

# **Virtualization Assignment**

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**MSc in Computer Science**

**(Negotiated Learning)**

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## **Introduction**

The purpose of this assignment is to implement a suite of virtualization products and tools using the skills gained through taking a virtualization class during the semester. The assignment will focus on the implementation of a VMware vSphere environment and the utilization of this environment for real world business scenarios.

The purpose of the document is to serve as a guide to any IT administrator who would like a step by step guide to set up a VMware vSphere environment. The document consists of multiple screenshots in order of setup to show a clear visual representation of what an IT administrator should see during the setup of each component of the VMware vSphere environment. The step by step approach is to ensure that every setting and configuration screen can be seen and followed by a novice.

Some of the screen shots will also be accompanied by text. The text is specifically to explain “How?” and “Why?” a particular step or setting is been implemented. When implementing a virtualization environment for the first time it should be noted that the process is time consuming and that troubleshooting the system will be inevitable.

The advantages of learning and implementing a virtualization environment out way the disadvantages but I cannot stress enough how much learning the virtual environment and infrastructure is necessary before implementation. If you are an experienced IT Administrator in a physical environment don’t automatically think the transition to the virtual platform is easy. The main problem is rushing through a setup and then when something goes wrong not understanding how to diagnose connection issues or utilize the features available such as snapshots and templates.

The guide below should help with any problems that may occur during the implementation of a virtual environment.

## A. 1

The first step is to download and install a vSphere client. The tricky part here is where to get the vSphere client download and the required settings that are needed. What you need is the URL or IP address for the vCenter server or host that you will be connecting to. In the case of this project the URL is - <https://csi6220-4.ucd.ie/>. When you navigate to the assigned URL or IP address you will see the download options below. For this step we will choose “Download vSphere client for Windows”.

The reason why we download the vSphere client is to be able to connect to the host remotely. The vSphere client is the principal interface for managing the vCenter server and ESXi.

Step 1- Enter the URL or IP for vCenter Server or Host. Next click download vSphere Client for Windows.

Welcome to VMware ESXi

VMware ESXi  
Welcome

**Getting Started**

If you need to access this host remotely, use the following program to install vSphere Client software. After running the installer, start the client and log in to this host.

- [Download vSphere Client for Windows](#)

To streamline your IT operations with vSphere, use the following program to install vCenter. vCenter will help you consolidate and optimize workload distribution across ESX hosts, reduce new system deployment time from weeks to seconds, monitor your virtual computing environment around the clock, avoid service disruptions due to planned hardware maintenance or unexpected failure, centralize access control, and automate system administration tasks.

- [Download VMware vCenter](#)

If you need more help, please refer to our documentation library:

- [vSphere Documentation](#)

**For Administrators**

**vSphere Remote Command Line**

The Remote Command Line allows you to use command line tools to manage vSphere from a client machine. These tools can be used in shell scripts to automate day-to-day operations.

- [Download the Virtual Appliance](#)
- [Download the Windows Installer \(.exe\)](#)
- [Download the Linux Installer \(tar.gz\)](#)

**Web-Based Datastore Browser**

Use your web browser to find and download files (for example, virtual machine and virtual disk files).

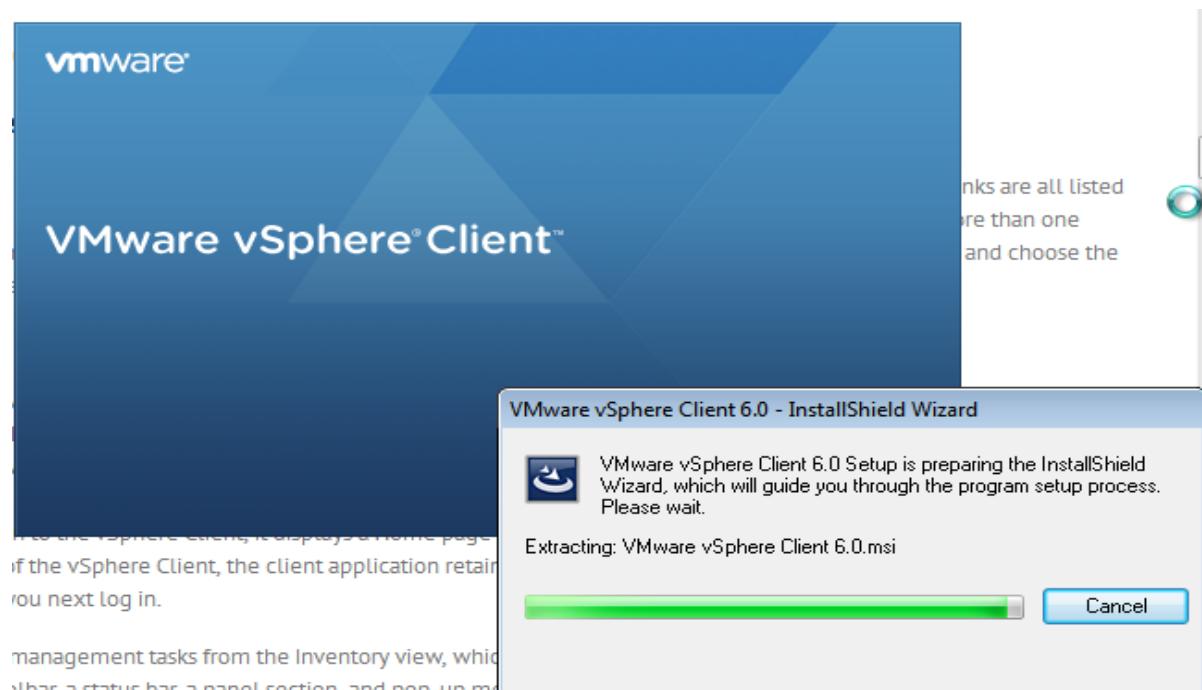
- [Browse datastores in this host's inventory](#)

