

Advanced VMware Workstation and VM Remote Control Lecture

SUS08

Novell Training Services

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SUS08: Advanced VMware Workstation and VM Remote Control

Doc Hodges

Demo Systems Team

Novell Online Demo System (NODS)





Short History of VMware Inc.

Palo Alto California

- Founded 1998 by Diane Greene, Mendel Rosenblum, Edward Wang and Edouard Bugnion.
- Type 1 and 2 hypervisors grew into GSX and Workstation
- Workstation – May 1999
- GSX and ESX - 2001
- Virtual Center – 2003
- Acquired by EMC in 2004 for 625 million
- Diane Greene replaced by Paul Maritz in 2008



Acquisition History of VMware Inc.

Acquisitions

- 2006 – Akimbi Systems – Software Lifecycle Management
- 2008 - B-Hive Networks – Application Management - Israel R&D
- 2008 – Tungsten Graphics – 3D Graphics driver
- 2009 – SpringSource – Web App Development and Management
- 2010 – Zimbra – Open Source Collaboration
- 2010 - GemStone (SmallTalk)– working under Zimbra
- 2010 – TriCipher – Identity/Access Management SaaS
- 2010 – Integren - Performance Management and Op Efficiency
- 2011 – SlideRocket – Online Presentation Tools
- 2011 – Shavlik Technologies – vCenter Update and GO
- 2011 – Digital Fuel – IT and Business Management SaaS



VMware Product set

- DATACENTER & CLOUD INFRASTRUCTURE
- VMware vSphere
- VMware Go
- vSphere Storage Appliance (VSA)
- VMware vCloud Product Family
- VMware vCloud Director
- VMware Cloud Infrastructure
- SMB PRODUCTS
- VMware vSphere for SMBs
- VMware vSphere Storage Appliance
- VMware Go
- VMware vCenter Protect Essentials Plus
- VMware vCenter Protect Update Catalog
- MAC PRODUCTS
- VMware Fusion
- DESKTOP & END-USER COMPUTING
- VMware View
- VMware ThinApp
- VMware Workstation
- VMware Zimbra
- VMware SlideRocket
- VMware Horizon Application Manager
- VMware Mobile Virtualization Platform (MVP)
- INFRASTRUCTURE & OPERATIONS MANAGEMENT
- VMware vCenter Operations Management Suite
- VMware vCenter Product Family
- VMware vCenter Infrastructure Navigator
- VMware vCenter Server
- Heartbeat
- VMware vCenter Orchestrator
- VMware vCenter Capacity IQ
- VMware vCenter Site Recovery Manager
- VMware vCenter Lab Manager
- VMware vCenter Configuration Manager
- VMware vCenter Converter
- IT BUSINESS MANAGEMENT
- VMware IT Business Management Suite
- VMware vCenter Chargeback Manager
- VMware Service Manager
- SECURITY PRODUCTS
- VMware vShield Product Family
- VMware vShield App
- VMware vShield App with Data Security
- VMware vShield Edge
- VMware vShield Endpoint
- FREE PRODUCTS
- VMware vSphere Hypervisor
- VMware Server
- VMware Player
- APPLICATION PLATFORM
- VMware vFabric Product Family
- VMware vFabric Data Director
- VMware vFabric GemFire
- VMware vFabric Hyperic
- VMware vFabric RabbitMQ
- VMware vFabric SQLFire
- VMware vFabric tc Server
- VMware vFabric Web Server
- APPLICATION MANAGEMENT
- VMware vFabric Application Performance Manager
- VMware vFabric Application Director
- VMware vCenter Application Discovery Manager
- VMware vCenter AppSpeed
- VMware Studio
- OTHER
- Volume Purchasing Program
- VMware VMmark
- VMware Capacity Planner
- Cisco Nexus 1000V
- VMware Compliance Checker for PCI
- VMware Compliance Checker for vSphere
- SUSE Linux Enterprise Server for VMware
- FOR SERVICE PROVIDERS
- VMware vCloud Integration Manager



VMware Inc. Fun Facts

- Annual revenue growth 32% year over year
- ~ 3.77 billion sales 2011 – up 32% over 2010
- 4.5 billion cash - currently
- 2.71 billion unearned revenue – 2011
- 11,000 employees
- ~ \$342,000 revenue per employee
- ~31 customer accounts per employee

- How does this compare to your workplace?

