

Open Source Solution for Centralized Storage System using Network Attached Storage (NAS)

Yaser Mowlawizadah¹, Nayana D.K², Hamed Sadiqzada³, Bilal Ahmad Ayobi⁴

^{1,3,4}Post Graduate Scholar, REVA University, Karnataka, India

²Professor, REVA University, Karnataka, India

Abstract - While a personal computer that uses traditional computing system is used there is no problem in using traditional hardware system also because it is not in need of high performance and there is no centralized system to optimize system, so hard disks can be used on every system separately or if it is a small network in this case also this approach can be used, but while there is an enterprise network in which cost and performance are important there it is better to use a more productive, secure, high performance, high available, and cost effective approach. In this approach there are centralized servers that function for every service separately so that have best performance along cost effectiveness and best use of all resources, in the following research the focus is only on the storage optimization which is using NAS (Network Attached Storage) as the core of the topic.

Key Words: Centralized System, Optimize, Hard Disk, NAS, Cost, performance

1 Introduction

Today data are an important part of every organization and as the IT world is moving daily, data are added in enormous amounts, and all these data need to be managed and organized, the question here would be how to manage and organize these data so that they be available whenever we need them and be safe so that we don't face any data loss.

1.1 DATA

How critical data is for companies and organizations?

What would happen if a company does not have access to its data?

Would customers be satisfied?

Can everything go normal after a mass data loss in a company?

Above questions are all kind of questions that should be asked if someone wants to know the importance of the

data in today's world or if they want to continue on the following paper.

With world getting as digitalized as every day is passing, there should be some way to manage and keep all this data, imagine next 5 years with the growth of Artificial Intelligence and Internet of Things how much data would be there compared to the size of data that is existed today?

So, everybody might have come to feel the importance of all these data, maybe someone says that the data is not important but it is recommended to go through above questions once again.

As it might be understood data might be the most important asset of many organizations and companies today, and everyday the size of their data is increasing, everyday they should find some new way to keep their data safe and accessible in the time of need, assume of a clinic which patients are registered in its storage systems with all their disease history, somehow all this data is erased now what? How much should this clinic struggle to get back to its normal situation, but during this time this clinic's customers wouldn't be satisfied from its services surely, because when their medical history is not available so they can not be treated properly as they could if their medical and treatment history was yet available, keep in mind that this situation can happen to any organization and they would all face the same problem if they lose their customers data.

And yet there are problems to solve and more answers to question, imagine of a small company that is working in application development, this company has many developers that are divided in different groups and each group is working on different subject or application what is best suggestion for this company that should give the ability to the developers to work on same application and can update, alter, upgrade and delete the application on which they are working and it should have expand ability so that they can expand it with time?(consider the low budget of the company) or another organization which the ease of use is most important factor for them to have a

shared datacenter among their employees with as less costs as possible.

All the above examples are real scenarios that are being implemented daily all around the world, one of the best alternatives that can be given to these companies is NAS (Network Attached Storage) to keep their data safe and highly available at any time.

1.2 Why Network Attached Storage?

NAS systems have advantages that give them little bit of preferability compared to other systems available, for most type of organizations, the advantages of NAS are as follow:

- NAS systems are so simple to apply and be deployed, sometimes there might be no need for a dedicated IT professional to manage and deploy it, just with only a little IT knowledge it is possible
- Can be deployed with low cost
- Gives data backup accessibility easily and anytime requested, beside they can be automated to be backed up
- Gives centralized data system so it is easier and less time consuming to be controlled
- RAID (Redundant Array of Independent Disks) can be applied on it, so it will give higher availability and performance.
- Can be deployed as a standalone server

Above points are some of the pints that can be critically useful while someone is in making of a decision for their Data storage system and they can make huge impact on anyone's decision.

1.3 NAS (Network Attached Storage)

NAS or complete form Network Attached Storage is a storage standard that enables multiple users and clients to have access to a single and centralized storage server.

In this type of storage connection is made through network or a LAN on ethernet standards. NAS servers are accessed by IP addresses and usually don't have keyboard or monitor, they can be standalone servers and are usually controlled over SSH or telnet.

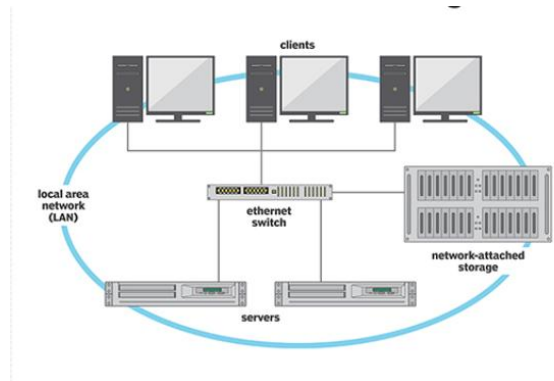


Fig - 1: NAS

NAS has too many advantages compared to other storage types such SAN and local storing approaches such as: ease of access, high capacity, low cost, centralized storing, backing up and also cloud tier.

