Introduction

One of the questions asked most often by vSphere enthusiasts is: "what's the best way to build a home vSphere lab?" Realistically, there are only two answers to this question:

- Get on EBAY and buy one or two generation old server hardware that's still on the VMware HCL: http://www.vmware.com/go/hcl.
- Use VMware® Workstation™ Pro to build a virtual vSphere home lab.

Nothing replaces the overall experience of building vSphere on real, physical server hardware! There are just certain things you can't do with virtual (nested) installations of ESXi like: RAID, IPMI and DPM. Using real server hardware, however, is just not practical for any number of reasons:

1. Your wife will hate you.
2. Your power bill will go up by hundreds of dollars per month (no kidding!)!
3. Your cat will think you have installed an always-on vacuum cleaner.
4. The minor ego-boost you get from showing-off "real servers" will be far outweighed by the looks of pity on the faces of most good-looking women, whose only thought will be: "what a dork"!
5. As a minor offset to the disadvantages of running physical servers at home, is that you could (and I have) heat your house with them in the winter!

Virtual vSphere labs provide a great deal of flexibility and an awesome learning platform, **without increasing your power-bill by $500+/month (no kidding!).**

The Backstory

Many years ago, when ESX ran on top of RHEL, I created my own lab(s) on what amounted to junk. Because RHEL bootstrapped the hypervisor (vmkernel), and the Service Console was 32-bit, not only was ESX compatible with a wide variety of hardware and storage, but the resources actually required were tiny!

In the day, I used just about any POS personal computers available, converted the IDE storage to SCSI with nifty little gizmos that plugged into the back of the drive, and Voilà, I had created a viable ESX server from just about anything!
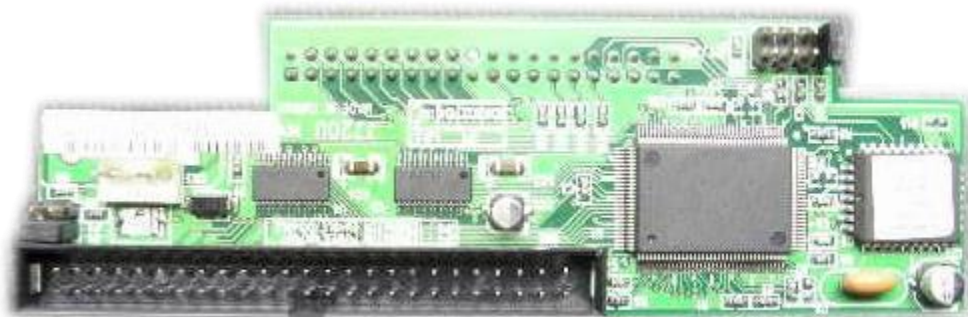
Things changed when VMware shifted from ESX to ESXi and the platform no longer ran on top of RHEL. First and foremost, ESXi was now exclusively 64-bit. You could no longer get away with 32-bit hardware by only building 32-bit Operating Systems; just to create a Whitebox ESXi server, you had to begin with a 64-bit capable system. Another challenge was storage and networking. Whereas ESX on RHEL had supported just about anything, ESXi had a finite list of

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supported adapters and would refuse to install if one of those was not present. Given the era ESXi became available, around 2008, 64-bit capable systems and supported adapters were still somewhat pricey and creating successful Whitebox labs became less viable.

Fortunately, along with ESXi came support for nested hypervisor installations. This had been previously possible, but only by going to great lengths and tricking the host hypervisor (usually VMware Workstation) and the guest hypervisor (ESX, at the time) into believing that they were physically hosted.

Somewhat concurrent with the initial release of ESXi, VMware added *native* support for nested hypervisor installations to VMware Workstation, and building a viable virtual vSphere home lab became a real and affordable possibility!

How are we going to do this?

In an orderly fashion, I hope.

What sort of a system will I need?

In order to build a viable home vSphere lab on top of VMware Workstation Pro, you are going to need a reasonably powerful PC. Don't even mess around with vSphere unless you have at least 16 GB of RAM on a multi-core CPU capable of Virtualization.
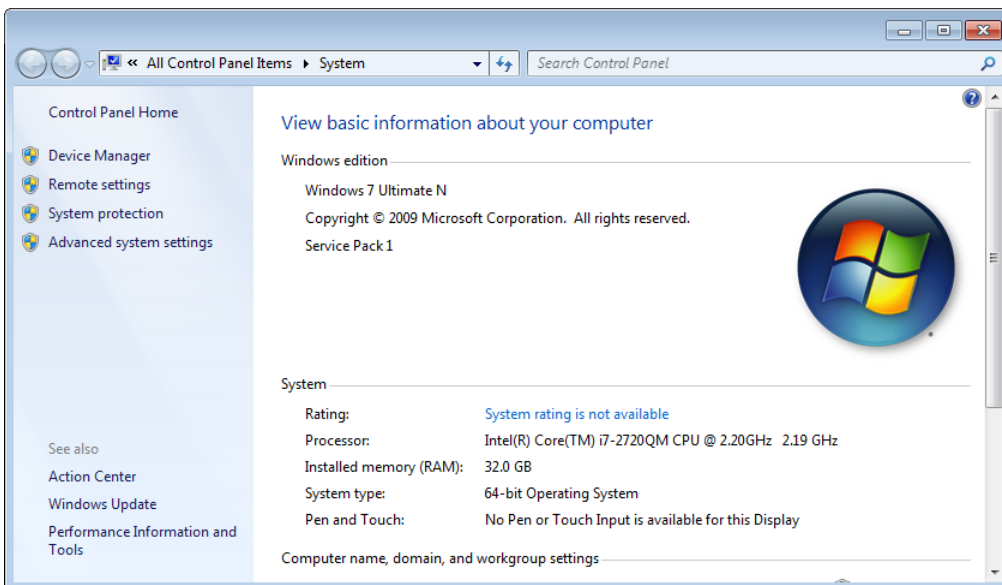
My own personal system is several years old, but more than up to the task, and a check of the Intel website confirms that my processor is capable of Virtualization.

Before even beginning, you will want to reboot whatever workstation you will be using and make sure that Virtualization in enabled in the BIOS. If it is not, enable it now. Ask your best friend Google what keystroke or combination is required for your model PC or motherboard to access the BIOS boot menu.
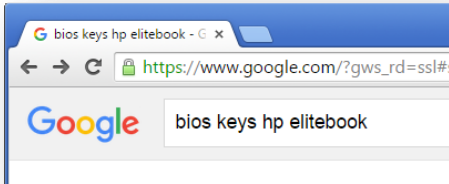
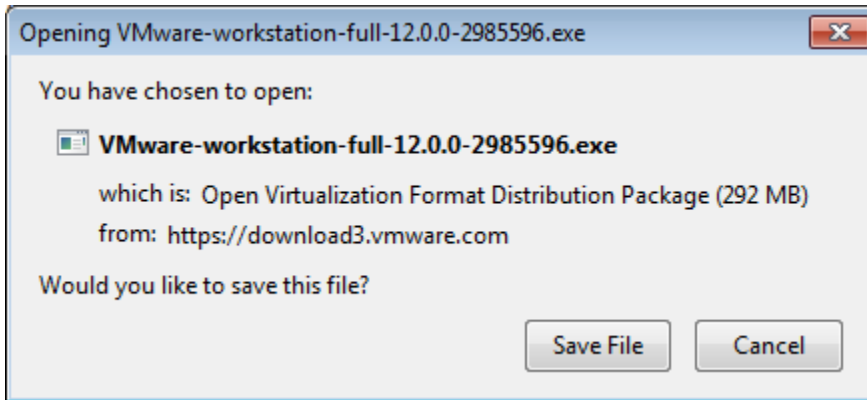# Part 1 – Installing VMware Workstation Pro and VMware ESXi as a VM

Getting and installing VMware Workstation Pro

VMware® Workstation™ Pro (formerly just: VMware Workstation) is available for Windows and Linux in a fully licensed and trial version from VMware. You can contact VMsources or any other authorized vendor to purchase VMware Workstation Pro once your trial expires.

1. Download Workstation
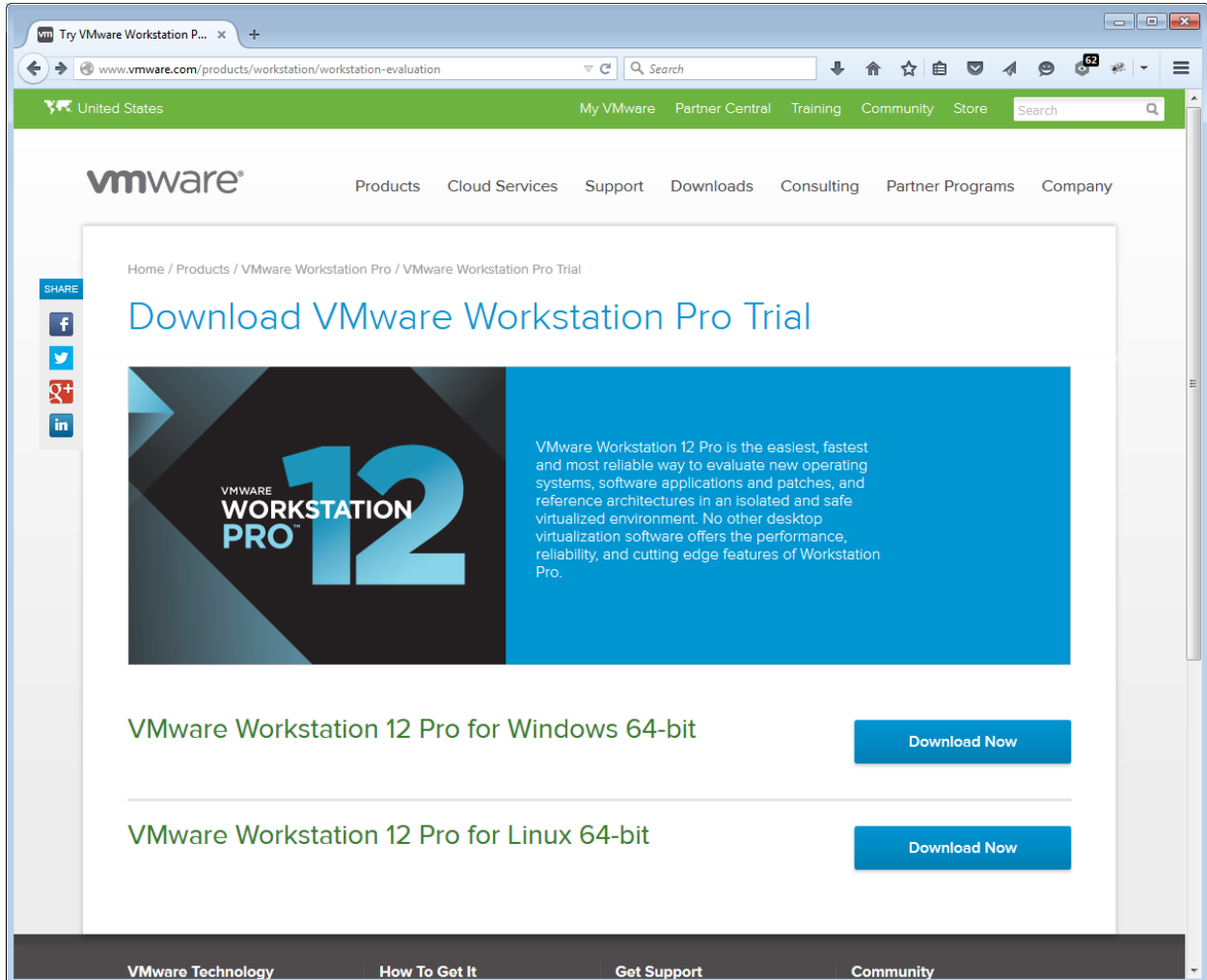
    a. Save to a default location

2. Run as administrator (always!)
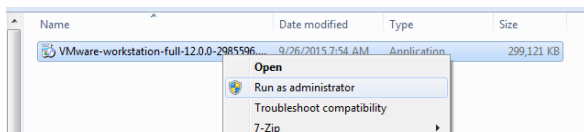
   a. Next

b. Next
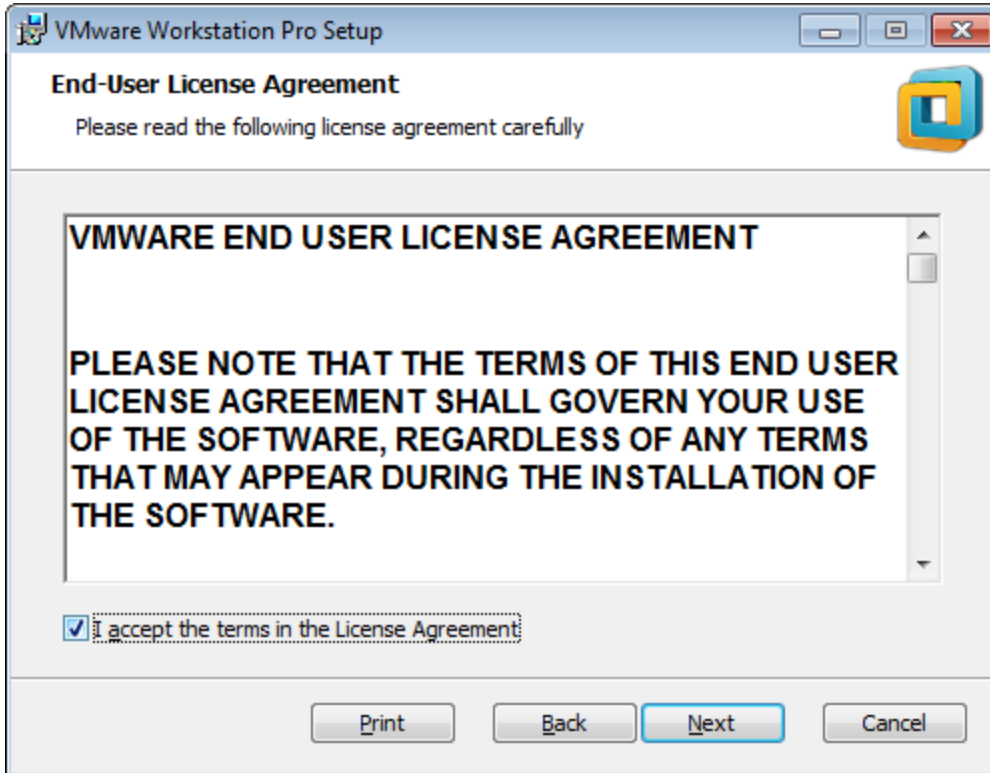
c. Next

d. Next

e. Next

f. Install

VMware Workstation Pro Setup

Ready to install VMware Workstation Pro

Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.

Back   Install   Cancel

g. Wait

VMware Workstation Pro Setup

Installing VMware Workstation Pro

Please wait while the Setup Wizard installs VMware Workstation Pro.

Status: Validating install

Back   Next   Cancel

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h. Finish

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Configuring Workstation Pro

Before building your lab, I recommend configuring the networks you will be using as you install ESXi, vCenter and any other vSphere components you will be setting up. For a Best Practices compliant installation, you will need, at the minimum, the following networks:

- A Management Network. This will be used for the ESXi "Management Network" vmkernel, vCenter and any of the vSphere API's.
    - o The firewall for the Management Network will be among the most secure.
- A Server network. This is the network where Servers (VMs) like SQL, Exchange and Apache will reside. Even if you are only building vSphere, you should create this network so you know how to separate "Management" from other services.
    - o The firewall for the Server network, typically, denies all connections and has "pass" rules specific to each hosted server and its required application ports.
- A Storage network. This is the network for iSCSI storage. Even if you plan on using only local storage provided by Workstation Pro, you should create this network so you can practice and demonstrate Port Binding, Jumbo Frames, and Path Selection Policies.
    - o The Storage network is ideally isolated, with no routes. This is also known as "air-gap network."

We'll use the default NAT virtual network (in this example, VMnet8) as our vSphere Management Network. This network will essentially be behind the Windows Firewall and/or any other software firewall on your PC. Although this network is configurable, I recommend you leave it alone. As a Class C network (CIDR: /24 –or- SNM: 255.255.255.0), it has more than enough host IP addresses to accommodate your needs. Also, in my experience, if you change the gateway IP of this network after Workstation is installed, software firewalls may block traffic causing an apparent lack of connectivity. Even though I personally would never place a gateway on .2, that IP is as technically valid as any other and I am going to live with it.

We'll use the default Host-only virtual network (in this example, VMnet1) as our Server network and we will create another Host-only network (in this example, VMnet2) as our Storage network.

