Advanced Configuration of the CTIS/CNS Lab and Server Room

CTIS 471

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Introduction

- Main goal is to establish an advanced computer lab that is capable of meeting the technology needs for all CTIS and CNS students
- Our task is to cluster the servers for efficient use and management, and secure them behind a Next Generation Firewall.
- Make a space that can offer flexibility to test new software and penetration testing. A place with true technological freedom

1

Lab Environment

Establish a dedicated lab environment for testing and learning

2

Set up the essentials

Gathering the necessary requirements such as computers and servers to meet our goal

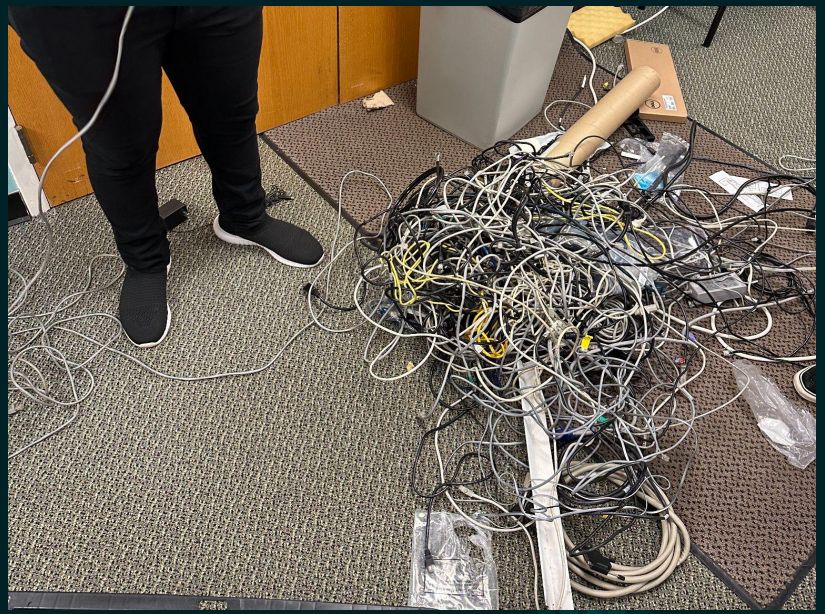
3

Lab Management

Utilizing advance software to manage the server's resources.

Before the Transformation

Cleanup Process



- Being the most time consuming task
- Tie up and organize each cable into boxes
- HDMI, EThernet, VGA, fiber optic, etc
- Test which cables worked

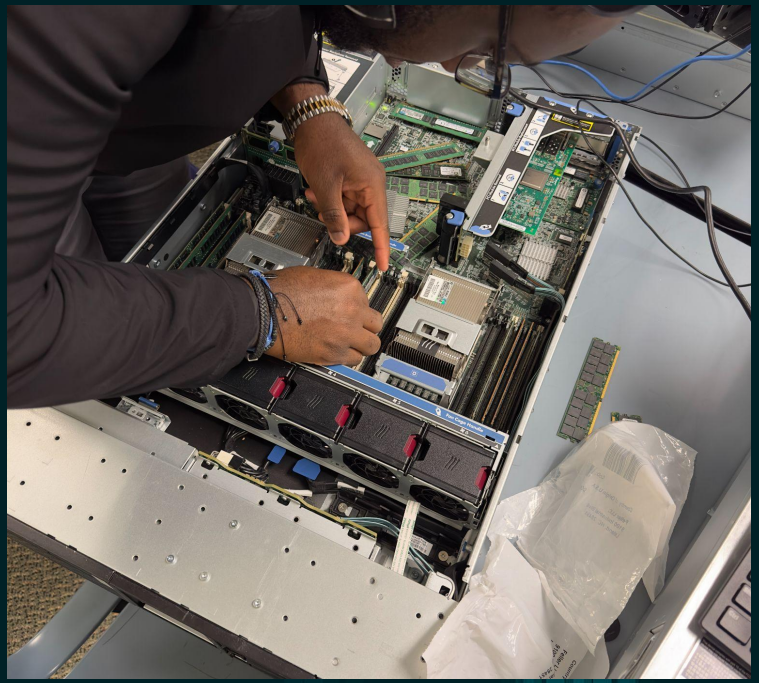
Testing Out Desktops

- There were 21 desktop computers that needed to be tested in order to be ready to be imaged.
- We want to repurpose technology that could still work for our needs
- About half of them had a normal boot up.
- Some had major problems: missing hard drives, nonstop beeping, older os
- This process was crucial so that we can download Kali on them.