Alongside NAS there is also SAN (Storage Area Network) which stands beside NAS as one of the main networked storage types. While NAS handles unstructured such as audio, video, website, text files and Microsoft office documents SANs store blocked data also known as structured data inside databases.

NAS gives wide area of abilities and advantages for the clients and enterprise networks.

By using NAS data can be shared among many users, without need to have multiple copies within every single user's devices, this is going to be some kind of collaboration and effectiveness, this feature can be used most while there are many teams that should work in collaboration with each other and access the same data, while there is also need to make updates, versions, copies, and deletion on the data in an organized way.

Along above features it also gives the remote access ability so if clients and team members are located in different time zones and geographical areas, they can still collaborate with each other as they are sat near to each other, totally distance can't make any effect on the performance of the server.

NAS systems can be deployed as a standalone server or either as an integrated service on another server, also there are NAS hardware devices available that are easy to setup and start using them, these devices are ranged from small LAN devices to large enterprise network devices, different devices are existed according to different requirements.

There are different NAS product categories available in the market that can meet the need of almost every user and organization the products are mostly divided into following three categories:

- High end NAS: it is also called as the enterprise NAS, as the name says this type of NAS is mostly used in the enterprise networks and where data exchange is too much. These types of products mostly come with RAID (Redundant Array of Independent Disks) capability which gives more capabilities on clustering, high availability and better performance.
- Midmarket NAS: These types of products are mostly used in smaller networks where requires only several hundred terabytes of data storage. These type of NAS devices usually don't include features as the enterprise NAS devices.
- Low end NAS: it is also called desktop NAS, usually used for small LANs where the need is not too much and doesn't require to handle several hundred terabytes of data

As technology is improving nowadays in every aspect and it's making its way through every part of creatures life, all of these processes and advancements are working on some kind of data and are analyzing these data so imagine after a decade with the growth of IoT (Internet of Things) and Data Analytics how much data would be there on the planet saved on the storage devices, all this data needs some type of management that be able to manage it in best way, means data should be available at the time of need, data should be kept secure, data should be safe if in case of data corruption backups be available, data should be highly available and many more factors, so to achieve all these goals there should be specific approaches to manage all these data, surely storage protocols such as NAS can help us too much in these manners. With the above-mentioned features that NAS can give us surely, it can be used one of the best alternatives to manage data.

2 Practical Approach

As an easy example NAS is deployed on an Ubuntu Server 19.04 so that reader has a basic idea of how easy it is the steps and configurations are tried to be as short as possible.

First of all, install the ubuntu server (19.04 in this example) on PC.

As it was told NAS systems are usually without mouse keyboard and monitor, they are usually controlled remote, by another computer or device here SSH (Secure Shell) can also be installed so remote access over the server would be

available. This can be done by typing the following command on the terminal

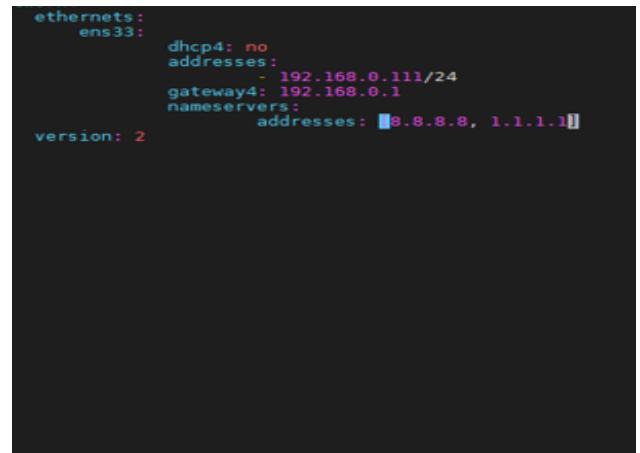
- Sudo apt-get install openssh-server

Above command is going to install the SSH Server on the system, now that remote access is available over the system it can be accessed through another system for more comfort.

NAS server should be with static address and it should be always accessible through organization to achieve this Static IP Address should be assigned on server so that it be known by a single static IP Address all over the organization and does not make problems by changing IP Address.

Static IP Address can be set on Ubuntu Server by going to the following file in the system and writing down the following block of code in it.

- /etc/netplan/50-cloud-init.yaml → name of the file (bare in mind that the name of the file may be a little bit different under some circumstances)



```
ethernets:
  ens33:
    dhcp4: no
    addresses:
      - 192.168.0.111/24
    gateway4: 192.168.0.1
    nameservers:
      addresses: [8.8.8.8, 1.1.1.1]
version: 2
```

Fig - 2: Static IP Address

2.1 SAMBA

Samba is an open source protocol as alternative for Microsoft SMB (Server Message Block)/CIFS (Common Internet File System). This protocol can be used for variety of services and purposes, one of which is used here as data storage.

It can be installed easily by the following command on the system:

- Sudo apt-get install samba

After installation completion the server should be configured, the default configuration file is located in the /etc/samba directory and is named as smb.conf file, better to make a copy before making any changes to the file as precautions.