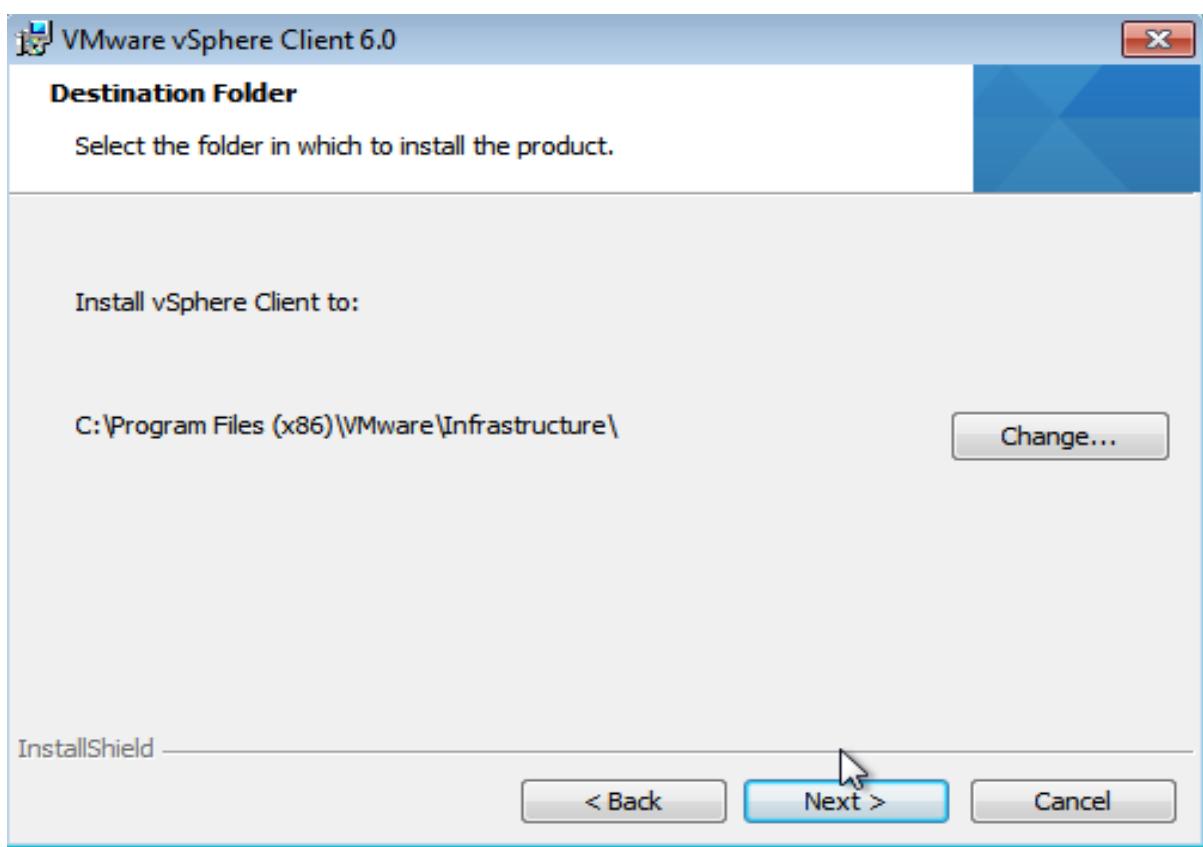
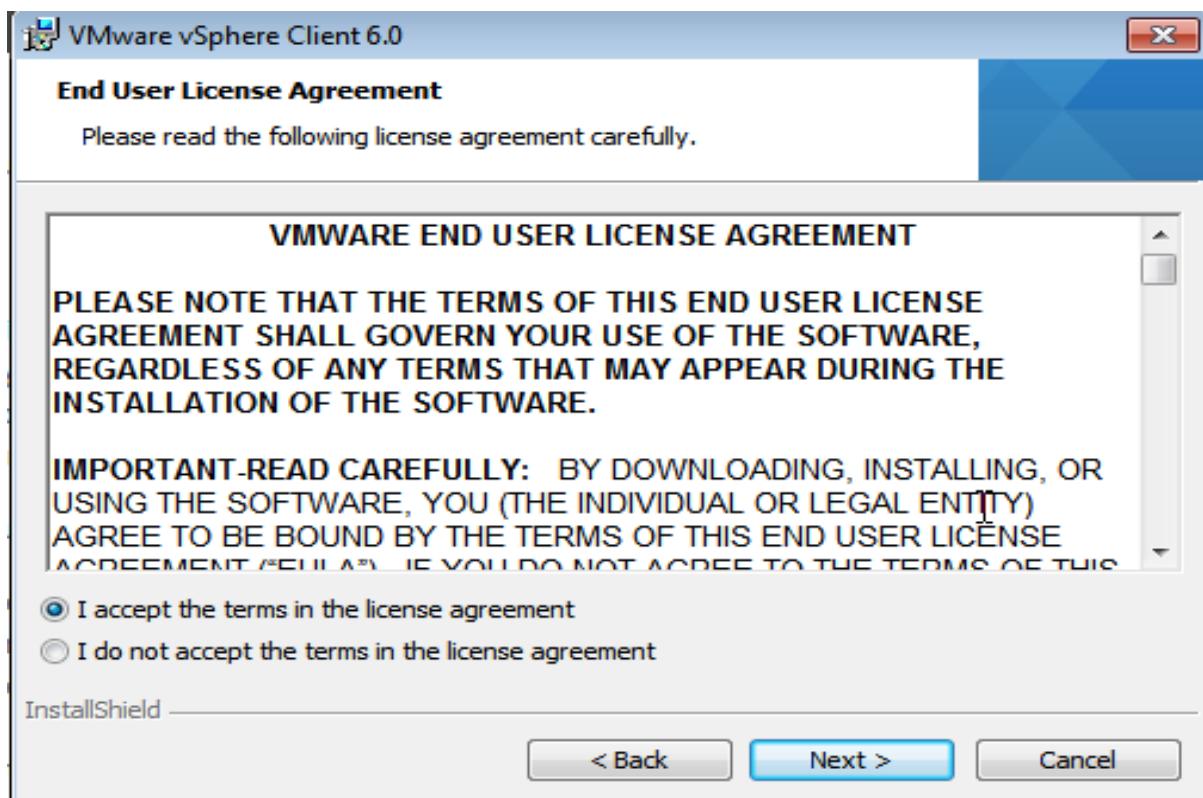
**For Developers**