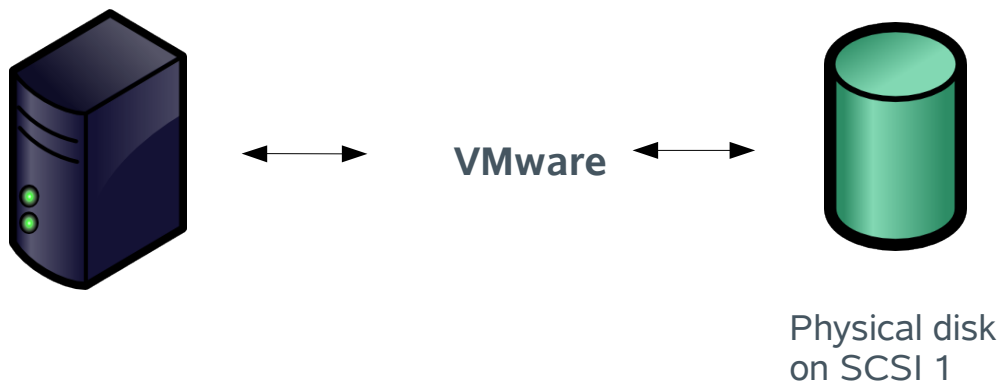


VMware Workstation

- Shipping version 8 on Windows/Linux
- Shipping version 4 on Mac (Fusion)
 - Fusion is the same code base but a very different product team
- Some tools have changed names
 - Bookmarks, snapshot, linked clones
 - VMware GSX, Server, died June 2011
 - > Features live on in Workstation, VIX, ESXi etc
- Some great ideas are tested on Workstation
- Live migration in ESX worked in Workstation first as background restore
- Not the “glamour group” at VMware

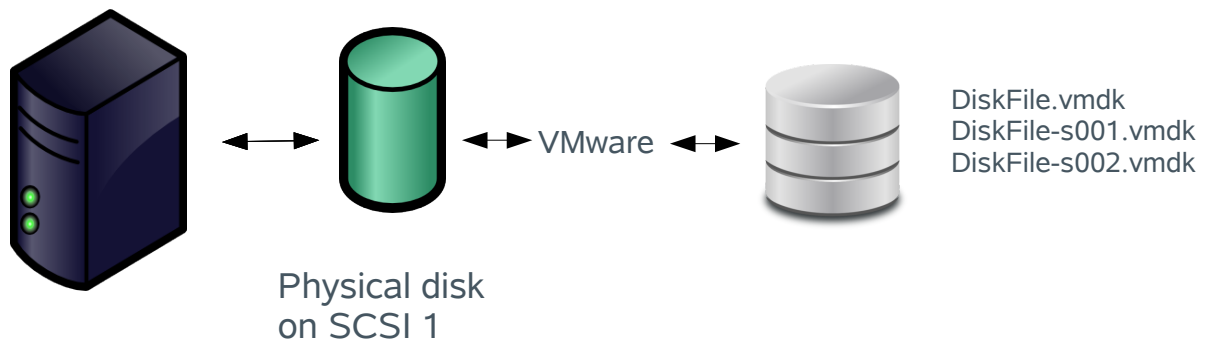
VMware Workstation - Advanced

- The structure of a vmware disk
 - Appears to the guest VM as a physical disk with partitions etc attached to SCSI or IDE controller



