

Baremetal VSphere Mac Minis

A Case Study

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Background on New Relic PDX

- ***New Relic is to SaaS, servers, and Mobile apps as the check engine tool is to a car, or MRI/ASD is to a Mac. We collect data that can insight into what is broken so you can fix it.***
- ***PDX staff are software engineers and support techs***

Background on New Relic PDX, c'td

- ***All Mac hardware.***
- ***Distributed models: 15" Retinas and 13" Airs.***
- ***Users and laptops are constantly on the move.***
- ***Modern Macs ≠ Kensington lock ports... so...***

Why we needed Mac Minis

- ***We need Mac OS instances for Xcode for Teams***
- ***We need Mac OS instances for building iOS apps***
- ***Team-controlled network shares***
- ***Friendlier GUI based shared hosts***

VMs on Mac Minis: Previously

- ***Former coworker balked at setting up VSphere due to EULA, instead opted for VMware Fusion***
- ***Mini running 10.8, 16GB RAM with 3 VMs in Fusion***
- ***VMs only worked when system was logged in***
- ***If Fusion crashed, so do everything else***

There must be a better way...

- ***There's gotta be something more stable than Fusion in Mac OS.***
- ***Bailing wire and duct tape solutions don't scare me.***
- ***I can cobble things together and not need to get direct support.***
- ***I don't mind coming up with creative interpretations of EULAs.***
- ***I needed a challenge. I spent eight months without any significant challenges at work.***

Catalyst

- *The Mobile team needed two long running instances of Mac OS X 10.9 to replace existing 10.8 installs*
- *They also wanted to play with Xcode for Teams*
- *The existing Fusion-based solution \neq scalable*
- *So... Finally, a challenging project!*

Project: Mac OS VMs

Goal: Get Mac Minis turned into baremetal VSphere systems.

Benefits

- *ESXI's overhead RAM/storage usage is low.*
- *Each VM operates independently of the others.*
- *Snapshots.*
- *VMs can be turned over to respective teams.*
- *Each Mini can comfortably run 2 VMs.*

Benefits, continued

- ***Mac Minis are cheap.***
- ***2x Minis per 1U rack mount.***
- ***It's easier to do this than hunt down Xserve or old Mac Pro towers***

Things I'm not solving

- ***Accessing connected devices from VMs.***
- ***Video memory/graphics applications.***
- ***Rock solid uptimes.***
- ***Production-grade stability.***

Getting to Baremetal

- ***Upgrade and test the Mini***
- ***Nuke 'n' Pave the Mini***
- ***Get VSphere on a Flash Drive***
- ***Install and Configure VSphere***
- ***Conquer the Pink Screen of Death***
- ***Check For the SMC***

“Serverizing” Mac Minis

- ***Mac Minis ≠ Xserves or silver Mac Pros***
- ***5400 RPM HDDs are slow and useless***
- ***Apple prices for RAM and SSDs are exorbitant***
- ***Modern Minis are easy to disassemble***

The Six Million Dollar Mini

- ***Mac Mini with OS X Server: 2.3 GHz i7 quad-core, 4GB RAM, 2x 1TB HDDs***
- ***16GB RAM kit***
- ***2x 500GB SSDs***
- ***Mac Mini Logic Board Tool from iFixit***
- ***Torx and Philips Screwdrivers***
- ***Spudgers/Black Sticks***