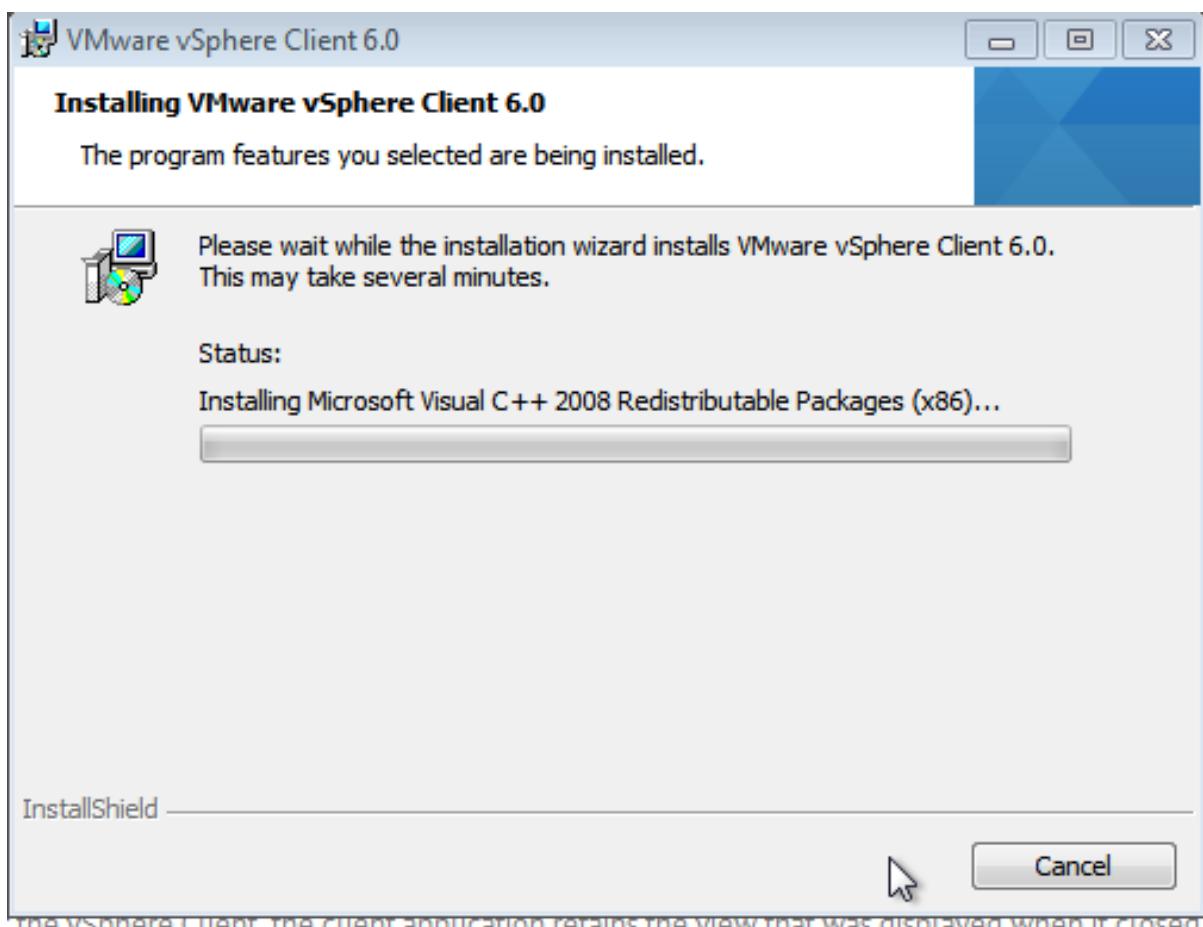