VMware Workstation - Advanced

- The structure of a VMware disk
 - The disk is actually a collection of files





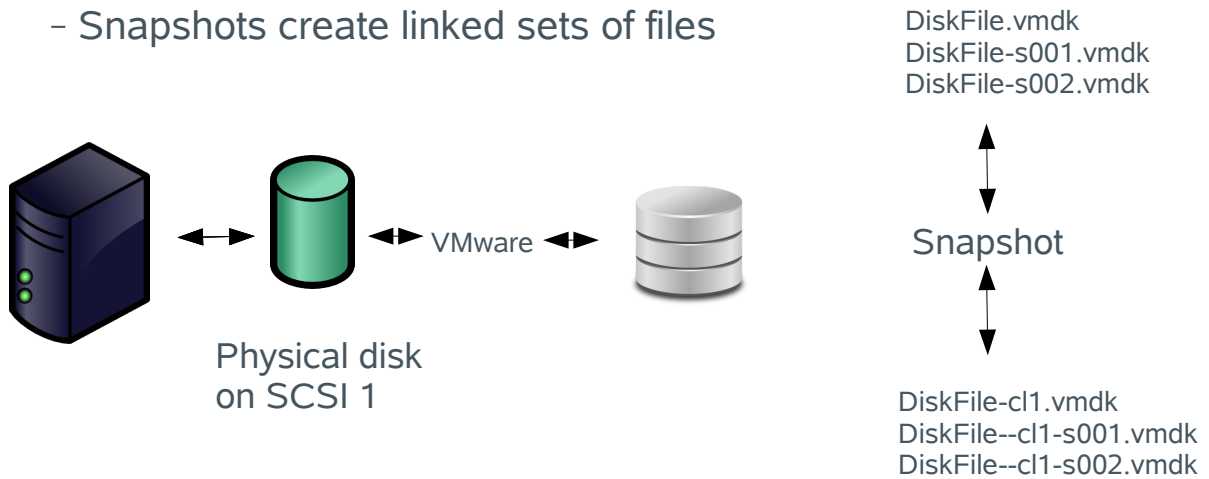
VMware Workstation - Advanced

- The structure of a vmware disk
 - A file or files on the host
 - Appears to the guest VM as a physical disk
 - Can be full size right away or expandable
 - Can be one file or many
 - We will work with Type 1, expandable, split into 2GB files
- Type 1 disks allow easy manipulation
- Type 1 split disks expose all the goodies in an editable text file..

VMware Workstation - Advanced

- The structure of a VMware disk

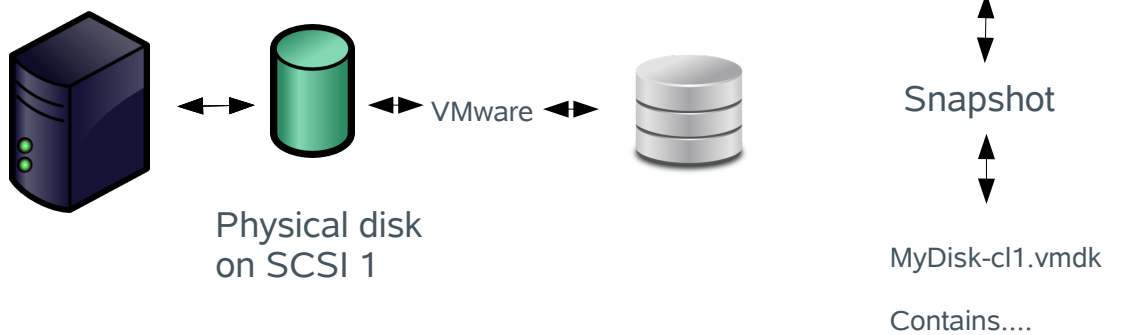
- Snapshots create linked sets of files



VMware Workstation - Advanced

- The structure of a VMware disk

- Snapshots create linked sets of files



```
parentFileNameHint="/var/opt/novell/nods/MyDisk.vmdk"
```

Being able to change the path is important.
If the path is different, writing to base and shrinking etc is forbidden



VMware Workstation – VMDK example

- Type 1 disks have one or more ~2k text file that defines disk
- MyDisk.vmdk
 - # Disk DescriptorFile
 - version=1
 - encoding="windows-1252"
 - CID=d215b934
 - parentCID=65ae1fdc
 - parentFileNameHint="/var/opt/novell/nods/vmbases/MyDisk.vmdk"
 - # Extent description
 - RW 4192256 SPARSE "MyBigDisk-cl2-s001.vmdk"
 - RW 4192256 SPARSE "MyBigDisk-cl2-s002.vmdk"
 - ddb.longContentID = "0d501a1aa1c7e220f131a896d215b934"



VMware Workstation – VMDK example

- Type 1 disks have a GUID that defines disk
- MyDisk.vmdk
 - # Disk Descriptor
 - version=1
 - encoding="windows-TZ"
 - CID=d215b934
 - parentCID=65ae1fdc
 - parentFileNameHint="/var/opt/novell/nods/vmbases/MyDisk.vmdk"
 - # Extent description
 - RW 4192256 SPARSE "MyDisk-cl2-s001.vmdk"
 - RW 4192256 SPARSE "MyDisk-cl2-s002.vmdk"
 - ddb.longContentID = "0d501a1aa1c7e220f131a896d215b934"

These GUIDs tell parents and children if they are the right files.

