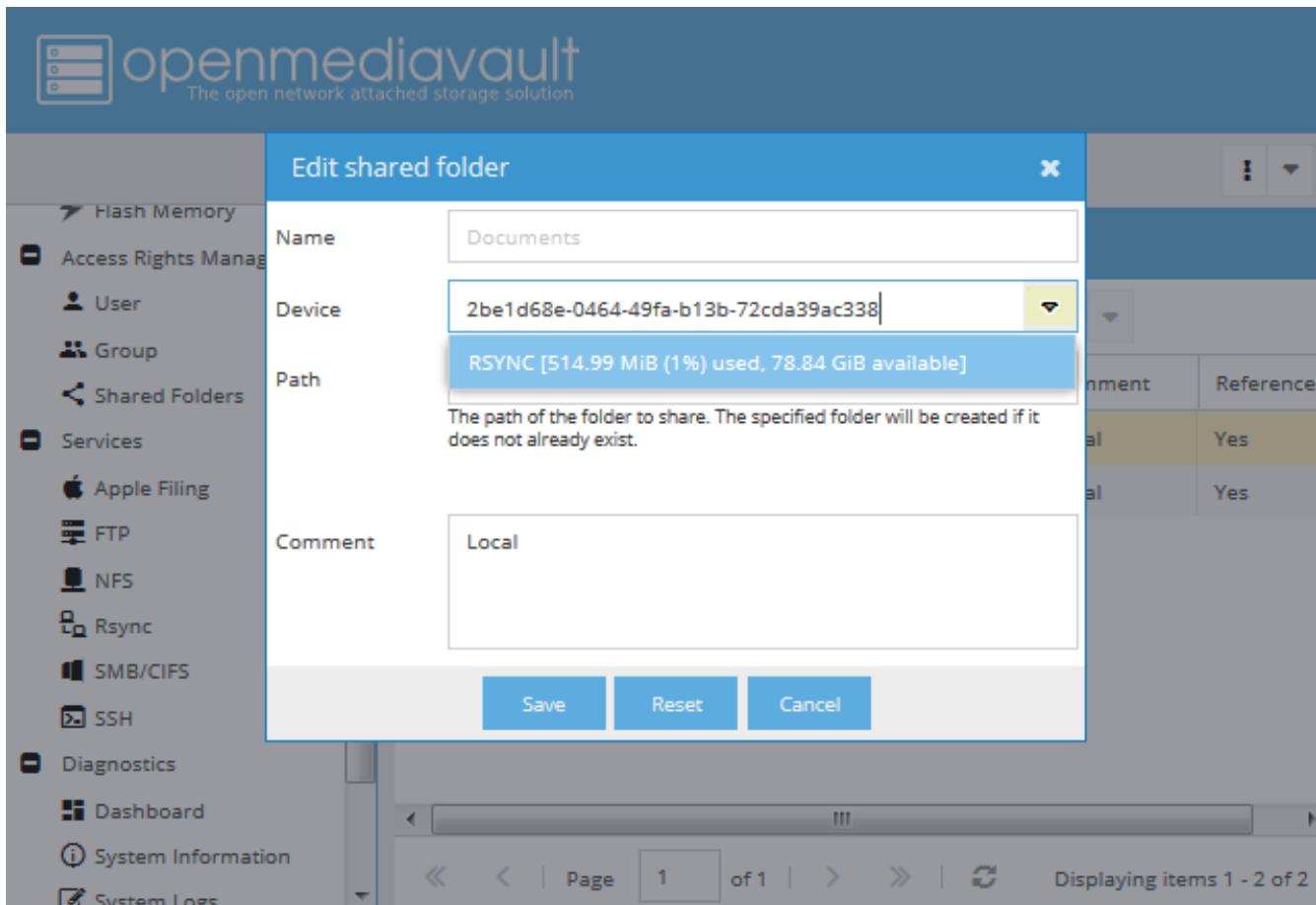
Name	Device	Relative Path	Comment	Referenced
Documents	/dev/disk/by-label/DATA	Documents/	Local	Yes
Music	/dev/disk/by-label/DATA	Music/	Local	Yes

At the bottom, it says 'Displaying items 1 - 2 of 2'.

Since the DATA drive no longer exists and there's an exact duplicate of all folders and files on the backup drive, we'll repoint the shared folder named **Documents** to the RSYNC backup. Click on the **Documents** Shared Folder, above, and the **Edit** button.

In the **Edit Shared Folder** Dialog Box, click the **drop down button** on the **Device** Line and select the destination / backup drive. (In this example the drive with RSYNC in the label is the backup.) A confirmation dialog box will prompt “**Do you really want to relocate the shared folder?**” Click “**Yes**” and “**Save**”.

(Remember that *all* contents of the now missing source drive and the destination drive were *identical* as of the last backup, to include the path statement. Changes are not necessary. Repointing the share is just a matter of selecting **the backup drive**.)



Click on **Save**, confirm the change, and it's done.

Do the same process for all remaining Shared Folders. (In this example, Music was repointed as well, but not shown.) Again, error dialog boxes may appear during the process. Acknowledge them (with **OK**) but do not revert, or back out of change confirmations. When all Shared Folders are redirected to the backup drive and saved, the error dialog boxes will end.

In the final result:

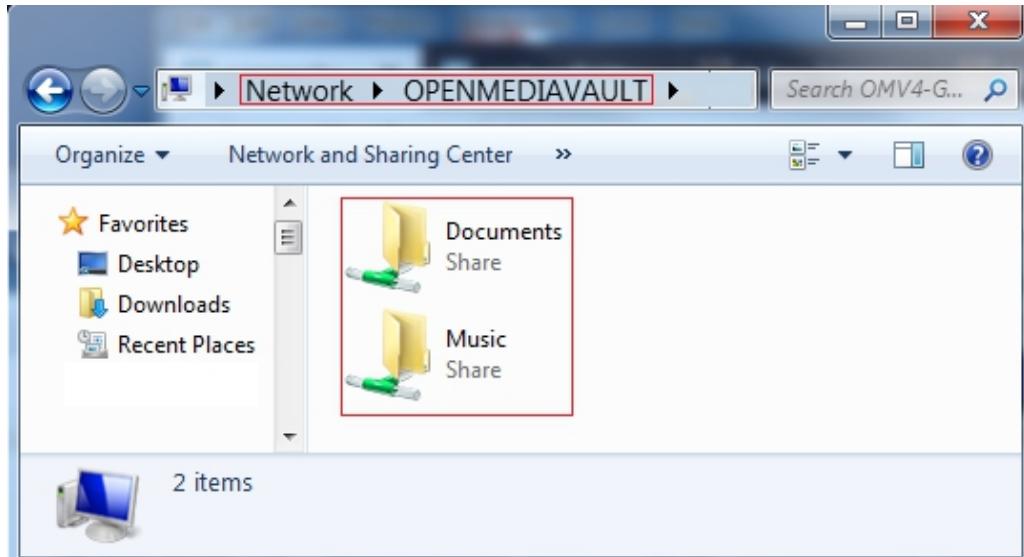
With one operation per shared folder, all shared folders have been redirected to the backup drive labeled RSYNC.