Gut and Rebuild the Mini

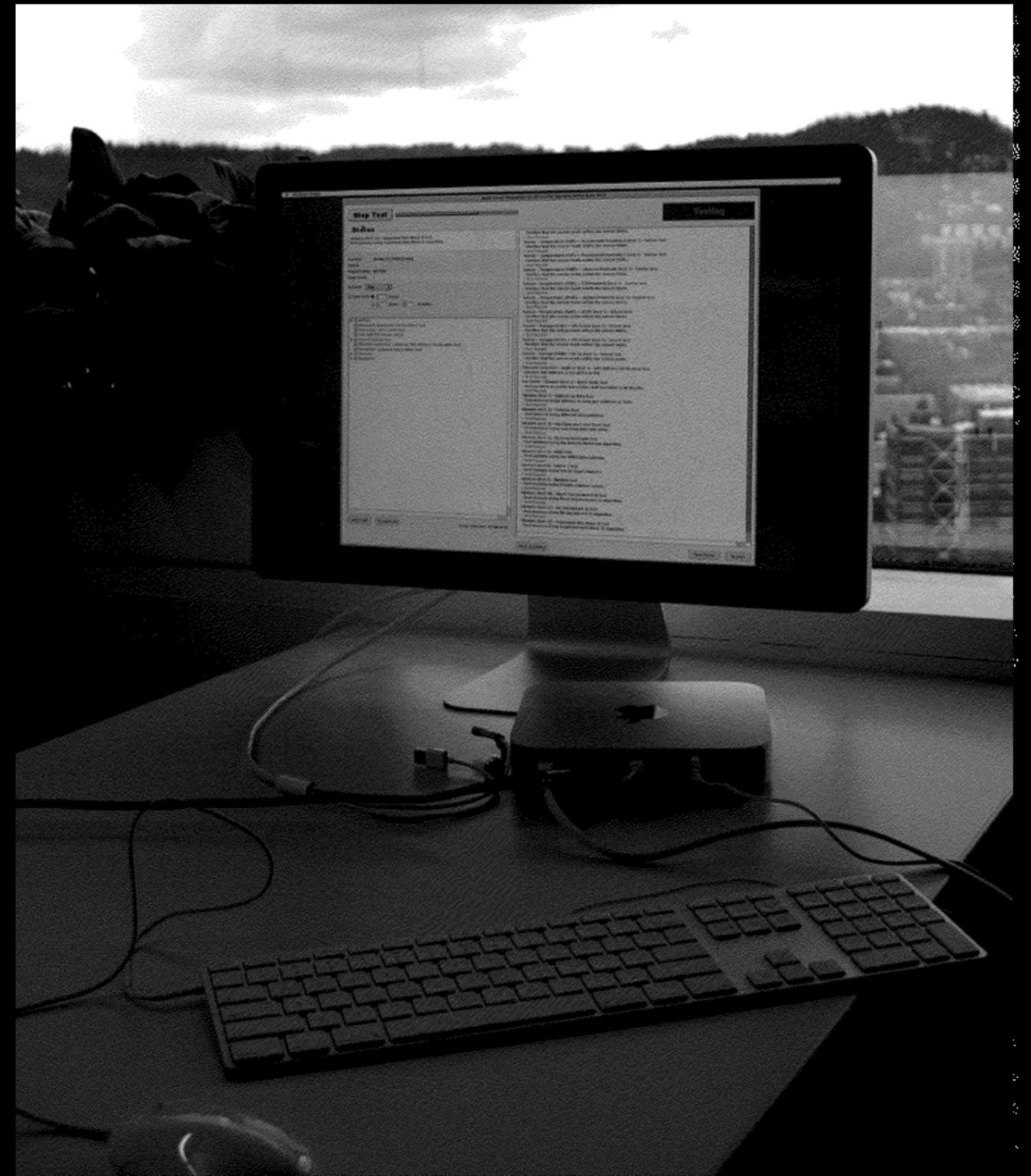
Bye-bye Apple Warranty!

***Now that we've rebuilt the Mini
Testing, and then onwards, to VSphere!***

Does it work?

AHT, MRI, ASD.