When a file set it written to, this number changes.



VMware Workstation – VMDK example

- Type 1 disks have one or more ~2k text file that defines disk
- MyBigDisk.vmdk
 - # Disk DescriptorFile
 - version=1
 - encoding="windows-1252"
 - CID=d215b934
 - parentCID=65ae1fdc
 - parentFileNameHint="/var/opt/novell/nods/vmbases/MyBigDisk.vmdk"
 - # Extent description
 - RW 4192256 SPARSE "MyBigDisk-cl2-s001.vmdk"
 - RW 4192256 SPARSE "MyBigDisk-cl2-s002.vmdk"
 - ddb.longContentID = "0d501a1aa1c7e220f131a896d215b934"

All linked clones will have a line like this. The base file will not. If this path is not the current path, VMware will not write to the parent



VMware Workstation – VMDK example

- Type 1 disks have one or more ~2k text file that defines disk
- MyBigDisk.vmdk
 - # Disk DescriptorFile
 - version=1
 - encoding="windows-1252"
 - CID=d215b934
 - parentCID=65ae1fdc
 - parentFileNameHint="/var/opt/novell/nods/vmbsamples/MyBigDisk.vmdk"
 - # Extent description
 - RW 4192256 SPARSE "MyBigDisk-cl2-s001.vmdk"
 - RW 4192256 SPARSE "MyBigDisk-cl2-s002.vmdk"
 - ddb.longContentID = "0d501a1aa1c7e220f131a896d215b934"

These files hold the actual disk data



Creating a “base” library

- Why? If you have 5 VMs of 10GB each = 50GB
- If you have a 5GB base shared you use 30GB
 - or you can run 9 VMs in the space of 5
- At NetIQ/Novell/SuSE we save 10TB SAN with this
- Copying the VM without the base is faster too
- Bases can be remote. One base can be shared with dozens of servers and hundreds of linked clones.
 - > * Once a disk has a snapshot or clone, you cannot “shrink” it
- Exercise 1- Create a linked clone
 - Make a copy of the linked clone making 2VMs with one base



Advanced networking concepts

- NAT, Bridge and Host-Only can be used in combination
 - The # assigned by default doesn't mean anything
 - You can delete vmnet8 and make vmnet1 a NAT
 - Consider using a non-standard vmnet, like 5 to limit the possibility of clashing when sharing
 - The network config is in /etc/vmware/vmnetX, not the vmx file
 - The vmx file says which vmnets to use, not how they work
 - We rely on NAT for development and demo, bridge for production

- The \$64,000 question “Moved or Copied”
 - > To keep you from running two VMs with the same MAC, VMware will make a new MAC if you choose “Copied”



Moved or Copied

- What happens if I choose Moved?
 - Nothing – the MAC is unchanged
- What happens if I choose Copied?
 - A random MAC is added to the VMX
 - Many OSs will see the MAC change as a new NIC
 - > May refuse to use it – often silently
- What happens if I lied?
 - Running two VMs at the same can cause IP conflicts, kernel panic, router failure, martians and all manner of bad behavior
- You could change the bios in the vmx to get a new mac
 - `uuid.bios="56 4d 33 65 61 09 c1 9b-12 57 e9 0c 8a d9 c5 23"`
- * Boot the VM and check the NIC – some don't like the change *



vmrun command – your keys to the engine

vmrun is a command line tool that can:

- Start, stop, suspend and list running VMs
- Run, list and kill programs inside the guest VM
- Install vmware tools to the guest
- Copy files into and out of the guest
- List, make, delete and restore snapshots



