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Research Article

Network-Attached Storage: Data Storage Applications

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Abstract: This paper is a work on completely backing up disk files on client server/cloud drives. This paper contains objectives, introduction, literature review, methodology, hardware and software required, application and references. NAS (Network-attached storage) is a data storage, which is connected to a computer network. NAS acts a file server in a network, offering data storage to be located in a stand-alone network, which client computers can be connected. NAS can be seen as a computer drive (via ethernet) and as such, it can be used to save documents and files and as well as read them.NAS is specialized for serving files either by its hardware, software, or configuration. It is often manufactured as a computer appliance – a purpose-built specialized computer. NAS systems are networked appliances that contain one or more storage drives, often arranged into logical, redundant storage containers or RAID. Network-attached storage removes the responsibility of file serving from other servers on the network. As businesses and industries keep growing and technology is advancing the need for drivers for accessing data quickly has become a necessity, hence many drivers have been introduced and implemented in different fields as this paper adopts those concepts. As to any situation or a gift of science , there is always two sides to it, yes, pros and consequences. NAS systems will always have a growing and increasing potential as long as technology continues to grow for the need of storing large amounts of data and also the desire of accessing them quickly for a smooth and efficient working space.

Keywords: NAS, Storage, Security, Data, Server, Network

1. Introduction

NetWare server operating system and NCP protocol were released in 1983. Following the Newcastle Connection, Sun Microsystems' 1984 release of NFS allowed network servers to share their storage space with networked clients.

Inspired by the success of file servers from Novell, IBM, and Sun, several firms developed dedicated file servers. While 3Com was among the first firms to build a dedicated NAS for desktop operating systems, Auspex Systems was one of the first to develop a dedicated NFS server for use in the UNIX market. A group of Auspex engineers split away in the early 1990s to create the integrated NetApp filler, which supported both the Windows SMB and the UNIX NFS protocols andhad superior scalability and ease of deployment. This started the market for proprietary NAS devices now led by NetApp and EMC Celera.

Starting in the early 2000s, a series of start-ups emerged offering alternative solutions to single filer solutions in the form of clustered NAS. In 2009, NAS vendors began to introduce online backup solutions integrated in their NAS appliances, for online disaster recovery.

NAS (Network-attached storage) is a data storage, which is connected to a computer network. NAS acts a file server in a network, offering data storage to be located in a stand-alone network, which client computers can be connected. NAS can be seen as a computer drive (via ethernet) and as such, it can be used to save documents and files and as well as read them. Fundamentally, a NAS is a computer, optimized in hardware and software to be a file server. Data is a critical asset for company. Without access to their data, companies may not provide them the expected level of service. Poor customer service, loss of sales, or team collaboration problems are examples of what can happen when information is not available. Each of these issues contribute to lack of efficiency and potential loss of income if customers cannot wait for a data outage to be corrected.

The key difference between direct-attached storage (DAS) and NAS is that DAS is simply an extension to an existing server and is not necessarily networked. As the name suggests, DAS typically is connected via a USB or Thunderbolt enabled cable. NAS is designed as an easy and self-contained solution for sharing files over the network.

Both DAS and NAS can potentially increase availability of data by using RAID or clustering.

When both are served over the network, NAS could have better performance than DAS, because the NAS device can be tuned precisely for file serving which is less likely to happen on a server responsible for other processing. Both NAS and DAS can have various amount of cache memory, which greatly affects performance. When comparing use of NAS with use of local (non-networked) DAS, the performance of NAS depends mainly on the speed of and congestion on the network. With the introduction of new Wi-Fi standards (like WiFi6), networking speeds and dramatically increase to allow better performance when using a NAS.

NAS is generally not as customizable in terms of hardware (CPU, memory, storage components) or low-level software (extensions, plug-ins, additional protocols) but most NAS solutions will include the option to install a wide array of software applications to allow for better configuration of the system or to include other capabilities outside of storage (like video surveillance, virtualization, media, etc). DAS typically is focused solely on data storage but capabilities can be available based on specific vendor options.

NAS provides both storage and a file system. This is often contrasted with SAN (storage area network), which provides only block-based storage and leaves file system concerns on the "client" side. SAN protocols include Fibre Channel, iSCSI, ATA over Ethernet (AoE) and HyperSCSI.