  -5 desktops picked for Kali imaging

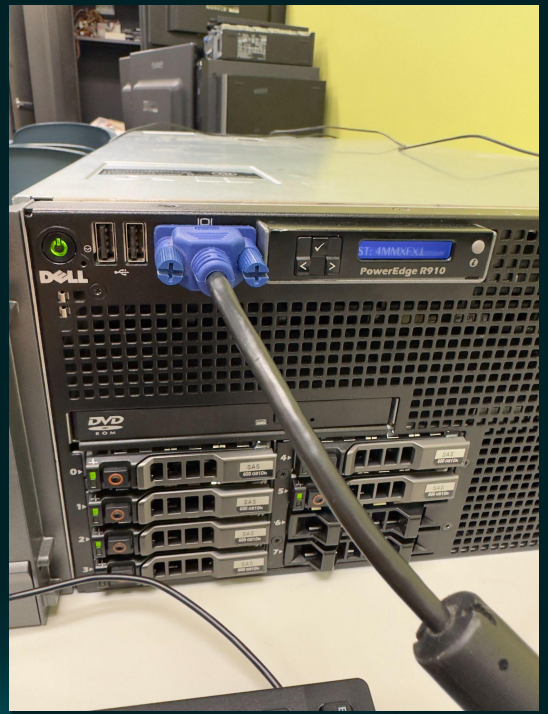
  -5 desktops picked for Windows use

Setting Up Servers



- There were multiple servers that needed to be tested and organized.
- Only a few were functioning and ready to be used.
- Servers that didn’t work
- Constant Beeping
- Missing hardware
- Broken hardware

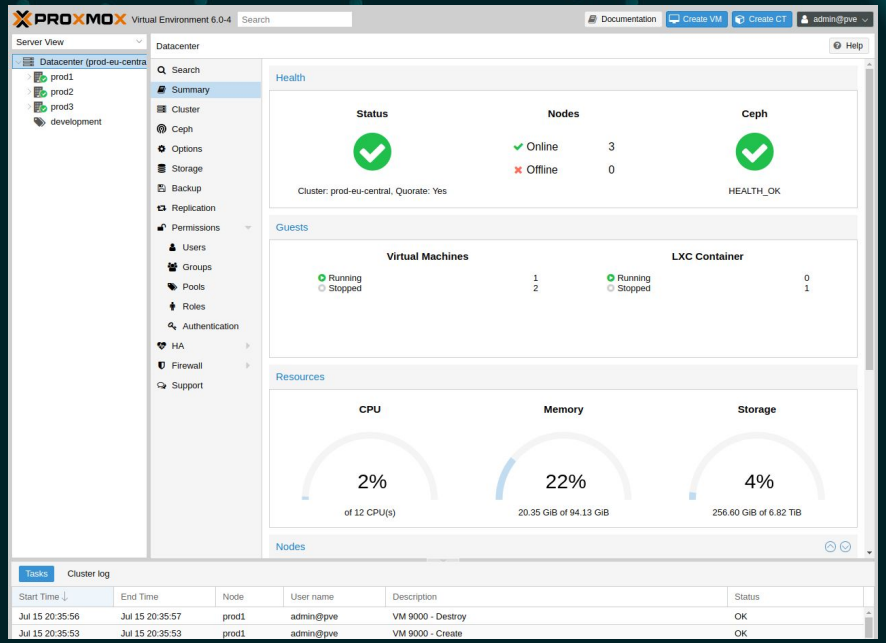
Fixing Servers



- At least 5 servers
- Some servers only needed a little kick
- The server (left) had a power supply issue that was quickly resolved (blue screen) after transitioning from a power strip to a direct connection to an outlet
- Some servers were stripped of their hardware to make use in other servers