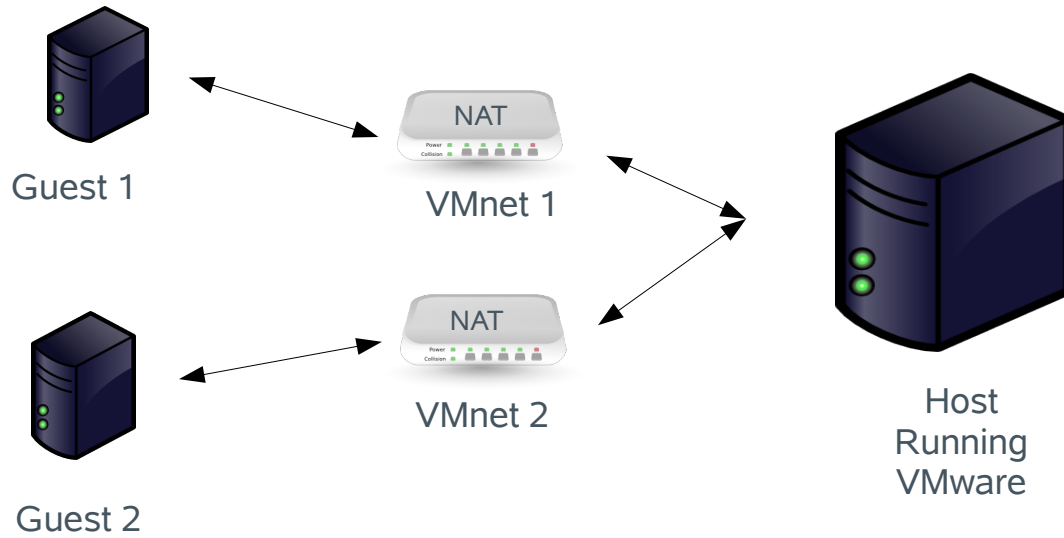
vmware-vdiskmanager

vmware-vdiskmanager is a command line tool that can:

- Create, expand, defragment, and rename disks
- Convert between types like monoliths and 2GB splits
- Change adapter type from IDE to SCSI and between SCSI types
- Prepare disk for shrinking and shrink it
- Clone drives – IE Converting is really a copy to a new disk name with changes made while copying

Hosting copies of the same VM

NATS=Magic





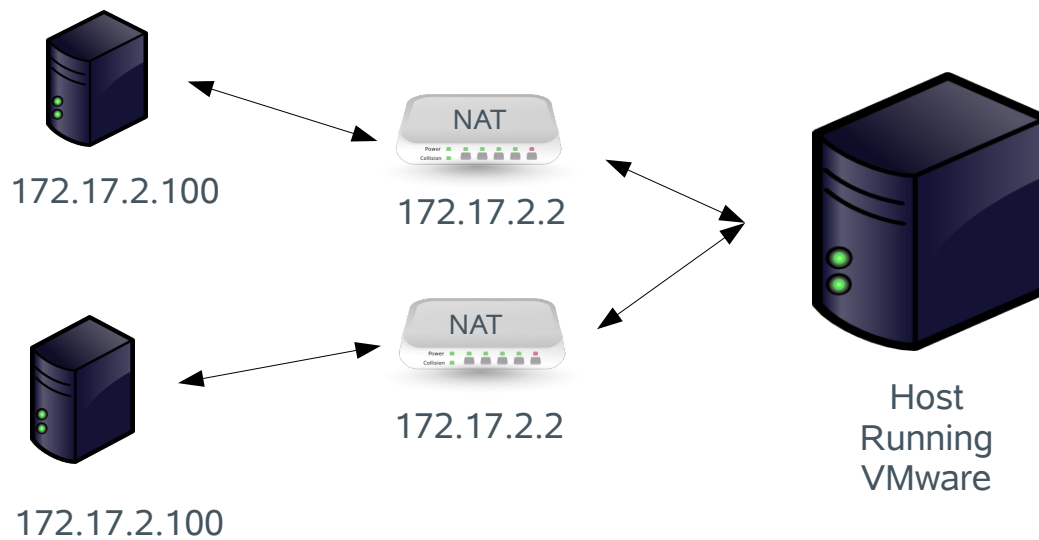
Hosting copies of the same VM

Can I use the same IP/MAC on two VMs on the same host at the same time? No, No, No (well, yes)

- Use a Linux host and NAT network
- Add this to the VMX file
 - > `ethernet0.ignoreMACAddressConflict="true"`
- Then use a different vmnets with the same IP
- Even though the MACs will be the same, the MAC of the vmware NAT, the packet source, will be unique.
- Technically this is unsupported. We've used it in production for many years.

