VIRTUALIZATION: IT'S NOT JUST FOR THE BIG GUYS

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WHAT IS VIRTUALIZATION?

VIRTUALIZATION IS:

- A METHOD FOR USING A COMMON SET OF HARDWARE TO RUN MULTIPLE ISOLATED "MACHINES" WITHOUT THEM INTERFERING WITH EACH OTHER.

VIRTUALIZATION IS NOT:

- RELYING SOLELY ON THE INTERNET FOR YOUR INFRASTRUCTURE (DEPENDING ON THE IMPLEMENTATION).

"VIRTUAL" VERSUS "CLOUD"

- The terms are related, but not entirely interchangeable

- Virtualization is a technique or tool

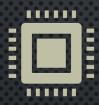- Cloud is an architecture or implementation

"VIRTUAL" VERSUS "CLOUD"

- "Virtual" does NOT necessarily rely on any sort of outside connectivity and can in some cases be a completely standalone internal system

- "Cloud" often does rely on connectivity to the Internet but does not necessarily need to in some applications

TYPES OF VIRTUALIZATION

On-Prem:

Hosted entirely "On Premise" (in-house) with user owned equipment at the user's site. Does not need to rely on any sort of outside connectivity for normal operations and can be a completely standalone infrastructure in some cases.

Private Cloud:

Consists of dedicated resources shared outside of the local network, but still controlled by the user.

Public Cloud:

Services such as Google, AWS, Azure, etc.

Also includes publicly hosted application services such as Office 365 and Google Workplace.

APPLICATIONS FOR VIRTUALIZATION

- Nearly ANY application can be virtualized
  - Back office/Operations
  - Automation systems
  - PAD generation and routing
  - Audio Processing
  - Remote Control and monitoring
  - Audio transport (CODECs)
  - HD Radio applications

BENEFITS OF VIRTUALIZATION

- ALLOWS SUBSTANTIAL CONSOLIDATION OF HARDWARE

- CAN REDUCE DOWNTIME (UPDATE ONE INSTANCE WHILE ANOTHER TAKES ITS PLACE, THEN UPDATE THAT INSTANCE WHEN THE OTHER COMES BACK UP)

- OPERATIONAL COST SAVINGS

- SINGLE POINT OF MANAGEMENT

- SHARED RESOURCES

- LEVERAGE EXPERIENCE AND RESOURCES OF MUCH LARGER COMPANIES TO HOST, MANAGE, AND MAINTAIN THE INFRASTRUCTURE

POTENTIAL DRAWBACKS

- "Public" cloud designs relying on Internet connectivity are only as robust as your last mile connectivity

- Risk of outages for any given service provider (Azure, AWS, Google, etc)

- On-prem hosting requires some level of specialized experience for more complex deployments

- "All eggs in one basket" scenario

HARDWARE CONSIDERATIONS

- Able to run on nearly ANY available hardware!

- Primary consideration is the requirements of the application(s)

Hardware Considerations

- Scalability
  - Can scale all the way from a single system running multiple VMs for a single site or small business, up to massive systems running large enterprise applications
- Resiliency
  - Can be made as redundant as your budget and tolerance for failure allow.
  - Multiple "nodes" can be "clustered" together
  - Storage can be configured as a fault tolerant system and shared among all nodes in the system
  - "Snapshots" of machines can be captured at any time and stored offline for cloning of virtual machines or disaster recovery

"CONTAINERS" VERSUS VIRTUAL MACHINES

- Virtual Machines are exactly what they sound like...They contain a fully functioning operating system and applications, just as a traditional server or desktop PC would.

- Containers are more like "applications" in a virtual environment, but different in the fact that they aren't a full system. They just contain the binaries and configuration files required for a given application. These containers could host anything from tiny little micro services to full applications.

"CONTAINERS" VERSUS VIRTUAL MACHINES

- Common management platforms for containers include Kubernetes and Docker. Docker for development and small scale operations, Kubernetes for running containers at scale.

- Advantage is that they don't affect anything else if they happen to crash and can be migrated or scaled up and down more easily than "full" virtual machines.

- Drawback is that they may not be suited for certain things where a full operating system environment might be needed for an application. Another drawback is that "nested networking" can cause misdirection of resources or latency spikes in real-time media applications.

