

Analyzing the Challenge of Storage Virtualization

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Abstract—This paper we are discussing about the Challenges of Storage Virtualization and abstraction of logical Storage from physical Storage in Storage Virtualization there are 3 different types. They are 1) DAS-Direct Attached Storage 2) NAS-Network Attached Storage 3) SAN-Storage Attached Network. DAS is the conventional method of data storage where storage drives are directly attached to server machine. NAS is the shared storage which connects through the network. It is used for file sharing devices sharing. SAN is a storage device that are shared with different server over a high accelerate network. Be specific or outline what are the challenges to be discussed?

Keyword—Cloud Computing, Virtualization, Architecture of Virtualization, Storage Virtualization, Need of Storage Virtualization, Type of Storage Virtualization, and Challenges of Storage Virtualization.

1 INTRODUCTION

Cloud computing refers to a collaborative IT (Information Technology) environment, which is planned with the intention of measurable and remotely purveying scalable IT resources for effective and efficient utilization. Cloud computing is one of the most useful technology that is been widely used all over the world. It generally provides on demand IT services and products. This paper discusses about cloud computing, how storage virtualization of data is going to be done in cloud computing.

2 CLOUD COMPUTING

“Cloud computing technology is based on three factors-grid computing, utility computing and automatic computing”. Cloud computing are the biggest cloud service providers providing very large storage to its users and making the work easier.

3 VIRTUALIZATION

Virtualization allows multiple instances of an operating to run concurrently on single computer.

The main aim of virtualization is to manage the workload by transforming traditional computing to make it more scalable, efficient and economical. Virtualization can be applied to a wide range such as operating system virtualization, hardware-level virtualization and server virtualization. Virtualization is a technique of abstracting physical resources in to logical view, Increases utilization and capability of IT resource, Simplifies resource management by pooling and sharing resources

4 ARCHITECTURE OF VIRTUALIZATION

Virtual machine is computer software that runs operating system and applications. It is the duplication of real machine. The physical server on which one or more virtual machines are running is defined as host. The virtual machines are called guests. Multiple virtual systems (VMs)

can run on a single physical system. This is shown in figure 1.

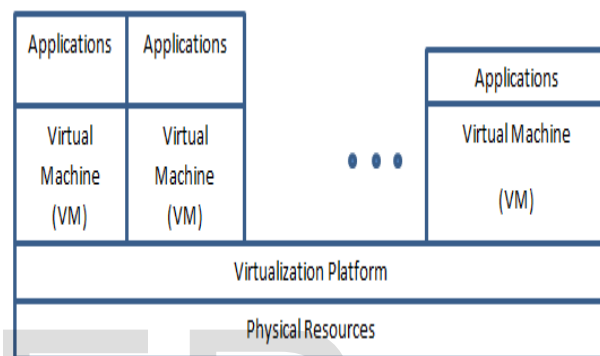


Fig: Architecture of Virtualization

5 STORAGE VIRTUALIZATION

Storage virtualization is the process of grouping the physical storage from multiple network storage devices so that it looks like a single storage device. The process involves abstracting and covering the internal functions of a storage device from the host application, host servers or a general network in order to facilitate the application and network-independent management of storage. Storage virtualization is also known as cloud storage. Storage virtualization is a multiple network storage devices into what appears to be a single storage unit. Storage virtualization is usually implemented via software applications and often used in SAN (storage area network), a high-speed sub network of shared storage devices, and makes tasks such as archiving, back-up, and recovery easier and faster

6 BENEFITS OF STORAGE VIRTUALIZATION

In addition to consolidating storage resources, other top use cases for storage virtualization include:

- Efficiently scale the storage environment while leveraging existing storage assets.
- Streamline technology refreshes and improve storage utilization.
- Simplify management needs, particularly across multivendor storage resources.

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- Reduce complexities of data migrations and risks to bolster business continuity.

7 ADVANTAGES

- Less energy use
- More disk space
- Cost-effective in terms of not having to purchase as much additional software
- Increased loading and backup speed
- The same amount of work can be completed with less servers since they are effectively working together

8 DISADVANTAGES

- Often violates licensing agreements
- Reduced costs and increases in disk space can encourage people to increase the number of servers, creating server sprawl, in which there are too many servers to be managed
- The network system is much more complicated
- If one system fails, they all fail
- If one server is infected or breached, the entire network is compromised.

9 NEED OF STORAGE VIRTUALIZATION

Storage Area Networks impose the need for managing large amounts of storage, in a uniform way and from a central location. The fast growth in storage capacity and processing power in many enterprise installations, coupled with the need for high availability and 7x24 operations, requires the SAN architecture to enable seamless addition of storage without downtime. These goals are best achieved via virtualization of the storage.

Storage Virtualization should provide the following functions without affecting inherent performance:

9.1 Universality - the creation of a unified view of the virtual storage regardless of the physical elements or topology

9.2 Single Point of Management - as dictated by the enterprise policy Server, Operating System and File System independence - to enable the construction of the most cost effective SAN

9.3 Storage sub-system independence - to enable unbiased selection of best of breed system

9.4 Heterogeneous SAN support - to enable smooth growth in changing market conditions

Flexible allocation of storage space to servers - to effectively meet users' needs

9.5 Support the overall SAN criteria - e.g. High Availability, Scalability, Security etc.

10 TYPES OF STORAGE VIRTUALIZATION

The storage components of the three traditional solutions namely DAS, NAS and SAN will be discussed.