***Run at least one of them to
verify it's been properly
reassembled.***



Nuke the Site from Orbit

- ***Once the Mini passes AHT/MRI it's time to partition the drives***
- ***Otherwise they won't be visible to the ESXI VSphere installer.***
- ***Internet Recovery or Netboot will work, use Disk Utility or diskutil based on comfort.***
- ***Note: Make sure you partition both drives!***

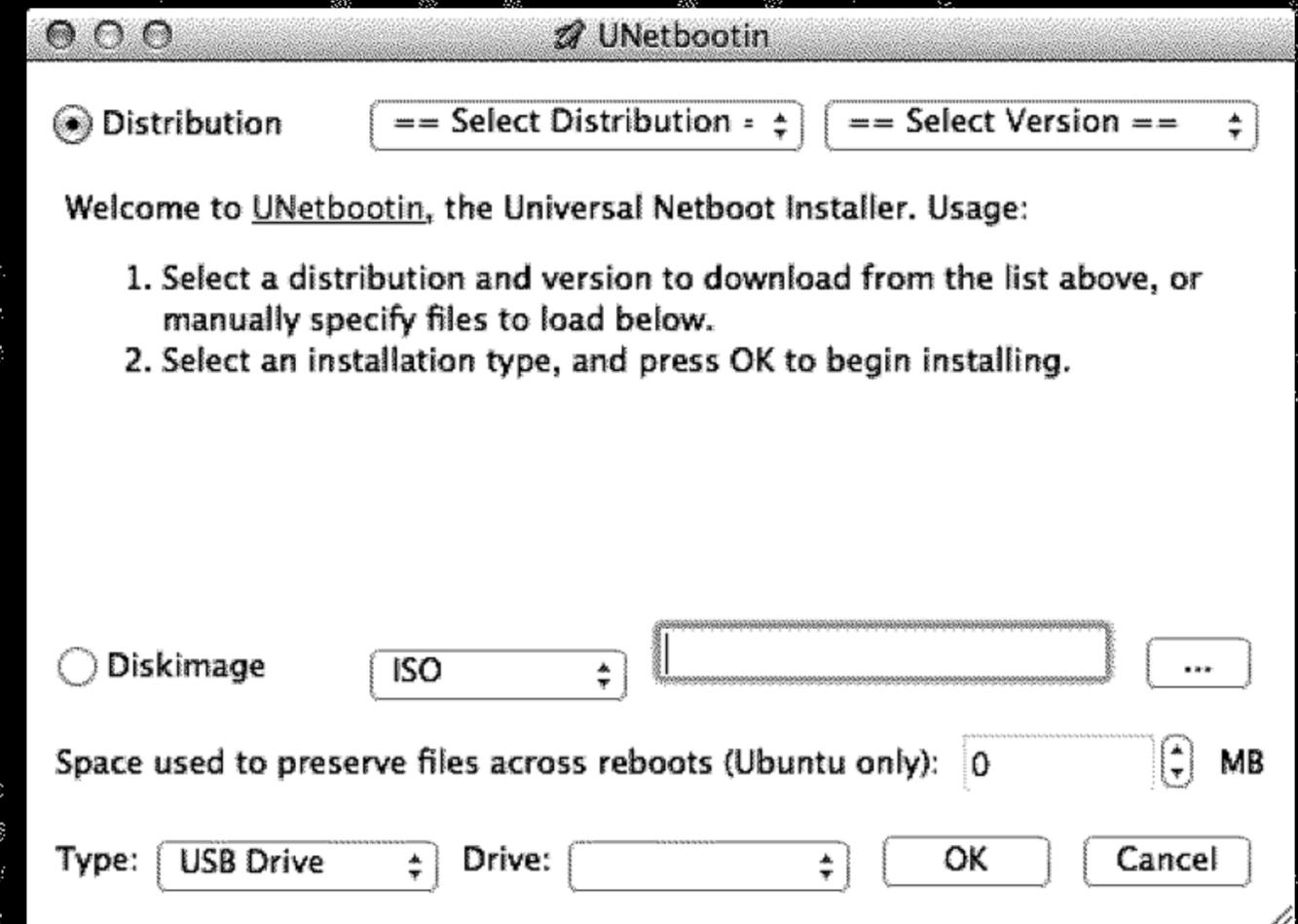
Baremetal here we come

Things you'll need:

- ***Upgraded Mini***
- ***USB Flash drive***
- ***Keyboard & Mouse***
- ***Display***
- ***Another computer***
- ***Access to Windows***
- ***An existing Mac netboot server***
- ***Wired network access***
- ***Patience***

VSphere on a Flash Drive: Unetbootin

- ***Format USB drive to Master Boot Record FAT32 in Disk Utility***
- ***Download VSphere***
- ***<http://unetbootin.sourceforge.net>***
- ***Truly the greatest tool ever.***
- ***Choose: Disk Image ISO, pick VSphere ISO via [...]. USB Drive should auto-select.***



***Before we go over installing Vsphere,
there's something I'd like you to meet...***

***Meet your new friend,
The Pink Screen of Death***

```
VMware ESXi 5.5.0 [Releasebuild-1331820 x86_64]
NOT_REACHED bora/vmkernel/hardware/intel/vtd.c:3927
cr0=0x8001003d cr2=0x0 cr3=0x100208000 cr4=0x12c
*PCPU0:32768/bootstrap
PCPU 0: SISISISISISIS
Code start: 0x418014000000 VMK uptime: 0:00:00:04.636
0x417fd40087d0:[0x41801408ccd9]<no symbols>+0x1408ccd9 stack: 0x0
0x417fd4008830:[0x41801408cfd1]<no symbols>+0x1408cfd1 stack: 0x417fd4008850
0x417fd4008880:[0x4180143621b8]<no symbols>+0x143621b8 stack: 0x417fd40088d0
0x417fd40088f0:[0x418014397b44]<no symbols>+0x14397b44 stack: 0x417fd4008910
0x417fd4008940:[0x418014397f44]<no symbols>+0x14397f44 stack: 0xd4008970
0x417fd4008990:[0x4180143f9823]<no symbols>+0x143f9823 stack: 0x0
0x417fd40089c0:[0x418014401196]<no symbols>+0x14401196 stack: 0x417fd4008a00
0x417fd40089e0:[0x4180143cded8]<no symbols>+0x143cded8 stack: 0x4180a9f892e0
0x417fd4008a00:[0x4180143c991c]<no symbols>+0x143c991c stack: 0x417fd4008a30
0x417fd4008a30:[0x4180143f78be]<no symbols>+0x143f78be stack: 0x417fd4008aa0
0x417fd4008a80:[0x4180144031ed]<no symbols>+0x144031ed stack: 0x417fd4008ae0
0x417fd4008af0:[0x418014013f61]<no symbols>+0x14013f61 stack: 0x71aa4180a9f894e3
0x417fd4008b10:[0x418014012bce]<no symbols>+0x14012bce stack: 0x417fd4008b40
0x417fd4008b60:[0x4180140130c0]<no symbols>+0x140130c0 stack: 0x6970636100000000
0x417fd4008cb0:[0x4180144030d2]<no symbols>+0x144030d2 stack: 0x417fd4008cf0
0x417fd4008cf0:[0x418014067027]<no symbols>+0x14067027 stack: 0x41801400bd3e
0x417fd4008df0:[0x418014000649]<no symbols>+0x14000649 stack: 0x10000000001
0x417fd4008fe0:[0x418014001169]<no symbols>+0x14001169 stack: 0x418014253140
base fs=0x0 gs=0x418040000000 Kgs=0x0
No place on disk to dump data.
No file configured to dump data.
Debugger waiting(world 32768) -- no port for remote debugger.
```

Installing VSphere

- *Option boot the Mini. Choose EFI Boot. (that's the flash drive)*
- *As soon as it starts booting press SHIFT + 0 to evade the PSOD*
- *Then at the prompt type a space followed by:
iovDisableIR=TRUE*
- *Follow the prompts & install VSphere, which requires a reboot*
- *Remember to hit SHIFT + 0 and type in iovDisableIR=TRUE*