Later, in a different article, I will cover how to create a Virtual Router which can secure your Server network and any other networks you might choose to create.
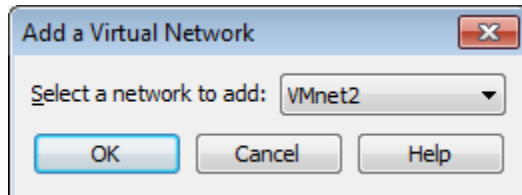
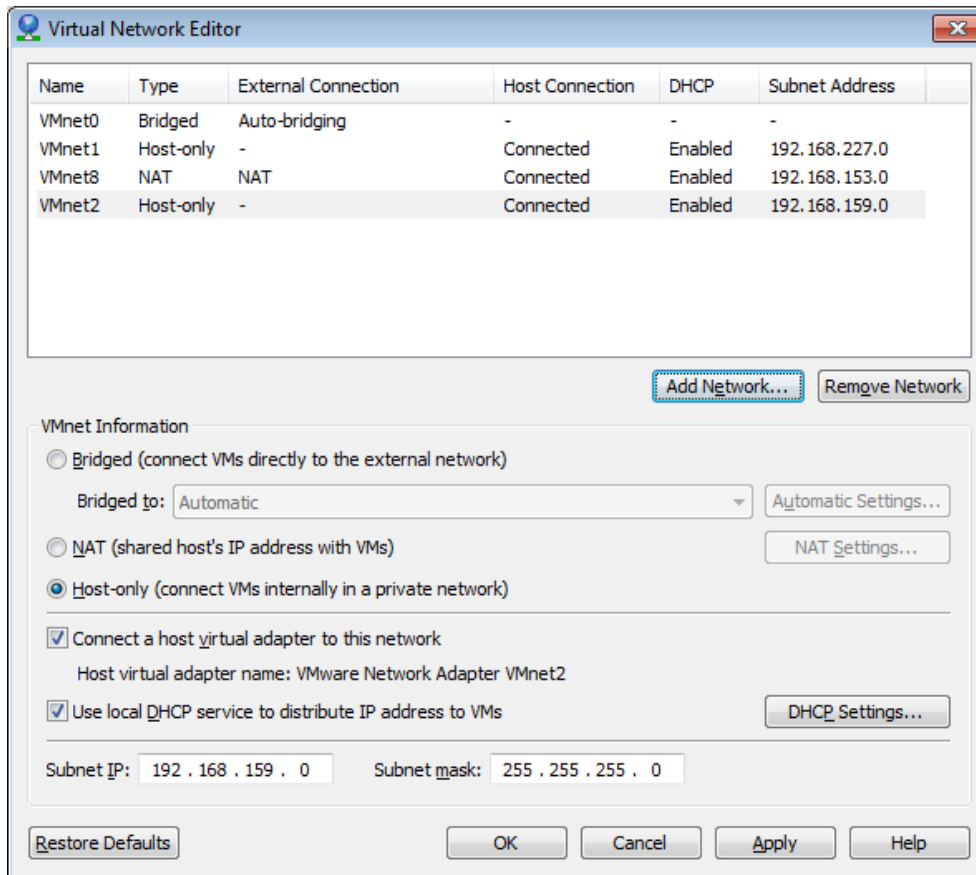1. Right-click on Edit and select the Virtual Network Editor
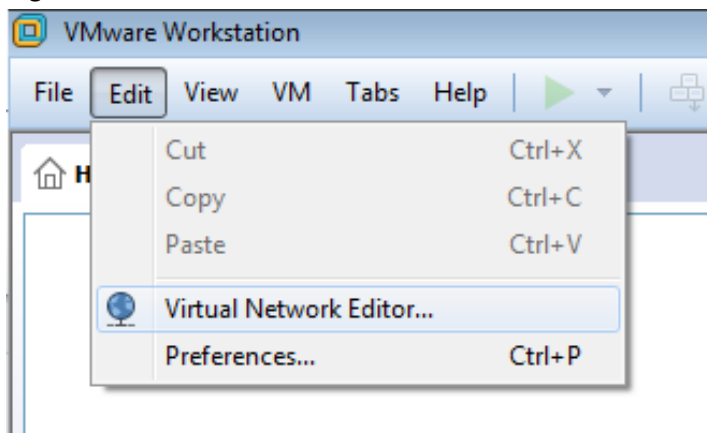
a. Choose: Add Network
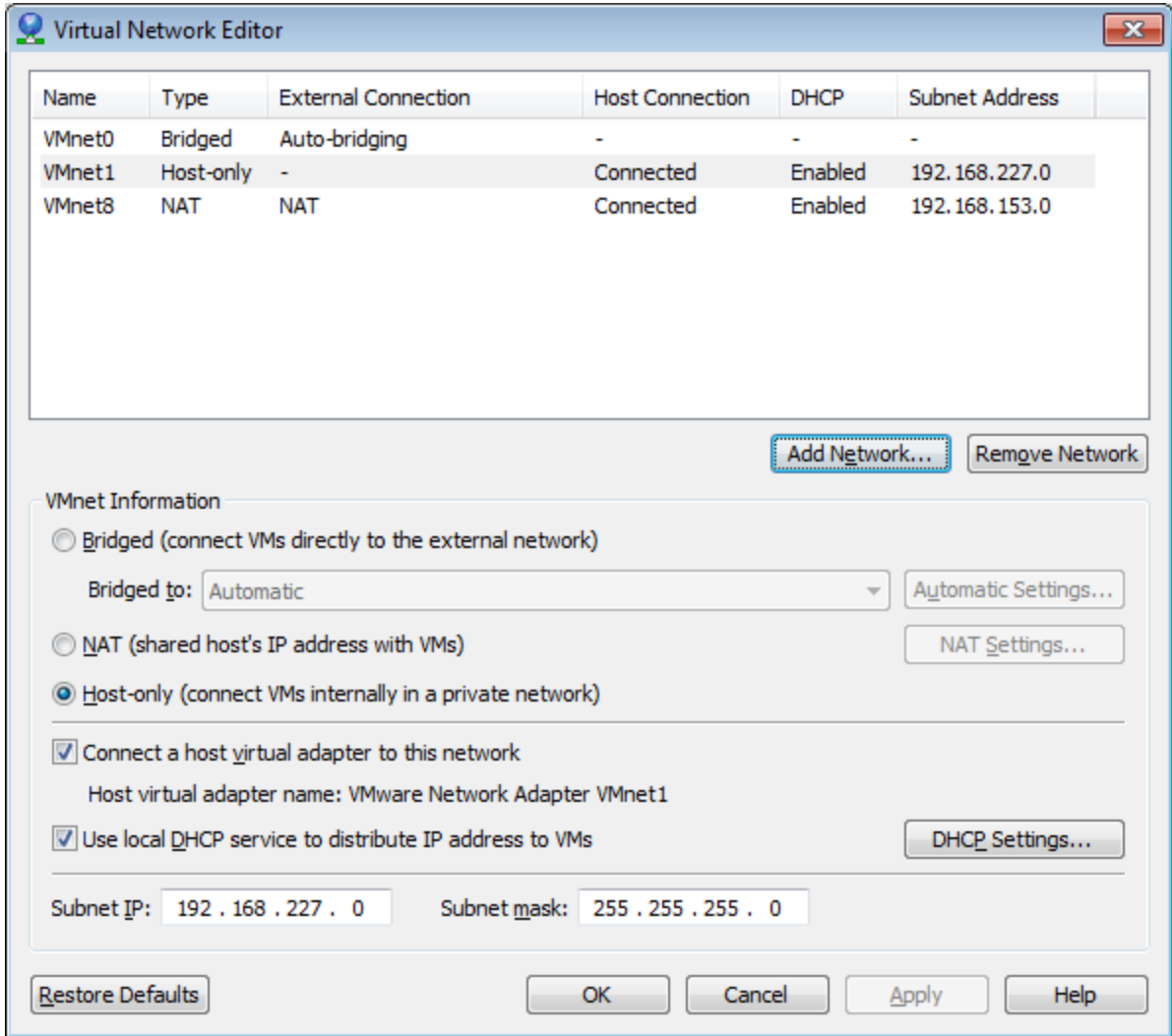
i. Use the default or select a VMnet to use

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b. This is what the completed configuration should look like

Many administrators shy-away from 192.168.X.Y networks because they feel that these are somehow "armature grade" inferior networks. Truth is that you should pick a network that is large enough to accommodate your foreseeable needs, and no larger. Also, while Classless networks are valid, they should be used with reason. Classful networks are much more elegant.

Since neither vSphere Management nor Servers would require more than 254 Host IP's, except in larger installations, the 192.168.X.Y/24 networks will work just fine.

Getting vSphere

You will want to acquire binaries from VMware:

- ESXi (the VMware version, not a vendor-customized ISO)
- The VMware vSphere Client (for Windows)
- The vCenter Server Appliance (Recommended by me) or vCenter installable for Windows
- The vCLI, the vMA and any other utilities and extensions
- vSphere Data Protection

VMware will give you access to all of these under its trial program, all you need is a valid email address. . The trial version of vSphere is Enterprise Plus Edition, so download your binaries from that category (in truth, ESXi and vCenter are the same binaries for every Edition and Kit). You can contact VMsources or any other authorized vendor to purchase VMware vSphere once your trial expires.

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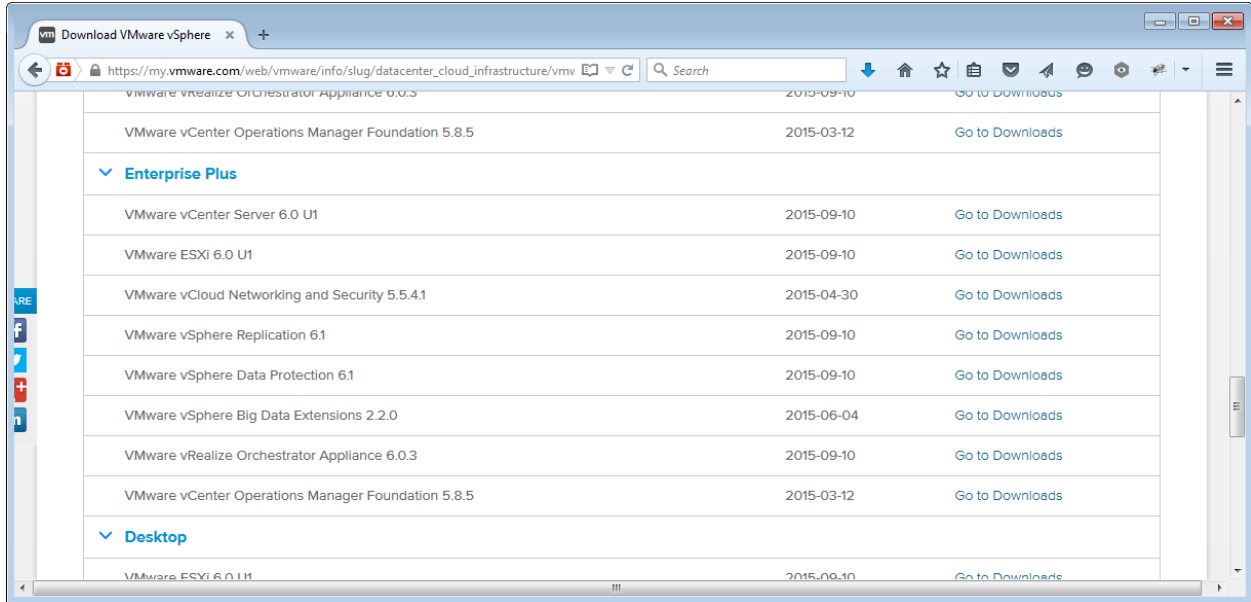
1. Go to Downloads

a. Download the VMware vCenter Server Appliance (or the Windows vCenter if you must)

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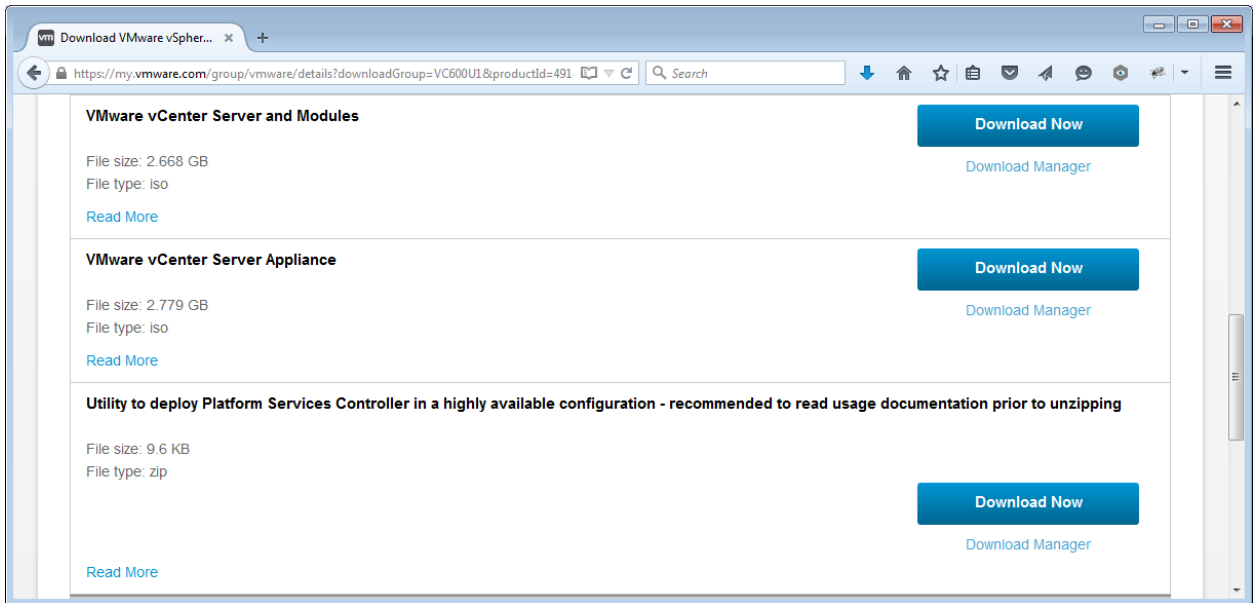
i. Read and accept the entire EULA!
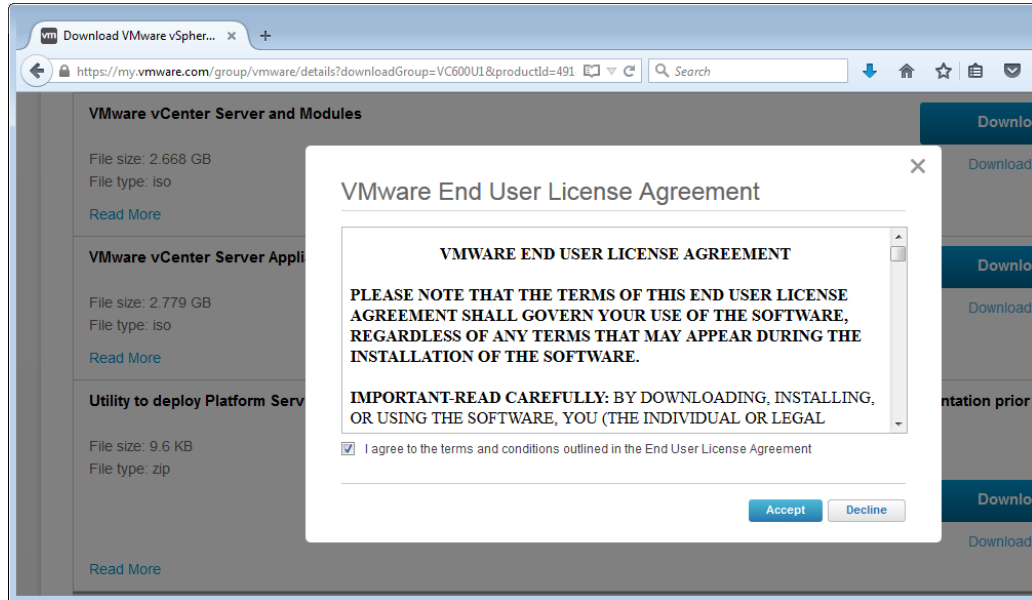
b. Download the ESXi ISO Image (Includes VMware Tools)