The screenshot shows the OpenMediaVault web interface under the 'Shared Folders' tab. The left sidebar includes 'Access Rights Management' (User, Group, Shared Folders), 'Services' (Apple Filing, FTP, NFS, Rsync, SMB/CIFS, SSH), 'Diagnostics', 'Dashboard', and 'System Information'. The main panel displays a table of shared folders:

Name ↑	Device	Relative Path	Comment	Referenced
Documents	RSYNC	Documents/	Local	Yes
Music	RSYNC	Music/	Local	Yes

Pagination at the bottom indicates 'Displaying items 1 - 2 of 2'.

In this case there were SMB network shares layered on top of the Shared Folders above. The SMB network shares followed their associated Shared Folders, without additional configuration, so SMB shares are up and running on the Network.



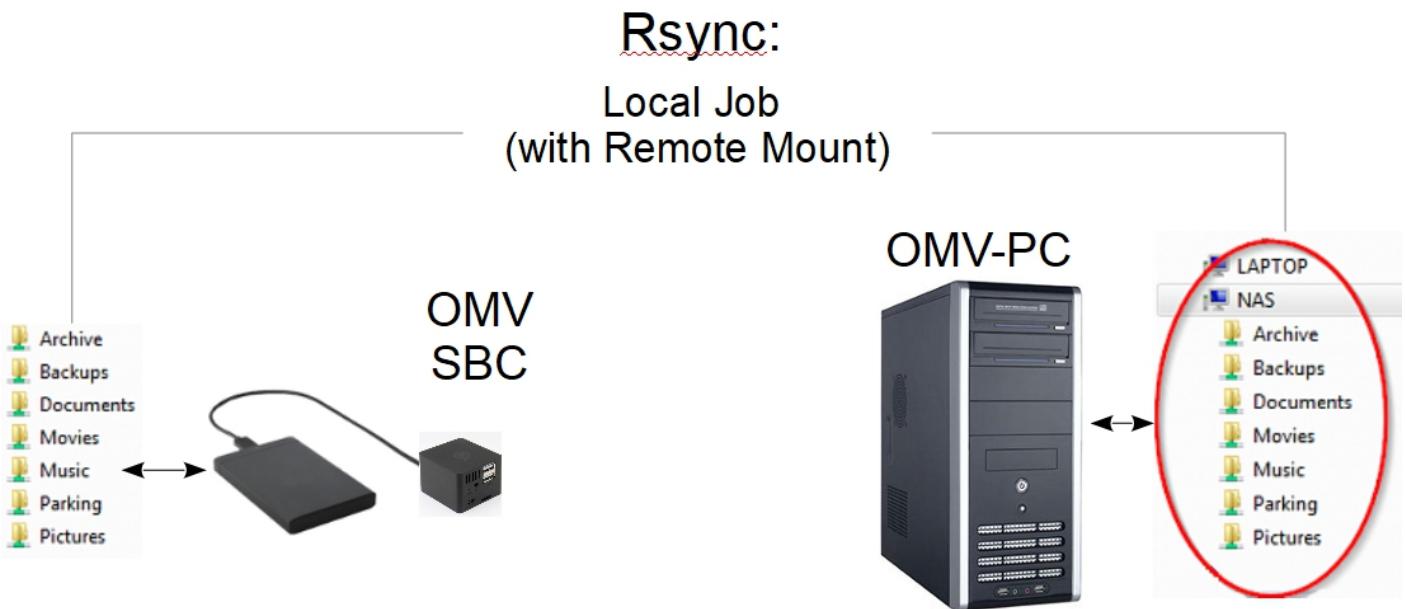
In addition, most simple services that are applied to these shared folders, would follow the shared folder when it is repointed to the backup drive.

One last operation is needed to completely remove the failed DATA drive. Go to **Storage, File Systems** and note that missing drive DATA is no longer referenced. When clicking on the failed drive, the **Delete** button is now active. **Delete** the drive.

Device(s)	Label	Filesys...	Total	Available	Used	Mounted	Mount Point	Referenced	Status
/dev/disk/by-label/DATA		ext4	n/a	n/a	n/a	No	/srv/dev-disk-by-label-DATA	No	Missing
/dev/mmcblk0p1	boot	vfat	62.01 MiB	40.39 M...	21.52 MiB	Yes	/boot	No	Online
/dev/mmcblk0p2		ext4	7.15 GiB	5.77 GiB	1.26 GiB	Yes	/	Yes	Online
/dev/sda2	RSYNC	ext4	83.66 GiB	78.84 GiB	514.99 MiB	Yes	/srv/dev-disk-by-label-RSYNC	Yes	Online

At this point, all shares in this example have been successfully redirected to the backup drive and the server is fully functional again.

Second Level Backup – Replication to a Second Host



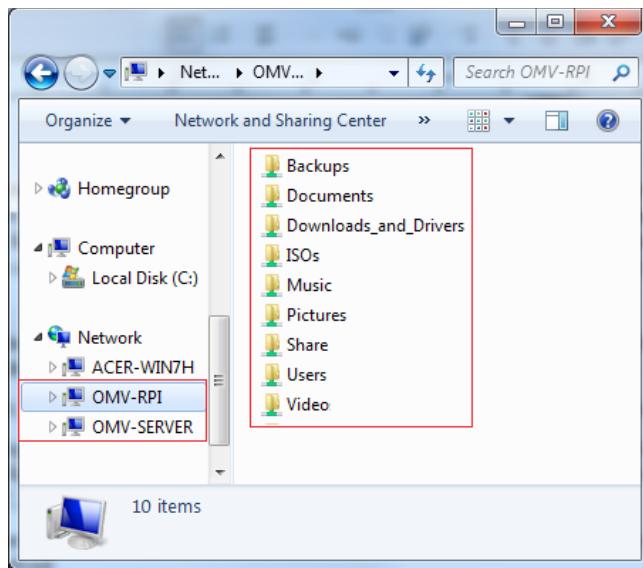
The first item to note, is that this scenario can be accomplished using a LAN client, as the second host, and it could be a Windows client. The additional cost would be the price of a second drive of sufficient size (internal or external) to house the second copy of data, attached to a remote host. The Remote Mount Plugin can mount a Windows network share (a user name and password with write access is required) and Rsync can be configured to replicate NAS data to the Windows share.

As illustrated above, the second host could be a low cost SBC. This scenario can be designed with a number of desirable features.