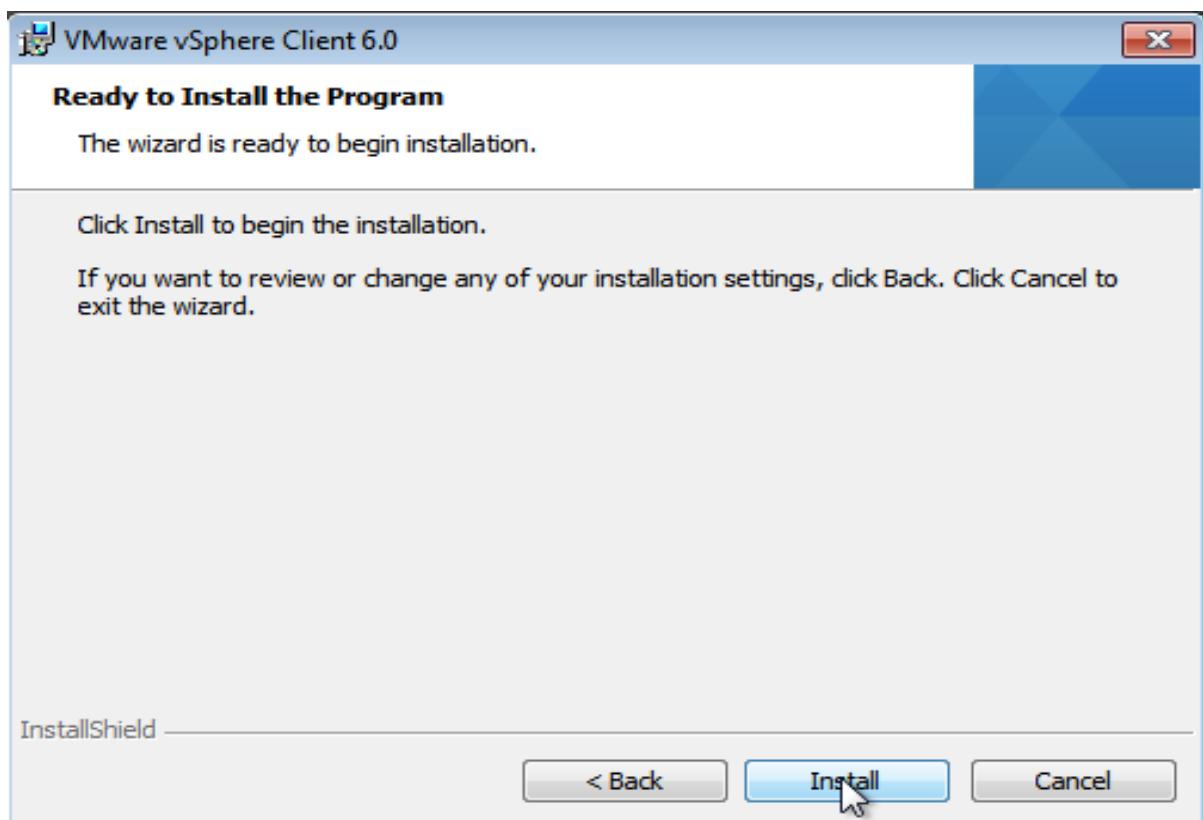
**vSphere Web Services SDK**