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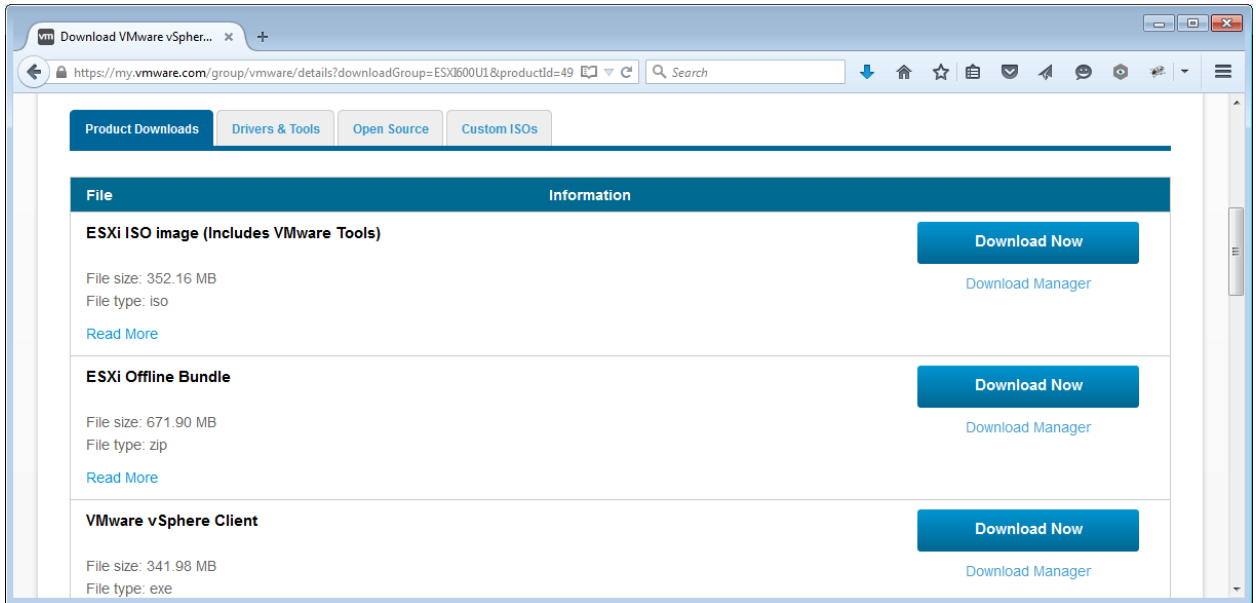
    i.   Read and accept the entire EULA!
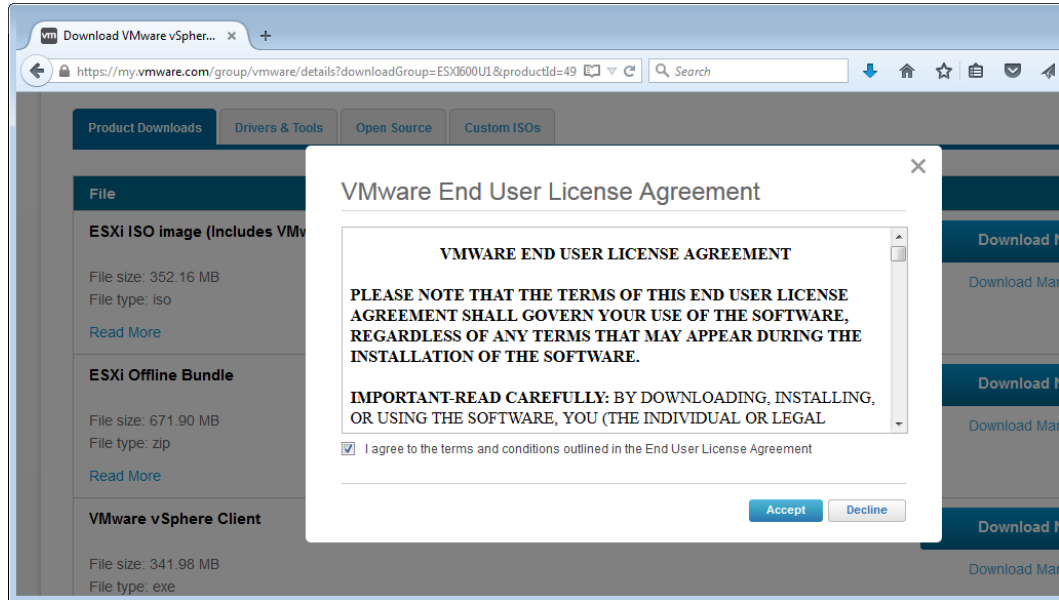
c.   Now go to Drivers and Tools
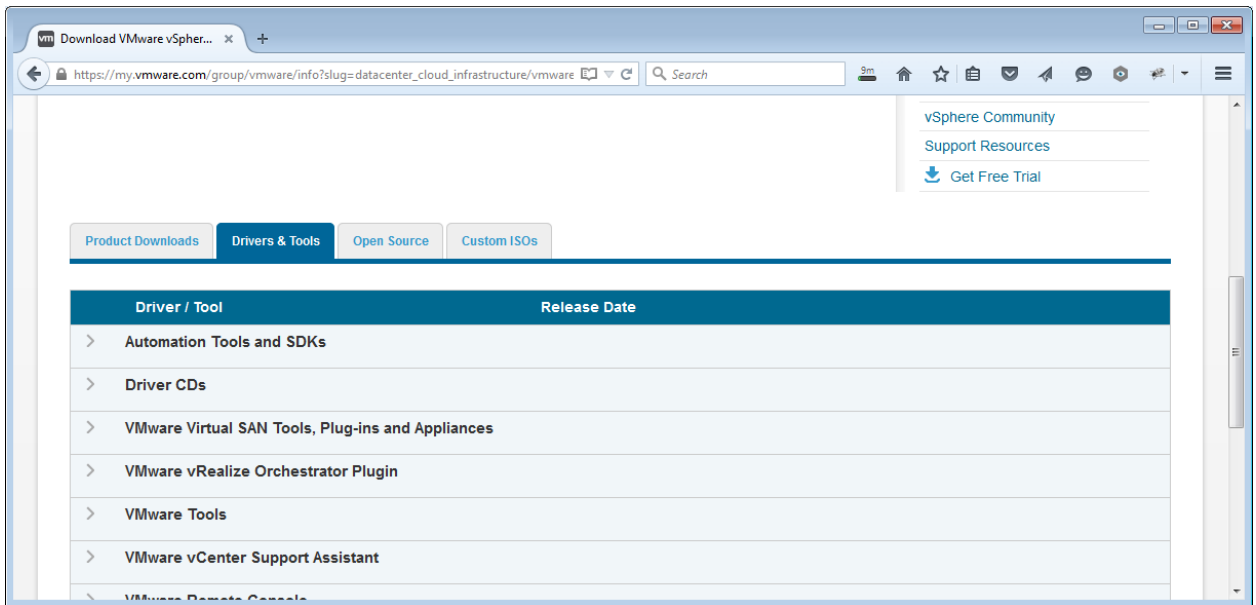
i. Locate and download the binaries you want.
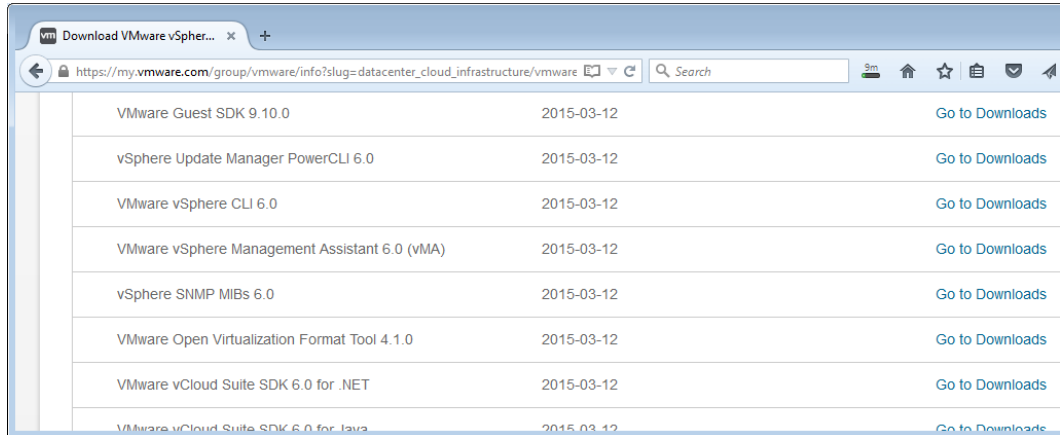
ii. I recommend the vCLI
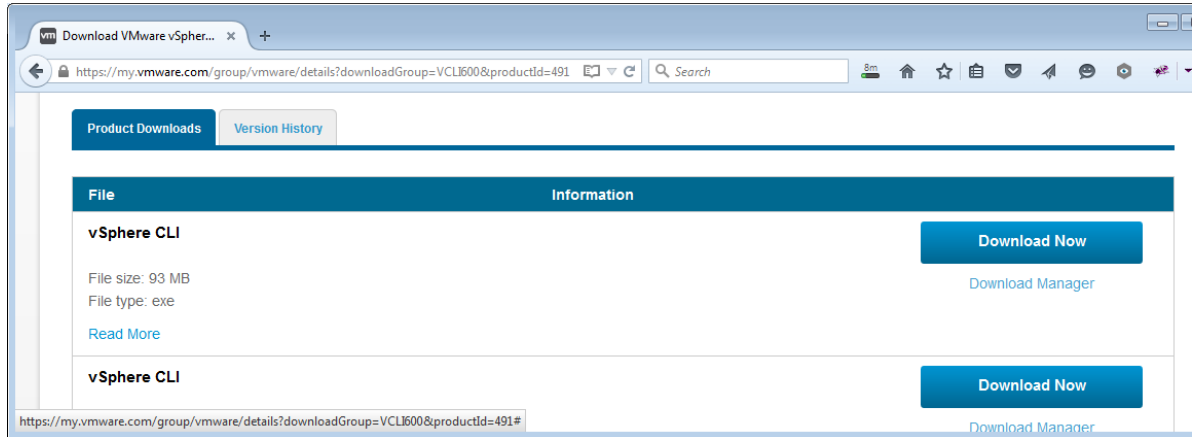
iii. I recommend the vSphere Management Assistant

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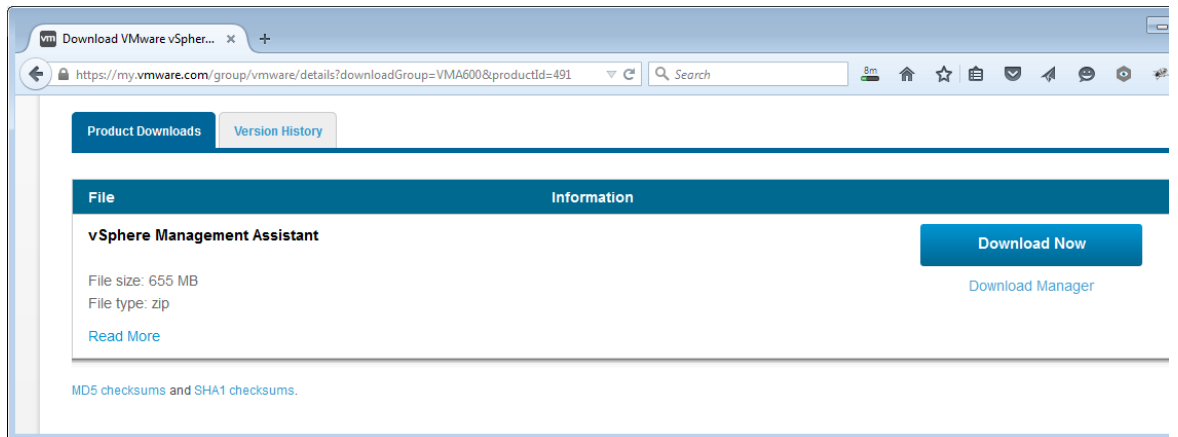
Installing ESXi as a VM (Virtual Machine)

1. In Workstation, go to File > New Virtual Machine
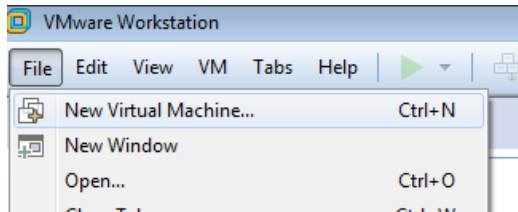
   a. Use a Custom install

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b. Accept defaults
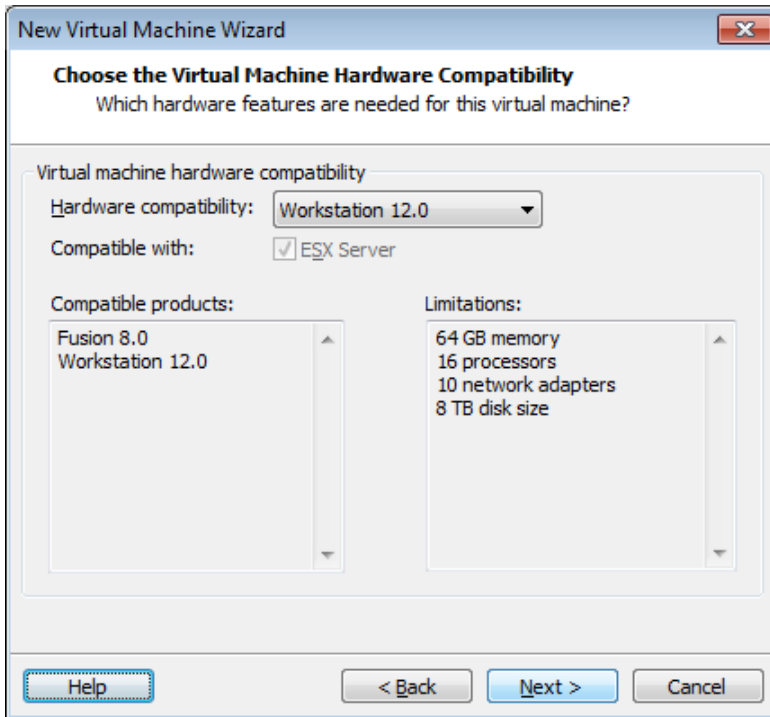
c. Browse
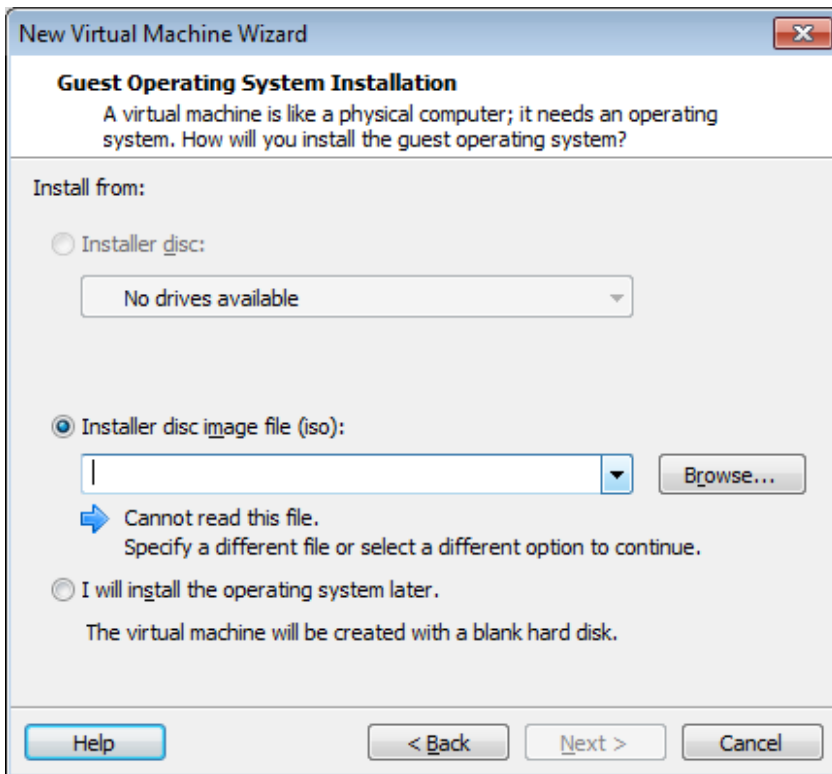
    i.   Locate the ESXi ISO you downloaded earlier
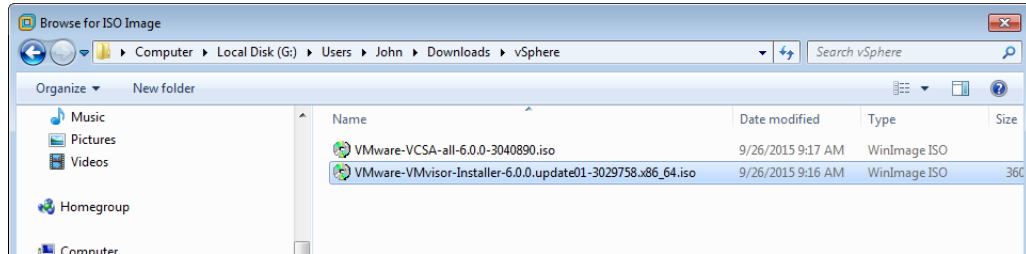
    d.   Next
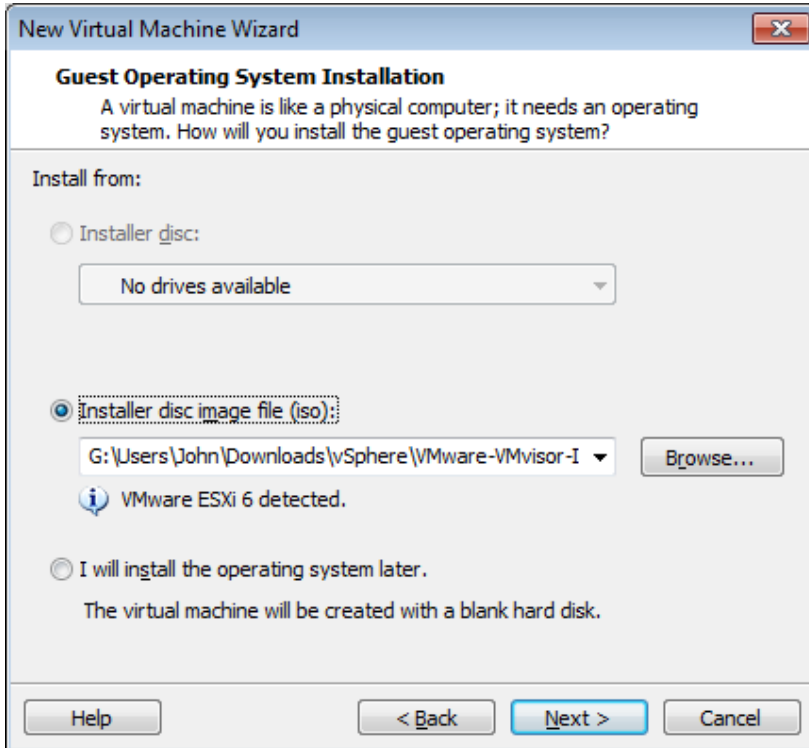
e. Name the VM in an extensible format and place the Virtual Machine files in a suitable location on your computer. Remember these are the Local Disks, or DAS where your ESXi installation will be going. Although technically a viable VMFS Volume, this is not the storage location you will want to place your Virtual Machines if you want to configure vMotion and/or HA.
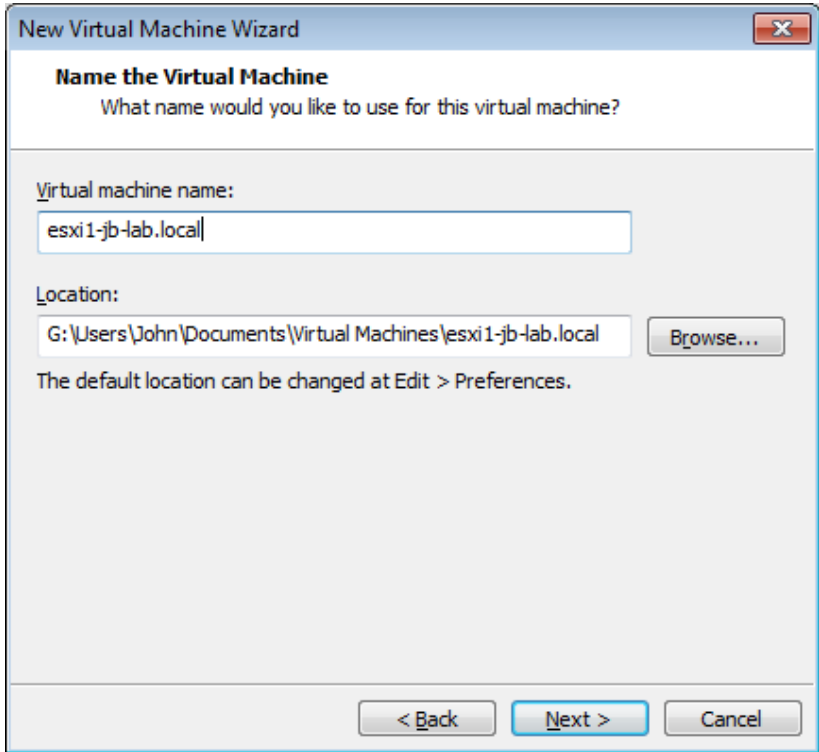
f. Choose reasonable numbers here that your hardware supports.
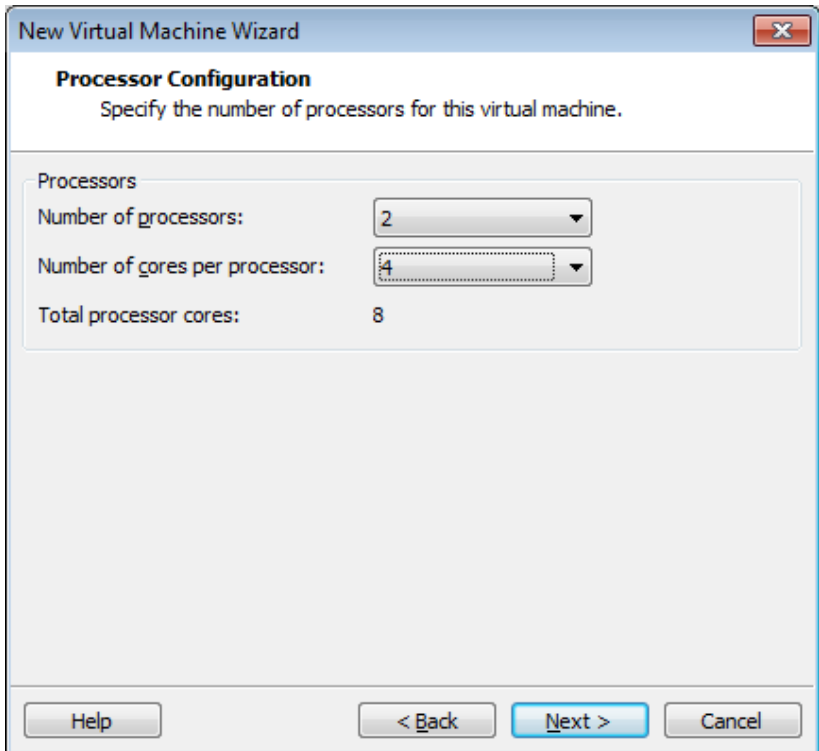
g. I am going to build a 'typical' cluster of 3 ESXi Hosts, so 8 GB is reasonable for a system with 32 GB RAM available.
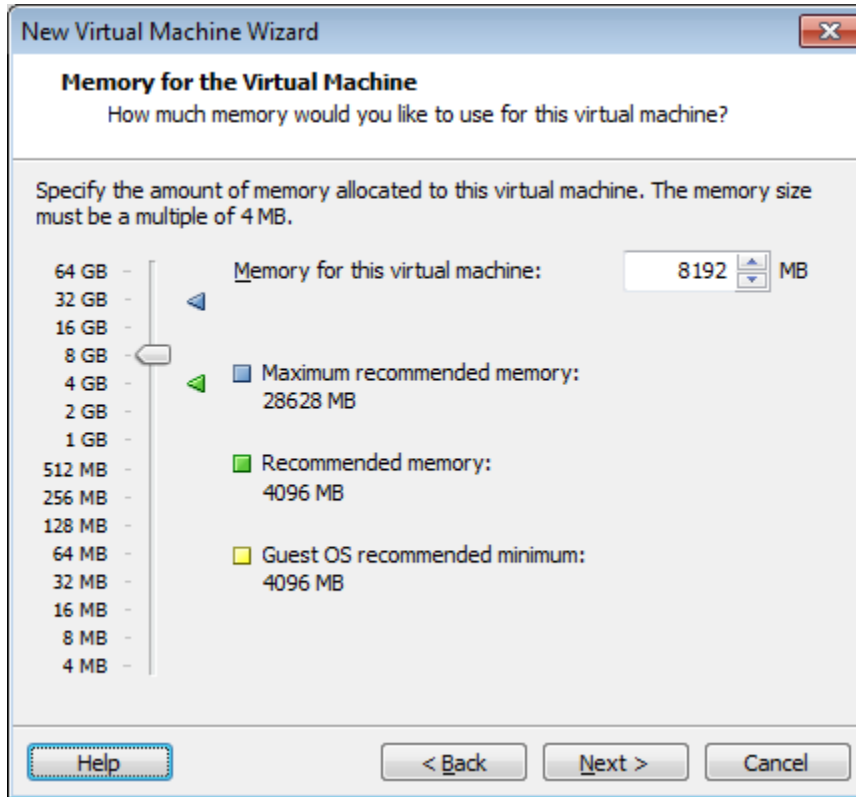
i. Would I be better off with 2 ESXi Hosts that each had 16 GB RAM? Maybe, but I harp so often about 3 hosts being the minimum realistic Cluster size in production, and the basic unit for all vSphere Kits is also 3 Hosts, I couldn't bring myself to build a 2-host cluster!

