Date ____/____/____
Page _____

UNIT-III

CLOUD MANAGEMENT-

① Resiliency -

It is the capacity to rapidly adapt and respond to risks, as well as opportunities. This maintains continuous business operations that support growth and operate in potential adverse conditions.

→ Cloud resilience services are -

(1) Systematically and automatically backup data which increase availability and recovery rates in ~~a~~ adverse situation.

(2) Archiving documents which improves the efficiency of storing and retrieving information as needed, whether of regulatory compliance or business need.

(3) Enable faster recovery of application without the high cost

→ Resiliency Capabilities -

The framework combines multiple parts to mitigate risks and improve business resilience -

(1) From a facilities prospective, you may need to implement power protection

(2) From security perspective, to protect applications and data

(3) From process perspective, you may implement identification and documentation of most critical business process.

(4) From organizational perspective, geographical diversity, backup of ~~data~~ workstation data

(5) From strategy and vision perspective, you would want to have a crisis management.

② Provisioning - (means to provide)

Cloud provisioning is the process of allocating a cloud providers resources to the customer.

Whenever a cloud provider accepts the customer request, it needs to establish the appropriate number of VMs and allocate resources for supporting them. This process is carried out in three way -

(1) Dynamic Provisioning - In this the provider allocates more resources as per requirement and removes them when they are not needed. The customer

is charged according to pay-per-use basis. If this dynamic provisioning is used to create a hybrid cloud, then it is referred as cloud bursting.

(2) Advance Provisioning - In this the customer undertakes a contract with the provider for the required resources and the cloud provider arranges the appropriate resources before beginning the service. The customer is billed a flat fee or on a monthly basis.

(3) User Self-provisioning (Cloud self service) - In this process the customer purchases the required resources from the provider with the help of a web form by creating a customer account and then paying for the resources through credit card. The cloud provider's resources are made available for customer use within a span of a few hours.

(3) Asset Management :

This task is to manage all the assets, such as network, hardware and software that makes the cloud infrastructure. The main aim of asset management is to secure organizational assets.

Asset management strategy includes -

(1) Software Packaging - The output from software package will be used during the installation and configuration of the various software package requested by customers.

(2) Incident Management - Used to track any interruptions or issues to the asset management service.

(3) Pool Management - It works with asset management to make sure that the products requested are available on the requested date and for specified duration.

(4) System Management - It is both a process and a service. In order to interface with asset management, it provides all of the information on what attributes of OS, middleware components need to be managed.

(5) Release Management

(6) Configuration Management -

(7) Backup Management

④ Concepts of MapReduce -

MapReduce is a software framework that allows developers to write programs that process massive amounts of unstructured data in parallel across a distributed cluster of processors or stand-alone computers. It was developed by Google for indexing web pages and replace their original indexing algorithms and heuristics in 2004.