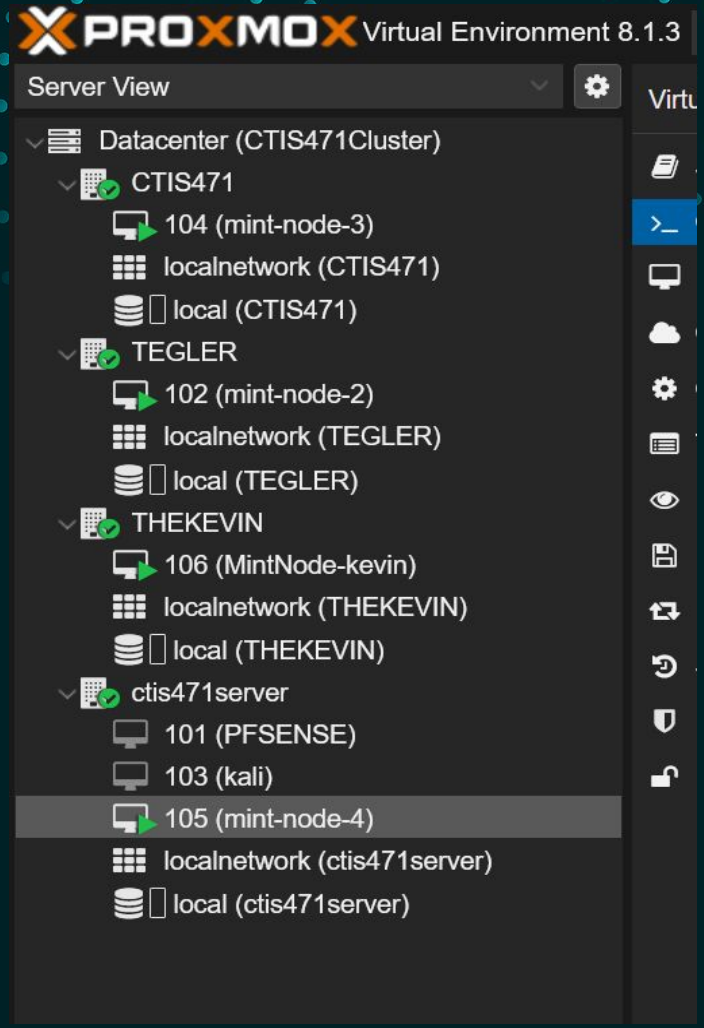
Introduction to Proxmox

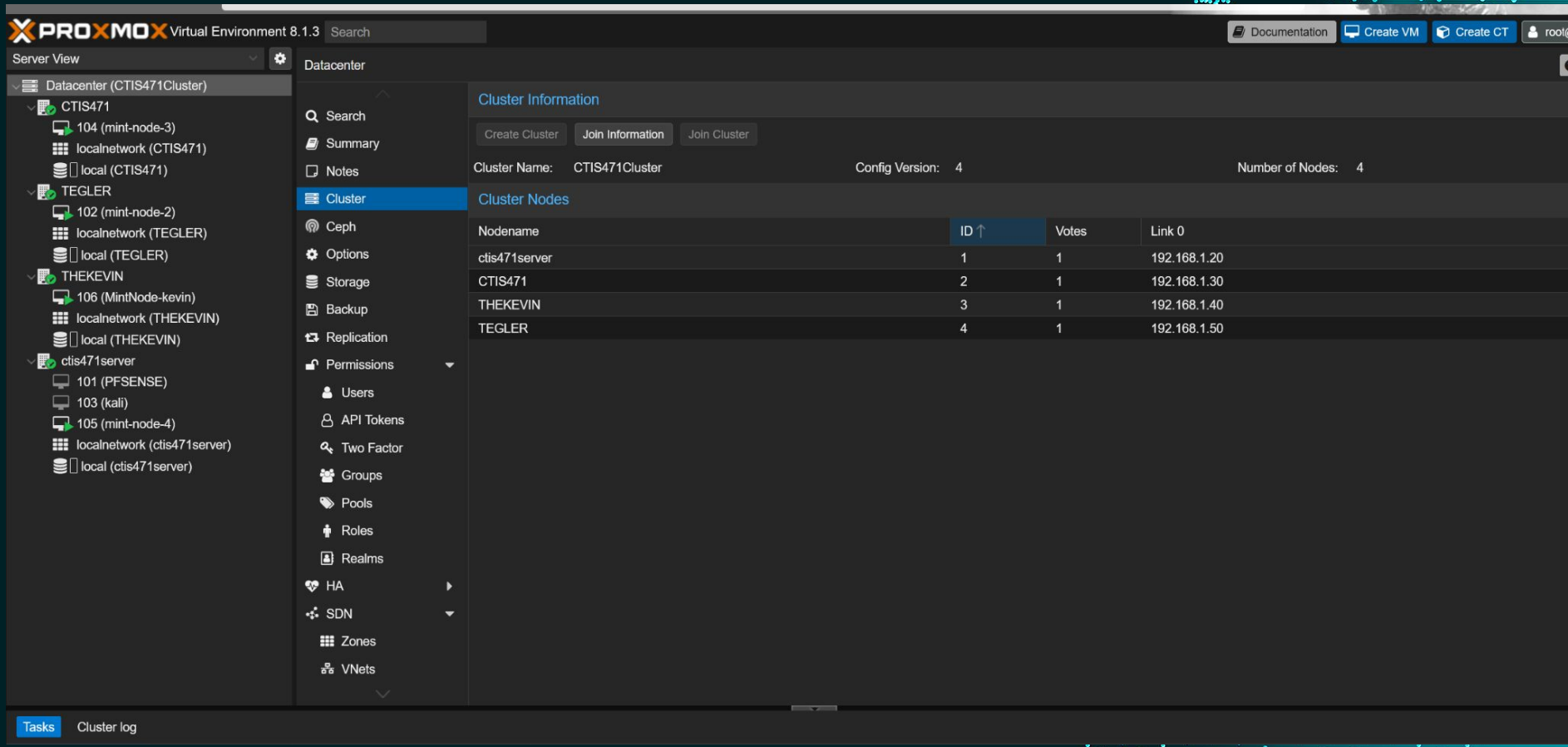
- Brief overview of Proxmox as a virtualization platform
- Importance in lab setup and management
- Practical uses of Proxmox
- Talk about using pfSense to make it secure and how we made this all secure