Note that the file has two parts:

- Global configurations which are related to the server behavior
- Shared configuration which are related to the shares

Now make a root directory in host system so that all shares files are saved to it. The directory can be located anywhere on the server.

Know that while installing the samba it is going to make a user with name of sambashare so directory that was created in pervious step, it's access should be given to that user so samba can alter the directory. The access can be granted by the following command:

```
Sudo chown :samabashare directory/
```

There should be users through whom they are going to access shared files and storage, there can be as much users as required. And for each user it is better to make a directory in the root directory that was created earlier as samba root directory.

Better to create the user using the following command to avoid any misleading:

```
Sudo adduser -home directory/user_directory -no-create-home -shell /usr/sbin/nologin -ingroup sambashare User_Name
```

Give access of the specific directory that was created to the desired user that is created. Can be done using the following command:

```
Chown User_Name:sambashareDirectory/
```

To use the directory without any problem in future full directory access should be given to the user alongside child directory access to it also, it can be done by the following command:

```
Sudo chmod 2770 directory/
```

Now the user is going to be added to the samba server. It can be done by following two command

```
Smbpasswd -a User_Name
```

```
Smbpasswd -e User_Name
```

It will ask for a password which is going to be used as the password while someone wants to access the file share.

Note: -a is used for adding user if it is not added

Note: -e is used for enabling user in the server if it isn't enabled

There can be added as many users as required, and the process for all of them is the same.

The configurations yet were related to the user, server configurations are all going to be done in the samba main configuration file, in that file every user can have its own block of configurations, the configurations can be complex or as easy as to only give simple storage access.

Configuration block for every user can be added as follow:

```
[share_name]
```

Path = path to the user directory inside server

Read only = are valid users only allowed to read the share

Valid users = list of valid users, groups can be added also if it is required.

2.2 Connecting from client

Can be done by adding the storage as a network drive, as follow

```
\\Sever IP\User Name --> on windows
```

Type login credentials, and it is done.

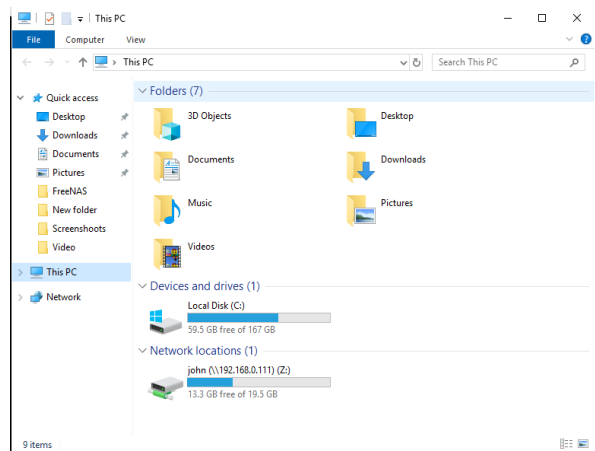


Fig - 3: Client Connection

Keep in mind that the above configuration was as simple as possible deployment of the NAS server, it can be much more complex and much more useful by adding and removing rules and tasks on it.

3 Conclusion

Beside NAS there are other Centralized Storage approaches also that can be deployed and each of the approaches has its specific use cases, some of these approaches are as follow:

ISCSI (Internet small computer system interface) which is an IP based storage system, is useful when you want to share physical drive within a network.

NAS (Network Attached Storage) is what we have discussed above, this type of storage protocol gives access as a file server on the network.

SAN (Storage Area Network) is same as NAS except that while using NAS the storage is going to look like as File server on the client but using SAN it will look like as a disk

Fiber Channel is a new storage technology that gives a very high-speed file access and it is better to be used in enterprise and advanced networks.

A better understanding of these file system importance would be understood while someone is working in an enterprise network and all the employees are in need of a fast and reliable storage service so that all have access to this storage according to their privileges and access level, so anyone can choose one of these file systems and use it as their need

4 References

Cooper, E. (2018, May 11). *How To Set Up a Samba Share For A Small Organization on Ubuntu 16.04*. Retrieved from Digital Ocean: <https://www.digitalocean.com/community/tutorials/how-to-set-up-a-samba-share-for-a-small-organization-on-ubuntu-16-04>

Official, U. (2019). *OpenLDAP Server*. Retrieved from Ubuntu Server Guide: <https://help.ubuntu.com/lts/serverguide/openssl-server.html>

Sadr, H. (2016). Implementation and challenges of Free-NAS System. *Herat University, Computer Science Faculty*, 43.

Tech, S. (n.d.). *What is NAS (Network Attached Storage) and Why is NAS Important for Small Businesses*.

Retrieved from Seagate: <https://www.seagate.com/in/en/tech-insights/what-is-nas-master-ti/>

Wallen, J. (2018, June 14). *How to configure a static IP address in Ubuntu Server 18.04*. Retrieved from Tech Republic: <https://www.techrepublic.com/article/how-to-configure-a-static-ip-address-in-ubuntu-server-18-04/>