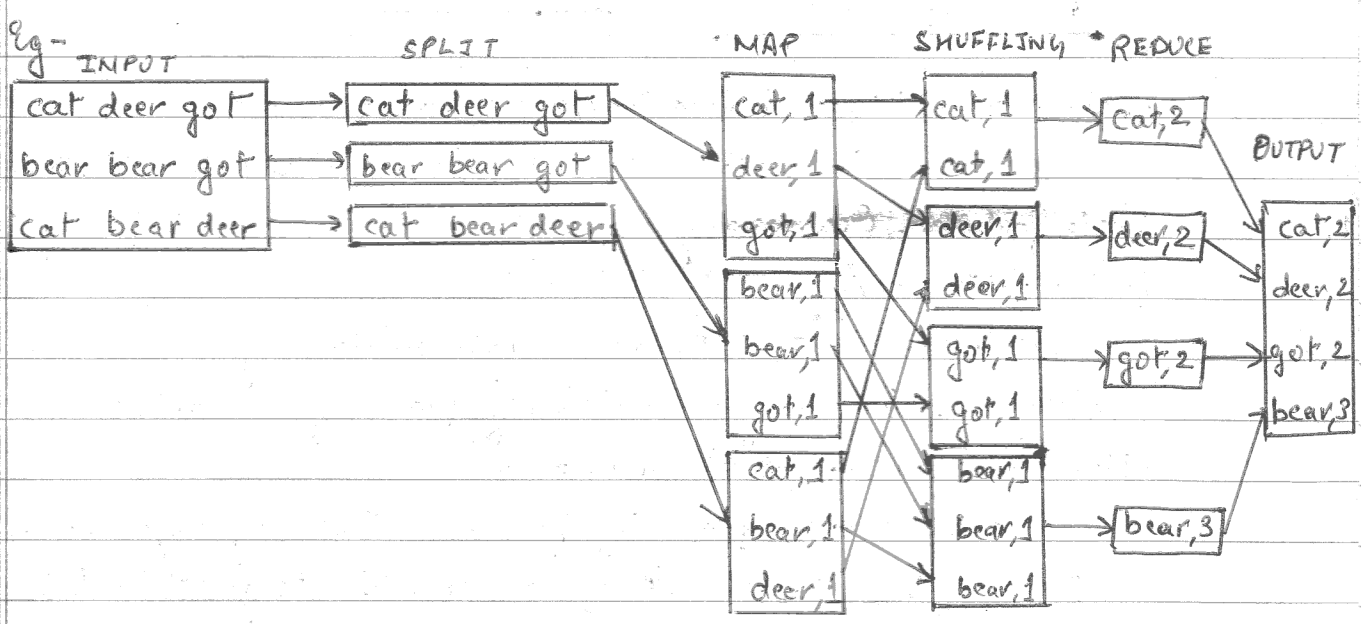
The framework is divided into two parts -

(1) Map - A function that parcels out work to different nodes in the distributed cluster.

(2) Reduce - Another function that collates the work and resolves the results into a single value

The MapReduce framework is fault-tolerant because each node in the cluster is expected to report back periodically with completed work and status updates. If a node remains silent for longer than the expected interval, a master node makes note and re-assigns the work to other nodes

A SIMPLE MAPREDUCE JOB



Date ___/___/___
Page _____

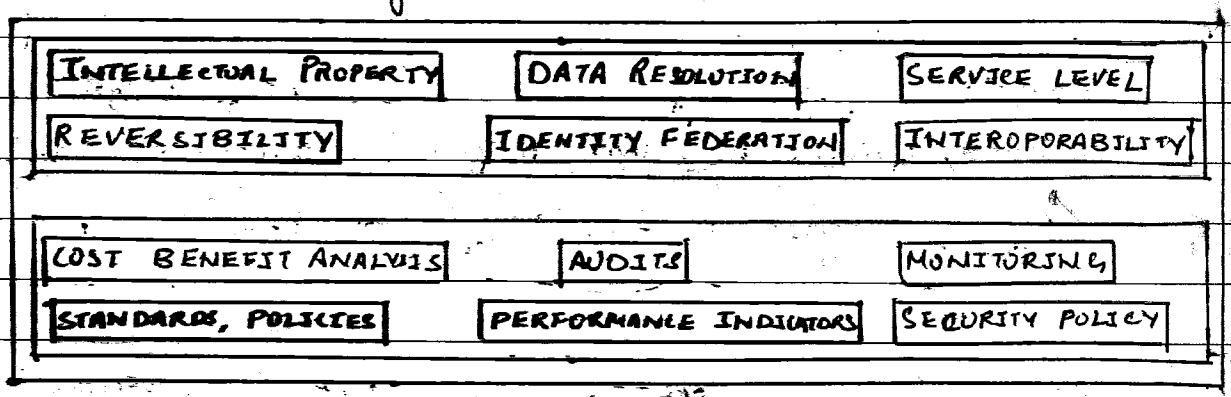
⑤ Cloud Governance -

It is the process of controlling the access to the service with the help of policies, tracking services using repositories, and logging and monitoring the execution of those services.