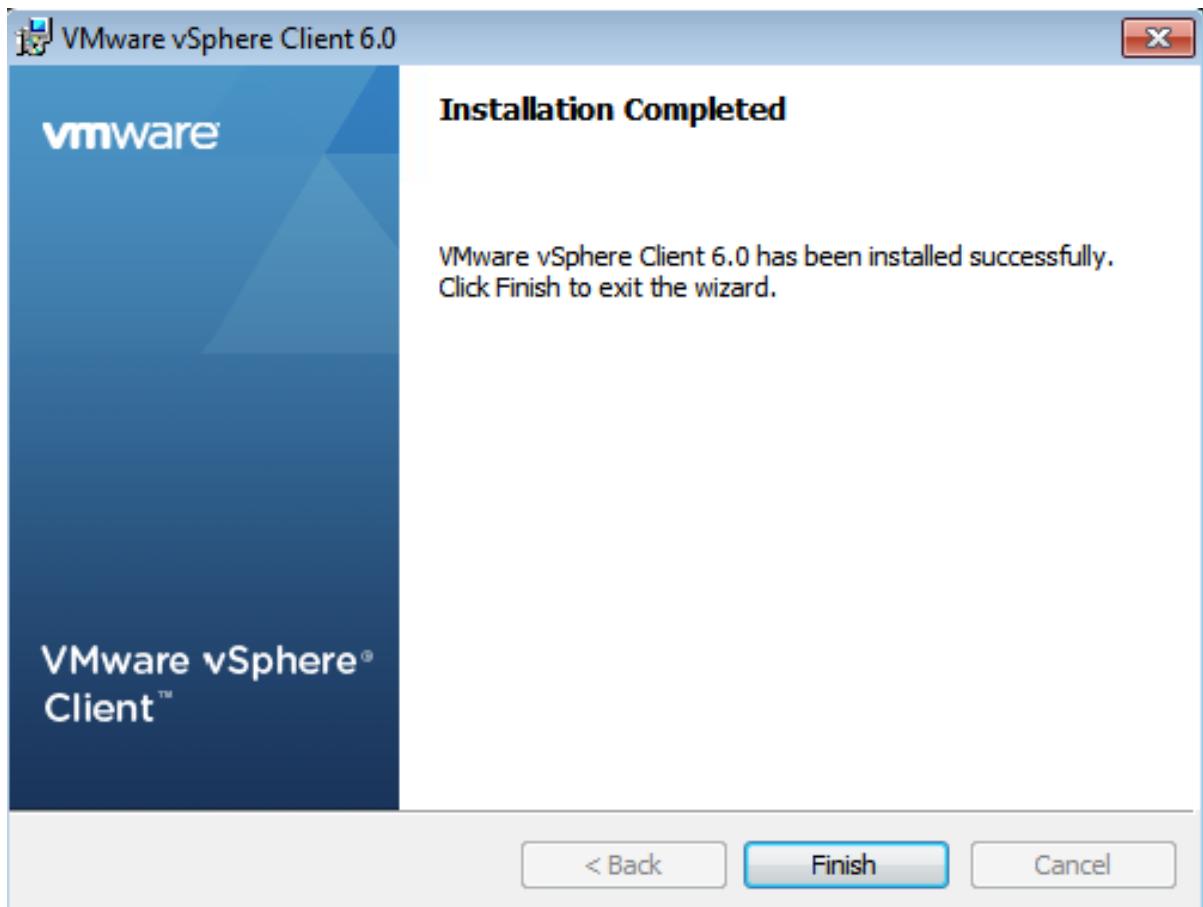
## Step 2 – Install vSphere Client

The process here is very simple and all that is needed is to follow the prompts for the installation shown below.