Hosting copies of the same VM

NATS=Magic



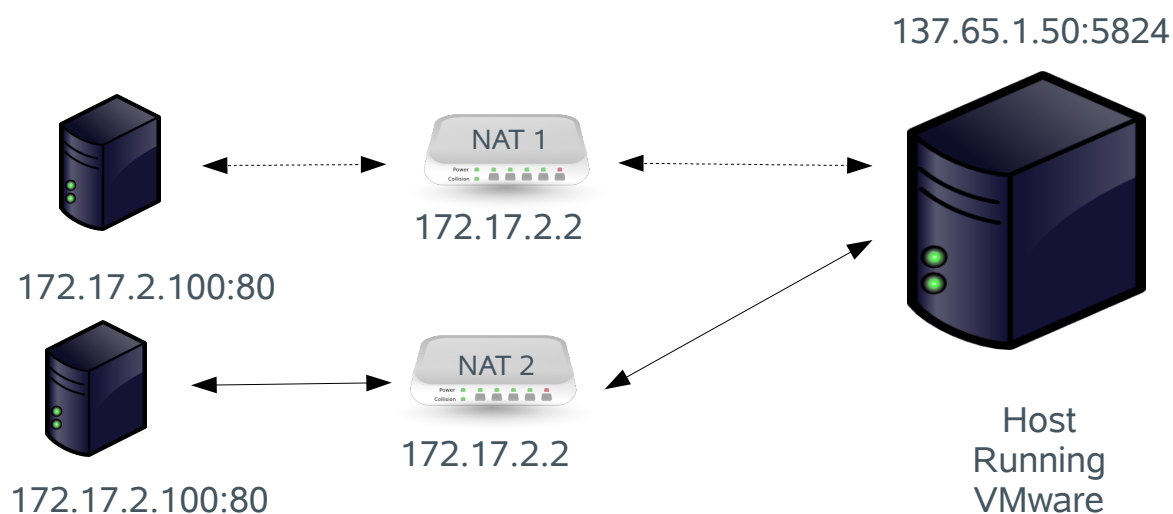
- > Adding this to each VMX file allows this to work
- > `ethernet0.ignoreMACAddressConflict="true"`
- > Exercise 2 – create copies of the VM that share a base



Creating port forward

- If you have identical VMs on 172.17.2.100, can the outside world use both web servers? No, No, No (well yes)
- Using NAT vmnets and the lines in /etc/ware/vmnet1/nat/natd.conf
 - [incomingtcp]
 - 5824 = 172.17.2.100:80
- In this case any traffic hitting the host server on port 5824 will be sent to 172.17.2.100:80
- You can create many vmnets with the same IP address and each can have many port forwards.
 - > The outside number (5824) changes

Creating port forwards



> Adding this to `/etc/vmware/vmnet1/nat/natd.conf`

> `[incomingtcp]`

> `5824 = 172.17.2.100:80`



Restarting a single vmnet

- With several VMs running, restarting one net can be hard
- Various tools have come and gone but here is a sure fire way
- **ps ax | grep vmnet2** (Returns the lines used to start vmnet2)
 - 28243 /usr/bin/vmnet-dhcpd -cf /etc/vmware/vmnet2/dhcpd/dhcpd.conf -lf /etc/vmware/vmnet2/dhcpd/dhcpd.leases -pf /var/run/vmnet-dhcpd-vmnet2.pid vmnet2
 - 28245 /usr/bin/vmnet-natd -m /etc/vmware/vmnet2/nat.mac -c /etc/vmware/vmnet2/nat/nat.conf
 - 28250 /usr/bin/vmnet-netifup -d /var/run/vmnet-netifup-vmnet2.pid /dev/vmnet2 vmnet2
- Kill -9 28243 28245 28250
- Copy and paste each of the 3 lines with a space and & on the end
- **/usr/bin/vmnet-netifup -d /var/run/vmnet-netifup-vmnet2.pid /dev/vmnet2 vmnet2 &**
- **Exercise 3 – Add a port forward to port 80 in your VM on vmnet1 and restart only vmnet1**



Remote Control

- With more VMs you will need easier access
- Good remote control is like having dozens of machines at your fingertips
- Firewalls take longer to adjust than VMs do – consider setting up a range for your VMs and then keep them all in the range.
- Newer firewalls will not only check the port but the type
 - IE – Running VNC on port 80 often fails the “HTML” test