The main aim of cloud services governance is to protect data and applications which are located remotely.

It deals with -

(1) Telling company policy for cloud computing
(2) Risk based decisions
(3) Assigning responsibilities for enforcing & monitoring of policy compliance
(4) Set corrective actions for non-compliance.
(5) Improve productivity



⑥ High availability and disaster recovery -

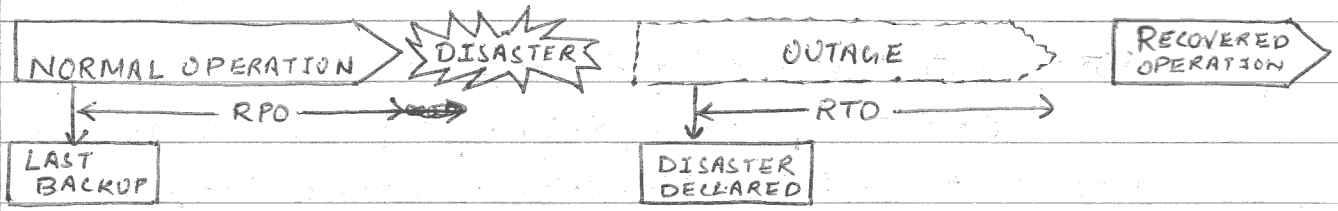
While high availability systems are designed to withstand any single failure. Occasionally disaster events cause multiple systems to fail simultaneously.

As these events overwhelm high availability mechanisms, an additional tier of business continuity planning and disaster recovery is often deployed to protect critical services.

Disaster recovery planning focuses on two key objectives -

(1) Recovery time Objective (RTO) - It is the target time between when disaster is declared and when service is recovered on backup site.

(2) Recovery point Objective (RPO) - It is the most recent point in time to which system state can be recovered onto backup site.



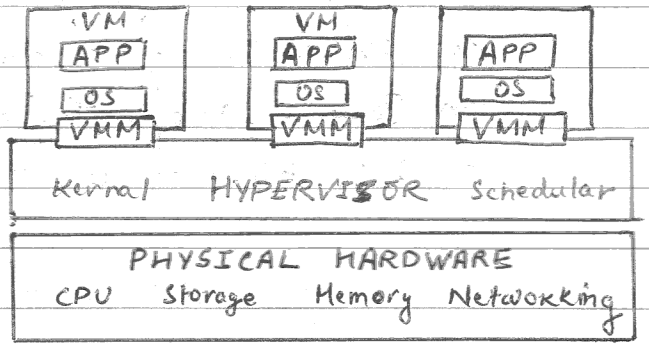
Although the RTO and RPO for critical failures are generally seconds or minutes while RTO and RPO for disaster events are often hours or days.

VIRTUALIZATION –

① Virtualization is defined as an abstraction of computer resources. It creates a virtual form of a device or any computer resource, like storage device, network, server and an operating system in which the framework partitions the resource into one or more execution environments.

② Compute Virtualization –

It is a technique for masking or abstracting the physical hardware from the operating system. It enables multiple operating system to run concurrently on single or clustered physical machines.



VMM → Virtual Machine Manager

VM → Virtual Machine

→ Virtualization layer resides between hardware and VM also called Hypervisor

→ Advantages –

(1) Run multiple OS concurrently
(2) Make OS and application, hardware independent
(3) Isolate VM from each other, no conflict
(4) Improves resource utilization
(5) Offers flexible infrastructure at low cost.