Server Clustering

- Server clustering is grouping multiple servers to act as a single unit
- increased performance
- reliability
- scalability
- High Availability
- Virtualization




PROXMOX Virtual Environment 8.1.3
Search
Documentation
Create VM
Create CT
Server View
Datacenter
Datacenter (CTIS471Cluster)
CTIS471
104 (mint-node-3)
localnetwork (CTIS471)
local (CTIS471)
TEGLER
102 (mint-node-2)
localnetwork (TEGLER)
local (TEGLER)
THEKEVIN
106 (MintNode-kevin)
localnetwork (THEKEVIN)
local (THEKEVIN)
ctis471server
101 (PFSENSE)
103 (kali)
105 (mint-node-4)
localnetwork (ctis471server)
local (ctis471server)
Search
Summary
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Cluster
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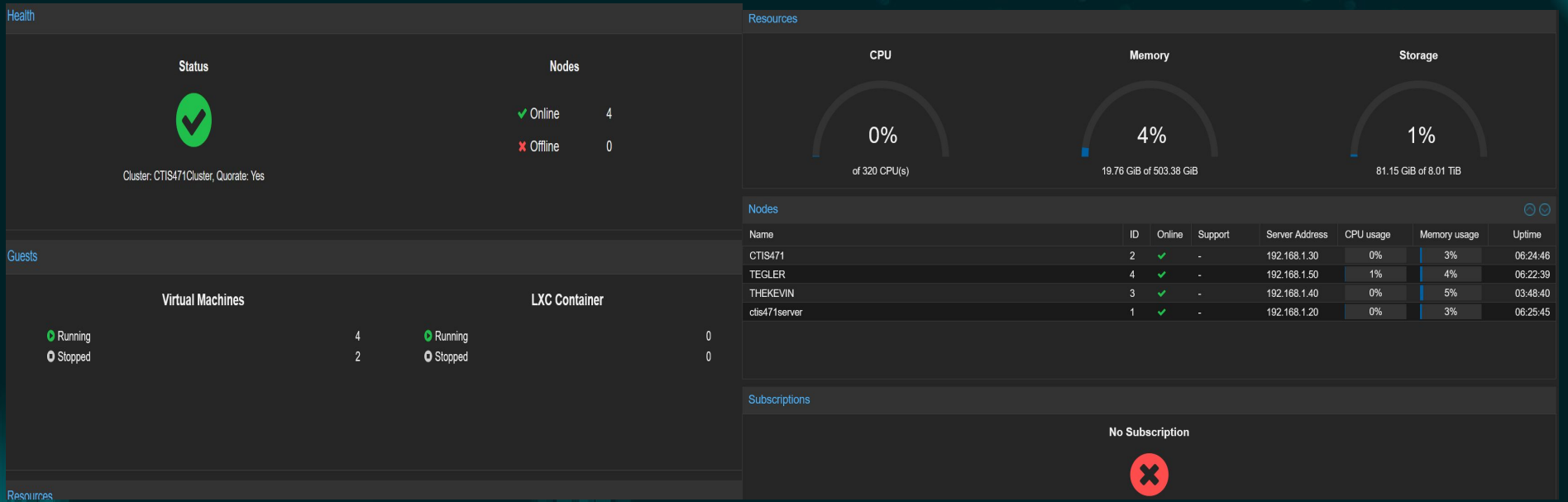
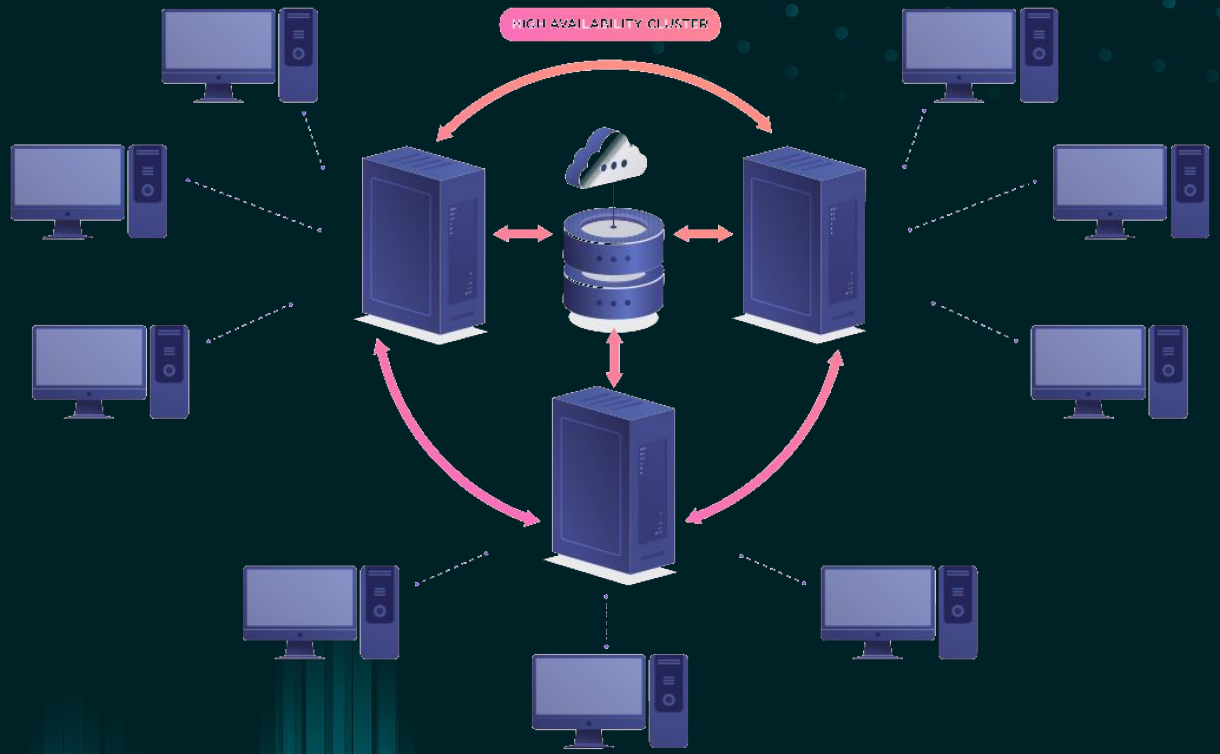
Two Factor
Groups
Pools
Roles
Realms
HA
SDN
Zones
VNets
Cluster Information
Create Cluster
Join Information
Join Cluster
Cluster Name: CTIS471Cluster
Config Version: 4
Number of Nodes: 4
Cluster Nodes
Nodename
ID
Votes
Link 0
ctis471server 1 1 192.168.1.20
CTIS471 2 1 192.168.1.30
THEKEVIN 3 1 192.168.1.40
TEGLER 4 1 192.168.1.50
Tasks
Cluster log