One way to loosely conceptualize the difference between a NAS and a SAN is that NAS appears to the client OS (operating system) as a file server (the client can map network drives to shares on that server) whereas a disk available through a SAN still appears to the client OS as a disk, visible in disk and volume management utilities (along with client's local disks), and available to be formatted with a file system and mounted.

Despite their differences, SAN and NAS are not mutually exclusive and may be combined as a SAN-NAS hybrid, offering both file-level protocols (NAS) and block-level protocols (SAN) from the same system. An example of this is Open filer, a free software product running on Linux-based systems. A shared disk file system can also be run on top of a SAN to provide filesystem services.

2. Literature review

According to KOIVISTO, JARI-PEKKA: Network-attached storage for small companies Case: Design Foundation Finland and the employees manage their own data by storing it into their own hard drives. This generates a threat of a data loss in multiple ways: user may accidentally remove his/her own data and while there are no constant backups made, the data may not be recoverable. They have concluded that in this research, the artifact is based on an industry leading server technology which allows more services than just file sharing.

As for the recent years , the NAS system has received a decent positive feedback and gained popularity because it can share multiple file across server. it is better to understand and cost effective. NAS is a file server which takes up a network file system to provide a file access interface to a network. Network attached storage (NAS) is a mainly used for file sharing rather than computing intensive application which require higher processing power. Network attached storage (NAS) is most popular virtualized environment. It also helps to store and access the file through one central location. Security can be implemented in network attached storage by using and authentication model to secure the storage from hacker ESXI [1].Network attached storage in the data centre where it hold in vm files, files ISO and NAS is a storage shared over the network at the file system level ESXI [2]. It provides an easy way for data sharing and backup among multiple consumer electronic devices in home network TESA [1]. Disk writes are common for many home NAS devices since home NAS is usually used for data storage and backup. It’s also called as information storage system.

Network based storage combined with smart storage management, can provide it. NAS is a data storage mechanism that uses special devices connected directly to the network media.

• Supports comprehensive access to information: Enables efficient file sharing and supports multi-to-one and one-to-multi configurations. The multi-to-one configuration enables a NAS device to serve many clients simultaneously. The one-to-multi configuration enables one client to connect with many NAS devices simultaneously.

• Improved efficiency: Eliminates congestions and provides efficient working that occur during file access from a general-purpose file server because NAS uses an operating system specialized for file serving. It improves the utilization of general-purpose servers by dismissing them of file-server operations.

• Improved flexibility: Compatible for clients on both UNIX and Windows platforms using industry-standard protocols. NAS is flexible and can serve requests from different types of clients from the same source.

• Centralized storage: Centralizes data storage to reduce data duplication on client workstations considerably, simplify data management, and ensures greater data protection.

• Simplified management: Provides a centralized console that makes it possible to manage file systems efficiently. • Scalability: Scales well in accordance with different utilization profiles and types of business applications because of the high performance and low-latency design.