③ Storage virtualization (Cloud Storage) –

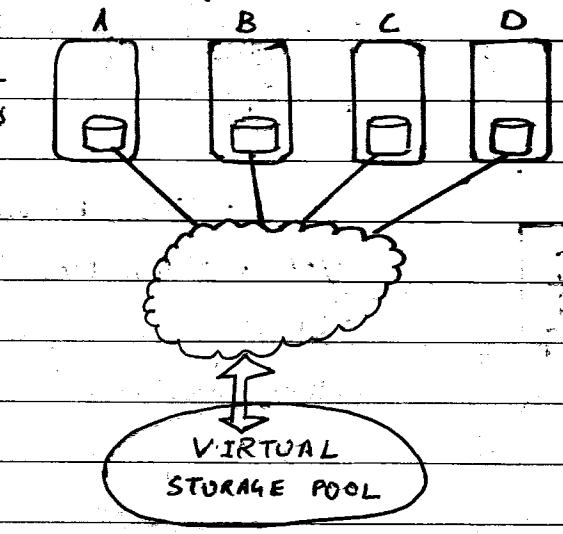
It is the process of defining a physical storage from several network storage devices which act like a single storage device. It allows the storage administrator to perform different tasks such as backup, recovery, archiving very easily, and that too in a short span of time.

Storage virtualization is structured in three ways –

(1) Network-based – In this, storage virtualization is treated as a network-based device

(2) Host-based – Physical drives are under the control of the traditional device driver in which a software layer existing above it intercepts I/O requests which finds metadata and redirects I/O.

(3) Storage device-based – The primary storage controller considers pooling and manages metadata which allows the direct attachment of any other storage controllers.



Advantages –

(1) Storage management is easy
(2) Less energy usage
(3) Reclamation of storage space is possible
(4) Ability to migrate data
(5) Increase storage utilization
(6) Support heterogeneous storage platform

Disadvantages –

(1) Does not allows vendors to easily interoperate very frequently
(2) Network system is highly complicated
(3) If a single server gets infected the whole network is compromised

④ Network Virtualization –

It is a process of logically segmenting or grouping physical network and making them operate as a single or multiple independent networks

called virtual networks.

Network virtualization involves virtualization of both physical and virtual machine networks.

Physical Network - It may consists of network adapters, switches, routers, bridge, repeaters, hubs. It provides connectivity -

(1) among physical server running hypervisor.

(2) between physical sever and clients.

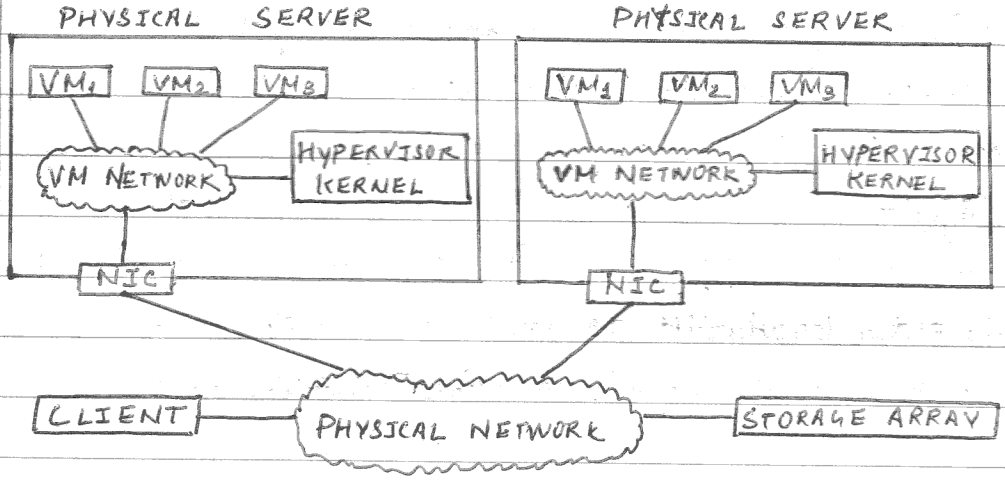
(3) between physical server and storage.

Virtual Network - It resides inside a physical server. It includes logical switches. It provides connectivity -

(1) among VMs inside a physical server

(2) to hypervisor kernel

(3) connects to physical network.