- First, if backing-up to a second server platform, two fully independent copies of data are possible.
- When using an SBC with OMV installed:
If the primary server failed completely, the second platform can be configured to take over as a backup file server. With all data backed up and resident on the SBC, this data can be made available to the network with SMB shares.
- Other than re-homing clients to the shares on the backup device, there's no recovery time and no "crisis" involved in getting data back on-line. It's already there.

The costs for this level of backup are very reasonable, with the cost of a hard drive of adequate size and an SBC. Good performing SBC's are available for \$50 USD or less. Older PC platforms or laptops could be configured as a backup server as well.

As an illustration of the backup server concept, the following is a File explorer example of an OMV NAS server and an SBC used for backing-up the main server's files.



This particular R-PI (OMV-RPI) is replicating all of the data shares of the OMV-SERVER and is re-sharing the same data to the network. Again, Rsync replication jobs of individual shares can be scheduled as desired, or triggered manually.

**** The Practical details for setting up Primary Server to Backup Server share replication, using Remote Mount and Local Rsync Jobs will be covered in future documentation.****

While replication to an independent host is an excellent method of avoiding data loss catastrophes, there are other potential events which can threaten irreplaceable data. Fires, roof or plumbing leaks and other unforeseen events can result in the loss of data, even on two independent hosts. For these reasons, backup professionals and experienced server administrators recommend an off-site copy. While this may seem extreme, it's actually fairly easy to accomplish. It can be done with an SBC or an old laptop, connected wirelessly, and housed in a utility shed with AC power. Some users set up a backup host in a family members' house, and replicate changed data over the internet.

In the bottom line, if users want to keep their irreplaceable data, an absolute minimum of two full copies is recommended, with a 3rd off-site copy preferred. As previously noted, effective backup strategies do not have to be expensive and are relatively easy to set up.

For further information on Backup concepts and best practices, an excellent explanation of Backup is provided by Backblaze.com.

Operating System Backup:

By design, the OMV/Debian operating system installs on its own partition, segregated from data. This makes copying or cloning the OMV boot/OS drive an easy process. So, one might ask, why is a clone or a copy of the operating system important?

Building OMV, from scratch, using the installer ISO is a 15-minute proposition, give or take. While it takes longer, roughly 45 minutes to an hour, the actual hands-on portion of an SBC build is even less.

As users configure their servers, add services, reconfigure shares, move their data around, tweak access controls, etc., servers tend to become “works in progress”. Configuring a server to the user's preferences can be an evolution that may take weeks or even months. If a complete server rebuild is required, the customization, add-ons, and the collection of various user tweaks may take several hours to recreate. It is this time and effort that Operating System Backup will preserve.

There are several ways to duplicate an operating system boot drive, but many can be technically involved; requiring network access to remote servers, bootable utilities and somewhat complex processes.

Given the low cost of flash media and with sockets mounted on the *outside* of a PC case, SD-cards and USB thumb-drives lend themselves to **cloning** and very quick recovery.

The Benefits of Maintaining Operating System Backup

In accordance with “[Murphy's Law](#)”, users may encounter issues where things go wrong. As examples, users may test software on their active server or try new settings. On occasion, installing an add-on may have unintended consequences. Trying new settings or working on the command line, may break OMV in a way that might not be recoverable. In other cases, there may be instances where a software update goes south – the source repository may go off-line in the middle of an update resulting in broken packages.

In all of these cases, having a confirmed working clone of the boot drive will allow users to “drop back” to a known good state. The “FIX” would be as simple as shutting down and booting the server on a known working clone.

The advantages of maintaining operating system backup are obvious. Beginners, with very little knowledge of Linux, can work with their servers without fear, which facilitates learning. If a Linux update causes ill effects, it's possible to drop back and selectively install packages to isolate the exact cause of the problem. If an add-on update doesn't work (direct installed software, a plugin, Docker, etc.), the user can gracefully back out of the update and leave the older (but working) software package in place.

It's the easiest, quickest, and most effective fix, for resolving problems with OMV and the underlying Debian Operating System.

The practical issues of maintaining boot drive clones – when to update and rotate?

1. It makes sense to apply Linux Operating System updates and wait a week or so, to insure that all is working and that there are no ill effects. If all is well, update the backup and rotate.
2. The above would also apply to add-on packages, Docker, or plugin upgrades. (Plex, Urbackup, Pi-Hole, etc.)

3. If a network share is added, deleted, or any aspect of the NAS is reconfigured that changes the operation of the NAS; the backup would need to be updated. (Otherwise, the configuration of the previously cloned boot drive would not mesh with the configuration and contents of data storage drives.)
4. If a cloning mistake is made (let's respect Murphy's Law), a 3rd clone could become a “fallback of last resort”. Given that Linux package upgrades and OMV sub-version upgrades have little to no effect on network shares or the high level configuration of the NAS, a 3rd clone can be maintained that is updated only when the NAS configuration is changed.

****A Last Important Note About Backing Up your OS****

Just as it is in the commercial world, where support for a product may be discontinued, the open source community is constantly moving forward as well.

Users may believe that an ISO file, or image, contains all the software needed for a build. In some current build cases, that assumption would be incorrect. Linux distro's, during the initial build and to finalize the installation, may depend on on-line software repositories. After the installation is complete, patches and updates may be applied which rely on on-line repositories as well.

Can it be assumed that those same software repositories and resources will be available on some future date, exactly as they were at the time of a current build? The answer is “No”. Distributions of a specific Linux version, complete with specific applications, fully patched and updated, can be built for a limited time.

Therefore, if users have extensively configured builds, are using specialty hardware (such as SBC's) or are using OMV to serve a critical function; it would be wise to backup the boot drive to an image file, or Clone the fully configured working installation to separate media, and save one or more copies for future use.

Cloning Flash Media

To avoid issues that can result from dissimilar sizes, it's best to clone images from/to identical SD-cards or USB thumb-drives. Otherwise, it's easier to clone if a new drive is slightly larger than the working drive.

(And while it's an advanced technique, [Gparted](#) can be used to slightly shrink flash drive partitions, to fit on the smaller of the two flash drives.)

The Cloning Process for USB thumbdrives and SD-Cards

- Install [Win32Diskimager](#) on a Windows PC.
- Format the new SD-Card or USB thumb-drive with [SDFormatter](#)
- Test the new card or USB drive with [h2testw1.4](#), One test is enough. (Do not select endless verify.)
If the device registers errors, or if the capacity is significantly different from what is that's marked on the label (a fake), return it for refund or throw it away.