Increased Performance



High Availability



Virtual Machines (VM)

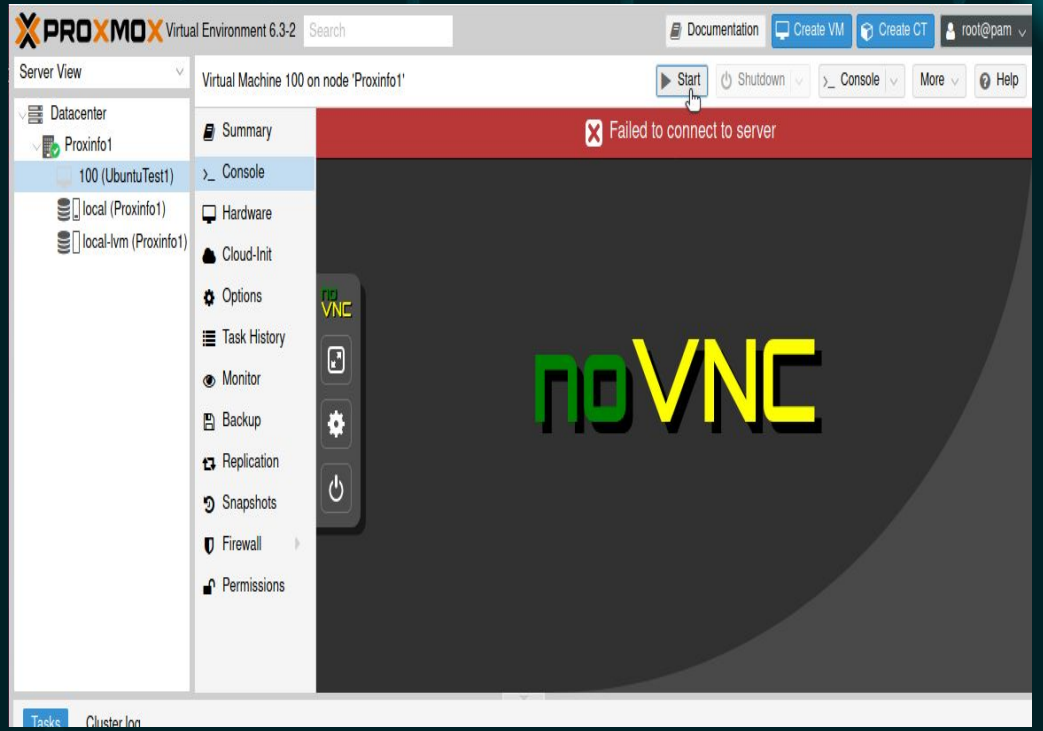
1. Safe Experimentation: VMs create isolated environments to test malware, security tools, and hacking techniques without harming their main computer.