h. Use NAT for the Management Network. One of the weaknesses of Workstation is not allowing the configuration of multiple network adapters at the time of virtual Machine creation.
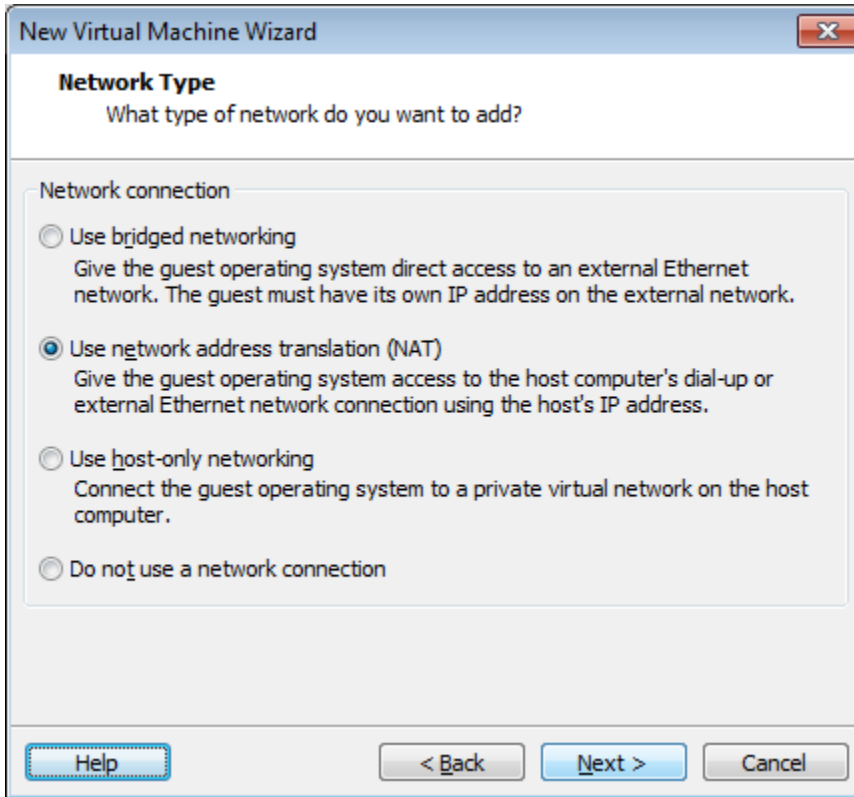
i. Use Defaults

j. Use Defaults

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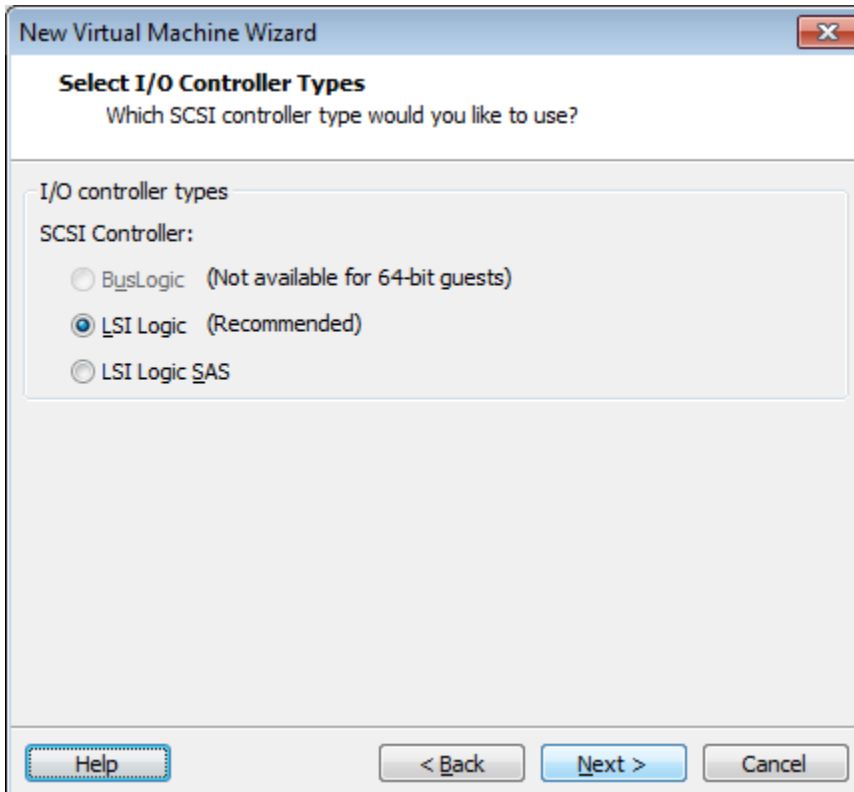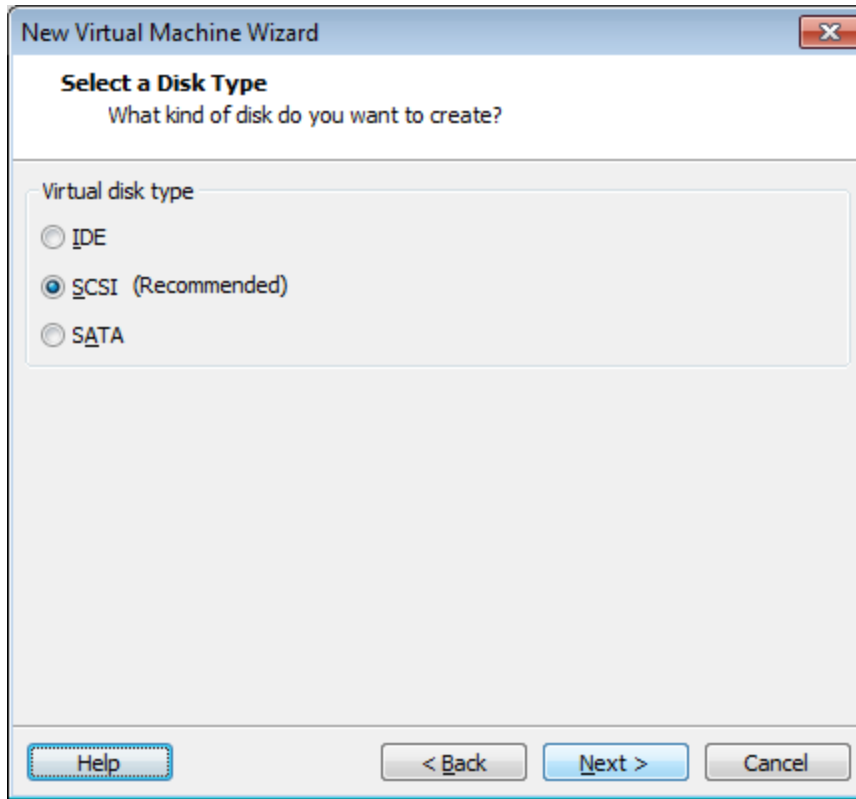
k. 40 GB is really generous for an ESXi installation. When physically installed on a server, ESXi *can* go on flash media as small as 2 GB, but it is recommended to install on at least 16 GB flash media so blocks may be marked unusable as they wear out. In a Virtual install, either treat it as a flash-media installation and redirect the logs to a different location, or go with defaults.

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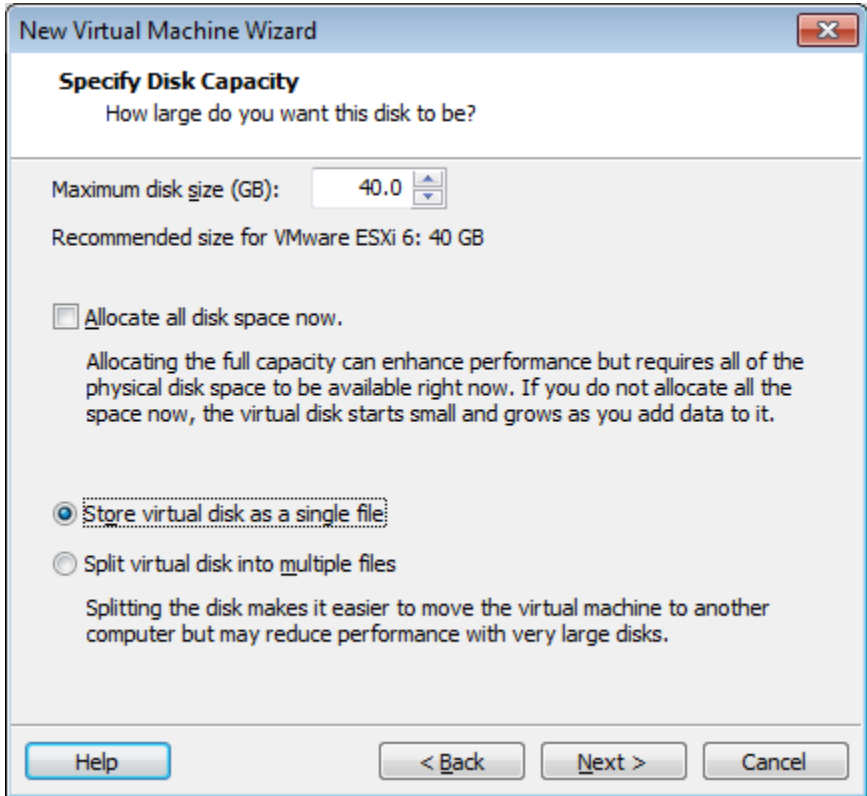
l. Use Defaults
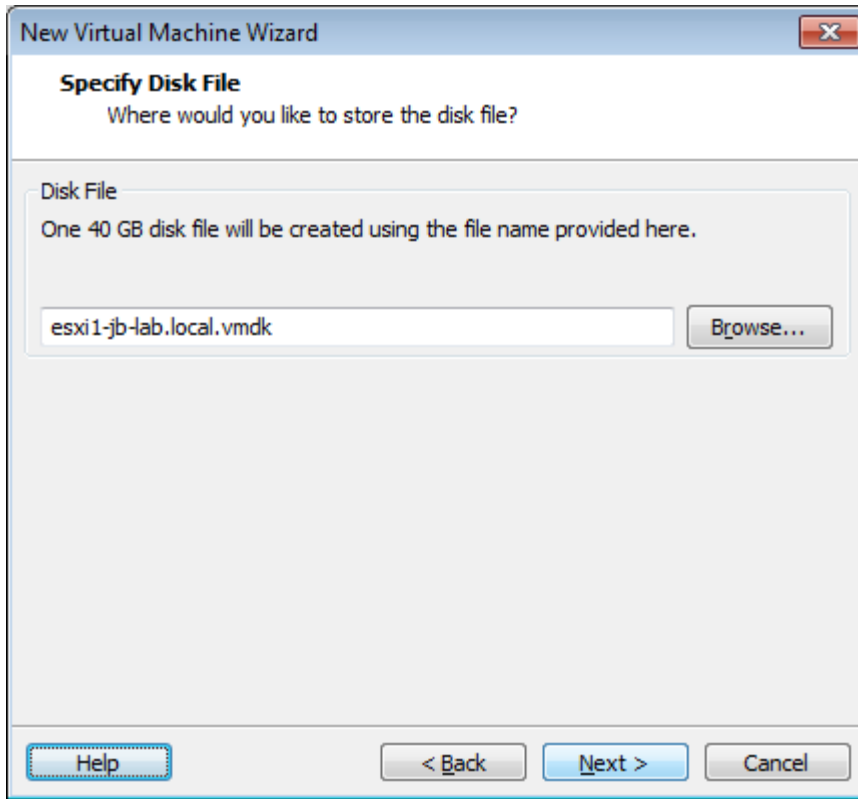
m. Finish
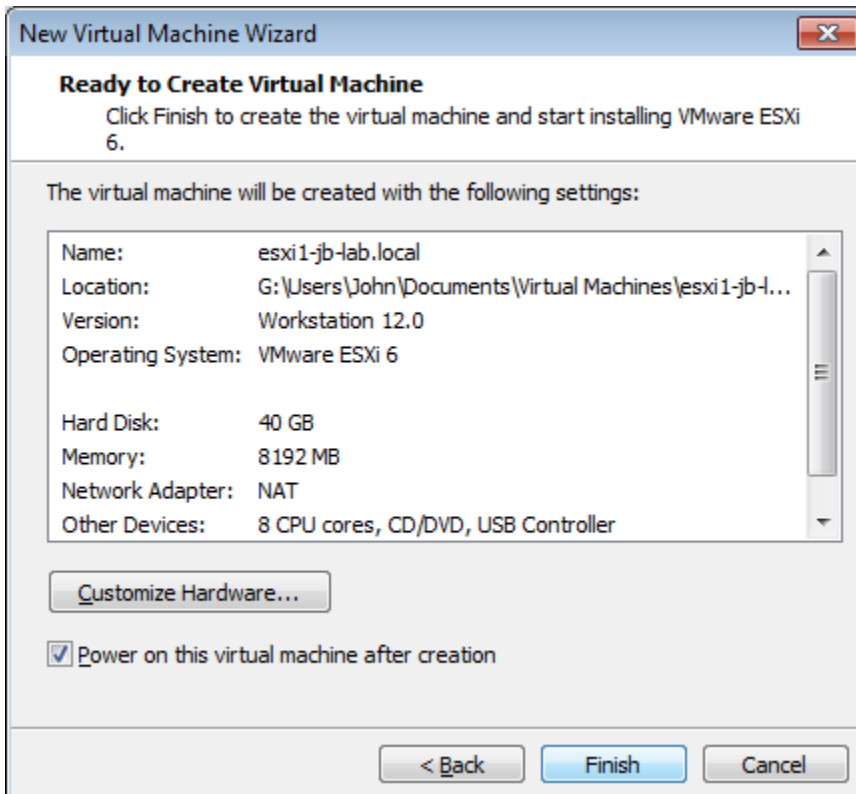
2. This is the Standard Installer

