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Setting Up A Secure Virtual Environment



Introduction to Virtualization



Benefits of Virtual Environments vs. Physical Environments



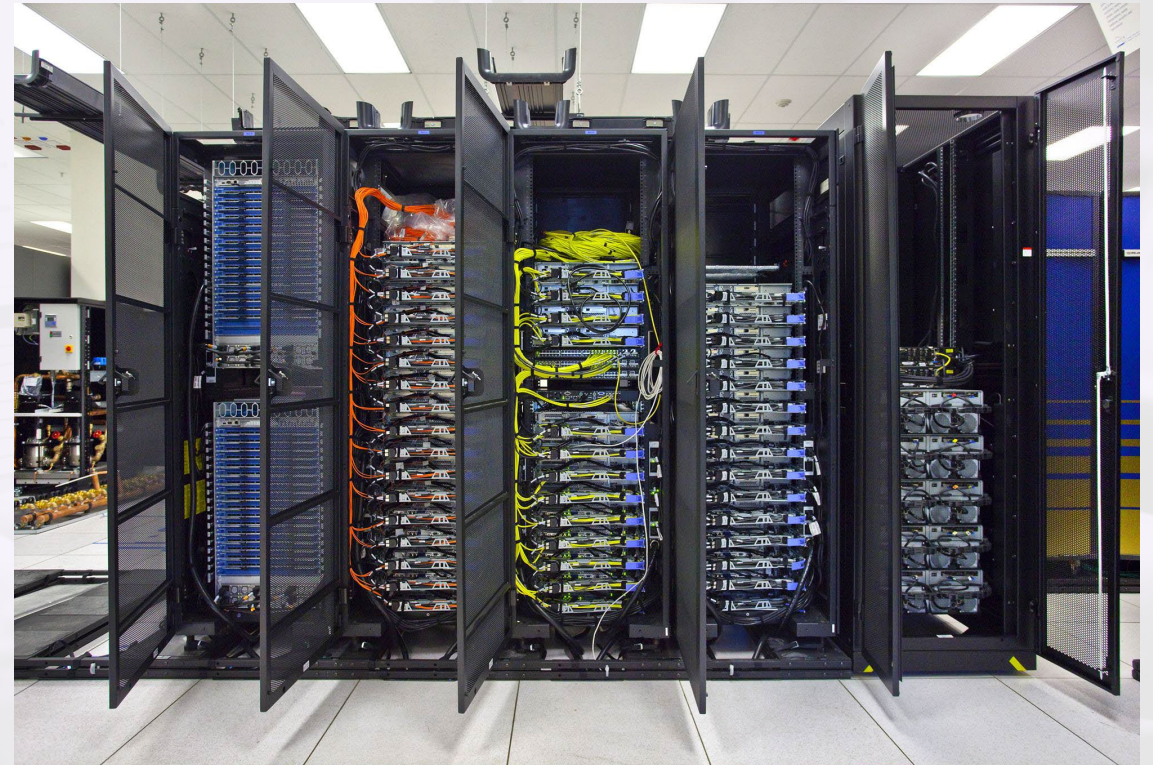
What is a Hypervisor



Components of Virtual Environments



Creating a Secure Virtual Environment



Setting Up A Secure Virtual Environment