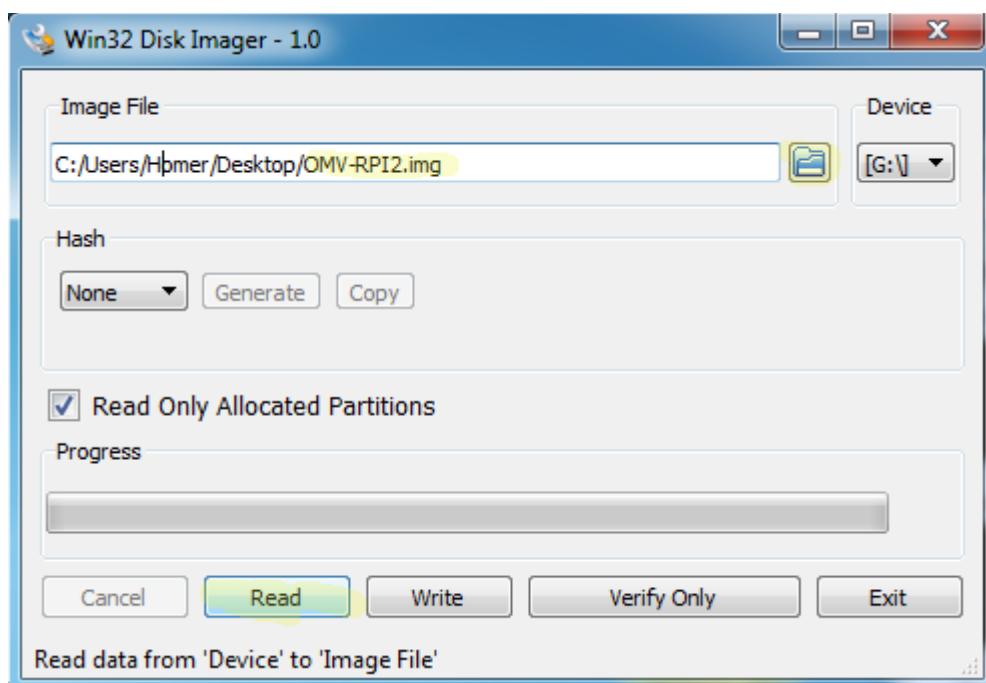
At this point you should consider marking your working SD-card (with permanent marker?) to make sure you don't mix it up with the blank card. Otherwise, it is possible to read a “blank card” and use the blank image to “overwrite” the working card.

- Insert the working card and start Win32Diskimager
SANITY Check, make sure you inserted your working SD-card / USB thumb-drive at this point.

****Note:** Windows will not be able to read the format of the partitions on the working boot drive and offer to format it for you. **DO NOT** format the drive. Close the dialog box with the **X**.

- In most instances, Win32Diskimager will detect USB thumb-drives and SD-cards, and set the Device drive letter. However, it would be prudent to check the letter Windows assigns to the drive with Windows Explorer.
- First click on the folder ICON and navigate to the location where you'll store your image file. Type a name in the file line. (OMV-RPI2.img was used for this example, but users can **add a date** to the name as well, such as OMV-RPI2-04-30-2018.img)
- Check the box for "**Read Only Allocated Partition**". (With larger drives, this option avoids imaging unused space which saves significant time when reading a drive to a new image and, later, when writing the image to another drive.)

- Click **Read**.



- When the **read** is done, **this is crucial**, click the **Verify Only** button. This will compare the image file just created, to the boot drive. **DO NOT SKIP Verification**. (Win32Diskimager has a known bug which may affect a very small number of use cases.)
 - If verification passes, pull the working boot drive and store it close by. If verification **FAILS**, the image file is corrupt and cannot be used.

******If the user/admin is running a business or is in another time sensitive scenario, where the NAS server can not be out of service for an extended period; the server can be booted on the source drive while the clone is being written. Thereafter, the drive swap could be accomplished during a low use period.******

While the resultant image file may be quite large, if the file is retained, it can be used to write another thumbdrive at a later date. In such a case, the image file itself can be saved as a dated backup and archived. The size of the image can be reduced significantly, by using 7zip to compress it before storage.

- Insert the **new** flash drive and start [Etcher](#). (Etcher typically detects flash drives as well.)
- Select the image file previously created, verify the destination flash media drive, and click the **FLASH!** button.

One of Etcher's features is that it writes the image and verifies it in a single operation. If the operation is successful, the working boot drive has been cloned. Insert the new clone into the server and boot it up. With a successful boot up on the clone, user/admin's will have two verified copies of their server's boot drive.

**Note – Win32diskimager will write an SD-Card or USB drive, but verification is required and it's a second operation. Etcher combines the write and verification in a single process. If users walk away during the write operation, which can take a long of time, Etcher is the best choice for writing flash media.

Add-on's – Adding Value to Your OMV server

General

The [OMV Forum](#) has an extensive [Guides](#) section. Whether a user's preference is videos or printed text, there's something for everyone among the numerous "How-To's". Beginners and Advanced users alike should take a few minutes to familiarize themselves with the content in the Guides section of the Forum.

OMV's Plugin's

OMV has numerous plugin's. Some are integrated into the base package by OMV's developer Volker Theile. Examples are iSCSItarget, usbbbackup, among others.

Still more were created by OMV plugin developers, such as Remote Mount, the flash-memory plug-in, backup plugins, and more.

Many plugins are integrations of third party packages such as SNAPRAID, MergerFS, etc. While questions or issues regarding the **integration of plugin's**, into OMV, are of interest to OMV's developers, questions regarding the **operation** of plugins are best directed to the application's supporting web site.

Dockers - General

While Dockers are an avenue toward adding **extensive** functionality to OMV, they are an advanced topic that may prove to be frustrating for beginners. To get started, beginners should consider installing Docker, then Portainer, as found under **System, OMV-Extras**. While it's command line oriented, this [Docker Tutorial](#) is very helpful for understanding basic concepts. User authored [Docker - How To's](#) can be found on the OMV forum.

So, What is a “Docker”?

Dockers are a type of Virtual Machine (VM) that share the Linux kernel and memory spaces with the host. A Docker is spawned from a Docker image. The resultant VM equivalent, that's built from a Docker image, is referred to as a "container". A container is fully self-sufficient, bare-bones, Linux operating system. The idea behind a Docker image is to create a Linux installation, that is as small and as lean as possible, that includes all necessary dependencies required to run the Docker application and nothing more. Since these containers tend to be very small, they can be constructed and destroyed in rapidly. (After downloading, usually, in a matter of seconds.)

Dockers are more resource efficient when compared to running a full VM in a hypervisor, due to direct allocation of hardware resources. Typically, VM hypervisors provision fixed blocks of memory and may require access to dedicated hard disk space or block device partitions. Whether these dedicated resources are used by the VM or not, they're no longer available to the Host operating system or other VM's. A Docker, on the other hand, uses the needed memory space to run its processes and the host's hard drive for storage, without wasted resources. Resource management is lean and tight, allowing more Docker containers to run concurrently with much greater efficiency.