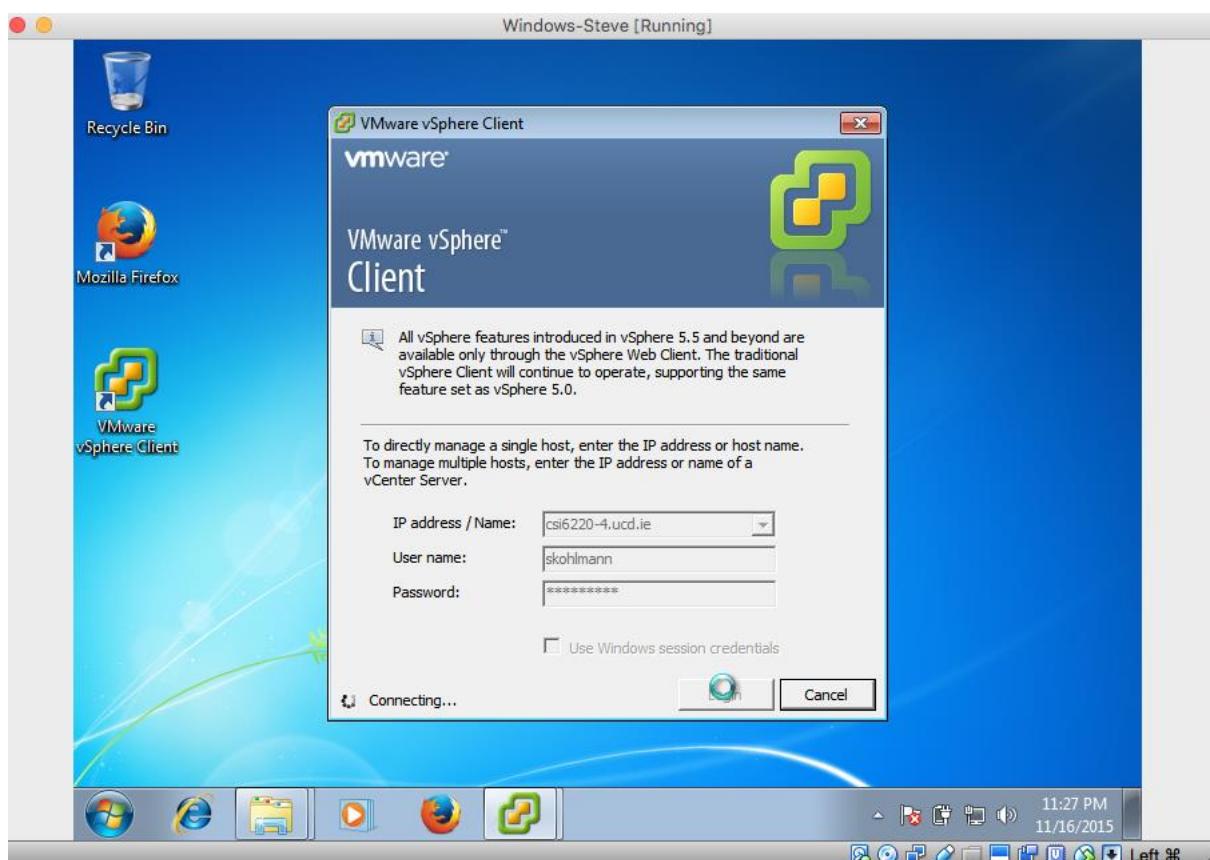


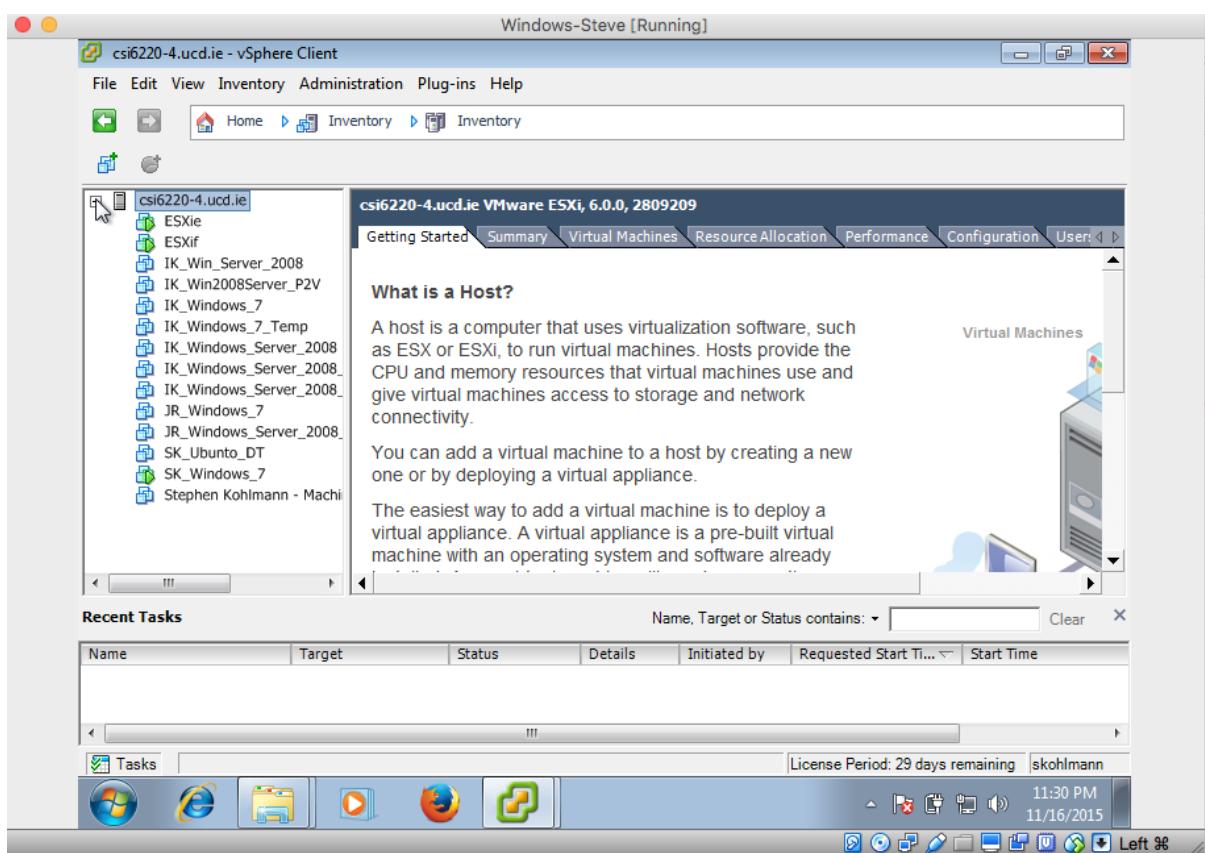