High Availability



Snapshot Advantages



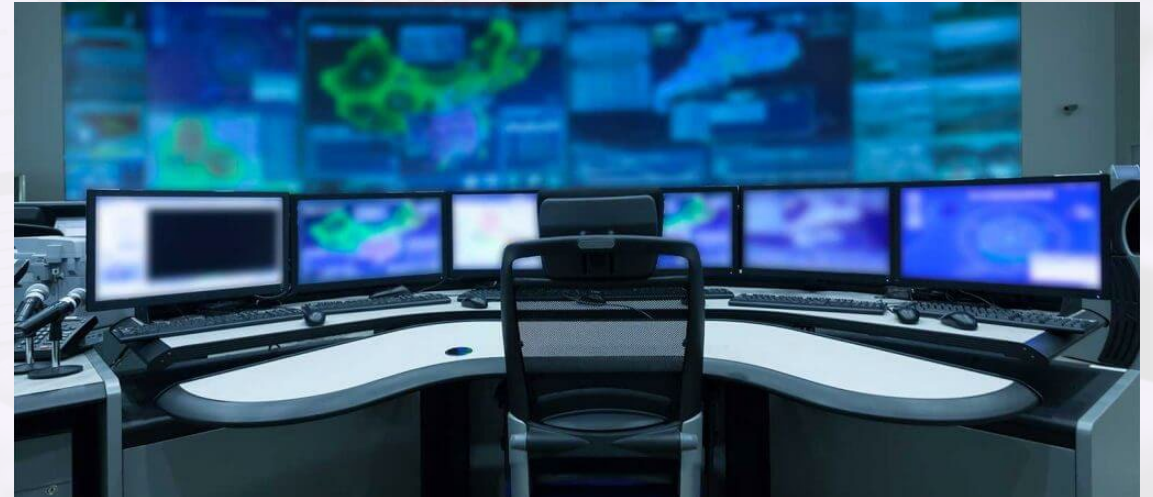
Disaster Recovery



Questions



We did it!

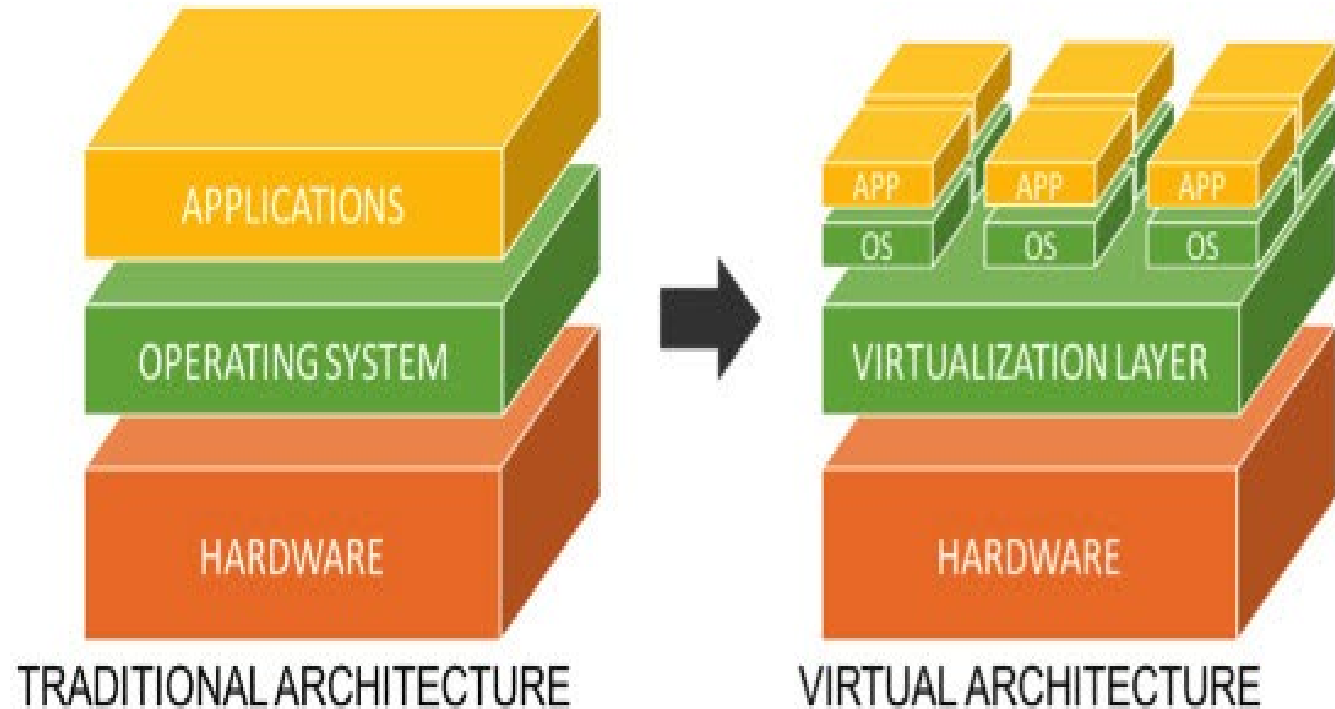


Introduction to Virtualization

Virtualization is the creation of a virtual version of a resource or device, such as an operating system, a server, a storage device, or a network.