SCALABILITY EXAMPLES

- Small scale remote site implementation
  - Single stations
    - Audio processing, remote control, and STL virtualized
    - Deployed in:
      - American Samoa
      - US Virgin Islands

"STANDARD" HD STATION EQUIPMENT RACK

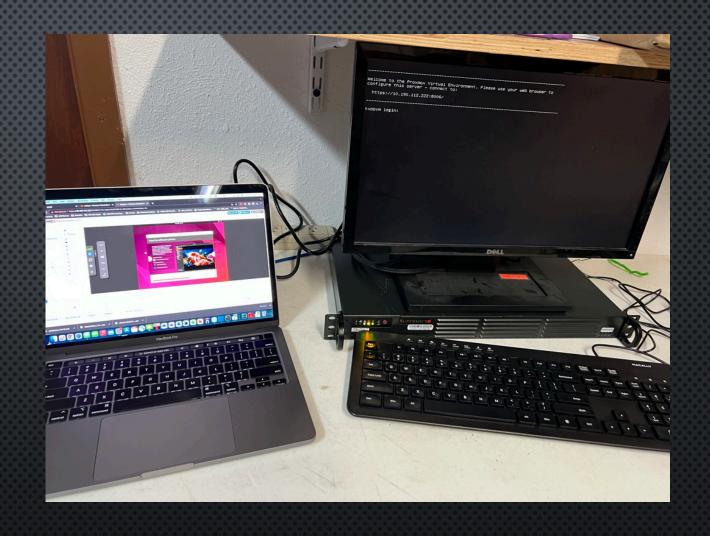Many of these components can now be virtualized

AMERICAN SAMOA

"SMALL SCALE" VIRTUALIZATION

A single station's audio processing, STL, and remote control (before installation)
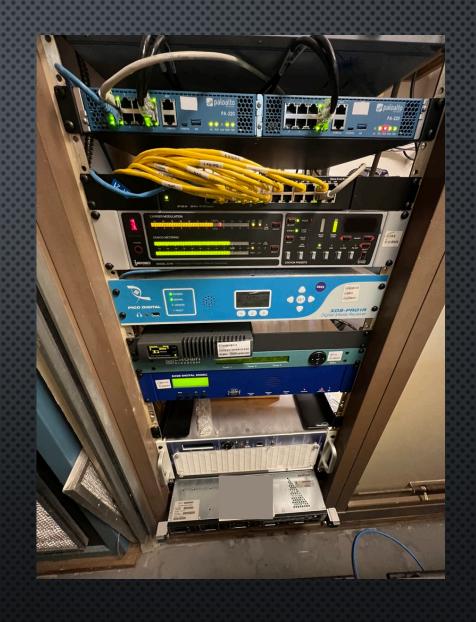
US VIRGIN ISLANDS

"SMALL SCALE" VIRTUALIZATION

Single station installation- Audio processing, remote control, and MPX encoding in server at bottom of rack

THANK YOU!!!

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Are YOU there yet?
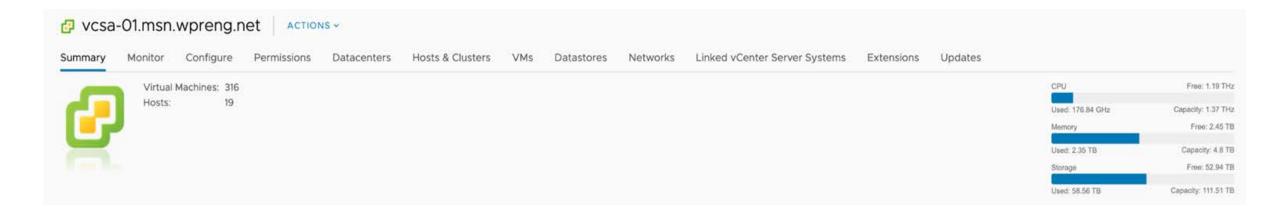
An (im)practical look at virtualization and implementation

Enter the Virtual World (In a BIG way)

WPRs Active VM environment

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WPRs Active VM environment

- 16 WideOrbit VMs, 24ch AoIP Each, 22 Individual Playlists
- 29 MusicMaster instances
- 60+ Virtual Desktop Sessions (VDI)
- 3500+ Multicast Channels
- 3 route controllers and logic engines (Axia Pathfinder Core Pro VMs)
- 20 Virtual mixers (iQs)
- 19 Physical servers statewide
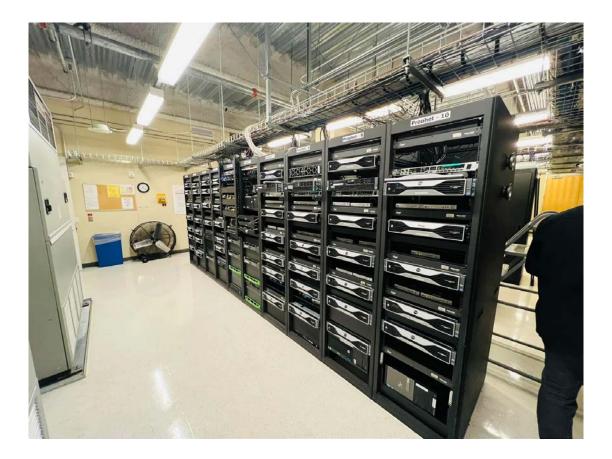- Hundreds of "utility" VMs doing other tasks (metadata, RDS, logging, etc)

Enter the Virtual World (In a BIG way)

WPRs Active VM environment

Enter the Virtual World (In a BIG way)

WPRs Active VM environment

Impressive! But what does that have to do with me?