Installing VSphere, c'td

- ***On reboot, past Shift + 0, hit F2 to enter System Configuration***
- ***Choose Configure Management Network and verify that the Mac Mini's network adapter is seen by VMware.***
- ***Go into Troubleshooting Mode Options and turn on ESXI Shell and SSH.***
- ***Optional: Go to IP Configuration and set a static address for your server. Also feel free to set a hostname in DNS configuration.***

Banishing the PSOD

- ***From your other computer SSH into your VSphere host.***
- ***Once you're in run the following command:***
esxcli system settings kernel set --setting=iovDisableIR -v TRUE
- ***The Pink Screen of Death shall trouble you no more, and you can now reboot the machine whenever.***

Check for the SMC

- ***SMC = System Management Controller.***
- ***Make sure VSphere can run Mac VMs by visiting:
[https://\[host\]/mob/?moid=ha-host&doPath=hardware](https://[host]/mob/?moid=ha-host&doPath=hardware)***
- ***Replace [host] with the IP or hostname***
- ***Verify that smcPresent is listed as true. This means you've got a functional Mac ESXI VSphere host.***

VMware ESXi 5.5.0 (VMKernel Release Build 1331820)

Apple Inc. Macmini6,2

Intel(R) Core(TM) i7-3615QM CPU @ 2.30GHz
16 GiB Memory

Well, look at that
A Mac Mini, booting ESXI

Next step: Mac VMs

Mac VMs

- ***Audience Interaction and Cautionary notes***
- ***Mac VM image notes***
- ***Creating VMs in VSphere***
- ***VM setup via VSphere Client Console***
- ***Switch to ARD***

Audience Interaction: Query!

***There are fates worse than
the Pink Screen of Death***

And if you're a Mac only shop, this is what you have to deal with next...

Your Mac

***Fusion
Windows VM***

VSphere Mac Mini

VSphere VM

***TL:DR — Fusion steals your key
commands and shortcuts.***

What this means:

- ***You'll expect CMD+Q to affect apps in the VSphere VM, but instead it'll kill Fusion.***
- ***Don't use Key Commands for this next part.***
- ***Yes, I know it's really hard not to.***
- ***It's worth it for your sanity to do without.***

Mac VM image notes

- ***VMs don't need to behave like regular Macs.***
- ***So... They're the only monolithic image I use.***

Mac VM image notes

- ***Energy Saver settings: gutted***
- ***Screensaver: disabled***
- ***Anything that could waste “power”: turned off***
- ***Admin account: already baked in***
- ***ARD and SSH enabled***

Creating VMs in VSphere Client

- ***Open the Windows VM you'll be using to access VSphere.***
- ***Download the VSphere client app from a web browser, add it to your VM.***
- ***Install the client app and connect to your Mini.***

172.16.2.24

pdx-esxi-mm-02.datanerd.us VMware ESXi, 5.5.0, 1331820 | Evaluation (60 days remaining)

Getting Started Summary Virtual Machines Resource Allocation Performance Configuration Local Users & Groups Events

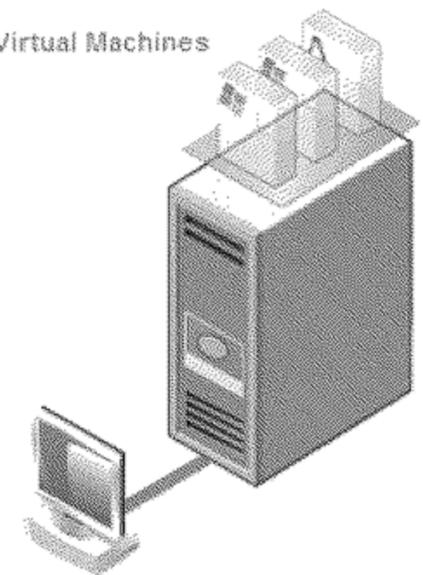
What is a Host?

A host is a computer that uses virtualization software, such as ESX or ESXi, to run virtual machines. Hosts provide the CPU and memory resources that virtual machines use and give virtual machines access to storage and network connectivity.