Examples of virtualization in use include:

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- Storage virtualization: Creating virtual storage devices from multiple physical storage devices.
- Network virtualization: Creating virtual networks from multiple physical networks.



Virtual Machines > VMware ESXi 6.5 U2

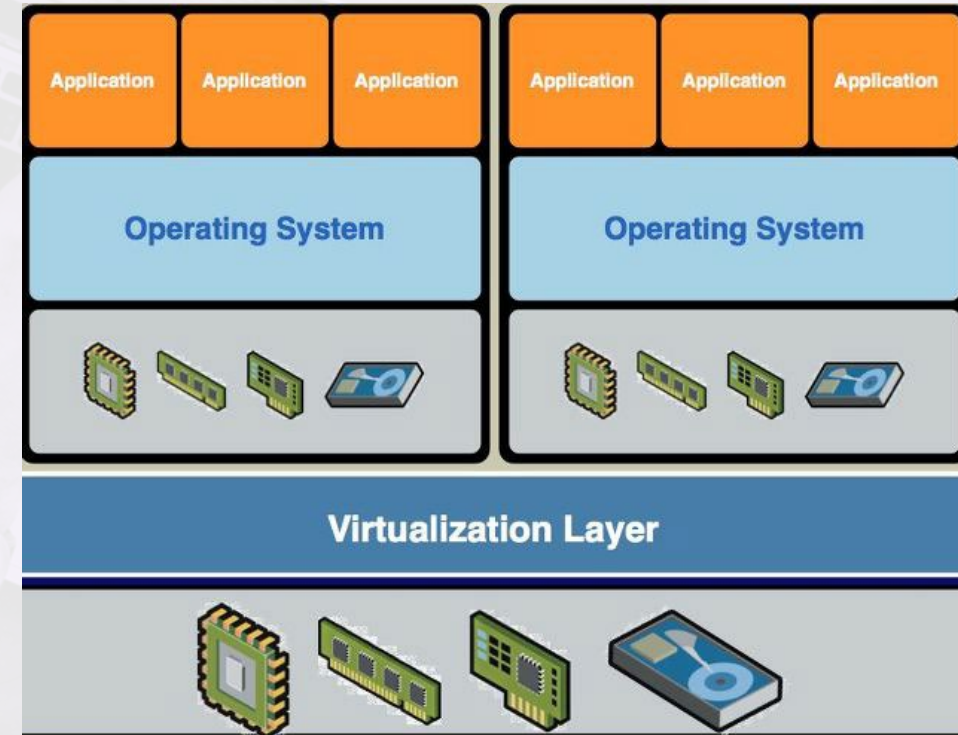
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VMware ESXi 6.5 U2.vmdk	1/3/2020 6:18 PM	VMware virtual dis...	400,512 KB
VMware ESXi 6.5 U2.vmsd	12/26/2019 3:49 PM	VMware snapshot ...	0 KB
VMware ESXi 6.5 U2.vmx	1/3/2020 6:18 PM	VMware virtual m...	3 KB
VMware ESXi 6.5 U2.vmx	12/26/2019 3:49 PM	VMware Team Me...	1 KB
VMware ESXi 6.5 U2-0-SSD.vmdk	12/26/2019 4:02 PM	VMware virtual dis...	121,856 KB
vmware.log	1/3/2020 6:18 PM	Text Document	1,132 KB
vmware-0.log	12/30/2019 4:29 PM	Text Document	1,320 KB

Benefits of Virtual Environments vs. Physical Environments

- **Cost savings:** By running multiple virtual resources on a single physical resource, organizations can reduce their hardware and energy costs, as well as save on space and maintenance.
- **Scalability:** Virtualization makes it easy to scale up or down your computing resources as needed, without having to purchase new hardware.
- **Improved disaster recovery:** Virtualization allows you to create backups and replicas of your virtual resources, making it easier to recover from a disaster or outage.
- **Simplified management:** Virtualization simplifies resource management by allowing you to manage all your virtual resources from a single console.
- **Increased flexibility:** Virtualization makes it easy to move virtual resources between physical resources and data centers, making it easier to adapt to changing business needs
- **Better Security:** Virtualization provides improved security by isolating virtual resources from each other and from the underlying physical hardware. This reduces the risk of data breaches and other security threats.