Advantages -

(1) Enhance security

(2) Enhance performance

(3) Improves manageability

(4) Improve utilization

(5) Reduce capital expenditure

Disadvantages -

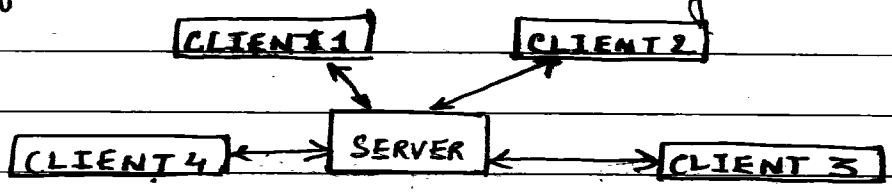
(1) Highly complex

(2) Requires thoughtful planning

⑤ Desktop virtualization -

It provides a user with an operating environment that is separate from their local physical system. It consists of the servers, virtualization

software on the server and virtual image on the desktops.



There are two types of desktop virtualization -

(1) Server-hosted desktop virtualization - The operating environment will be hosted on a server manually located in a data centre and accessed by the end-users over the LAN or WAN.

(2) Client-hosted desktop virtualization - The operating environment runs locally on the user's system hardware which includes hypervisor software which allows one desktop to run multiple ~~OS~~ OS's.

Advantages -

(1) Accessing desktop from anywhere

(2) Enhance security as administrator is centralized

(3) Faster, easier and reliable backup/recovery of data

(4) Reduced TCO (Total Cost of Ownership)

Disadvantages -

(1) Licenses for OS, applications etc still needs to be bought.

(2) Needs extra bandwidth to handle all remote users

(3) Difficult to handle graphics or High Definition video

(6) Application Virtualization -

It is the technique of providing an application to an end user without any installations, integration or dependencies on the underlying computing platform

APPLICATION	APPLICATION	APPLICATION
APPLICATION	SANDBOX	SANDBOX
APPLICATION	VIRTUALIZATION SOFTWARE	
OPERATING SYSTEM		
PHYSICAL OR VIRTUAL HARDWARE		

Two forms of application virtualization are -

(1) Remote application virtualization - Remote application are used to run on a server. It is possible for the end-users to view and interact with the required applications through a network via some remote display protocol.

(2) Streaming application virtualization - Whenever an application is requested by the end-user, the components get downloaded to the local system based on the requirement. Once the downloading process is finished, the streamed application will work properly without any need of internet connection.

Advantages -

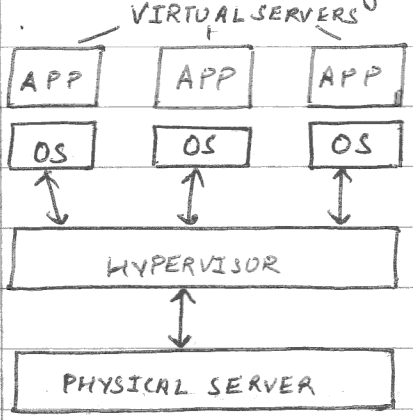
(1) NO installation required
(2) Application retirement simplified
(3) No more application conflicts
(4) Simplifies OS integrations
(5) Multiple runtime environments

Disadvantages -

(1) Single point of failure
(2) Very high cost
(3) High bandwidth required

(7) Server Virtualization

It is the masking of server resources including the number and identity of individual physical servers, processors and operating systems from server ~~utilization~~ users. The server administrator uses a software application to ~~dovdivide~~ one physical server into multiples isolated virtual environments.



Server virtualization can be viewed as part of an overall virtualization trend in enterprise IT that includes storage virtualization, network virtualization and workload management.

There are three types of server virtualization -

(1) Para-Virtualization - It provides several OSs to run on a single set of hardware by making use of system resources very effectively.

Disadvantage - Requires the guest OS to be revised.

(2) Operating system virtualization - It involves a standard OS to run various applications which are controlled by different users on a single system at a time.

Disadvantage - Choice of OS is limited.

(3) Hardware emulation - It is used when there is a need to run an unsupported OS within a VM. It is used to debug & verify a system which is under design.