(Continued)

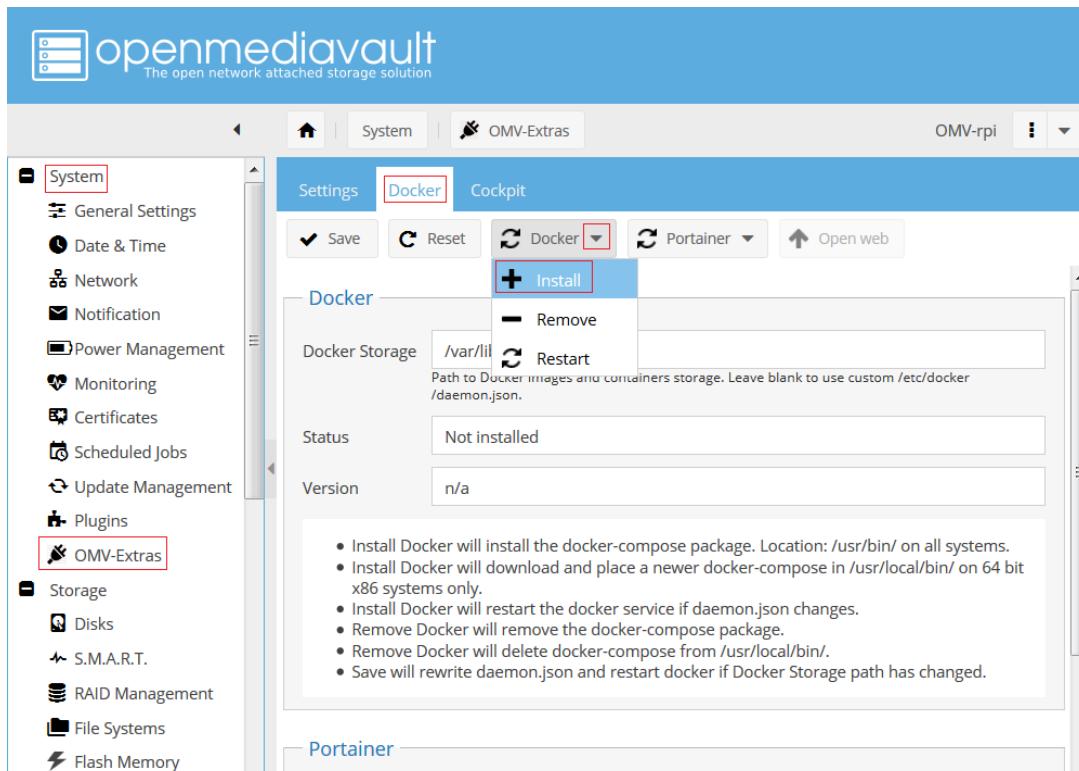
Installing Docker

Installing [OMV-Extras](#) is a prerequisite to installing Docker.

Under System, **OMV-Extras**, in the **Setting** tab, select the **Docker** tab.

Before installing Docker, take note of the Docker Storage location. **/var/lib/docker** is on the boot drive. This location is not an issue for hard drives and SSD's of medium capacity (notionally, 128GB or larger.) However, when using flash media to boot (8 to 32GB), the boot drive is not a good location for media servers or downloader type Dockers. There are two possible solutions:

- The easiest solution is to change the Docker Storage path to a data drive. If the default path is changed, downloader output and metadata created by media servers (Plex and others) will be stored on a data drive by default.
- A more advanced solution would be to leave the default storage location in place (`var/lib/docker`) and configure the Downloaders and media servers to store their output and metadata on a data drive, but this requires individual configuration of each Docker.



To install Docker, click the **Docker Button** and select **Install**.

An install dialog box will popup and scroll as files are downloaded and installed. At the end, **Done** will be displayed. Click the **Close** button.

The **Status** line will report: **Installed and running**.

(Continued)

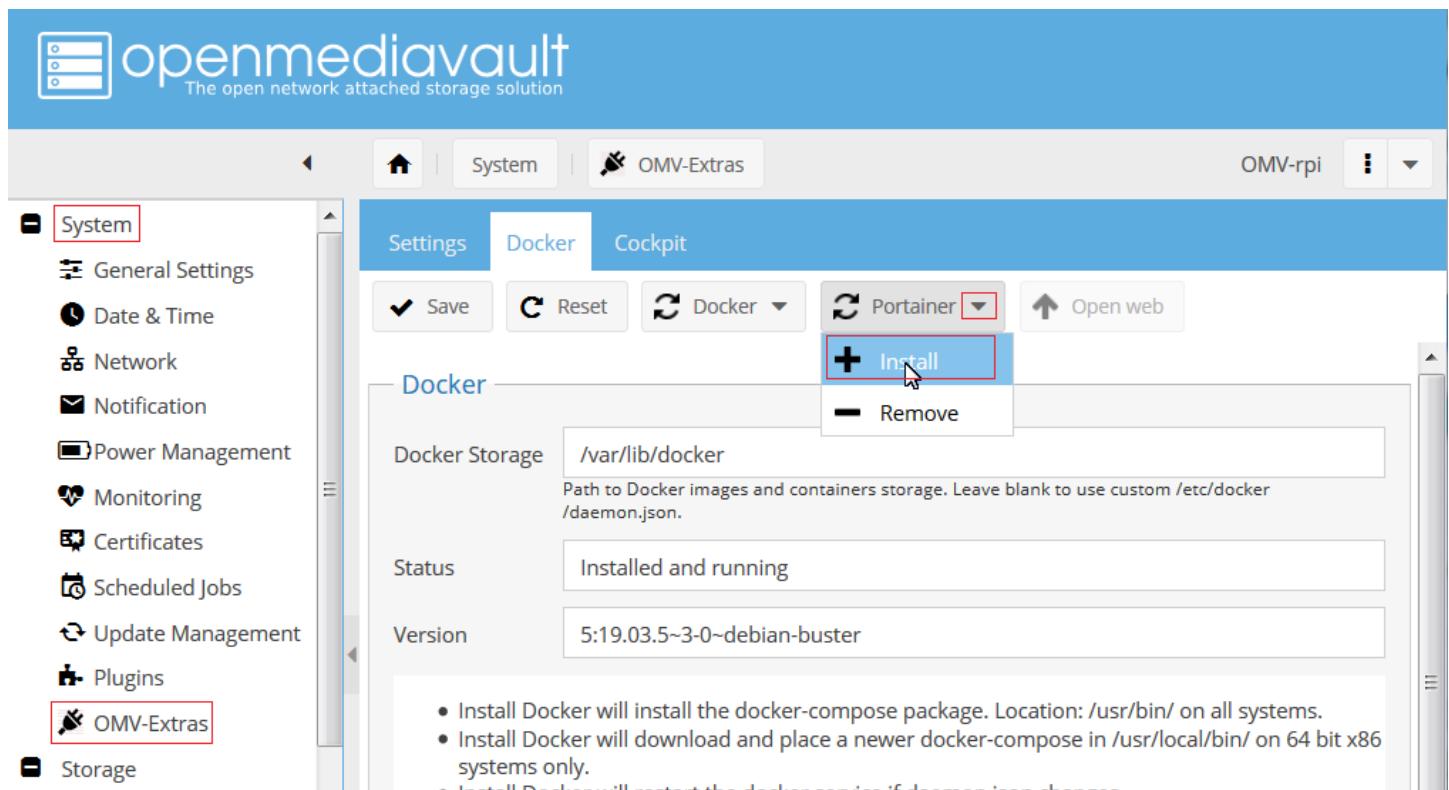
Installing Portainer

Under **System, OMV-Extras**, in the **Docker** tab, scroll down to the **Portainer** section.