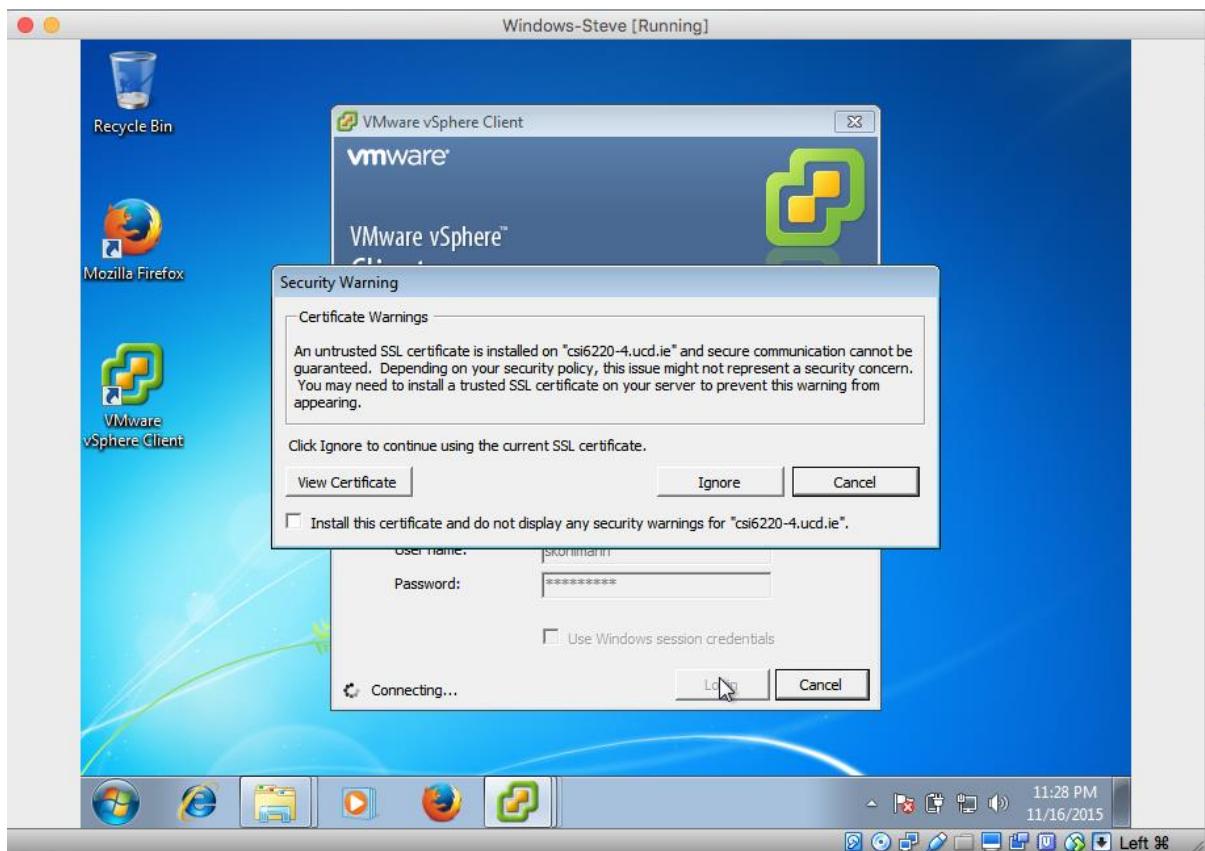