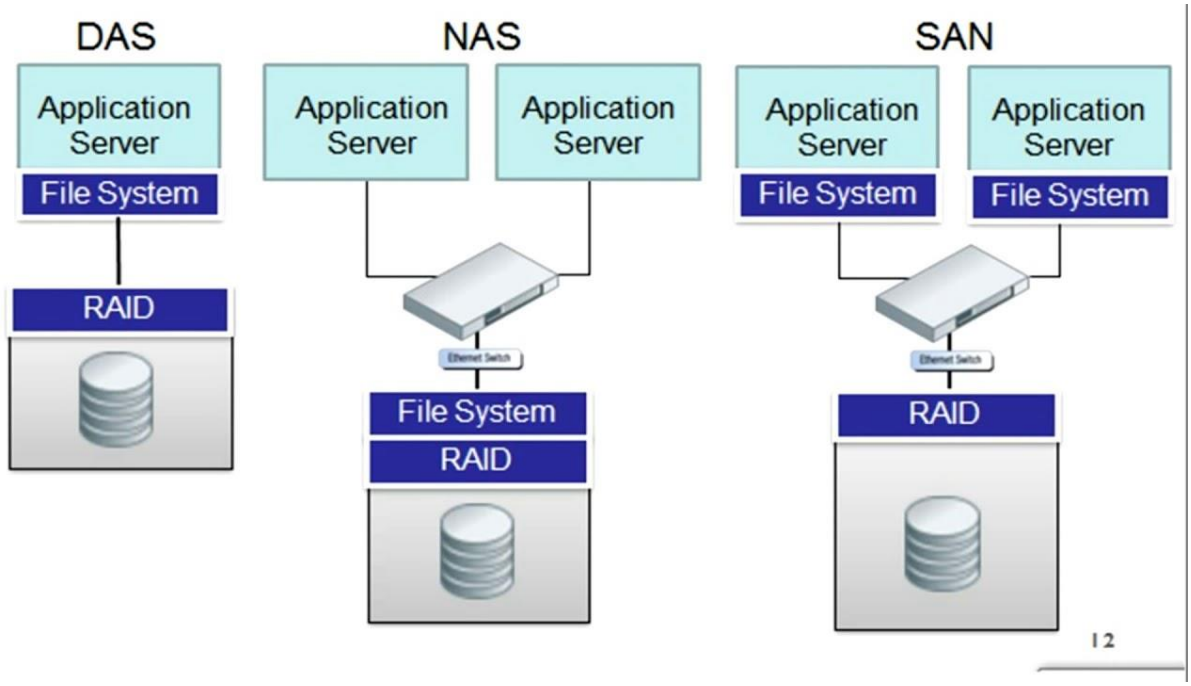
• High availability: Offers efficient replication and backup/recovery options, enabling high data availability. NAS uses redundant networking components that provide maximum connectivity options. A NAS device can use clustering technology for failover. • Security: Ensures security, user authentication, and file locking in conjunction with industry- standard security schemas.

3. Basics of data storage

Data storage in information technology is a technology which allows of retaining information. There are different data storage types in the industry, but the concept is very similar. For example, practically almost every computer has at least one hard drive, where all the information is stored. Such information can be for example the operating system or the files created by user. This information can be stored and accessed later on. Hard drives are called to be secondary storages as they're not directly accessed by the CPU of the computer. In computer the primary storage handles the information directly from the CPU, but this study doesn't cover this type of storage. NAS is also one type of a secondary storage.

FIGURE 1: Various forms of storage types

Above figure represents the different types of storages in the computer world. NAS is considered to be in the "Secondary storage" which also includes all types of hard disks.



.4. CURRENT STATUS of NAS

Network-attached storage (NAS) is a file-level (as opposed to block-level storage) computer data storage server connected to a computer network providing data access to a heterogeneous group of clients. NAS is specialized for serving files either by its hardware, software, or configuration. It is often manufactured as a computer appliance – a purpose-built specialized computer. NAS systems are networked appliances that contain one or more storage drives, often arranged into logical, redundant storage containers or RAID. Network-attached storage removes the responsibility of file serving from other servers on the network. They typically provide access to files using network file sharing protocols such as NFS, SMB, or AFP. From the mid-1990s, NASdevices began gaining popularity as a convenient method of sharing files among multiple computers. Potential benefits of dedicated network-attached storage, compared to general-purpose servers also serving files, include faster data access, easier administration, and simple configuration.

Starting in the early 2000s, a series of start-ups emerged offering alternative solutions to single filer solutions in the form of clustered NAS – Spinnaker Networks (acquired by NetApp in February 2004), Exanet (acquired by Dell in February 2010), Gluster (acquired by RedHat in 2011), ONStor (acquired by LSI in 2009), IBRIX

(acquired by HP), Isilon (acquired by EMC – November 2010), PolyServe (acquired by HP in 2007), and Panasas, to name a few.In 2009, NAS vendors (notably CTERA Networks and Netgear) began to introduce online backup solutions integrated in their NAS appliances, for online disaster recovery.

By 2021, three major types of NAS solutions are offered (all with hybrid cloud models where data can be stored both on-premise on the NAS and off site on a separate NAS or through a public cloud service provider). The first type of NAS is focused on consumer needs with lower cost options that typically support 1-5 hot plug hard drives. The second is focused on small-to-medium sized businesses - these NAS solutions range from 2-24+ hard drives and typically offered in tower or rackmount form factors. Pricing can vary greatly depending on the processor, components, and overall features supported. The last type is geared toward enterprises or large businesses and are offered with more advanced software capabilities. NAS solutions are typically sold without hard drives installed to allow the buyer (or IT departments) to select the hard drive cost, size, and quality.