2. Practice on Diverse Systems: Students can run multiple operating systems on a single machine, allowing them to explore vulnerabilities and security measures across different platforms.

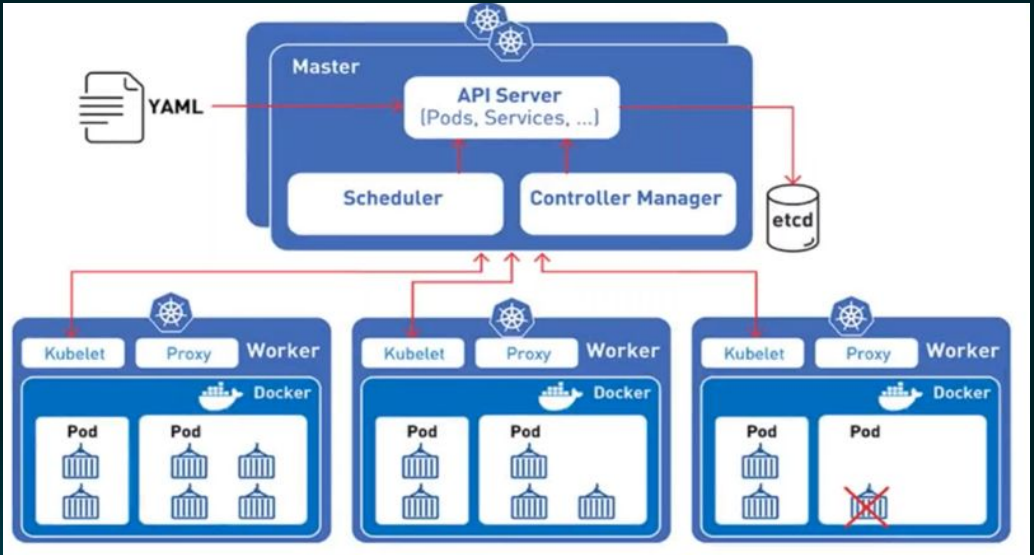
3. Simulate Real-World Scenarios: VMs can be configured to mimic complex networks, letting students practice security protocols and incident response in controlled settings.

4. Cost-Effective Learning: VMs eliminate the need for multiple physical machines, offering a cheaper way to access various software and configurations needed for cybersecurity education.