   a. The files will load to RAM
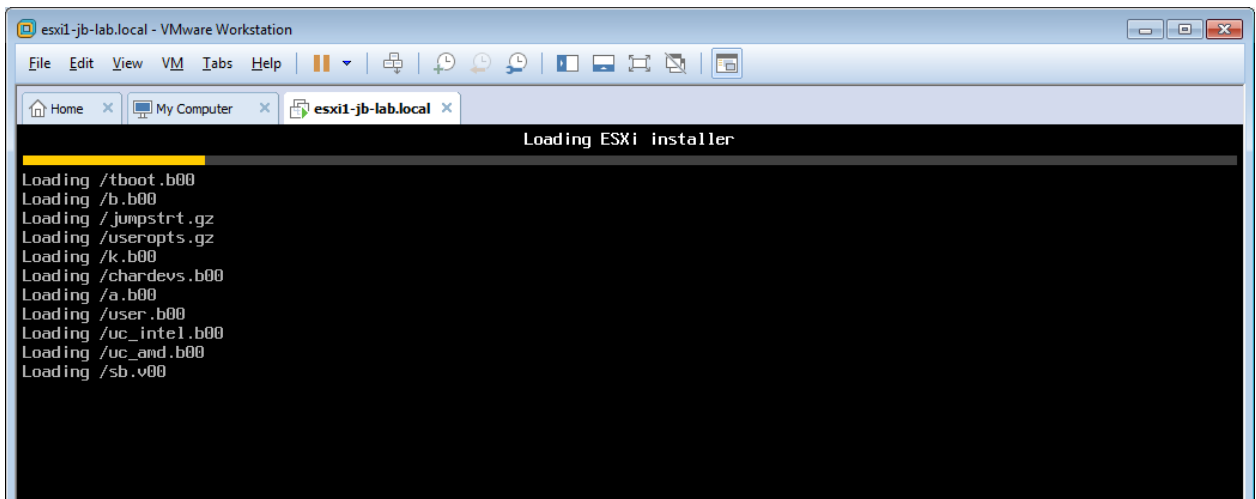
b. Enter
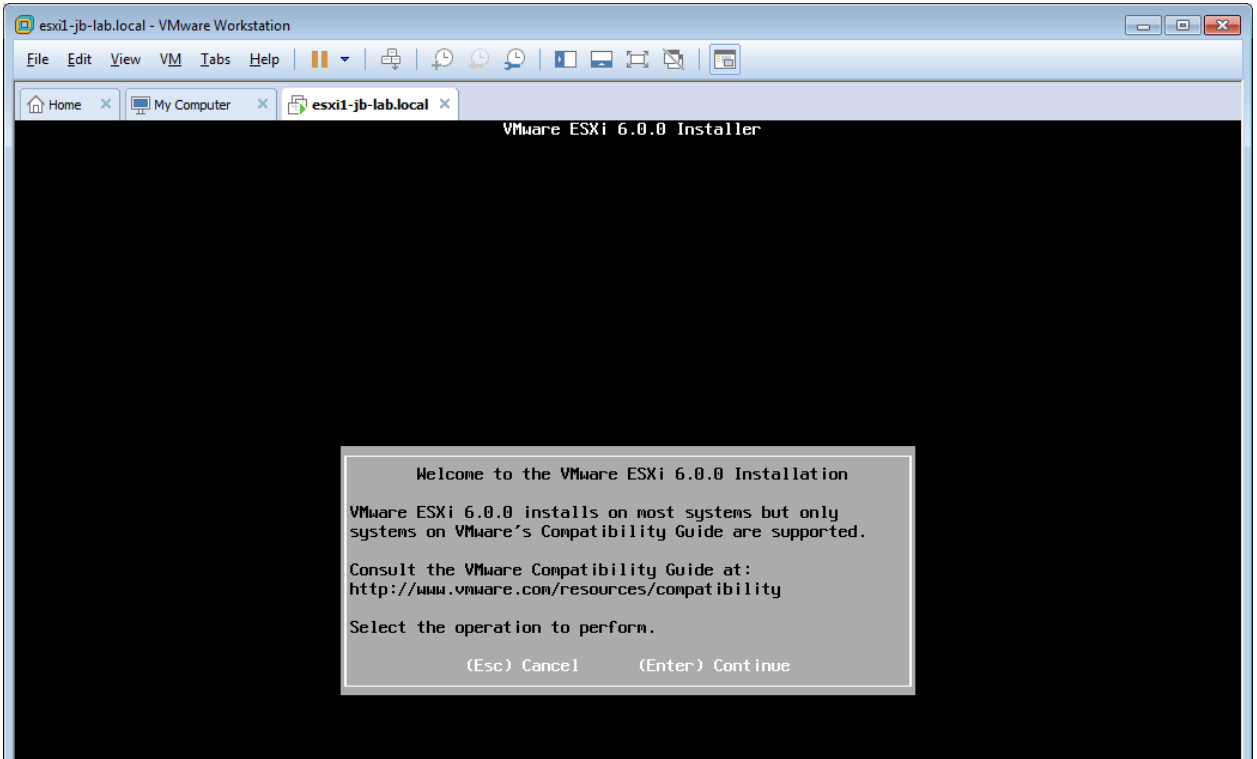
c. Use arrows to scroll
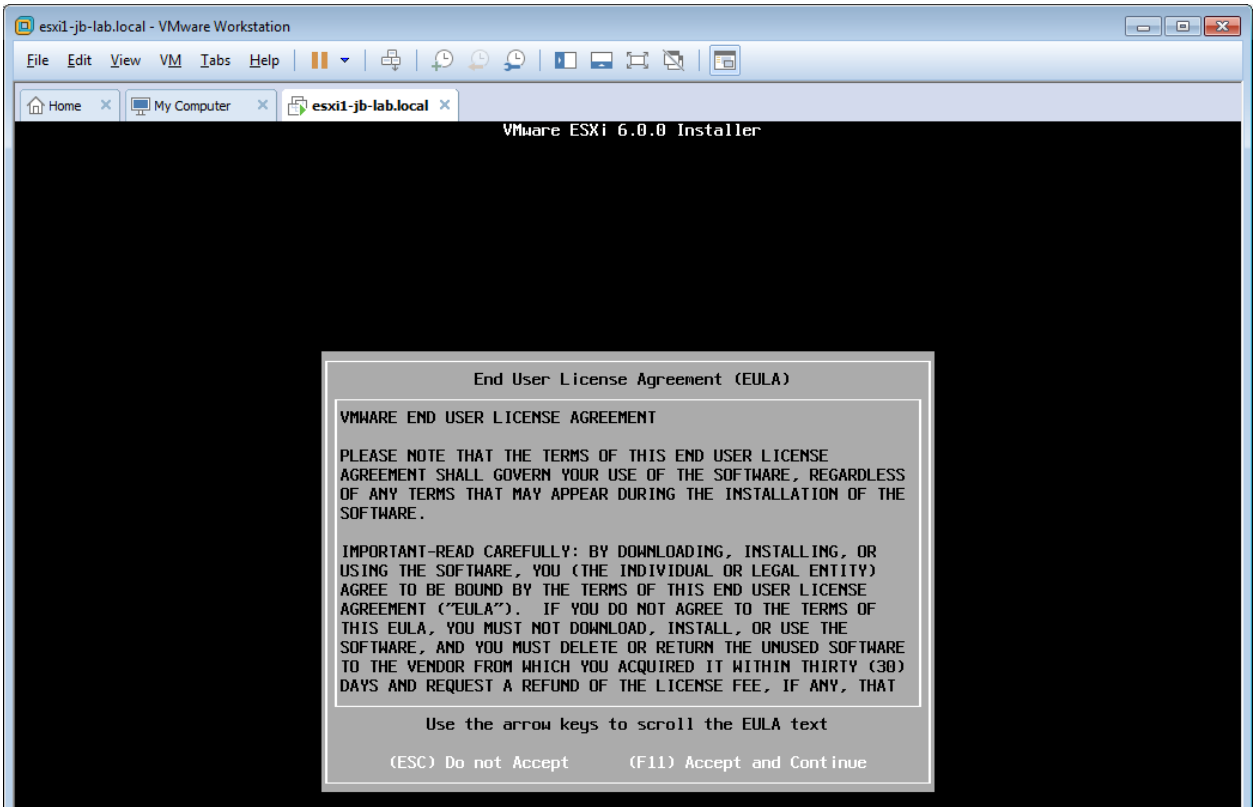
d. Once you have read the entire EULA, press [F11]
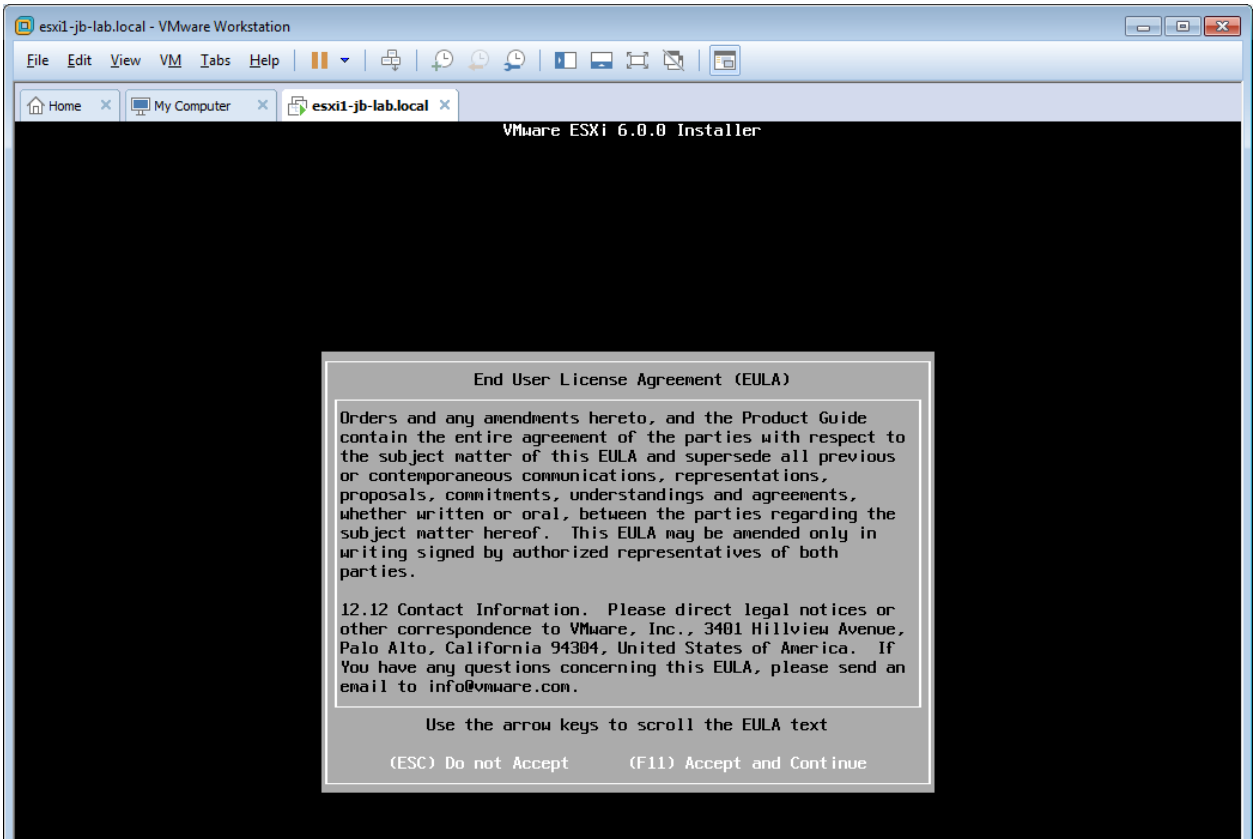
e. Enter
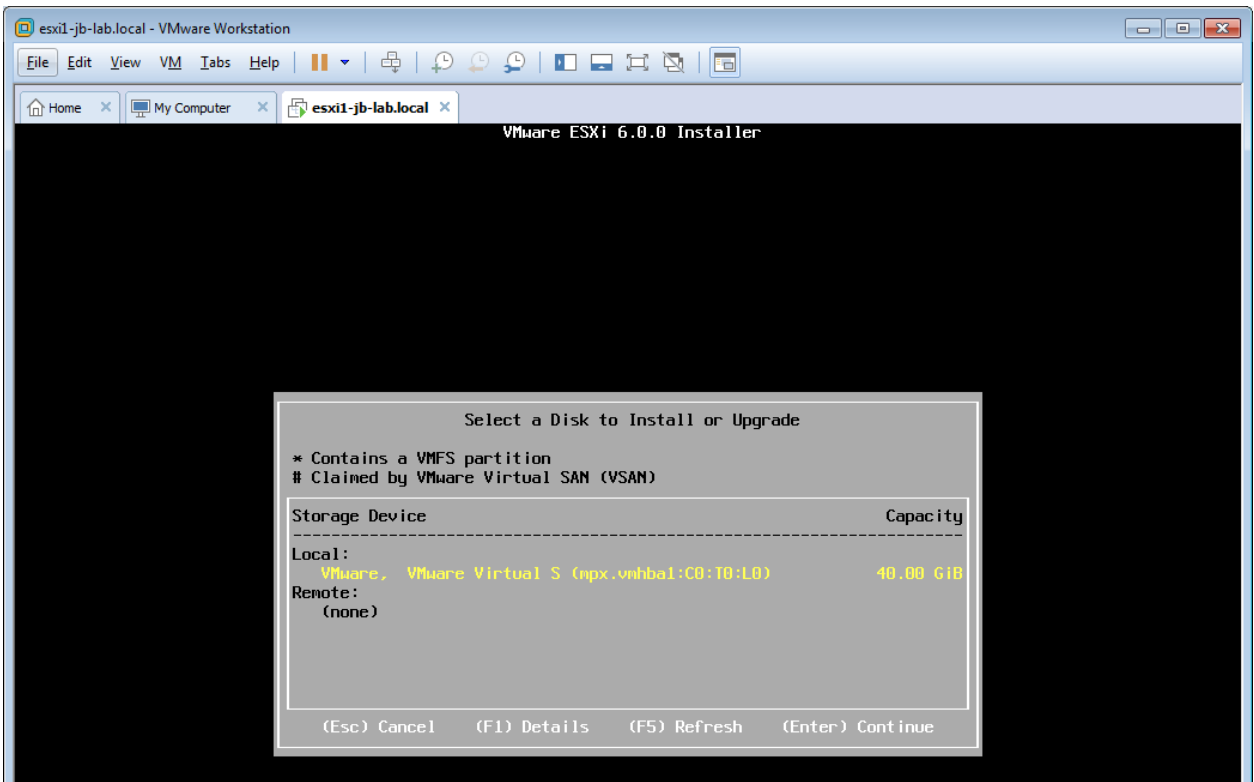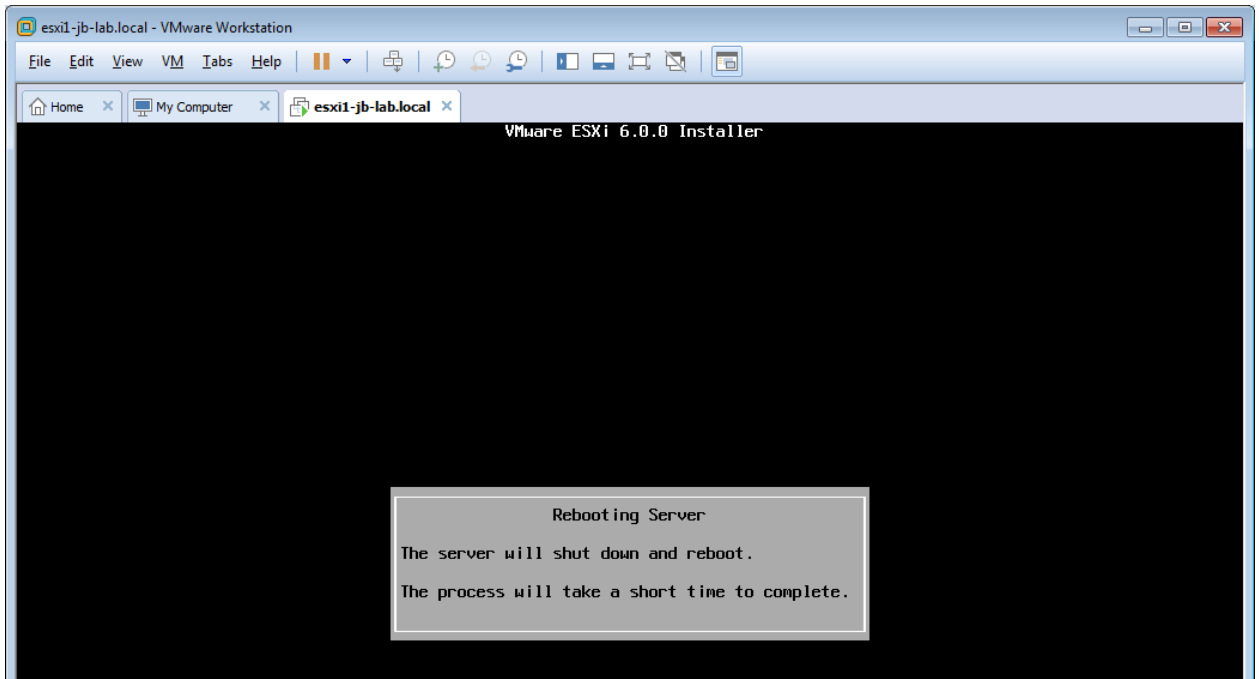
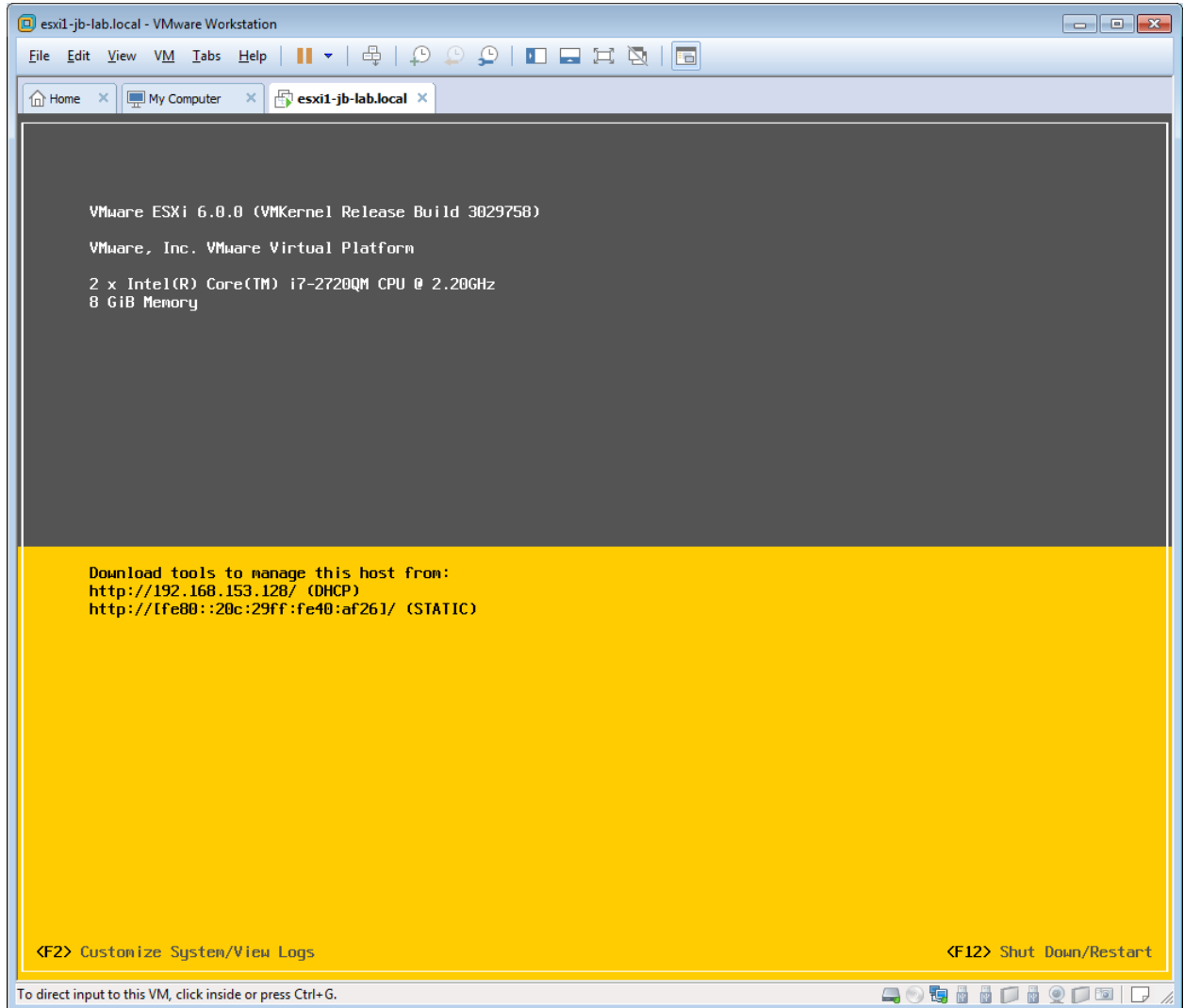f. US Default (or your choice)
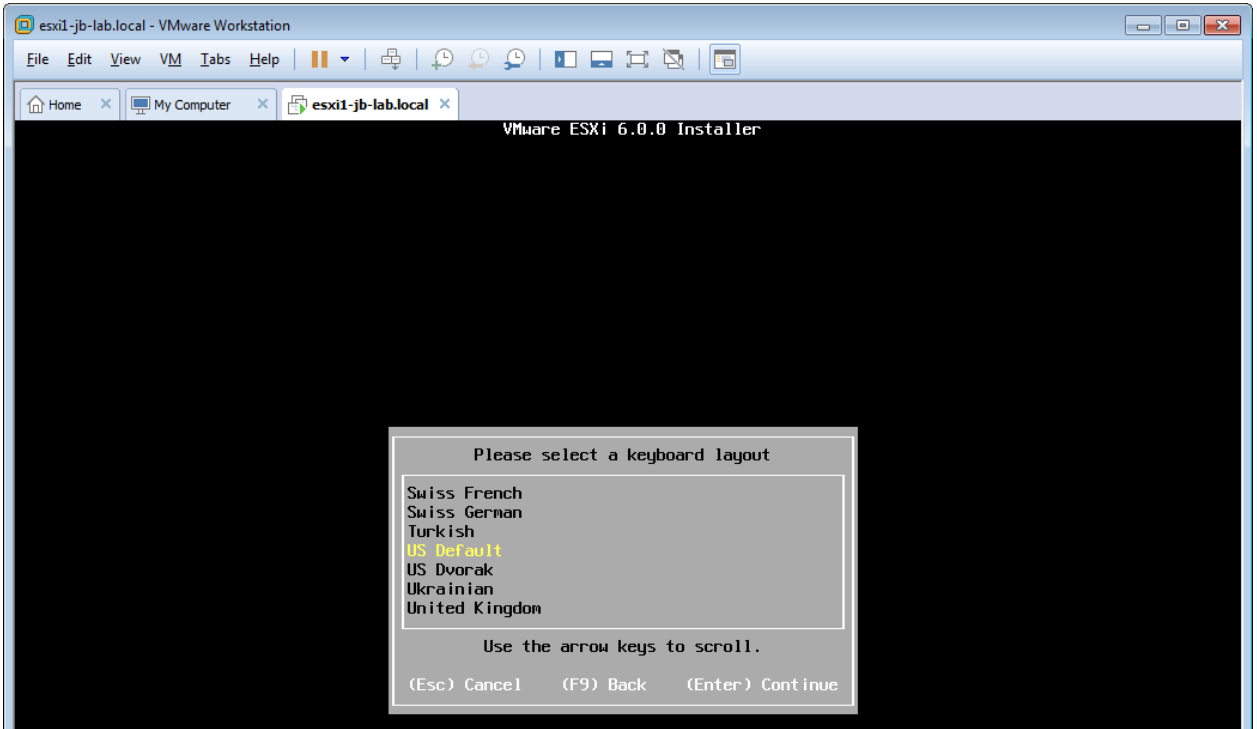
g. A suitable Password
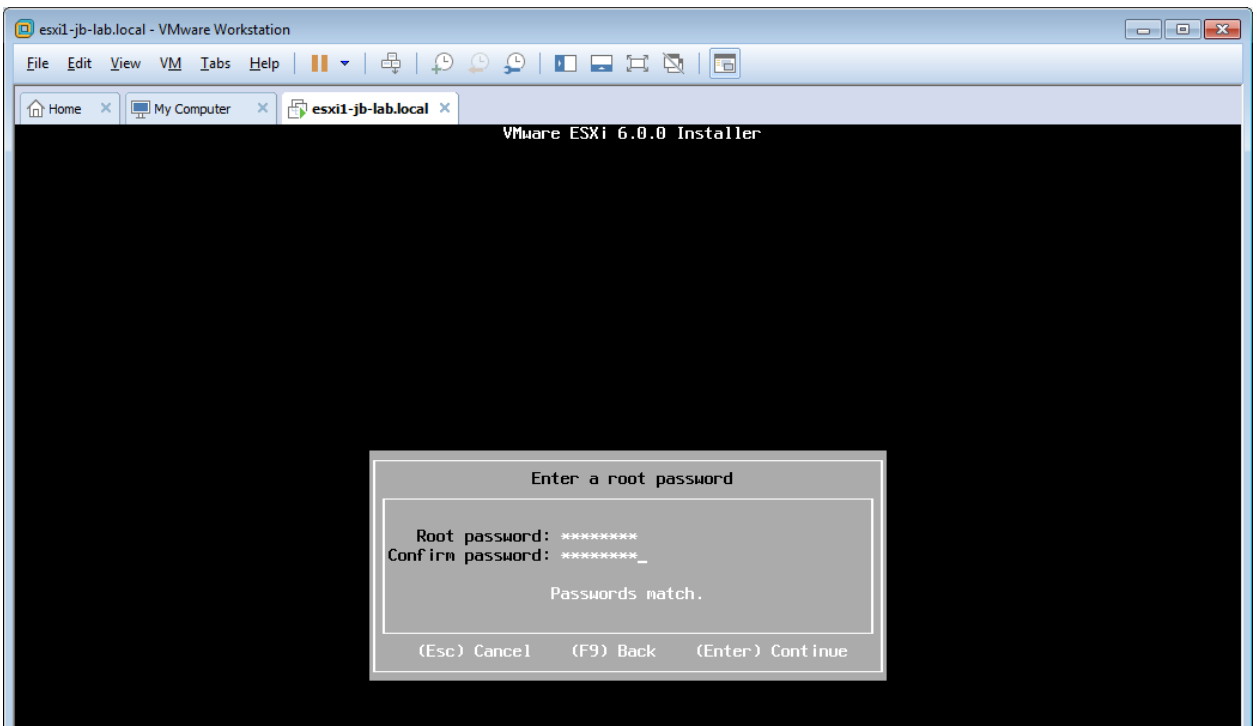
h. [F11]
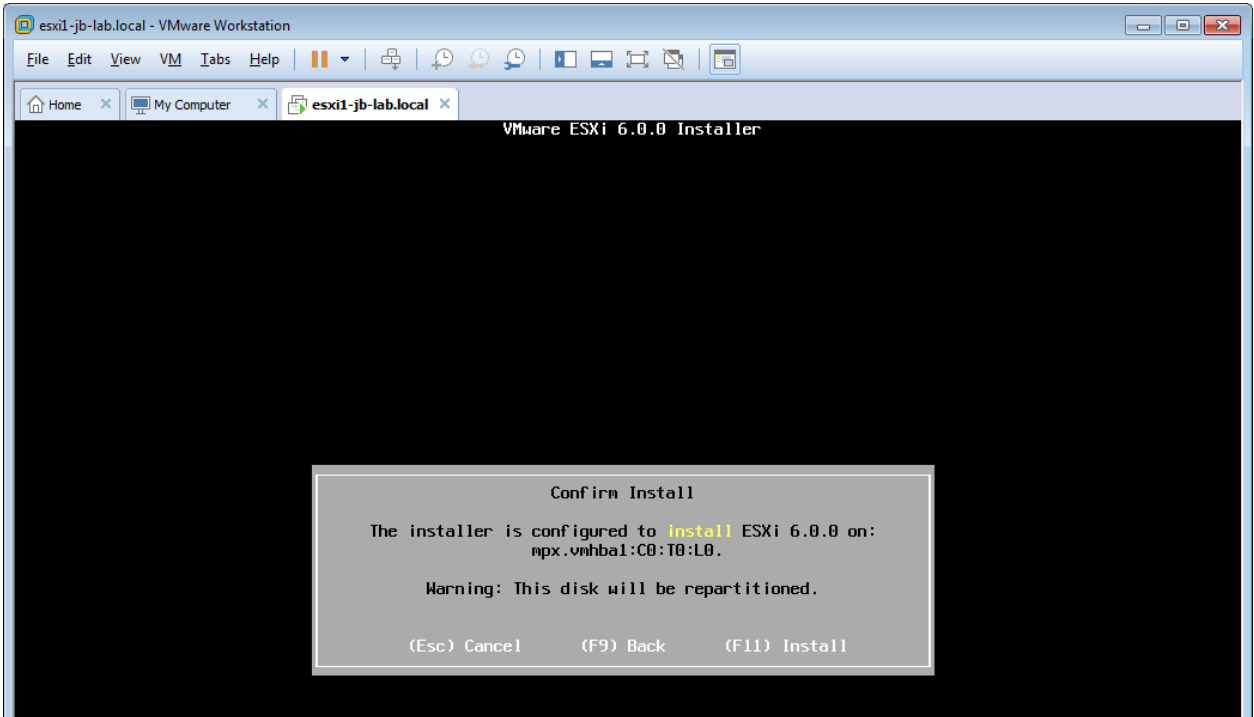
i. Wait 5-10 Minutes and press [Enter]. You can also click "I finished Installing" at this point.