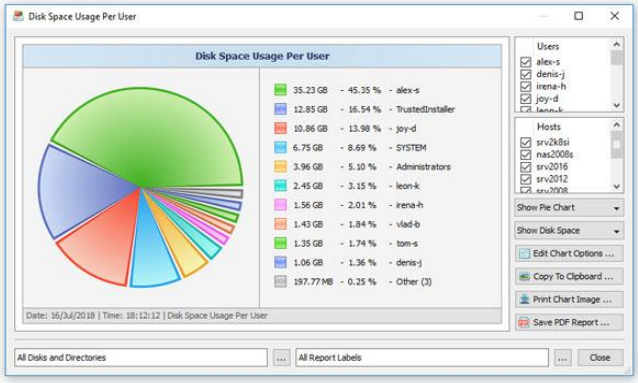


Figure 2: Disk space usage per user

4.1 RECENT SURVEY ON NAS

Large storage systems are designed to detect and handle drive failures. Client-based RAID over network-attached storage requires that the system expose both drive and network failures. Efficient recovery requires rapid remapping of communication channels to alternative storage devices. Recent works have decreased the failure of detection of data and failure of recovery of data.

4.2 CURRENT MARKET VALUE of NAS

NAS provides storage and retrieval facility for data from a centralized location for heterogeneous clients authorized network users and authorized network users. Network Attached Storage (NAS) Market is expected to witness significant growth over the forecast period owing to its features such as flexibility & scale-out, easy setup, and economical installation & maintenance costs. The configuration of NAS can be done easily through connected devices such as computers.

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Figure 3: Global NAS market

Network Attached Storage (NAS) Market was valued at USD 21.65 Billion in 2019 and is projected to reach USD 83.72 Billion by 2027, growing at a CAGR of 19.87% from 2020 to 2027.

The Primary drivers of the Network Attached Storage industry are increasing the need to access data anytime, anywhere in the corporate network and internet. The Global Network Attached Storage (NAS) Market reportprovides a holistic evaluation of the market. The report offers comprehensive analysis of key segments, trends, drivers, restraints, competitive landscape, and factors that are playing a substantial role in the market.

THE FUTURE POTENTIAL OF NAS SYSTEMS AND ITS GROWTH RATES

The global network attached storage market (NAS) is projected to grow from USD 23.2 billion in 2020 to USD 48.0 billion by 2025, at a CAGR of 15.7%. The key factors fueling the growth of this market are the rapid adoption of 4G and 5G technologies, creating high-volume digital content and laptops, and tablets resulting in the generation of large volumes of data. the increased use of smartphones, laptops, and tablets resulting in the generation of large volumes of data.

Network attached storage market in APAC is expected to grow at highest CAGR during forecast period

The network attached storage market in APAC is expected to grow at the highest CAGR during the forecast period owing to the presence of numerous small and mid-scale companies in the region. Also, the increasing investments by these companies in the development of IT infrastructure are driving the growth of the NAS market in these countries.

5.types of nas systems

2.5.1 Enterprise-Level NAS Server

The enterprise-level NAS servers offer high storage volume, Virtualization, and other advanced features. The enterprise-level NAS servers allow more than 1000 clients/users to be connected to it. They have several bays to accommodate multiple high-capacity storage drives. Some advanced NAS servers can provide a storage capacityof more than 1000 TB (1 petabyte).

These high-end servers can easily handle multiple requests coming from different users in the organization because of the support for higher network bandwidth and quicker processing speed.

Moreover, you can configure such NAS servers with different RAID levels to increase performance and leverage RAID disk fault-tolerance. Most of the enterprise-level NAS servers used in large organizations support RAID 0,RAID 1, RAID 1 + 0, RAID 5, RAID 5 + 0, RAID 6, and other RAID configurations.

2.5.2 Midmarket NAS Server

Midmarket NAS servers support storage capacity of up to 64 TB, which is comparatively lower than the enterprise-level NAS servers.

These NAS servers have advanced processors and suitable for hosting applications that support email systems, accounting database, payroll, video recording and editing, data logging, etc. Most of these midmarket NAS servers come with RAID and virtualization support.