1)DAS-Direct Attached Storage

2)NAS-Network Attached Storage

3)SAN-Storage Area Network

11 DIRECT ATTACHED STORAGE (DAS)

- ✓ DAS refers to a storage system attached directly to a server without the involvement of a network system.
- ✓ It is a non-networked storage solution, which does not provide access to other devices in the storage environment. This concept uses the server as the centre for data transmission purposes.
- ✓ The main protocols used in DAS connections are ATA, SATA, SCSI, SAS and Fiber Channel
- ✓ DAS is among the least expensive ways to add large amounts of storage to a server
- ✓ There is no storage networking to administer
- ✓ Local array controllers on modern servers are relatively powerful
- ✓ Storage direct attached will be accessed quite fast over SAS or a direct fiber channel connection

Direct Attached Storage (DAS)



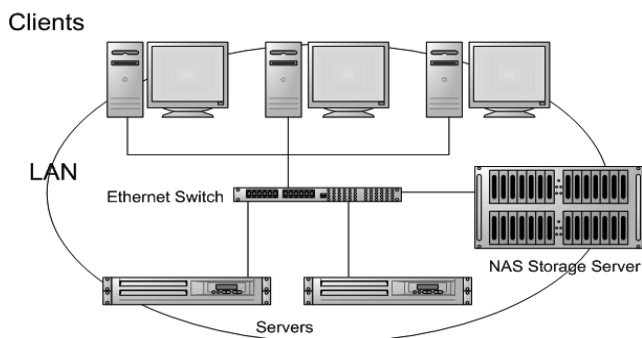
- Disk(s) directly connected to the machine.
- Most simple/common storage.
- Example: Our Laptops, Desk tops etc

Network Attached Storage (NAS)

- ✓ NAS is another primary solution for data storage. It is a file-level data storage which utilizes the built-in server as central data storage.
- ✓ NAS systems are normally networked and may be comprised of multiple logically or RAID arranged storage devices.
- ✓ Using file sharing protocols like AFP, NFS, and CIFS/SMB, file access is provided
- ✓ NAS appliances are storage units directly attached to a local area network (LAN).
- ✓ NAS provides solutions to a number of business requirements including solving the problems of DAS.

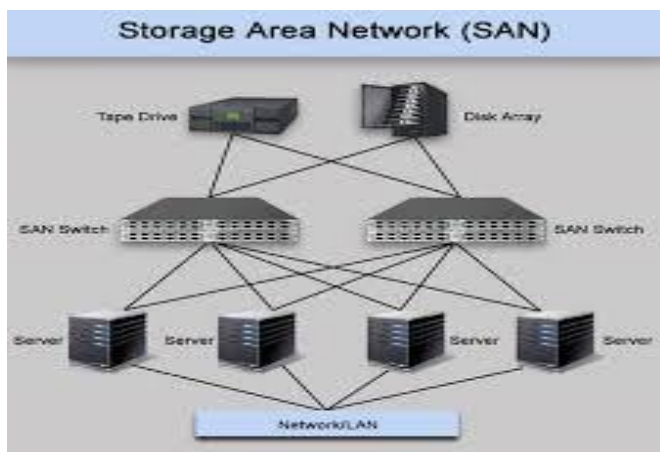
- ✓ Limited backup functionality can also be a dis-advantage of the NAS architecture.

Network Attached Storage



12 STORAGE AREA NETWORK (SAN)

- ✓ SAN is the most popular solution, which has been rapidly spreading across organizations.
- ✓ Storage devices can be connected directly to this network by fabric which contains switches and hubs to connect any storage to the servers as if they were local.
- ✓ Sans depend heavily on a high-speed fiber channel technology to provide flexible connectivity requirements.
- ✓ SAN contributed to solve the scalability issues of DAS and NAS by allowing servers and storage devices to scale independently
- ✓ The major disadvantages of SAN storage systems arouses usually have to stick to a single vendor, which results in isolated pockets/islands of SANs.



13 STORAGE VIRTUALIZATION CHALLENGES

Storage management and administrative costs continue to raise, despite the steady migration to storage virtualization solutions. One reason for this continued rise in costs is that the storage demands placed on enterprises are greater than in any other time in recent memory. Cloud computing, big data, mobile computing and other mega-trends are dramatically increasing demands for storage capacity. As data flows from mobile devices, Web applications, machine-generated data and dozens of other sources, enterprises have more data and data sources, to

store, move and manage than ever before. Still, storage virtualization was supposed to address these challenges: And it has, to some extent. But as enterprises further expand their storage infrastructure to support their expanding range of applications and their accompanying data, the complexity of the infrastructure continues to grow exponentially. And ongoing operating costs grow as well. Even with the advantages of storage virtualization, managing, monitoring and optimizing these immense environments is difficult, time-consuming and increasingly expensive.

13.1 Scalability

Ensure storage devices perform appropriate requirements.

13.2 Functionality

Virtualized environment must provide same or better functionality. Must continue to leverage existing functionality on arrays

13.3 Manageability

Virtualization device breaks end-to-end view of storage infrastructure. Must integrate existing management tools

13.4 Support

Interoperability in multivendor environment

14 CONCLUSION

This paper we have discussed about various components of the storage topologies, they are of three type namely Direct-Attached Storage (DAS), Network-Attached Storage (NAS) and Storage Area Networks(SAN),and the challenges of storage virtualization. How we can reduce the Data Storage in the future generation.

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