What is a Hypervisor ?

- A hypervisor is a software layer that enables multiple virtual machines (VMs) to run on a single physical server or computer.
- The hypervisor sits between the physical hardware and the virtual machines, abstracting the underlying hardware and making it available to the virtual machines as a set of virtual resources, including virtual CPUs, memory, storage, and network interfaces.
- There are two main types of hypervisors: Type 1 and Type 2
- Type 1 hypervisors include VMware ESXi, Microsoft Hyper-V, and Citrix XenServer.
- Type 2 hypervisors include Oracle VirtualBox and VMware Workstation.



Standard Redundant Systems



Redundant:
Network Switches
Servers
Power Supplies all around
Network Cards
UPS
RAID System
Storage controllers

Your Data will be Secure
Encrypting your data
Can create snapshots
Create a local backup

*Always recommended
to have secondary
location for backups

Basic Components to Create Virtual Environments

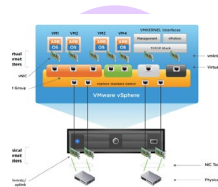
- **Virtual Machines (VMs):** Virtual machines are the guest operating systems that run on top of the hypervisor. Each virtual machine is a self-contained environment that includes its own virtual CPU, memory, storage, and network interfaces.
- **Virtual Networks:** Virtual networks are used to connect the virtual machines to each other and to the outside world. They are created and managed by the hypervisor and **can be configured to provide different levels of security and isolation.**
- **Virtual Storage:** Virtual storage provides the storage space for the virtual machines. It includes virtual disks, snapshots, and configuration files. Virtual storage is typically implemented as a shared storage device that is accessible by all the virtual machines running on a particular physical server or computer.
- **Management Interface:** The management interface is the tool used to manage the virtual environment. It provides a single point of control for creating and managing virtual machines, configuring virtual networks and storage, and monitoring the health and performance of the virtual environment.

Microsoft OS and VMWare Licensing

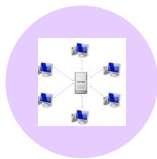
Things to considered



SERVER
PROCESSORS AND
CORES



NUMBER VM'S



SERVER USERS

Windows Server Standard: This version allows for up to two virtual machines*

Windows Server Datacenter: This version allows for an unlimited number of virtual machines

Licensing Requirements:

All physical cores in the Server must be licensed

A minimum of 8 cores must be licensed for each processor

A minimum of 16 cores must be licensed for each Server

VMware Licensing Requirements:

one CPU license covers one CPU with up to 32 cores.

If a CPU has more than 32 cores, you need additional CPU licenses.

Number of CPUs	Cores per CPU	Number of CPU Licenses
1	1-32	1
2	1-32	2
1	33-64	2
2	33-64	4

Microsoft Licensing Calculator

Minimum of 16 cores must be licensed for each server.

Licensing Calculator

Clear All

Input number of physical processors in the server

2 processor(s)

Input number of physical cores per processor noted above

16 physical cores per processor

Total of 32 cores need to be licensed

License Requirements

Base License Required

Windows Server® Standard (16 core)1

Additional Cores To Be Licensed16

Additional Licenses Required for Compliance

Windows Server® Standard Additional License APOS (16 core)1

Windows Server® Standard Additional License APOS (4 core)0

Windows Server® Standard Additional License APOS (2 core)0

To License Additional Virtual Machines (VM's)

Note: 2 VMs are included in the Standard Base License once all physical cores are properly licensed.

VM's included when all cores are licensed2

Additional VM's desired8

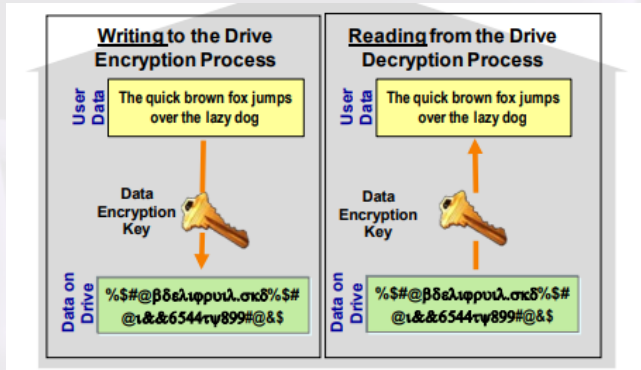
Total VM's10

Additional cores required to license additional VM's128 additional cores need to be licensed