2.5.3 Consumer-Level NAS Server Consumer-level NAS servers are the cheapest among the categories. As these low-end NAS are manufactured considering the requirement of home users, they can support connectivity of nearly 20 clients only. These servers are capable of storing and backing up home user's data, streaming media files for them, sharing and synchronizing files, giving users remote access to their data, etc. They usually don't have support for RAID functionality.

Enterprise-Level NAS	Midmarket NAS	Consumer-Level NAS
Serves more than 1000 clients	Connected clients are lesser as compared to enterprise-level NAS	Most brands support connectivity of up to 20 clients
High storage capacity - Up to petabytes	Most midmarket NAS servers support 20-64 TB storage capacity	Supports up to 20 TB of storage capacity
RAID and Virtualization capabilities	RAID and Virtualization capabilities	RAID is not supported
High availability with clustering	Clustering is usually not supported	Clustering is not supported
Typically used for data backup and sharing files	Used for data backup, sharing files	Used for storing and backing up data, sharing files, streaming media
Used for hosting applications that support email systems,	Used for hosting applications that support email systems,	Most brands don't offer cloud backup

6. APPLICATIONS of NAS

Network Attached Storage (NAS) devices allow individuals and small businesses especially to have their own private cloud data storage. Security concerns will motivate many to provide their own cloud data storage solutions, both private and commercial.

NAS devices are appliances with the sole purpose of providing data storage. It can be challenging to obtain a forensic image from a NAS device since they run limited services and protocols.

Microsemi is one of the foremost experts in designing ruggedized, high-reliability, high-density electronics for Network Attached Storage (NAS) to protect data at rest in a wide range of defense and aerospace applications.

7. PROS AND CONS of NAS

7.1 PROS OF NAS SYSTEMS :

While considering the needs of the small businesses, there are many advantages of NAS devices discussed as follows.

One of the biggest advantages of NAS is it provide consolidate space of storage within the organization1`s own network. That means it is easier to collaborate on the server and to the machine and it is must faster than any standalone storage solution in the market.

Another advantage is that it is much more reliable than simple hard drive. Therefore, administrators do not need to worry about managing any types of issues related to device corruptions.

It is easier to manage, take a lot less time to store and recover data from any computer over the local area network. Even if you have multiple offices and or mobile locations your data will remain accessible.

NAS storage solutions has cost advantage as it cost quite less than normal servers. So while fulfilling your storage needs you can also spare some money for other initiatives that can greatly benefit your business.

The NAS comes with fully functional operating system where access to many additional applications is also included. That means you can download different applications that can extend their functionality including security surveillance, back, disaster recovery, company knowledge database etc.

Most of the NAS devices come with their own cloud service. This allows you to remotely access the data, synchronize it with devices and the internet. This will also allow you to share the data with others without them need to own any hardware or software.

Smaller in size as compared to server, therefore require less energy and easily portable in less space as compared other servers.

As NAS drives save space in the office while providing you lot of storage capacity with less price, it can be a great option for small business storage and backup needs. At Whitehats, we fully assist our clients in selection, installation and maintenance of NAS storage device.

7.2CONSEQUENCES OF NAS SYSTEMS

As every device, NAS also have few disadvantages that are discussed here.

One of the main disadvantages of NAS storage solutions is it is onsite data backup, In the case of any natural disaster or human error that may affect your office, it may also cause you to lose your NAS and any data that is stored in it.

Another disadvantage is that NAS device usually has Linux operating and file system that makes it difficult to recover data in case of failure from another operating system, therefore, you may need professional help under such circumstances. That will require you to pay for their service.

Users who want to back up their data on NAS cannot proceed directly because they will need to do it through installed operating system.

With NAS you will get same speed of data transfer as of DAS (Direct Attached Storage) that is faster.

It requires some knowledge of computer networks to use them efficiently

Solution: we could use a cloud computing back up the needed/required systems using codes/algorithms taking up as files backed up by it and stored in NAS with a home assistant system

CONSUMER-LEVEL NAS Server

Consumer-level NAS servers are the cheapest among the categories. As these low-end NAS are manufactured considering the requirement of home users, they can support connectivity of nearly 20 clients only. These servers are capable of storing and backing up home user's data, streaming media files for them, sharing and synchronizing files, giving users remote access to their data, etc. They usually don't have support for RAID functionality.