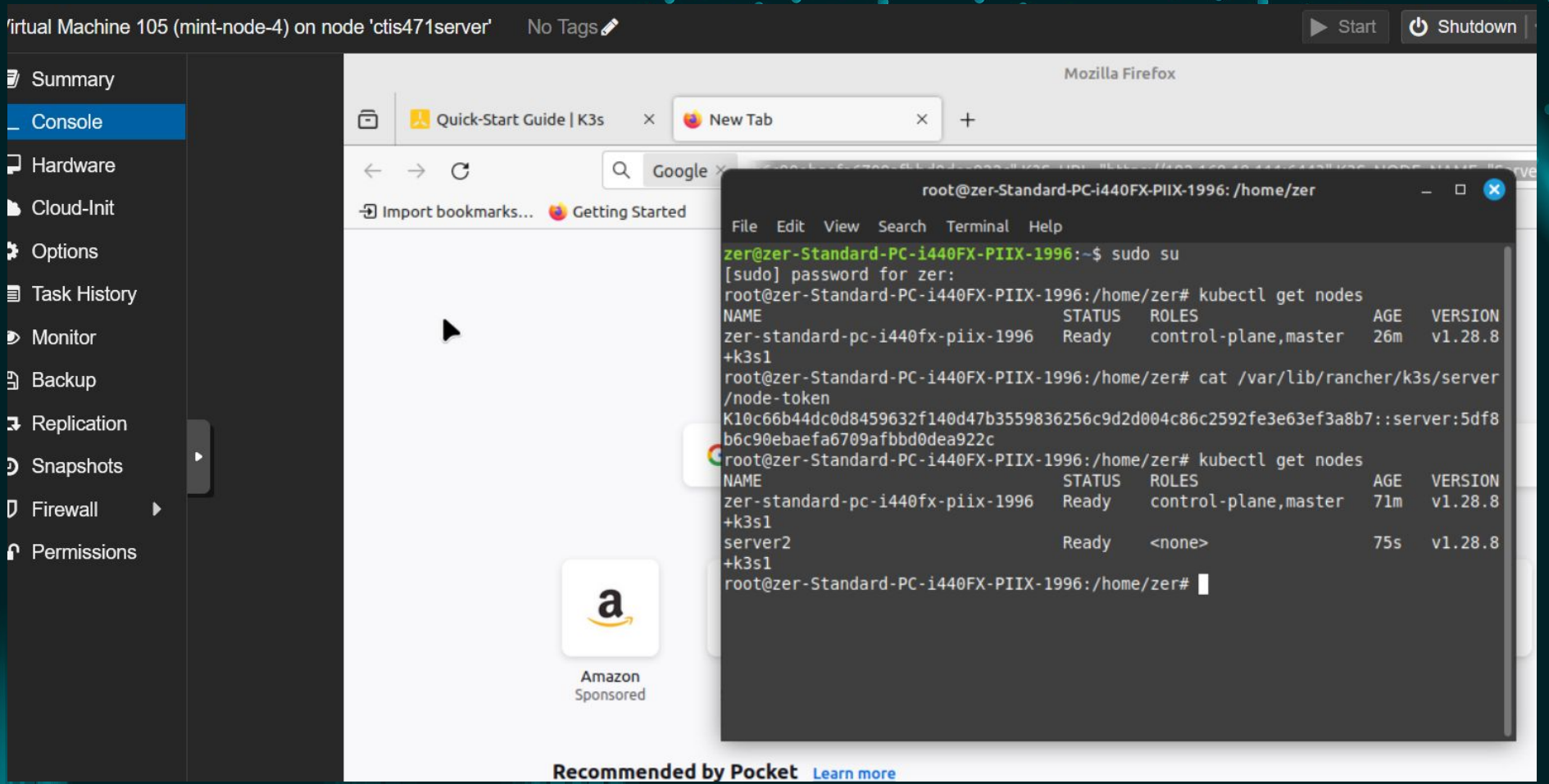
5. Snapshot and Restore: Students can create snapshots of their VMs, allowing them to easily revert to a clean state after practicing risky actions or encountering security breaches.



Introduction to Kubernetes

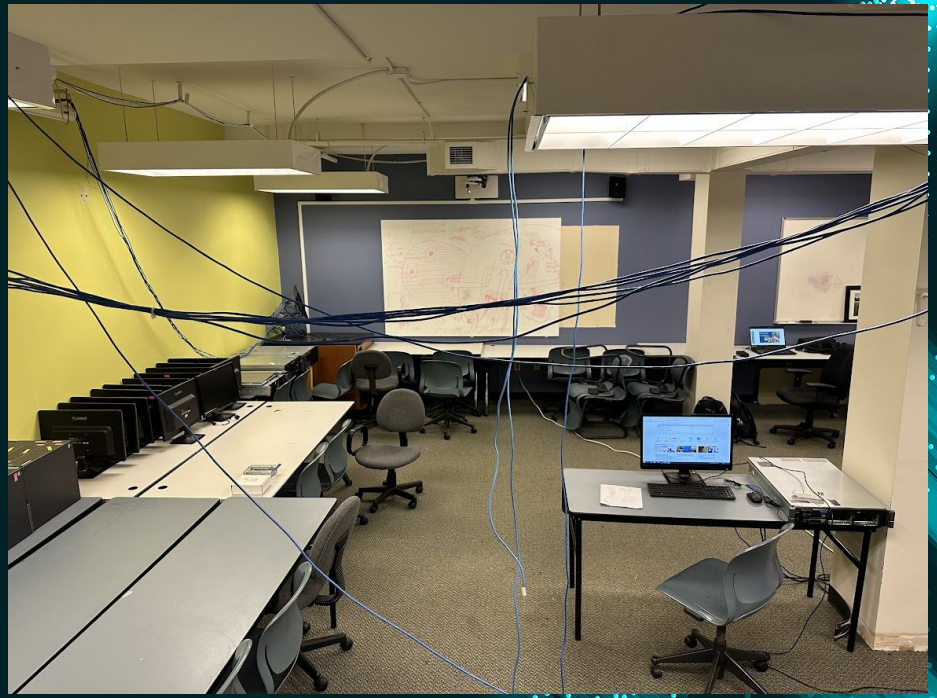


- Orchestrates the resources of the server machines to create a unified cluster where containerized applications can be efficiently deployed, scaled, and managed
- Used all four servers to deploy a web server and four virtual machines
- With a Master server, we distribute resources to make applications run smoothly and prevent any point of failure