Disadvantage - Need to install and update device drivers

→ Advantages of server virtualization - Disadvantage -

(1) Reduce the number of servers. (1) Slow

(2) Reduces IT cost. (2) limit the amount of storage space

(3) More application can be run. (3) Performance degradation exists

(4) Continuity in business (4) less secure

(5) Multiple OS on a single hardware platform.

(8) Virtualization Benefits -

(1) Most mature, proven and comprehensive platform

(2) High application availability

(3) Wizard-based guides for ease of installation

(4) Simple and streamlined management

(5) High reliability and performance

(6) Superior security

(7) Greater savings

(8) Affordability.

(9) Block level storage virtualization -

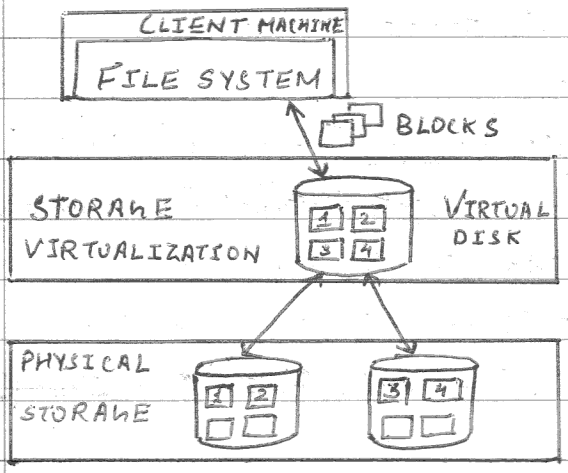
Storage capacity is made available to the OS or the applications in the form of virtual disks.

The task of the virtualization entity is to map these virtual blocks to the physical blocks of the real storage device.

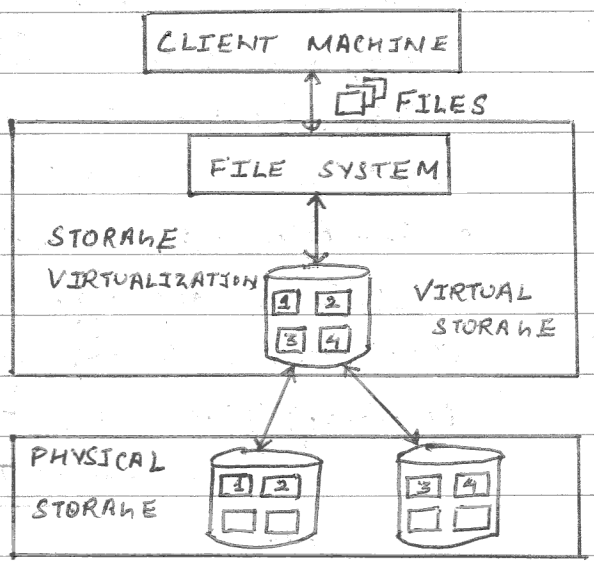
Date ____/____/____
Page _____

File level storage virtualization -

The virtualization entity provides virtual storage to the OS or applications in the form of files and directories.



BLOCK LEVEL STORAGE VIRTUALIZATION



FILE LEVEL STORAGE VIRTUALIZATION

Advantages of block level storage virtualization -

(1) It is suitable if the storage is to be virtualized for as many as different OS and applications as pomible.

(2) Actually necessary when dealing with applications that handle their storage access on block level and cannot work on file level.

Advantages of file level storage virtualization -

(1) Absolutely necessary for those who want to establish data sharing between several servers

(2) File system management is done by the storage virtualization.

(10) Hypervisor management software -

Hypervisor It is a compute virtualization software that enables multiple OS to run on a physical machine concurrently. It interacts directly with the physical resources of the compute system.

Hypervisor has two components -

(1) Kernel - provides the same functionality as other OS, like process creation, file system management, process scheduling, ~~resource~~ It also

provides resource scheduling, I/O stack etc.