Remote Control Options

- We'll use the VNC basics in this class but there are many great free/cheap solutions
- Logmein – free and html based. Your VM connects to their website and you access their site on 80/433
 - > Free for home – fee for commercial
 - > Can be run inside guest VM or on host
- FreeNX/NoMachine – ssh based port 22, free clients for all platforms, server Linux only
 - Free Open Source Server for Linux or paid with support
 - Fast and full color -
- Many more available

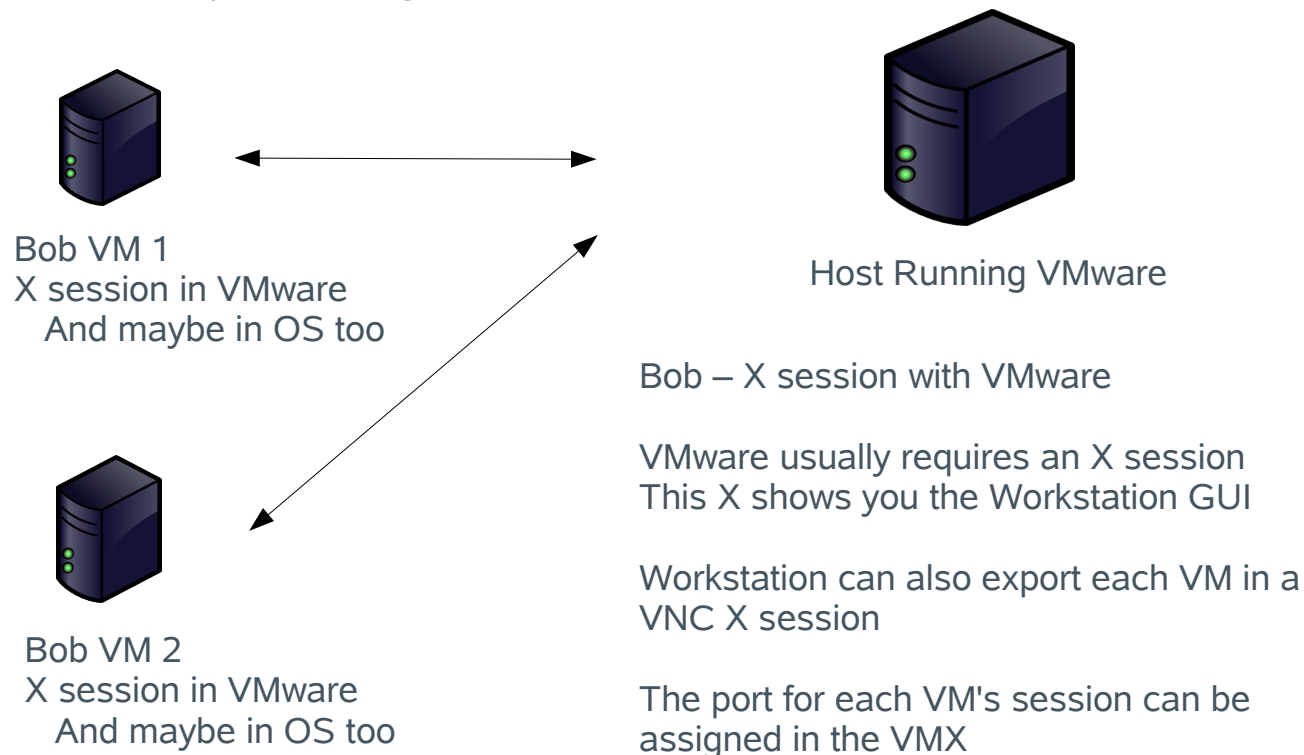


VNC server on the host

- Allows you to view the VMware Workstation GUI as well as other host desktop programs
- Free in most forms but a few commercial supported versions available
- Easy to start
 - `vncserver :5 -geometry 1024x768`
 - VNC uses ports starting at 5900 so `:5` is really 5905
 - `:0` is reserved for the current desktop user – session numbers are actually X session numbers. Each session is an X session.
 - A web port is also opened at `5800+port = 5805`
 - » Switches to 5905 after the session starts

Anatomy of VM remote Control

- The key is knowing where the X session is...