General:

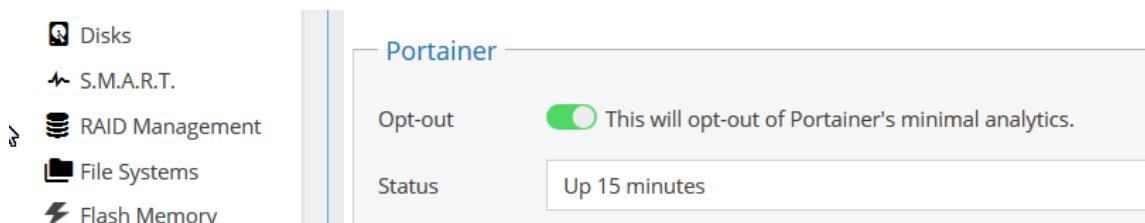
While Portainer is a Docker itself, it is the control interface through which Dockers are downloaded and configured in OMV.

Click the **Install Portainer** button.



An install dialog box will popup and scroll as files are downloaded and installed. At the end, **Done** will be displayed. Click the **Close** button.

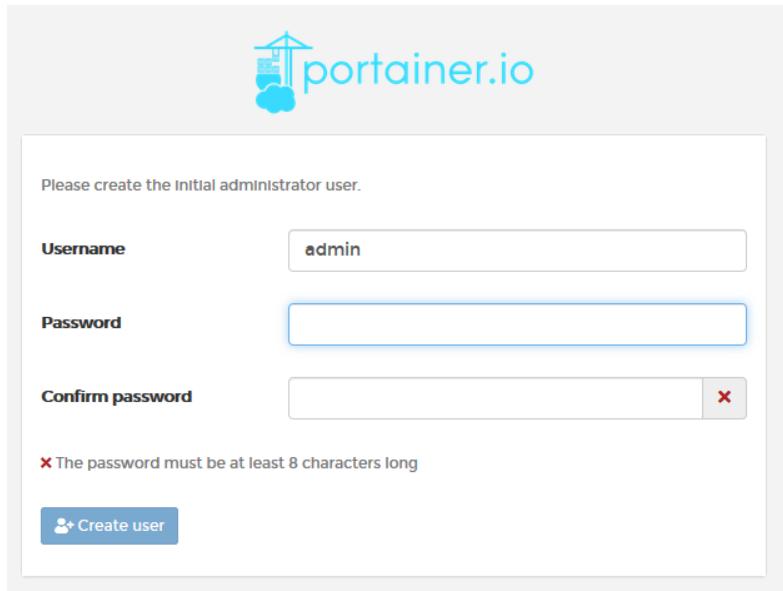
With a successful install, the **Status** line will change to reflect “up” time:



Finally, click on the **Open Web** button.

At this point, Portainer is completely unconfigured. The first configuration requirement is setting a password for the Admin user. Take note of this password. It will be needed to log into Portainer again.

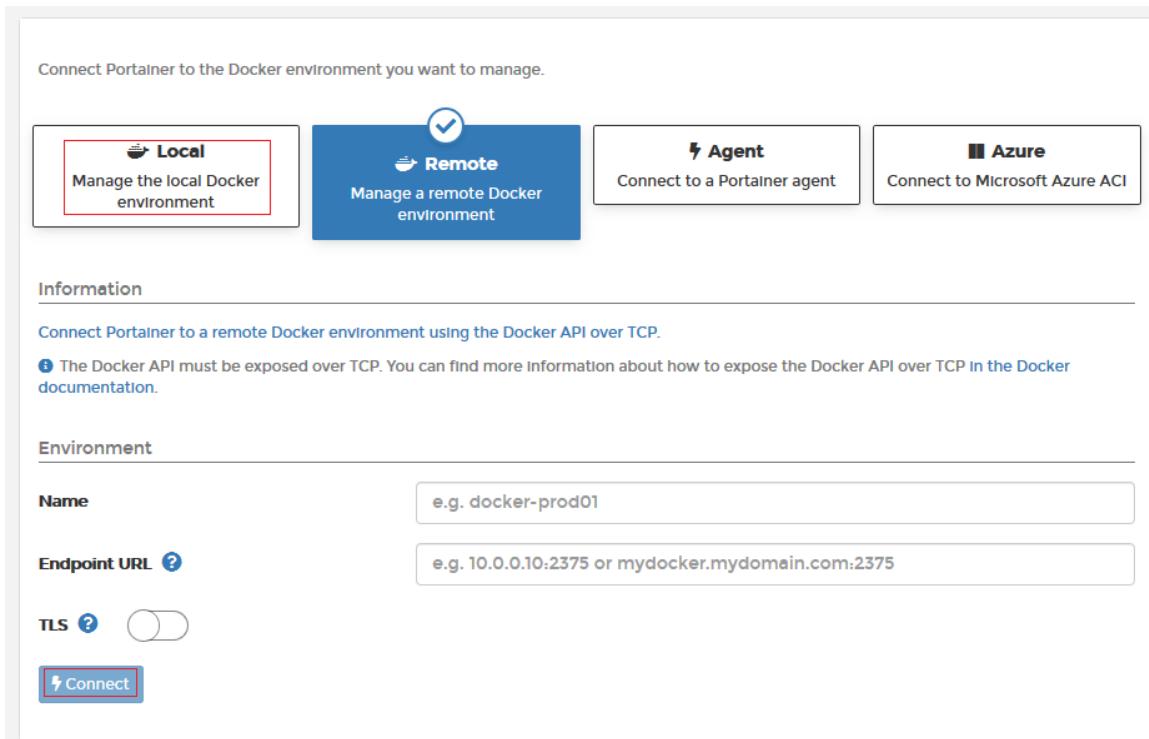
Then click on **Create User**



The screenshot shows the 'Create User' form for Portainer. At the top is the Portainer logo with the text 'portainer.io'. Below it is a message: 'Please create the initial administrator user.' There are three input fields: 'Username' (containing 'admin'), 'Password' (empty), and 'Confirm password' (empty). A red error message below the password field says: 'The password must be at least 8 characters long'. At the bottom is a blue 'Create user' button with a person icon.

In the next log in, there will be a login dialog with two empty fields. Enter the username **admin** in the top field and the **password** in the bottom field.