irtual Machine 105 (mint-node-4) on node 'ctis471server'
No Tags
Start
Shutdown
Summary
Console
Hardware
Cloud-Init
Options
Task History
Monitor
Backup
Replication
Snapshots
Firewall
Permissions
Mozilla Firefox
Quick-Start Guide | K3s
New Tab
Google
Import bookmarks...
Getting Started
root@zer-Standard-PC-i440FX-PIIX-1996: /home/zer
File Edit View Search Terminal Help
zer@zer-Standard-PC-i440FX-PIIX-1996:~$ sudo su
[sudo] password for zer:
root@zer-Standard-PC-i440FX-PIIX-1996:/home/zer# kubectl get nodes
NAME STATUS ROLES AGE VERSION
zer-standard-pc-i440fx-piix-1996 Ready control-plane,master 26m v1.28.8
+k3s1
root@zer-Standard-PC-i440FX-PIIX-1996:/home/zer# cat /var/lib/rancher/k3s/server
/node-token
K10c66b44dc0d8459632f140d47b3559836256c9d2d004c86c2592fe3e63ef3a8b7::server:5df8
b6c90ebaefa6709afbbd0dea922c
root@zer-Standard-PC-i440FX-PIIX-1996:/home/zer# kubectl get nodes
NAME STATUS ROLES AGE VERSION
zer-standard-pc-i440fx-piix-1996 Ready control-plane,master 71m v1.28.8
+k3s1
server2 Ready <none> 75s v1.28.8
+k3s1
root@zer-Standard-PC-i440FX-PIIX-1996:/home/zer#
Amazon
Sponsored
Recommended by Pocket
Learn more

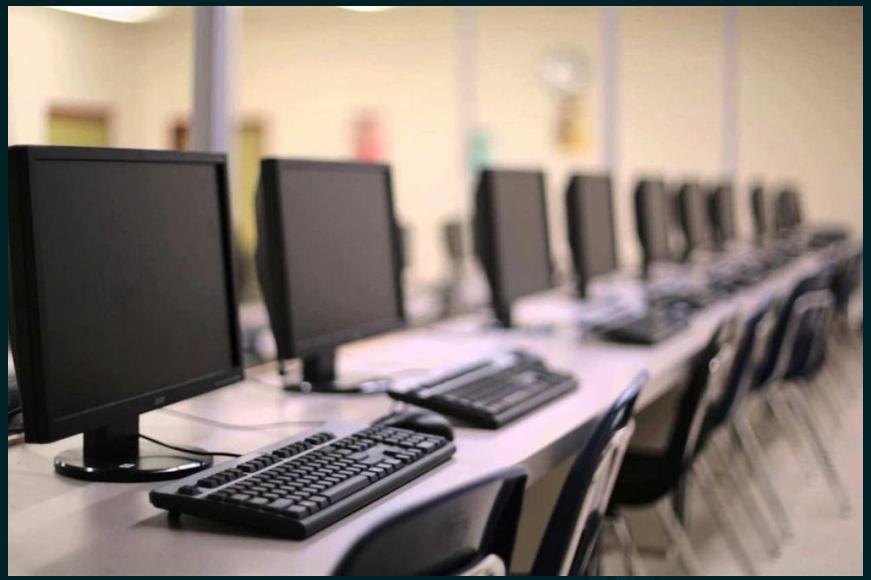
Server Rack

Before & After



Before & After

Current & Future State



- Currently working on re-imagining computers to have tools needed in major technology classes
- Making protocols and documentation on using the software on the servers
- Setting up a functional classroom layout

Conclusion/Benefits of this project

- In terms of hardware/software, the room is now setup and ready for future students to make use
- A lot of hands on work was involved which was great experience
- The server room was cleaned up which made it easier and safer for future students and staff to work in the room

ONLINE RESOURCES

Promox virtualization software - https://www.proxmox.com/en/

Lightweight Kubernetes - https://k3s.io/

pfSense - https://www.pfsense.org/

Linux Mint - https://linuxmint.com/

Kali Linux - https://www.kali.org/

Hardware Resources

PROXMOX SERVERS:

4 x Dell Poweredge R910 Server-4x Xeon E7-4870 Ten Core 2.4Ghz

KUBERNETES SERVERS:

2 X Dell PowerEdge R710 2 x Intel Six Core XEON X5670 2.93GHz 2U Server

1 X HP ProLiant DL385 G2 2x Dual Core 2.8Ghz 4GB RAM 2U Server

UNITERUPTERBLE POWER SUPPLY (UPS):

3 X SUA2200RM2U - APC Smart-UPS 1980-Watts 2200VA 120V 50-60Hz 6 NEMA 5-15R 2U Rackmount UPS