160 Cores

Creating a Secure Virtual Environment

- Data Encryption:

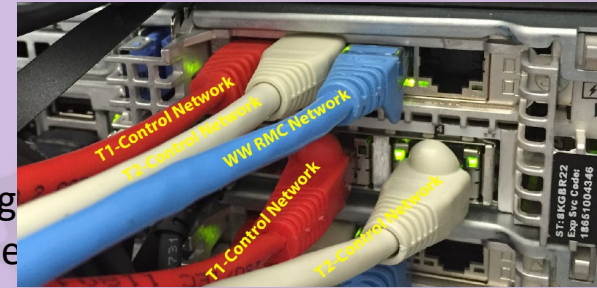


- Regularly update software: Regularly update software, including virtualization software, operating systems, and applications, to patch security vulnerabilities and ensure they are up-to-date with the latest security standard.

- Network segmentation

By isolating different parts of a network, network segmentation helps to contain the spread of malware, limit access to sensitive information, and reduce the impact of a security breach.

SCADA Network
PLC Network
RMC Network
Management Network
Business Network



- Firewall protection
- Monitoring and auditing
- Assigning Privileges for e
- Using Active Directory to Manage Users
- Disable Unnecessary Functions Inside Virtual Machines such as unused physical devices, such as CD/DVD drives, floppy drives, and USB adapters.
- Configure PTP or NTP- Synchronized systems are essential for certificate validation.

High Availability (HA)

In the event of server failure, affected virtual machines are automatically restarted on other production server with spare capacity

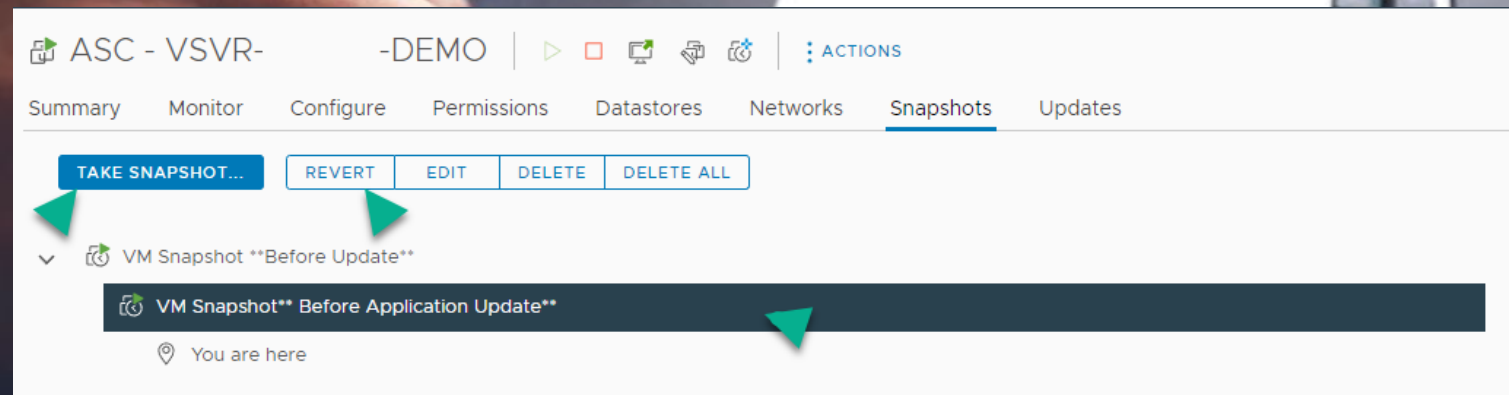


Snapshot Advantages

Rapid recovery: Snapshots can also be used for rapid recovery in case of a disaster or system failure. If a virtual machine fails, you can revert to a previous snapshot to restore the system to a previous state.

Easy rollback: Snapshots provide an easy way to roll back changes to a virtual machine. If a software update or configuration change causes problems, you can revert to a previous snapshot to undo the changes and restore the system to a previous state.

A snapshot preserves the state and data of a virtual machine at a specific point in time.



You need a Disaster Recovery Plan!

To protect from:

Hardware failure.

Malware Risk.