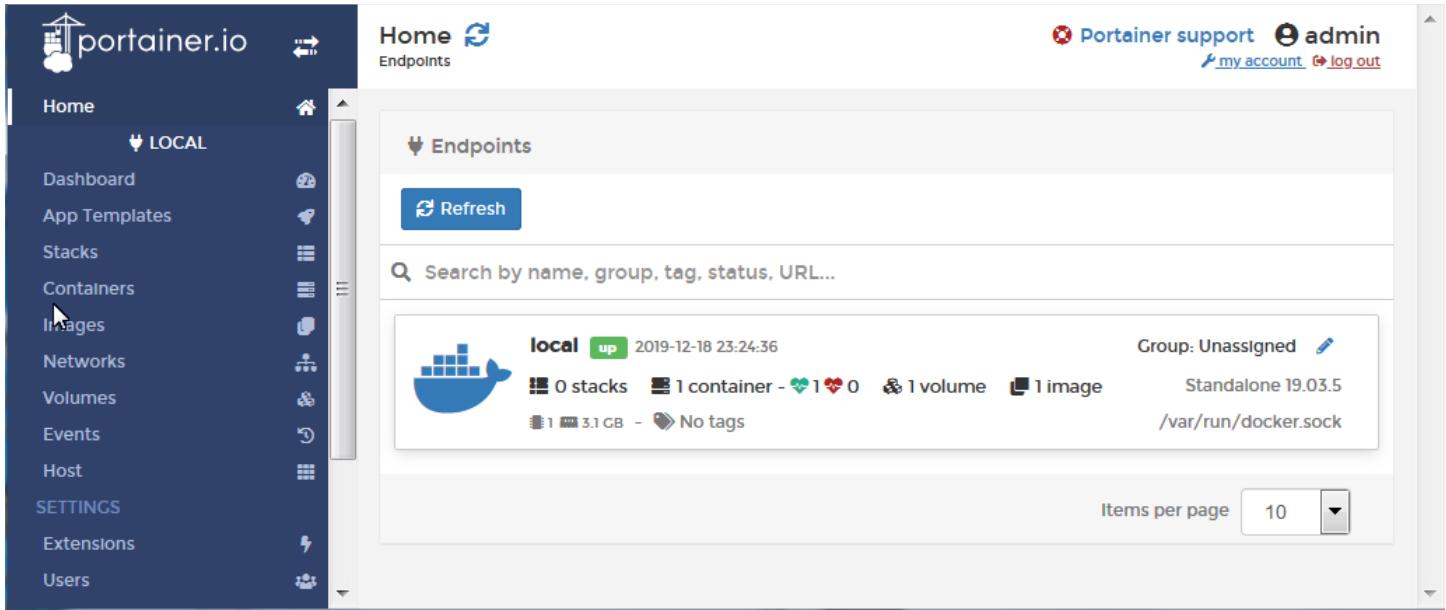
When this screen pops up, Click on **Local**, then **Connect**



The screenshot shows the 'Connect' configuration page for Portainer. At the top, it says 'Connect Portainer to the Docker environment you want to manage.' Below are four options: 'Local' (highlighted with a red border), 'Remote' (selected and highlighted in blue), 'Agent', and 'Azure'. The 'Local' section contains an 'Information' section with a note about connecting via TCP and a link to Docker documentation. The 'Environment' section has fields for 'Name' (e.g. docker-prod01) and 'Endpoint URL' (e.g. 10.0.0.10:2375 or mydocker.mydomain.com:2375). It also includes a 'TLS' toggle switch and a 'Connect' button.

Dismiss the News and Click on Local

The following screen will now be the “**Home**” screen. Using “Local” menu selections on the left, this is where Docker Images are downloaded, containers are created, etc.



The screenshot shows the Portainer.io interface. On the left, a dark sidebar lists various menu items: Home, LOCAL (which is highlighted), Dashboard, App Templates, Stacks, Containers, Images (highlighted), Networks, Volumes, Events, Host, SETTINGS, Extensions, and Users. The main content area is titled "Endpoints" and shows a single entry: "local" (status: up, last updated: 2019-12-18 23:24:36). It details: 0 stacks, 1 container - healthy (1 heart icon, 0 error icons), 1 volume, 1 image, and 1 file (size: 3.1 GB). The container is described as "Standalone 19.03.5" and is connected to "/var/run/docker.sock". A search bar at the top says "Search by name, group, tag, status, URL...". At the bottom right, there's a "Items per page" dropdown set to 10. The top right corner shows "Portainer support" with a link to "my account" and "log out".

This concludes the installation of Docker and Portainer.

(Continued)

Dockers - It's about choices

While there are 100,000+ Dockers, available on the [Docker Hub](#), all are not created equal. The offerings, from Docker authors, range from a one-off experiment with no documentation (users are on their own) to organizations like [Linuxserver.io](#) that specialize in building first-rate Docker images. Linuxserver.io offers Dockers that have been thoroughly tested, they support multiple architectures, they provide detailed container setup instructions, their offerings are “Tagged” and they retain inventories of their older images.

Selecting a Docker - Primary Considerations

First:

When installing a Docker, for the greatest chance of success, it is suggested that users follow the guidance provided in [Guides Section](#) of the OMV forum.

Second:

Potential Docker users should first look for Dockers that support their **architecture**. The three primary architectures supported by OMV are **ARMHF** or **ARM64**, **i386**(32 bit), and **amd64**(64 bit). In most cases, 32bit Dockers will run on 64bit hardware.

While there may be exceptions, i386 and amd64 Docker images may not run on ARM platforms. “**Multi-arch**” (multiple architecture) Docker images are more platform flexible.

Third:

To increase the chance of success, when attempting to install a Docker without a guide, look for the more popular Dockers with the highest number of “**pulls**” on the Docker Hub. ([hub.docker.com](#)) There are good reasons why these Dockers are broadly popular – they tend to work.

Forth:

In the vast majority of cases, Dockers that fail to work won't have anything to do with OMV or the Docker Plugin. Their issues tend to be with selecting the **wrong architecture**, selecting the **wrong network mode** (host, bridged, macvlan) for the application, other configuration issues (such as port 80 OMV/Docker conflicts), permissions problems or the Dockers themselves.

Since most Dockers share Network ports with the host (OMV), it's important to use ports that are not currently in use. To get a better understanding of network ports and for commands that will reveal ports that are in use, refer to this forum post for more information:

[**\[How-To\] Define exposed ports in Docker which do not interfere with other services/applications**](#)

When things go wrong

First take note of any error dialog boxes. On most Windows and Linux machines it's possible to copy and paste the text out of a dialog box by holding down the left mouse button and dragging the mouse pointer over text, to highlight it. Then use the keys with Ctrl+c (to copy), then click in a Notepad document and use Ctrl+v (to paste). This basic information will be helpful, in searching out the details related to the problem.