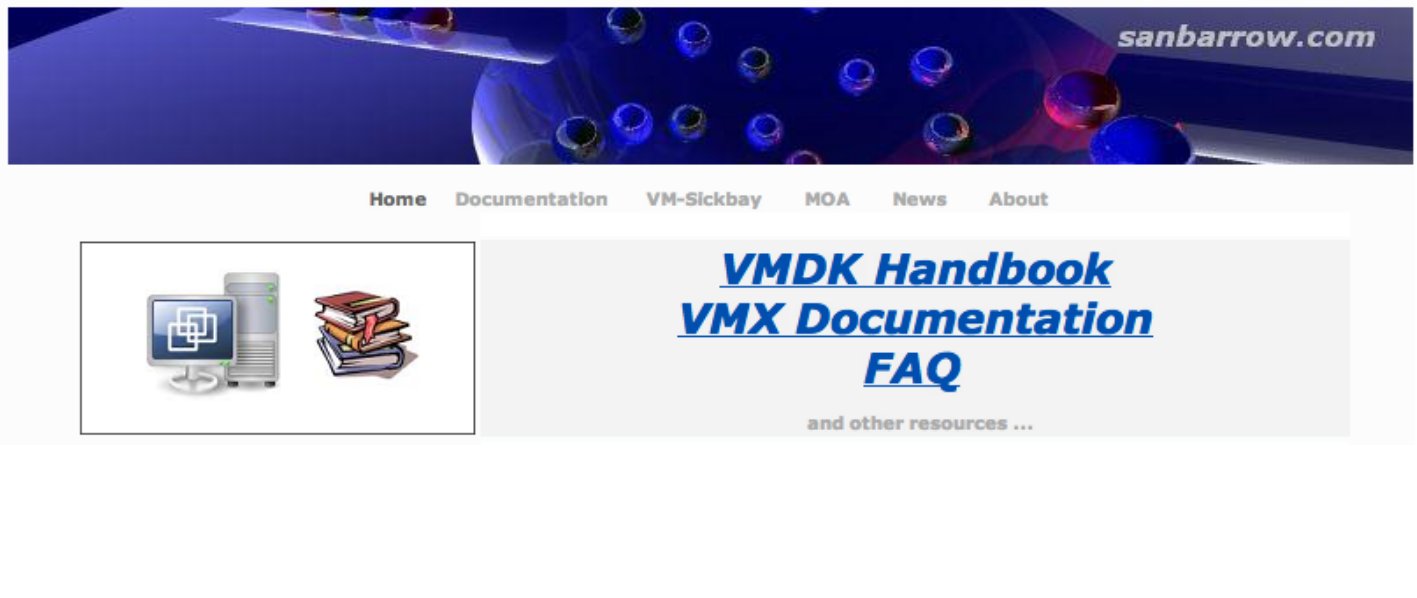
VNC Lab

- Exercise 4
 - Start a vnc server session on your first VM
 - Connect to it with your second VM
 - Configure remote control in VMware GUI (which is VNC) on the second VM and connect from the first



sanbarrow.com

- The resource for everything, known and unknown, about VMware
- The author, Continuum is a primary contributor to the VMware forums
- Read carefully, backup, be careful. There are staggeringly powerful things here and they can be dangerous.





Summary

- VMware Workstation is highly scriptable and can handle multiple users and sessions.
- By using shared bases you can create multiple copies of VM with a fraction of the space of full copies.
- Linux is the most configurable host but most of these features can be done on other platforms.
- `vmrun` and `vmware-vdiskmanager` are powerful tools that can extend your control of VMs.



LAB 1-1: Start, Suspend, Snapshot and Clone VMs from the CLI

Summary: In this exercise, you use the `vmrun` command to start, suspend, snapshot and clone VMs from the command line.

Special Instructions

Use the following values in the exercise:

(none)

Duration: ? min.

lab
machine

Lab Notes:



LAB 1-2: Make Two Copies of a Cloned VM

Summary: In this exercise, you make two copies of a cloned VM.

Special Instructions

Use the following values in the exercise:

(none)

Duration: ? min.

lab
machine

Lab Notes:



LAB 1-3: Virtual Network Manipulation

Summary: In this exercise, you forward network ports in to a VM and restart individual virtual networks.

Special Instructions

Use the following values in the exercise:

(none)

Duration: ? min.

lab
machine

Lab Notes:



LAB 1-4: VM Remote Control Basics

Summary: In this exercise, you view an entire VMware Workstation instance with all of its VMs as well as a single VM's screen.

Special Instructions

Use the following values in the exercise:

(none)

Duration: ? min.

lab
machine

Lab Notes:



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