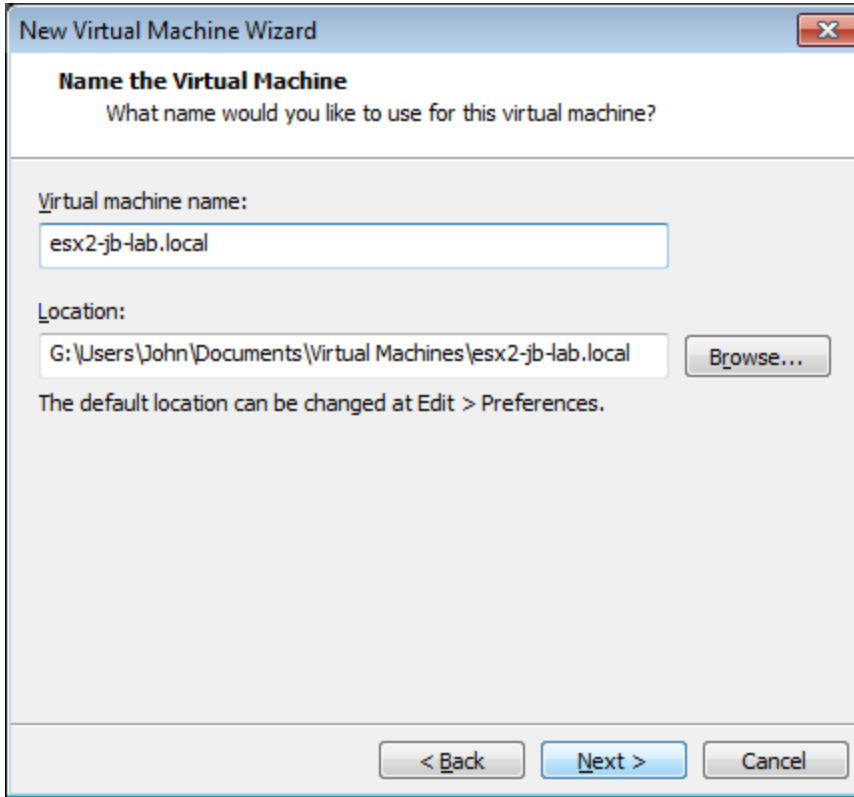 www.johnborhek.com

j.

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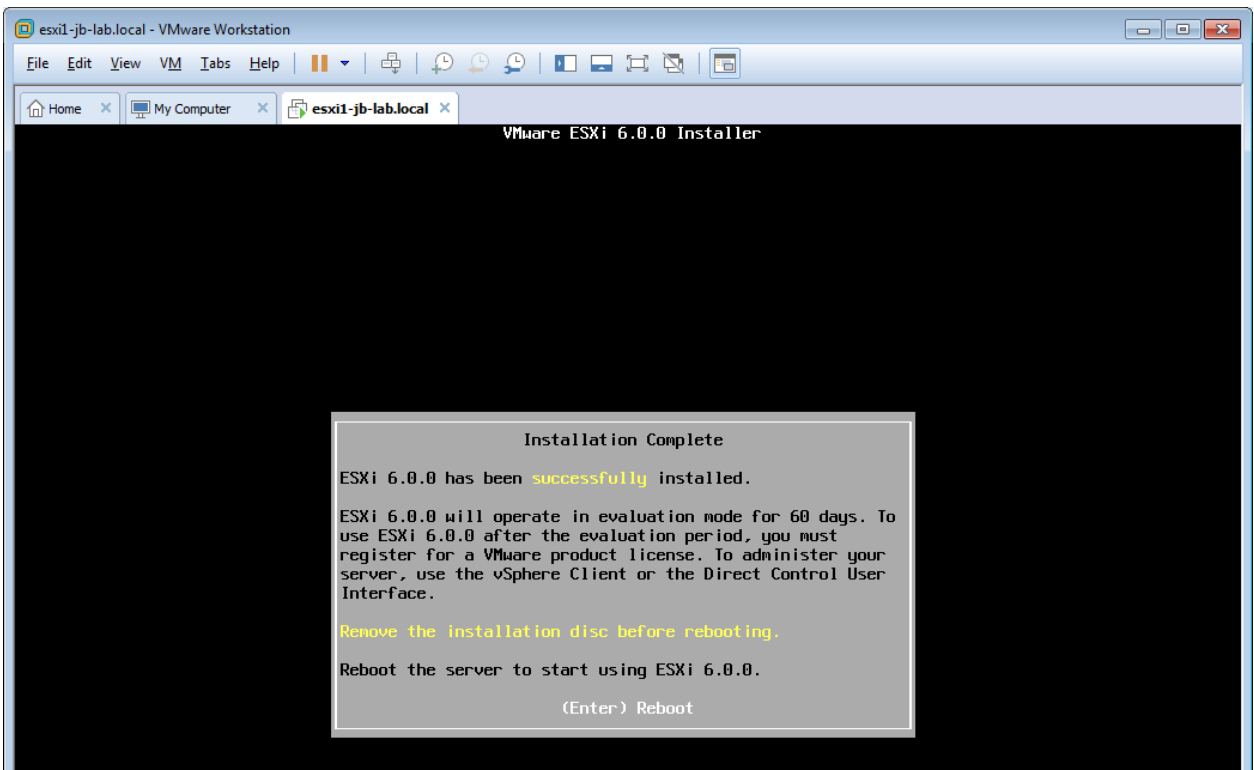
k. This is what the ESXI Console should look like after reboot.