You can add a virtual machine to a host by creating a new one or by deploying a virtual appliance.

The easiest way to add a virtual machine is to deploy a virtual appliance. A virtual appliance is a pre-built virtual machine with an operating system and software already installed. A new virtual machine will need an operating system installed on it, such as Windows or Linux.

Virtual Machines



Host

vSphere Client

Basic Tasks

- Deploy from VA Marketplace
- Create a new virtual machine

Explore Further

[Learn about vSphere](#)

Recent Tasks

Name, Target or Status contains: Clear X

Name	Target	Status	Details	Initiated by	Requested Start Time	Start Time	Completed Time
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Configuring the VM

- *Click “Create a new virtual machine” and choose “Typical” for the type.*
- *Set a Name for your virtual machine.*
- *Choose a datastore (This will be one of the drives you’ve set up.)*
- *Under guest operating system choose Other*
- *Select Mac OS X 10.7 (64-bit) — this works for all Mac OS X builds after 10.7.*

Configuring the VM

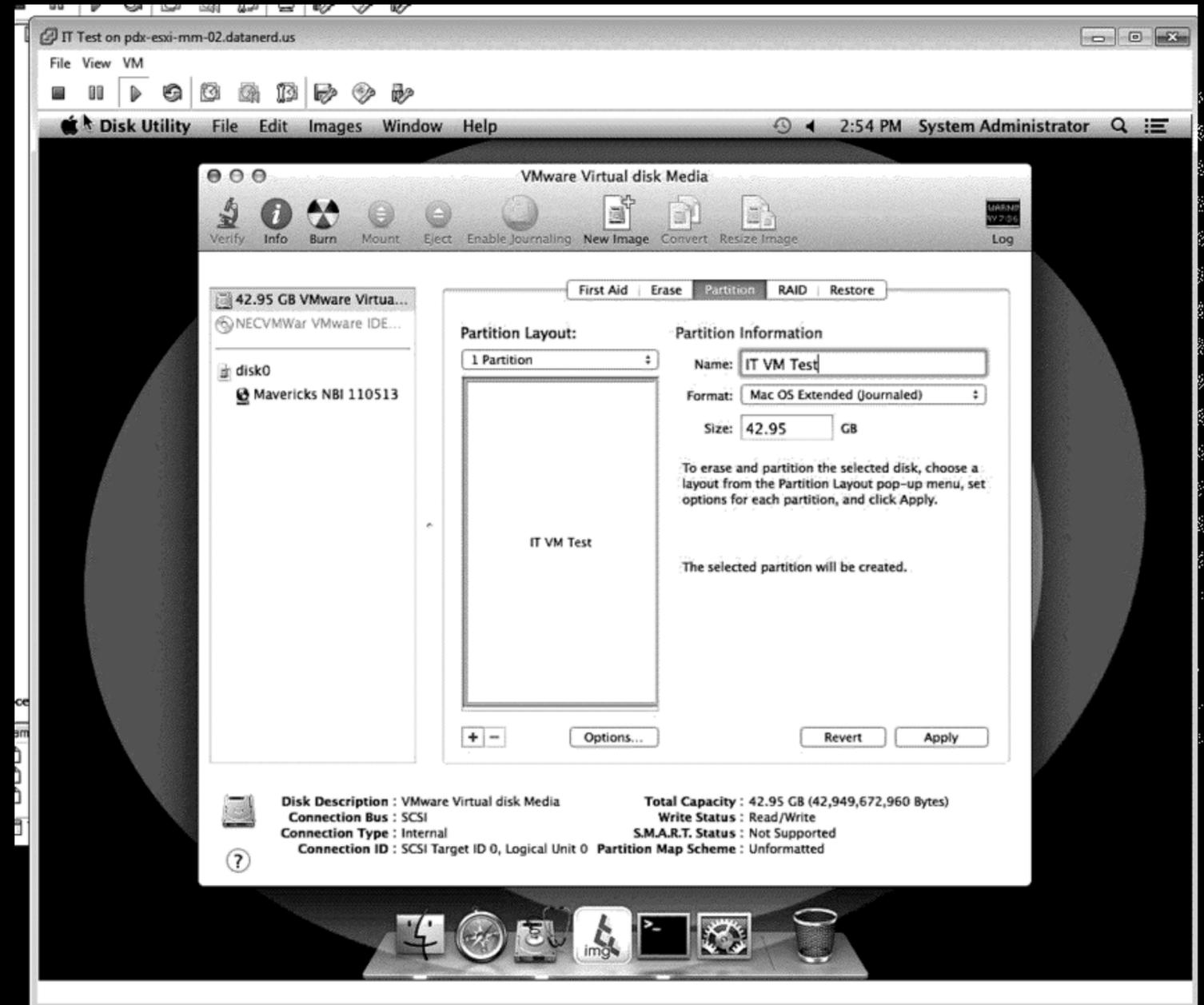
- ***Follow through the NIC screen, leaving the settings as is.***
- ***Create your VM's virtual disk.***
- ***Follow through to the end, select "Edit settings before boot" and hit Complete.***
- ***Allocate an appropriate amount of RAM on the configuration screen.***