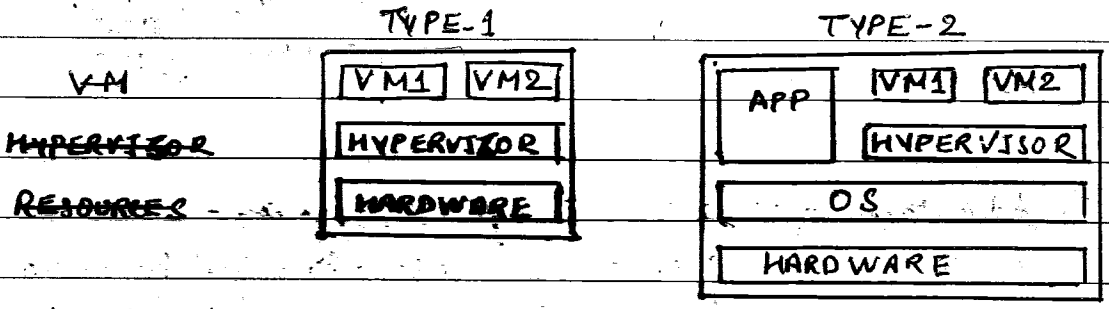
(2) VMM (Virtual Machine Manager) - It is a management solution for the virtualized datacenter, enabling you to configure and manage your virtualization host, networking and storage resources.

Hypervisor are divided into two types -

(1) Type 1 (Native or bare-metal Hypervisor) - These are installed directly onto the hardware just like a regular OS gets installed on a single server.

Eg - Microsoft's Hyper-V, VMWare ESXi etc.

(2) Type 2 (Hosted Hypervisor) - These are installed and run as an application on the top of the OS. Eg - Oracle VirtualBox, Microsoft Virtual PC etc.



(10) Hypervisor provides functions such as create VM, delete VM, move VM.

(11) Infrastructure Requirements -

Virtualization products have strict requirements on backend infrastructure components including storage, backup, system management, security and time synchronization.

Ensuring that these components are of required configuration is critical for successful implementation.

Server virtualization suitability assessment -

One of the key advantages of virtualization is greater utilization of physical server resources. To ensure that existing servers will operate in a shared environment, detailed hardware inventory and performance utilization information must be obtained and analyzed for assessment purposes.

Date ___/___/___
Page _____

Detailed Design -

Virtualization introduces many changes into the environment, and ensures that the platform can co-exist and interact with existing infastructure.

The purpose of the detailed design is to set naming and security standards, define the disk and network structure. It includes the following -

(1) Security and Administrative model.
(2) Backup methodology.
(3) VMWare service console configuration
(4) Implement tables and configuration setting.

(12) Virtual LAN (VLAN) -

A virtual local area network (VLAN) is a network technology used to logically separate large broadcast domains using layer 2 devices.

VLAN standard is IEEE 802.1Q.

→ Types of VLAN are -

(1) Data VLAN - Main type of virtual network. It is designed to carry user-defined data.
(2) Default VLAN - This is the VLAN assigned by default to all ports. For CISCO switches this is VLAN 1.
(3) Native VLAN - This is the VLAN assigned to untagged packets, which have not get travelled through a VLAN marked port.
(4) Management VLAN - A VLAN used for switch management.
(5) Voice VLAN - This is special type of VLAN used with VoIP devices.

→ Benefits of VLAN -

(1) Improved Security
(2) Higher Performance
(3) Cost Reduction
(4) Simplified network management.

(13) Virtual SAN (VSAN) -

A virtual storage area network (VSAN) is a logical partition in a SAN. It allows traffic to be isolated within specific portions of a SAN.

Benefits of VSAN -

(1) Virtual SAN Islands - A SAN island is a storage area network (SAN) that exists as a discrete, isolated entity within a larger SAN.

(2) Transparent to end devices

(3) ISL Trunking (Inter switch link) - Trunking allows ISLs to carry traffic for multiple VSANs on the same physical link.

(4) Fabric availability

(5) Fabric scalability

(6) Traffic management is easier

Fabric - The hardware that connects workstations and servers to storage devices in a SAN is referred to as a "fabric".