3. Now I am going to install 2 more just like it, with all settings the same, except the Virtual Machine name
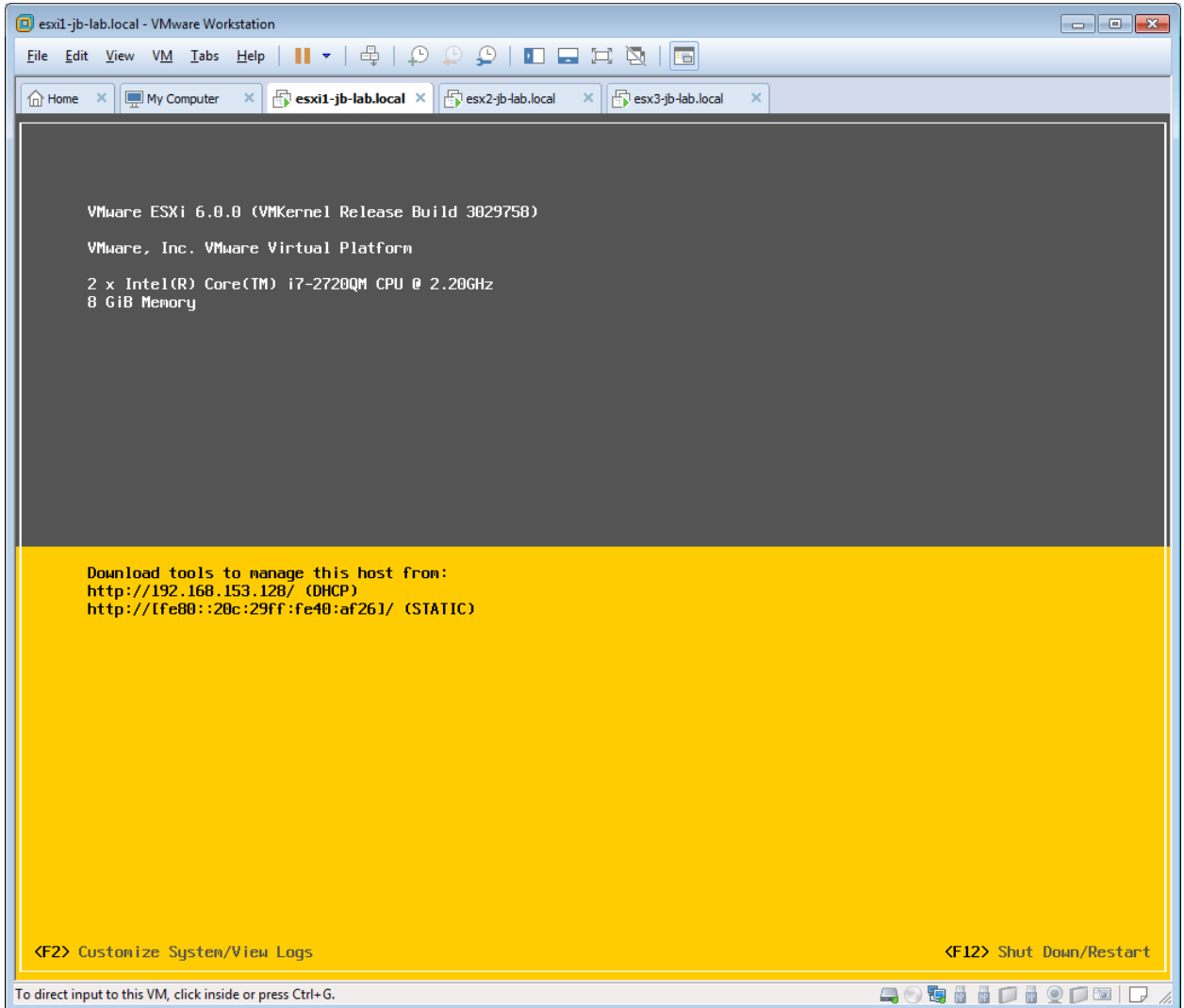
a. This one will be: esxi2-jb-lab.local
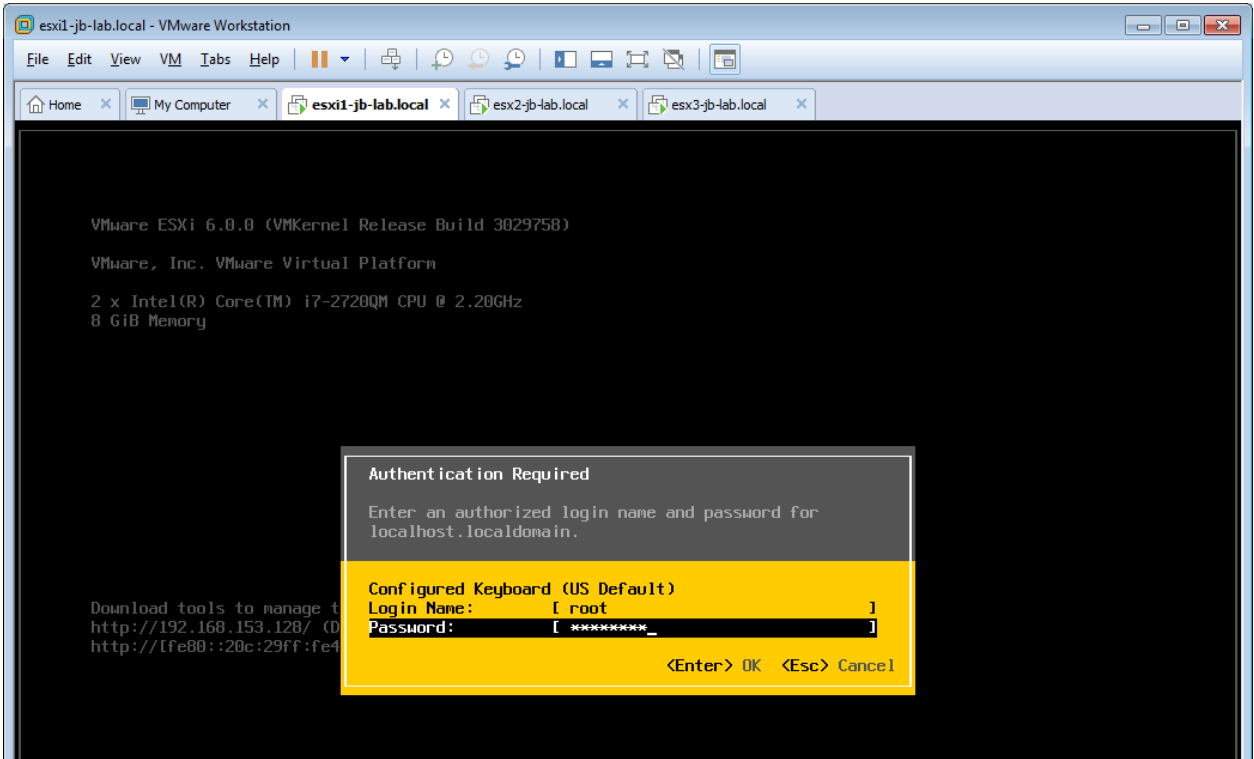

b. This one will be esxi3-jb.lab.local
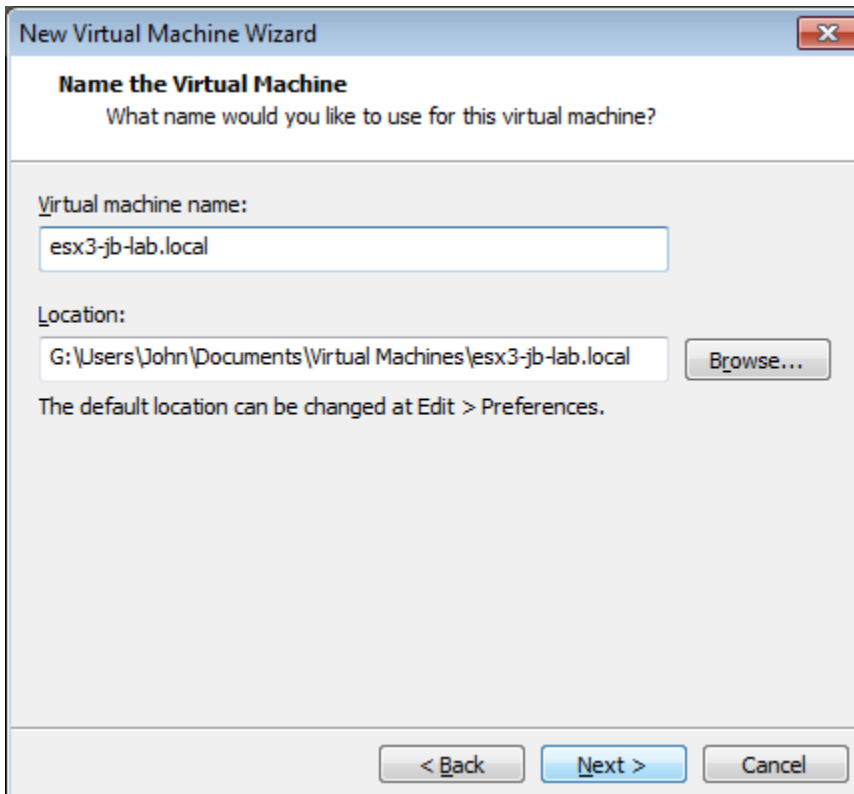
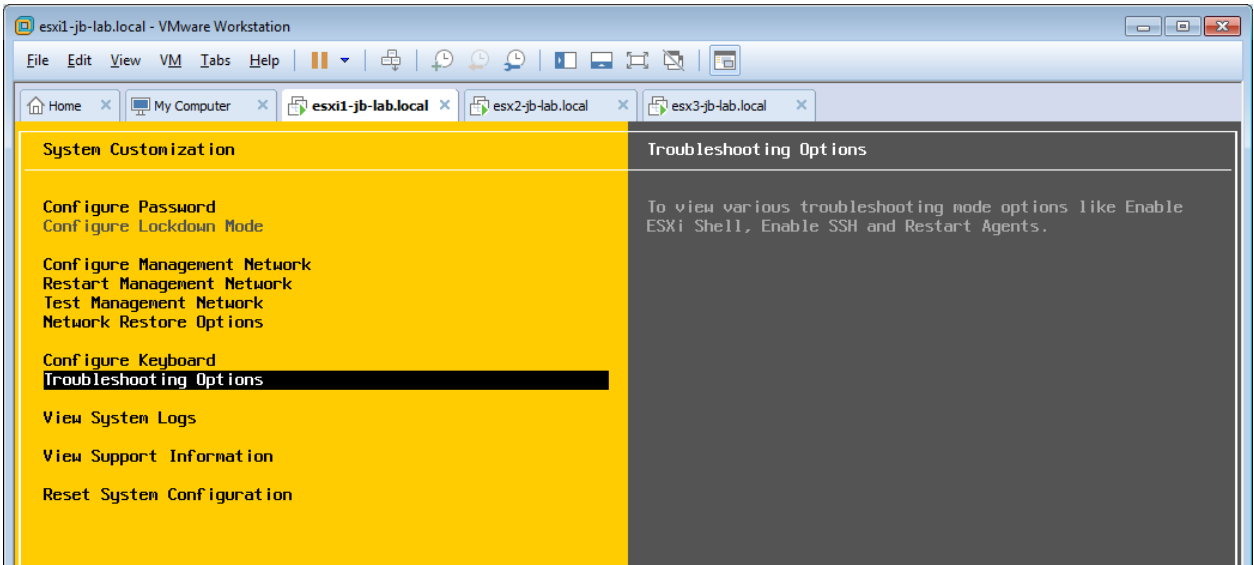4. Now we need to log-on to the DCUI of all 3 ESXi VMs and set the IP and hostname, among other settings.
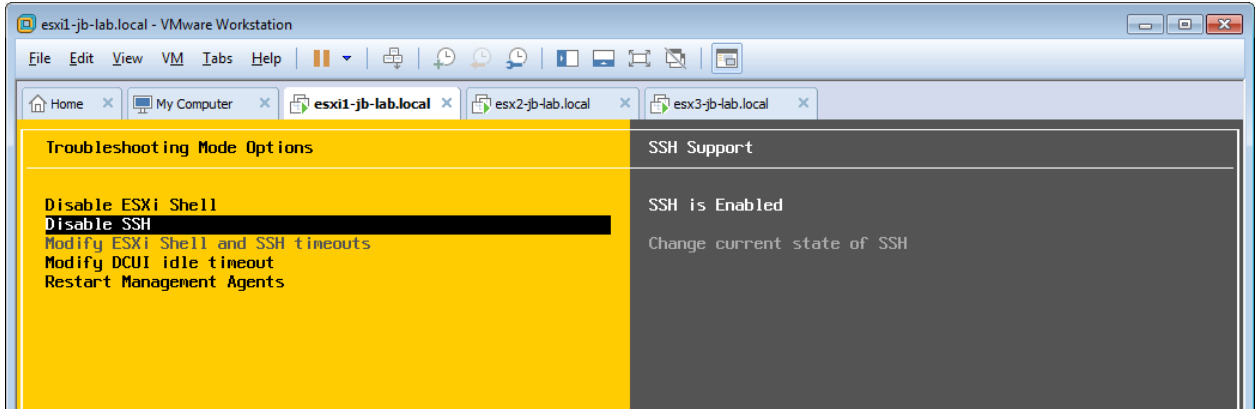
a. Press [F2]

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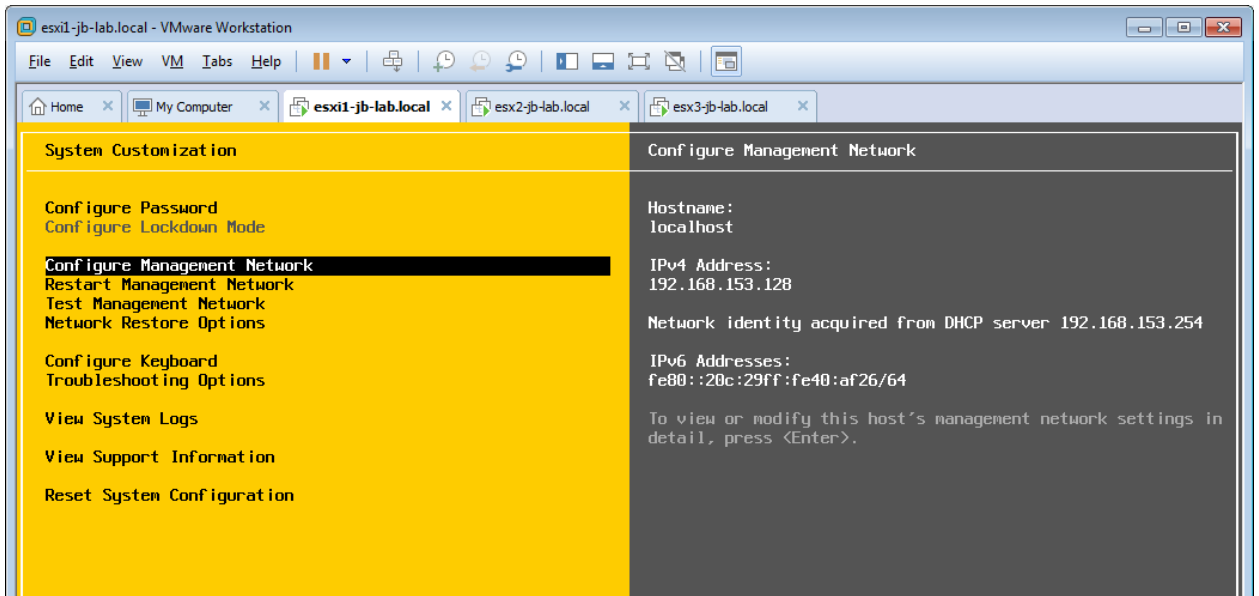b. Enter your password

c. First, select Troubleshooting options (this will save you an extra log-in after reboot!)
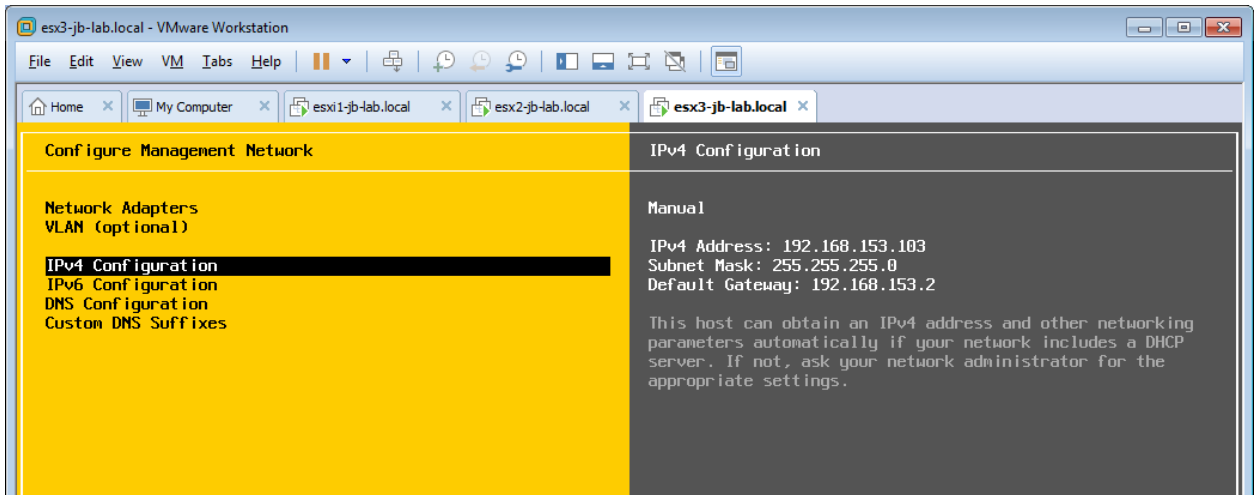

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d. Press [Enter] to enable both the ESXi Shell and SSH. You should know my feelings about SSH, and we are going to treat our Management Network as secure, so let's do it!
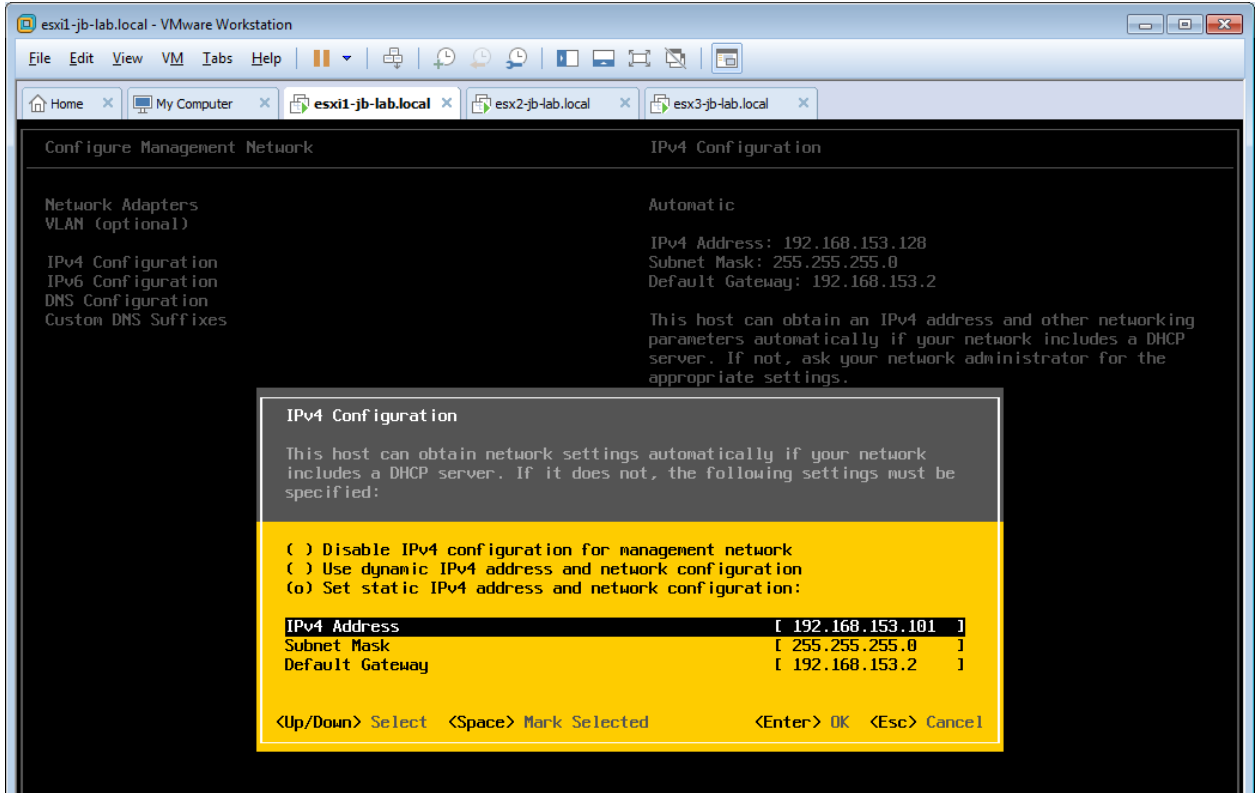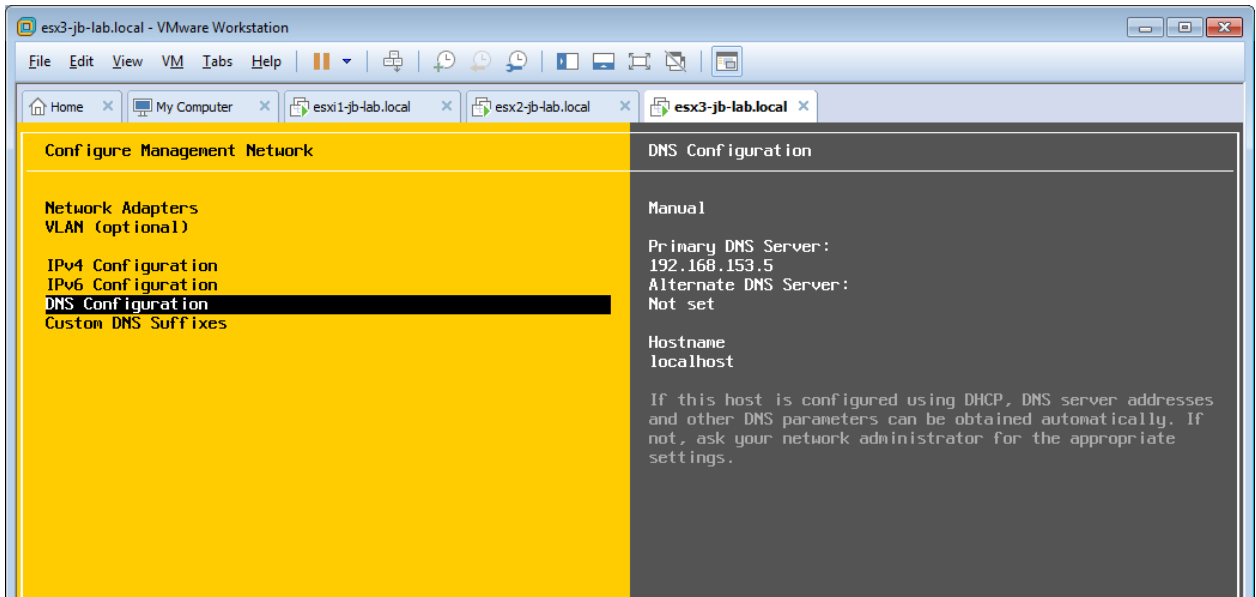