The First Resource – The Internet

Users should search the internet first. The solutions for many generic problems can be found with [google](#), [yippy](#), [duckduckgo](#), and other search engines. When searching on key words that match error message or the problem users may be having, in some cases, answers can be found quickly in real time. This is the fastest and often the best way to learn how to fix server problems. Since OMV is based on “**Debian**”, it may be a useful search term.

While the search function of the OMV forum site will produce “hits” on search criteria, it is by no means all inclusive. If **OMV** is included in search criteria, a Google search may generate more result hits on information found on the OMV forum, than the forum's integrated search function.

With information from searches, users should make an effort to address their own issues. This approach tends to be the path to the fastest answers and greatly facilitates the learning process.

The OMV Forum

When coming to the forum for help:

First search the forum. In many cases, user problems can be resolved with a few searches and a bit of reading. However, look at the dates of posts and the version of OMV referenced. Posts that are 3 or more years old may not apply to the current OMV version.

If posting a problem on the forum, start at the [forum index](#), and look for the category that looks to be appropriate for the post. Along with an explanation of the the issue, the OMV version, the appropriate logs and command line output, if known, and the hardware platform in use are the absolute minimums required. Realize that, without information, even the most experienced users, Moderators, and / or Developers will not be able to provide assistance.

- Ask the right questions. For beginners, this can be deceptively difficult. There's some “straight forward” guidance on this topic here → [Ask the right questions](#).
- While OMV's forum is known for responsiveness, it's unrealistic to expect answers in real time. It may be a matter of days before a forum member, who is familiar with the described problem, will read and respond to a post.
- When looking at answers, try to focus on the information presented, not the perceived tone. Remember that support is provided “**gratis**”, so act accordingly.
- Be open-minded. The reason why users post on the forum should be because they couldn't solve a problem on their own. With that in mind, when an experienced forum user replies, taking the time to make a suggestion or requesting more information, forum users should follow up and post the result.

Whether the issue is fixed or not, user posts help other users with the same or a similar problem.

- If a forum post or a “How To” fixes your problem, or gets you through a configuration issue, consider giving the author a “Like” or “Thanks”. The gesture is free and it’s an indicator to other users who may have the same problem. In essence, you’d be saying “I agree” or “this worked for me”.
- When users are experiencing problems with their data store (a file system issue, a hard drive, array, etc.) the working assumption on the part of experienced forum users and moderators will be that **users have full data backup**. Accordingly, recommendations for correcting filesystems, hard drives, and RAID array issues may result in the loss of data. **Keep this in mind.**

(Continued)

Common Problems:

Problem: After a reboot, the web page is not available. (Bad Gateway or 404 error.)

Solution: This may happen on an odd occasion. Instead of doing a dirty shutdown, SSH in with PuTTY, and issue the command: **reboot**. The system will reboot. Login.

Problem: Web interface has missing fields and/or items showing that have been uninstalled.

Solution: Clear your browser cache and, always, login to the Web console using the user, **admin**.

Problem: I mounted the drive using the command line and I can't select that drive in the shared folder device dropdown.

Solution: Never mount a drive with anything other than the OMV web interface. This creates the necessary database entries to populate the device dropdown.

Problem: I only see a few items in the web interface like the user section of Access Rights Management.

Solution: You did not login as the **admin** user. This is the only user that can access everything.

Problem: Samba is slow.

Solution: Read these threads - [Tuning Samba for more speed](#) and [Tuning Samba for more speed 2](#)

(**This does not apply to SBC images – Samba has already been optimization on these platforms.**)

Problem: You see an error where a domain name/host could not be resolved

Solution: You probably need to set your DNS server in **System -> Network -> Interfaces**

Problem: "No Network Interfaces" when looking at the console, after boot up.

Solution: Most of the time, this is caused by the system taking too long to get a DHCP IP address before the message is written. The adapter's address can be checked by logging in with any user (root is a good choice) and typing **ip addr**

Problem: I have an SBC and I'm having trouble with RAID. (OR) I have a USB connected drives that I want on a RAID array or enclosure.

N/A: USB RAID is not supported.

USB Power - A Common Raspberry PI problem

General:

Many problems with R-PI's, in versions prior to the R-PI4, are related to under-powering. While the R-PI4 is much improved, depending on the power requirements of connected peripherals, it is not exempt from power problems. The issues caused by under-powering can range from bizarre behavior to data corruption on storage devices.

Do I have a problem?

With all peripherals attached that are normally used – use the command `dmesg` on the CLI and scroll through the output. If an **undervoltage** situation exists, it will be noted in the output.

What is the problem?

Beyond using a power supply with the appropriate current rating for the R-PI model, it should be noted that a USB power source must meet certain voltage specifications “at the socket”. In essence, the output voltage of a USB power supply can't be increased to compensate for external voltage losses typical when using a long USB cable with small gauge wire.

Making matters worse is, models prior to the R-PI4 use a micro USB plug as the power connection. The tiny contacts of a micro USB connection, combined with cables for micro USB that have small gauge wires, drop power supply voltage significantly.

Consider the following chart of voltage losses, versus wire length and gauge
(Note that voltage drops increase as current draw requirements rise.)

AWG	Voltage Drop at 1000mA					
	15cm	50cm	1m	2m	3m	5m
20	0.129993	0.15331	0.18662	0.25324	0.31986	0.4531
22	0.135888	0.17296	0.22592	0.33184	0.43776	0.6496
24	0.145266	0.20422	0.28844	0.45688	0.62532	0.9622
26	0.16017	0.2539	0.3878	0.6556	0.9234	1.459
28	0.18387	0.3329	0.5458	0.9716	1.3974	2.249

AWG	Voltage Drop at 2000mA					
	15cm	50cm	1m	2m	3m	5m
20	0.259986	0.30662	0.37324	0.50648	0.63972	0.9062
22	0.271776	0.34592	0.45184	0.66368	0.87552	1.2992
24	0.290532	0.40844	0.57688	0.91376	1.25064	1.9244
26	0.32034	0.5078	0.7756	1.3112	1.8468	2.918
28	0.36774	0.6658	1.0916	1.9432	2.7948	4.498

Potential Remedies:

- Use a power supply that meets at least the minimum recommended current rating for the R-PI model being used.
 - Use the shortest possible USB cable. Cables that are 1 foot / 30cm or less, made of thick gauge wire are preferred. If a short USB cable is not long enough to place an R-PI in a convenient location, use an AC extension cord rather than a long USB cable.
 - Avoid using direct connected USB powered hard drives. The additional current load will drop voltage and may stress a weak power supply. A self powered USB hub or a drive dock is preferred.
 - Avoid leaving peripherals attached, such as a monitor, keyboard or a mouse. Even when they're not used, they consume power.
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A Closing Note

We, who support the Openmediavault project, hope you've found this guide to be useful and that you'll find your Openmediavault server to be efficient, easy to use, and enjoyable.