MAIN CON –

NAS Servers Vulnerability to Data Loss

Enterprise-level and midmarket NAS severs are less vulnerable to data loss as compared to consumer-level NAS. Most of the enterprise-level and midmarket NAS servers support fault-tolerant RAID configuration allowing you to rebuild RAID (within fault-tolerance limits) in case of failure of RAID disk **and restore data.** Moreover, some of these servers offer a cloud storage feature so that you can restore data from the cloud backup if required.

However, not only the consumer-level NAS server users but also midmarket and enterprise-level NAS server users are vulnerable to data loss. You may lose data from NAS servers due to various unavoidable reasons such as human errors, mechanical faults, overheating of drives, sudden power cut, natural catastrophes, etc.

If you've lost data from enterprise-level NAS, midmarket NAS, or consumer-level NAS, you must not use hit-and-trial methods of data recovery. This may put your huge amount of crucial business and personal data at risk of permanent loss. Instead, you must contact a NAS data recovery expert such as Stellar in the first place to recover the lost data with safety.

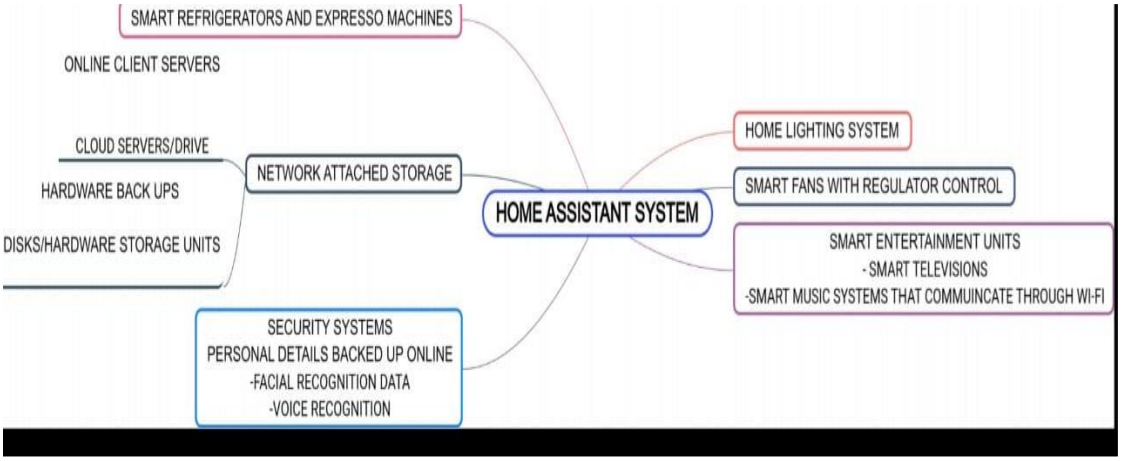
8. Applications regarding the present age (network attached storage)

NAS is the preferred option for hospital networks which have large amounts of cooperate data spanning several branch locations. The advantage here is that since NAS integrates many servers, it is easy to retrieve data and restore lost data quickly across the network.

Microsemi is one of the foremost experts in designing ruggedized, high-reliability, high density electronics for network attached storage (NAS). It provides high performance, highly secure and reliable IP connectivity to secure data in motion in military on board vehicle and aircraft communications. With more than three decades of ethernet networking expertise, our solutions are engineered to address the harsh conditions typical of military on-board vehicle network

9.methodlogy

Since data loss can happen in hardware devices, we implement it on software to work completely along with hardware disk, cloud client server as well, to reduce time, increase efficiency and to avoid data loss which one of the reasons caused due to poor backup. We can try to implement Google cloud/drive for the implementation/simulation. We are going to use lab View software to implement the simulation.



The primary drivers of the Network Attached Storage industry are increasing the need to access data anytime, anywhere in the corporate network and internet. Increasing adoption of remote & virtual office environments, business continuity planning, and the ensuring need to provide remote access to corporate networks to employees is fuelling the demand for the NAS technology. Business operations require maintaining the backup of confidential data; NAS devices are just the right fit. The rise in the use of this technology is because these backup targets and files to store copies of data. Data compression ability in NAS devices to store a duplicate copy of data will rise the adoption of NAS devices. Data deduplication replaces duplicate files on the NAS network which tags the files referring to the original file which reduces the number of duplicate entries, thereby enhancing the efficiency of the searching capability. However, data security is the primary concern among the enterprises due to misuse of privileged access leading to corporate espionage.