Natural disasters.

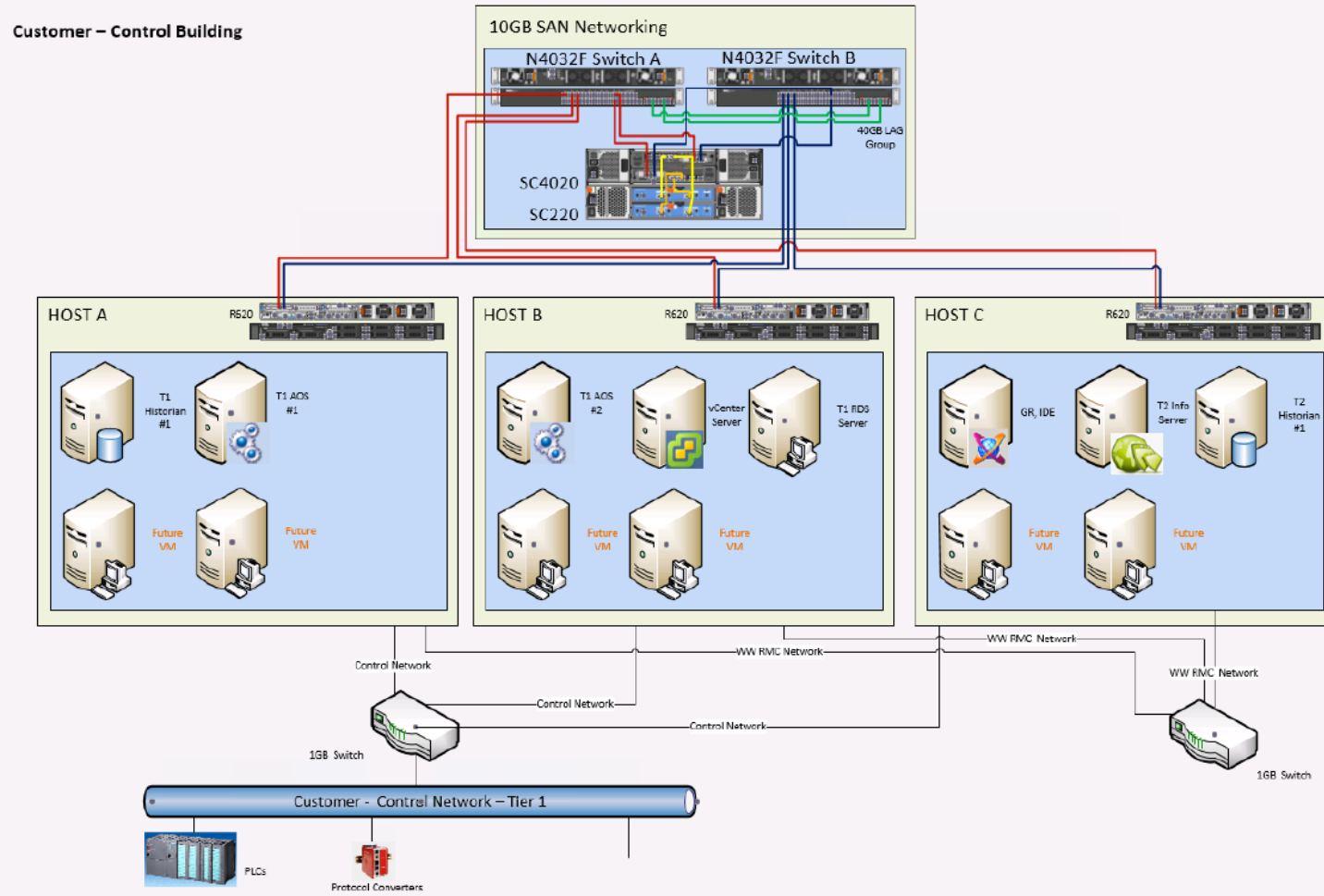
User Errors.

3-2-1 Backup Rule



Our Success Stories

Our experience in virtualizing systems has helped customers from Government , Oil and Gas power Plants various industries to streamline their operations and increase efficiency.



This is an example of the architecture that we did for a customer in the Gas industry.

Questions?





Thank You!

We are here to help!



Free lab information Guide!

<http://www.labguides.com/autolab/>



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