Main Screen turn on. All your base...

- ***Power on the VM and bring up the Console.***
- ***You have no chance to survive, make your time: No more key commands until you can ARD in.***
- ***The VM will grab your primary netboot image.***
- ***The initial boot will take a while, be patient.***

Netbooting the VM: Partitioning

- *Now that we're netbooted...*
- *You'll need to partition the virtual drive before you can image it.*
- *Using either Disk Utility or Terminal partition the VMware Virtual disk to GUID and HFS+.*
- *Good idea: Name the virtual drive something identifiable.*



Netbooting the VM: Imaging

- ***Close out of Disk Utility/Terminal and open your imaging software***
- ***At New Relic we use Casper, so I set up a configuration just for VMs***
- ***Just like any other Mac the VM will image***

Install the VMware Tools

- ***Once the VM has finished imaging go to the Console menu bar and select:***
- ***VM > Guest > Install VMware Tools***
- ***This will pop up the VMware Tools DMG installer in the VM.***
- ***Run it, let it reboot the VM, and then...***

ARD!

VM Housekeeping

- ***Close the Console, quit VSphere client, and exit your Windows VM.***
- ***Now is the perfect time to do housekeeping.***
- ***Add additional user accounts, software, etc.***
- ***Also, Casper fans: remember to remove Casper.***

Long Term Lessons

Takeaways from six months of VSphere Minis

Long Term Lessons

- ***Server.app and VSphere***
- ***Things that work well***
- ***Things that don't***
- ***Bonus: Other solutions!***

Server.app and VSphere

- ***Issue: VMware assigns too long of Serial Numbers***
- ***To run Server.app within a VM you need to edit the VMX file to include
SMBIOS.use12CharSerialNumber = "TRUE"***
- ***The resulting serial number will be the right length, but it won't look like a regular Mac serial number***

Things that work well

- ***Caching Server***
- ***Profile Manager***
- ***Non-production Casper server***
- ***VMs as "sandboxes"***

Things that don't work out well

- ***Console Mode.***
- ***GUI Apps. Resolution is locked in 1024x768.***
- ***Power outages.***
- ***Connecting other devices ???***

Another possible solution...
For network connected, always on Macs...



***What do you do with a busted Retina?
If you're me? Turn it into a monster!***



Miso and AbbyNormal

- ***Miso and Abby are OOW.***
- ***Their displays are broken.***
- ***I FrankenMac'd them.***
- ***I removed their back panels, hooked up their antennas, and used the displays as new back panels.***
- ***...and taped them together with Kapton tape.***
- ***Now they serve as network connected, high-powered test units.***
- ***Abby is 100% good.***
- ***Miso mostly works.***

***Questions? Comments? Concerns?
Rotten fruit?***

Now's the time!