Computer-based NAS –

Using a computer (Server level or a personal computer) with processors typically from Intel or AMD, installs FTP/SMB/AFP... software server. The power consumption of this NAS type is the largest, but its functions are the most powerful. Some large NAS manufacturers like Synology, QNAP, and Asustor make these types of devices. Max FTP throughput speed varies by computer CPU and amount of RAM.

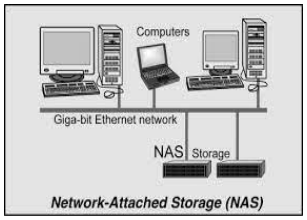
Open-source implementation-

Open-source NAS-oriented distributions of Linux and FreeBSD are available. These are designed to be easy to set up on commodity PC hardware, and are typically configured using a web browser. They can run from a virtual machine, Live CD, bootable USB flash drive (Live USB), or from one of the mountedhard drives. They run Samba (an SMB daemon), NFS daemon, and FTP daemons which are freely available for those operating systems.

Rasberry pi software

(Acknowledgment : Methods have been referred and all credits to : https://www.ionos.com/digitalguide/server/configuration/raspberry-pi-nas/)

There are many good reasons for setting up a Raspberry Pi NAS server: own server based on a minicomputer is cheaper than buying a completed NAS system. Energy costs in particular are much lower due to Raspberry having low requirements. It is also impressively compact and portable. If there are no other power sources, the Raspberry Pi NAS system can definitely run on a standard battery. Of course, the Raspberry Pi network storage is also inferior to commercial counterparts in some respects – for example, they have more processor power and offer better transmission rates.



Network-Attached Storage (NAS)

Like with Raspbian or other Raspberry Pi versions, you need an external computer to download and install OpenMediaVault. On this page, you can access the official SourceForge directory for the open source software, which contains the corresponding **image file** for the Raspberry Pi models 2 and 3. Download the file, which is just over 300 megabytes in size, and write it **into a microSD card** using imaging software like Etcher.

start the Raspberry Pi NAS and change the keyboard layout

In most cases, it is necessary to connect the monitor and keyboard to the Raspberry Pi to proceed further. Once you have done this, start the boot and installation process using the microSD card, until **you can log into the NAS program through the shell for the first time**. You can do this using the following standard

change password and display IP address

After switching to the appropriate keyboard language, it is time to assign a **new root password** for shell access to your Raspberry Pi NAS to prevent unauthorized users from logging in using the familiar default password. The required command is as follows:passwdEnter the new password twice and confirm the entry in both cases by pressing the **enter key**. If the change was successful, the command line displays the message ("password updated successfully").

Use the command "iconfig" to start the command line program of the same name, which provides you with all important **network information**. The IP address ("inetaddr") listed under "eth0" is particularly important to further configure your Raspberry Pi NAS server. This is the address assigned by your **router to the NAS server.**

logging onto the web interface

After you have laid the foundation for using the Raspberry Pi as NAS server in the previous steps, you can now log on to the web front end where the actual configuration takes place. To do this, you switch from the Raspberry Pi to another computer that is only on **the same network** and must have a **standard Internet browser**. Start the browser and enter the IP address that your router has assigned to the Raspberry Pi NAS into the address line. There is also a predefined **default login** for the NAS distribution.

After a successful login, OpenMediaVault's start menu opens, providing an overview of the available services and various service information. A first possible configuration step is to **adjust the system date and time** ("Date and Time"). If your network is connected to the Internet, you can check "**Use NTP server**" – otherwise simply enter the corresponding times manually.

securing the web interface

Since you make all the important settings on your Raspberry Pi NAS server through the web interface, it makes sense to secure the connection as thoroughly as possible. This is done by default through the unencrypted HTTP protocol, which is why it is advisable to **activate the encrypted pendant HTTPS counterpart**. To do this, select the menu item "General Preferences" in the "System" partitions and move the slider to "Secure Connection". To use TLS/SSL, you also need a **certificate** that can be created under "System" -> "Certificates" -> "SSL". Just click on "Add" and in the following pop-up window, click on "Save".

Note

If desired, you can also fill in the information fields for the certificate and determine the key length and validity period of the certificate yourself.