45 "workstations" for studios - 4 servers - Analog/AES audio - Pretty typical TOC
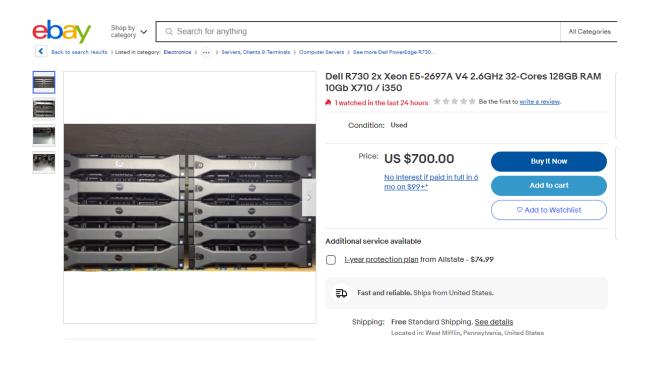
5 "Stations"

Impressive! But what does that have to do with me?

(Hyper)Scale is everything!

Small scale VM deployments can be done on recently-retired server-grade hardware as proof of concept and expanding comfort level.

Impressive! But what does that have to do with me?

Start Small

- Utility machines
- P2V (Physical to Virtual)
- Greenfield
- Docker/containers
- Learn networking in a virtual environment
- Learn Operating Systems
- Test new software / configurations / compatibility

Get into the nitty gritty... cost, expertise, etc.

Only analog items are legacy and microphones

IT-Centric world requires IT professionals who know how broadcast works as well

No soldering required!

Get into the nitty gritty… cost, expertise, etc.

45 desktop PCs - Dell Inspiron Desktop PC, i5-13400, 16Gb RAM, 256Gb SSD $499 each = $22,500 + Monitors (22" $75/ea) = 3,375

4 Servers (File storage, O365 connector, Microsoft Windows) Dell R350

- Xeon E-2314 Quad Core, Server 2022, 16Gb, 4TB HDD $2,500
- Windows Server licensing (45 workstations, 45 licenses) $2,500

4x$5,000=$20,000

2x Synology (Block and file storage for entire network, backups, etc) 10TB Each $1,200/ea = $2,400

2x 48 port network switches (TP-Link 48 Port "smart" switch) $400/ea = $800

$52,450 Total

Easy Peasy, right? Easy to manage, easy to troubleshoot, everything's physical. *Or is it?*

Get into the nitty gritty... cost, expertise, etc.

Everything is Server-based, Centralized management, updates, networking, control, backups, redundancy.

3x Dell R750 Servers

- 2x Xeon Gold 16C/32T, 768Gb RAM, 6x 2TB SSD/480Gb Boot $16,448/ea = $49,344
- Easily can run hundreds of VMs including 50 Virtual Desktops

Thin Clients - NComputing $315/ea x 45 = $14,175 (plus monitors $75 x 45 = $3,375)

Windows remote client licenses 50 pack $2,500

Keeping things cheaper, Proxmox Hypervisor instead of VMware (Free as in beer)

2x Synology (Block and file storage for entire network, backups, etc) 10TB Each $1,200/ea = $2,400

2x 48 port network switches (TP-Link 48 Port "smart" switch) $400/ea = $800

Total $72,594 - Oops! That's *WAY* MORE! WHY?!   ($20,000 more!)

Get into the nitty gritty... cost, expertise, etc.

Forgot about sound cards? (assuming 20 of our 45 machines are automation)

AudioScience 5744 cards and Breakout box $3300 x 20 machines = $60,000(!!!) Routing matrix? Patch system/punchblocks (ICK!) $$$

4 channel AoIP driver? $500. No hardware, portable in software inside our virtual world. 20 machines, $10,000

This is *JUST* for the PC systems, not the studios remember...

But I don't have 45 studios!!

Cool. It's even cheaper. :)

Okay, fine... I'll try it...

You're going to want help.

If you can think of it, someone else has DONE it, search out the how-to's online.

You won't get it right the first time, or the second time, or the 9th time...

IT professionals in this realm are rare. Not IT pros that do Virtualization, but IT pros who do Virtualization AND know how broadcast works. Might want to check with your children or grandchildren, they already set up your iPhone after all.

Networking without wires can be intimidating. Lots of "inception" happening.

Plenty of resources online - Youtube videos, reddit forums, mailing lists.

Most of all, you're never too old to learn new things!

The "way we always done it" is not going to be done any more in the industry if the manufacturers have anything to say about it.

All the Questions?

Thank you!

(Confused yet? I hope so!)