e. Now select the Management network and press [Enter]
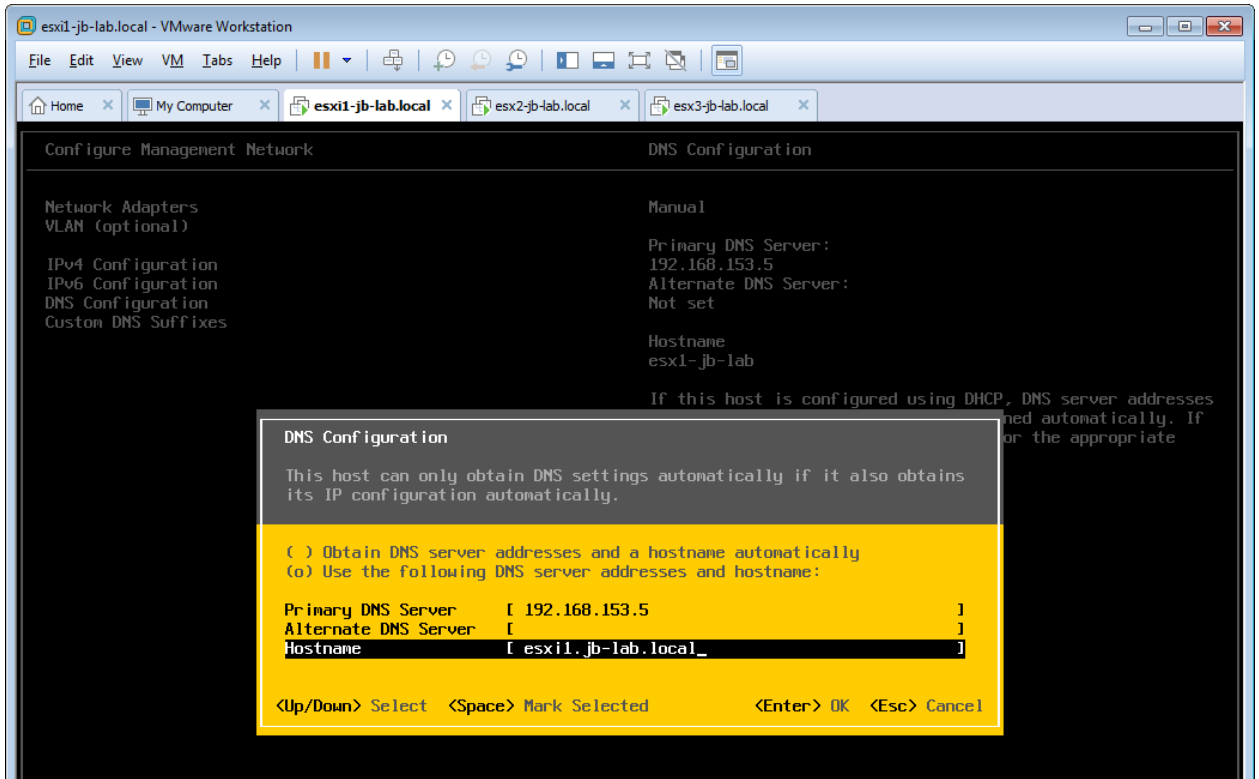

f. Select the IPv4 Configuration and press [Enter]

g. Choose an IP address that will fall within an extensible Management network and is not within the DHCP range. Press [Enter]
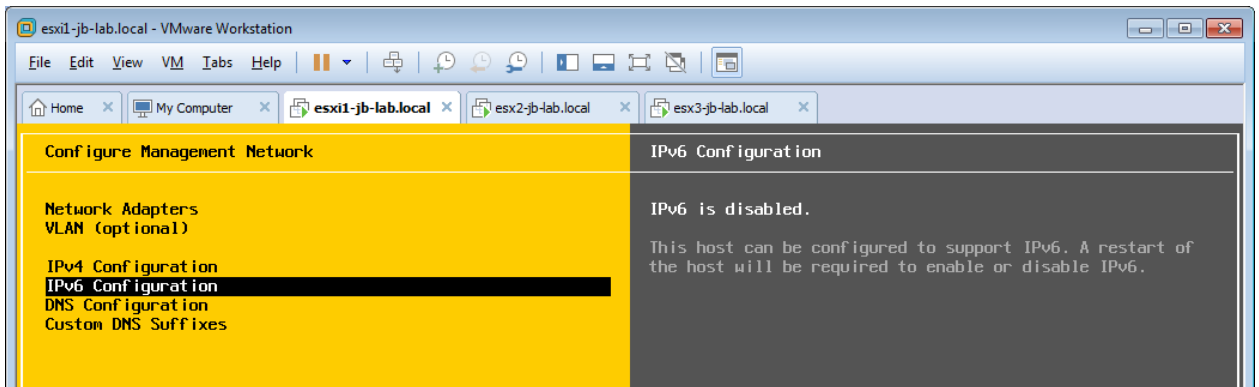

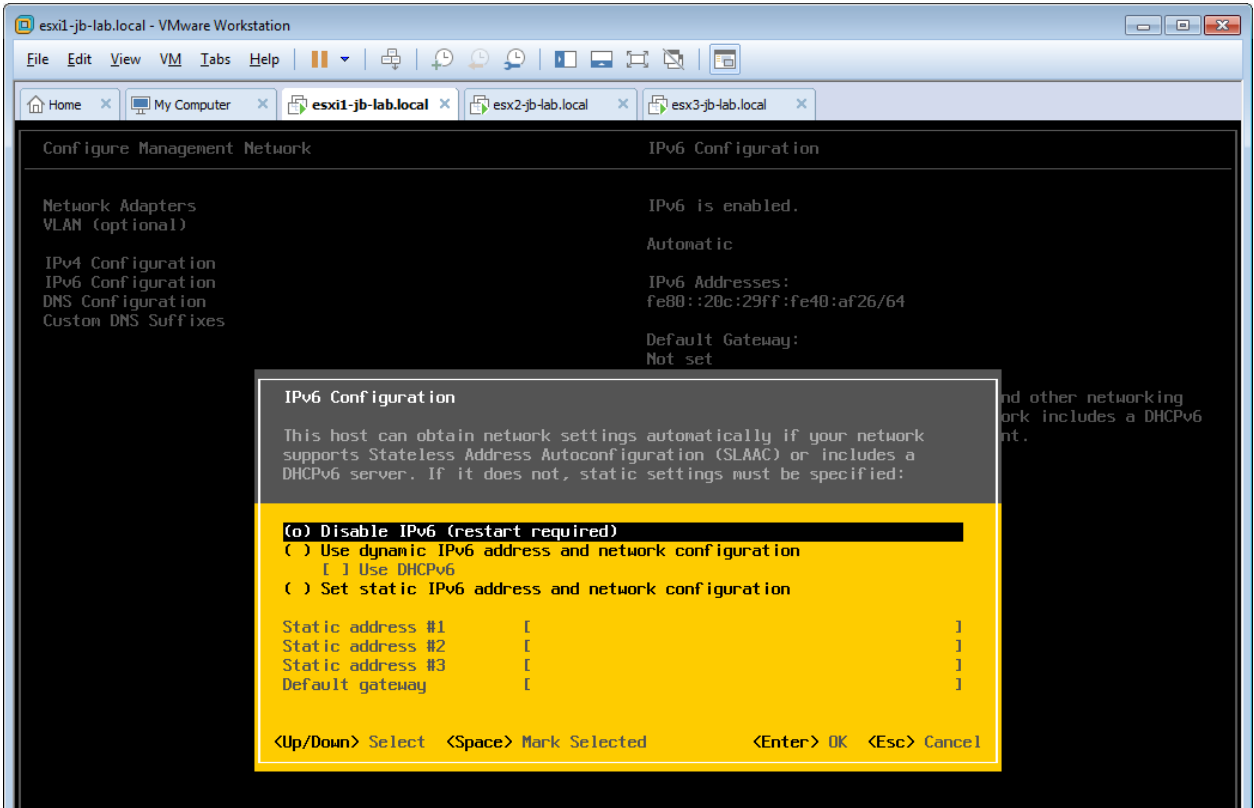h. Go to DNS Configuration and press [Enter]

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i. Set the hostname the same as the VM name and set the DNS Server to an arbitrary low IP on this network, where we will create DNS then Press [Enter]
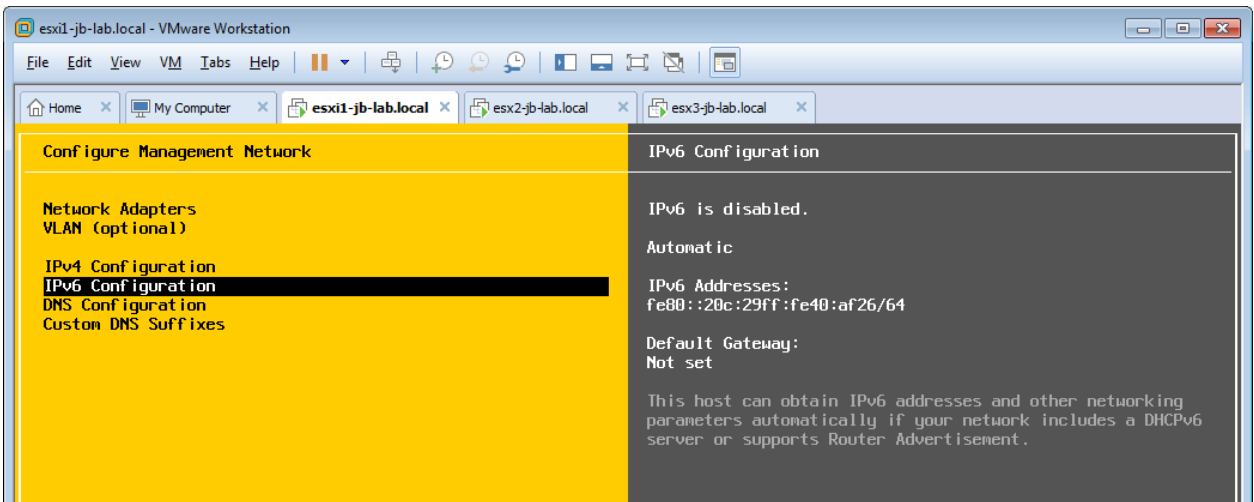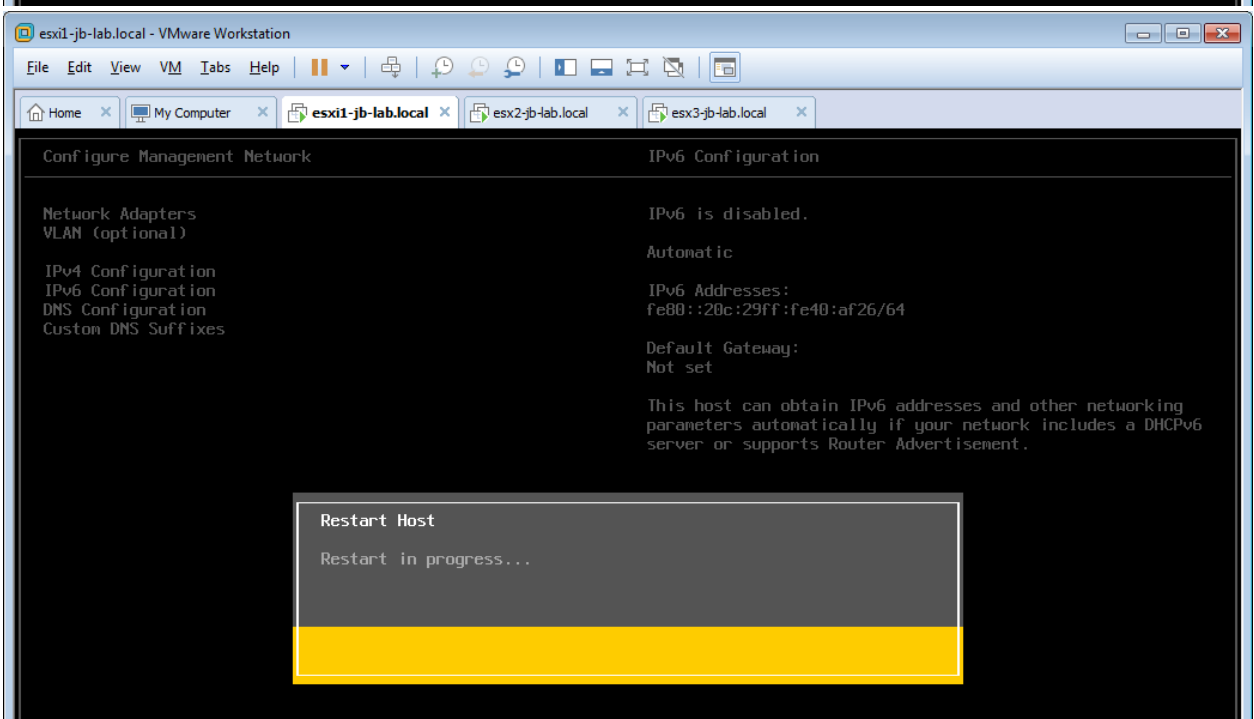

j. Now go to IPv6 Configuration and press [Enter]

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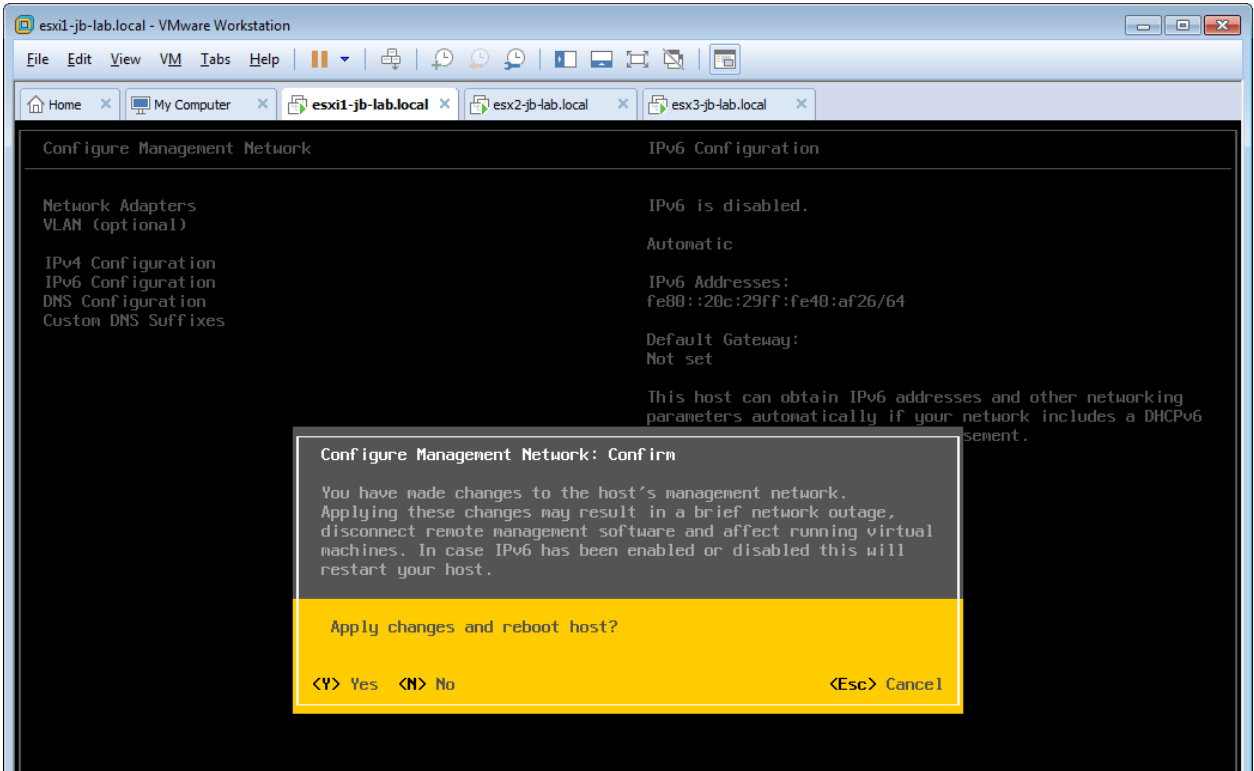k. Disable IPv6 Configuration and press [Enter]

l. Press [Esc]

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m. Press [Y] to reboot

n.

5. Now do the same to the other two ESXi Hosts, except use unique Hostnames and IP addresses!

Coming soon…..

- In Part two, we will create DNS (which is a prerequisite for installing vCenter in any form) and then we will install the VMware vCenter Server Appliance
- In Part three, we will create shared storage using Openfiler as an iSCSI SAN
- In Part four, we will configure vSphere Storage, Jumbo Frames, Port Binding and All, and then migrate our VMs to the SAN
- In Part five, we will configure a vSphere Cluster for DRS and HA, then test those services

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