Enter the certificate in the general settings, click again on "Save" and confirm the decision. Using the **three-point symbol**, you then disconnect the current connection from the web interface and replace the HTTP in the address line with HTTPS to initiate a new connection (this time through TLS/SSL). Since the **browser does not yet know the certificate**, a warning will appear until you have added the certificate as an exception. Log in one last time with the standard data to enter your own password under "System" -> "General Settings" -> "Web Administrator Password".

connecting the storage media to the Raspberry Pi NAS

For the NAS server to work as a central file storage location, the respective storage media needs to be connected to the Raspberry Pi and configured to the web interface. If there is **a power supply** and **physical connection**, then you can display the data carriers in the "Real Hard Disks" partition of the "Data Storage" partition. If OpenMediaVault does not automatically detect a disk, you might need to use the "Search" button. **Different partitions of your connected media** can be found under "File Systems". If one of the storage units you added is missing, you can add it using the "Create" option. Then mark the individual storage units you want to include, and add them to the Raspberry Pi NAS system using "Mount".

To allow users to store files on the connected data storage devices later, share the corresponding folders under "**Access Control**". To do this, click on the submenu item "Shared Folder" and then "Add". Start with the **user directory** (also called the "home" directory), which you need to assign the path homes/ for. With all other folders, however, you can let your imagination run wild with regard to name and path.

creating user profiles to access to Raspberry Pi NAS Server

Once you have added storage capacity to the Raspberry Pi NAS and structured it accordingly, the next step is to create a user profile. You can do this in the "**User**" section of the menu (or through "Access Control"). Click on the "Add" option and type in the corresponding **user data** (name and password). Move the slider across under "**Change Access**" if you want to allow a user to adjust their login information. Then open the overview of shared folders again, select the folders that are relevant for access, and **assign the corresponding rights** (read/write, read-only or no access).

setting up access services for the Raspberry Pi NAS Server

Finally, it is important to clarify how users can exchange data with the NAS server. **SSH** (secure shell) is **enabled by default**, but can only be used by Linux users (through the terminal) without needing additional software. Windows users need **client applications** such as PuTTY or WinSCP for data transfer through the network protocol.

A more convenient solution is therefore the **cross-platform SMB** (Server Message Block), which you can activate under "Services" -> "SMB/CIFS". Windows has been supporting the protocol by default for years, while Linux and macOS have been using Samba which is also a suitable solution. When activating the service, also check "Activate home directories for users" before adding the folders you want to be accessible through the protocol under the "Shares" tab.

accessing the Raspberry Pi NAS

All important points for operating and using the Raspberry Pi NAS server are now fixed, so that the starting signal for the central file storage can be given. The users only have to connect to the server. If using Linux or Ubuntu, open the **file manager** and select the option "Connect to server". Then enter the server address including the prefix smb: //, and the connection is initiated.

Windows users establish the SMB connection to the Rasbperry NAS through **Windows Explorer**. In this case, it is enough to just enter the IP address after inserting the double backslash ("\\").

10. Conclusion

Since data loss can happen in hardware devices, we implement it on software to work completely along with hardware disk, cloud client server as well, to reduce time, increase efficiency and to avoid data loss which one of the reasons caused due to poor back up.We are trying to implement Google files and Google cloud/drive for the implementation/simulation.We are going to use lab view software to implement the simulation. Rasberry pi is another such software that can be implemented, a LAN network/cable and RAID servers for the basic functional requirements of NAS system. Due to the congestions of the Gigabit network, the most effective method to raise or uphold the network bottleneck is increasing the physical network bandwidth or improving the utilization of the network, even back up drivers can be strengthened ,like using cloud computing, a virtual storage for faster access of data and efficient working. A more efficient network file system could be able to boost the performance of NAS. As a file server, the processing power of a generic CPU will not be a serious issue of the system performance of an NAS. Hardware methods are unnecessary for a general NAS architecture which has a Gigabit network to reduce the CPU utilization. On the contrary, the hardware methods could have a side effect on the throughput due to the small file accesses in NAS. Software RAID is more than enough to satisfy the performance requirements of the basic and most used applications on NAS. The increase in number of disk drives in an NAS which has a Gigabit network can only achieve limited performance improvement except expanding the storage capacity when the network is saturated or completely being used uptil the limit.

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