### Step 3 – Accessing the ESXi host through the vSphere Client.

After successful installation you will see the vSphere client icon on the desktop. To use the vSphere client to connect to vCenter server or the host you will need to enter in some credentials. After double clicking the vSphere client icon you will be presented with three input options. The first is the IP address or URL of the vCenter server or host you would like to connect to. For this assignment the address is ***csi6220-4.ucd.ie***. The second input is the username you have for the particular server or host which in this case is ***skohlmann***. Note that if you have no user name set up on the host you will have to sign in at the root level which requires the administrator password. The third option is the password associated with your account or the root account, in this case the password is ***Pa\$\$wOrd\_***.

After entering in the correct login details you can log in. You may get a security pop up box for an untrusted SSL certificate but that can be ignored unless you have specific security requirements. If that is the case, you may need to install a trusted SSL certificate on your server. Once logged in you will be able to manage and edit your server settings via the vSphere client.





## A. 2

### The differences between vCenter Server and the use of vCenter Server Virtual Appliance.

The VMware vCenter Server allows an IT administrator easy access to manage all elements of the vSphere environment. Multiple ESXi servers and multiple virtual machines can be created and managed from one place. The service is installed to run automatically and on a continuous basis. When no vSphere Clients are connected the server still maintains and performs all managing and monitoring requirements.

### **Centralized Control and Visibility**

The vSphere web client increases centralized control of managing essential functions of the vSphere by offering access through any browser across the world. The single sign on function allows users to login in on a single occasion and allow access to all instances of vCenter Server. No further authentication is needed which offers increased visibility across all instances.

With custom roles and permissions, the entire network can be restricted by assigning custom settings for virtual machines, resource pools and servers. Users assigned appropriate privileges can also create custom roles spreading the administrator work load. E.g. The accounts department can have a user assigned to create roles for the accounts department while the marketing department can have a user assigned to create roles for the marketing department. A simplified inventory search allows an IT administrator to explore the entire inventory from anywhere in vCenter.

### **Proactive Optimization**

Resource management allows allocation for processor and memory resources to virtual machines on the same physical servers. The ability to adjust allocations while the virtual machines are running is also possible. It is possible to continuously monitor utilization across resource pools using vSphere Distributed Resource Scheduler and intelligently allocate available resources to virtual machines that are relevant to business needs.

Using vSphere Distributed Power Management you can automatically track resource and power consumption in a Distributed Resource Scheduler cluster. To reduce power usage for a cluster when fewer resources are needed you can consolidate workloads and put hosts in standby mode. When more resources are needed you can automatically bring hosts in standby mode back online.

## **Management**

The VMware vRealize Orchestrator offers an easy drag and drop interface to assemble workflows and comes with option to automate more than 800 tasks straight out of the box. A management feature that can be purchased is the VMware vRealize Operations Standard which offers deep operational analysis giving the user analytical detail to tune the VSphere infrastructures performance and health features.

## **vCenter Server Virtual Appliance**

The VMware vCenter Server Virtual Appliance is very similar to vCenter Server. The vCenter Server Virtual Appliance provides an alternate platform for centralized management but still provides the same functionality of the standard Windows vCenter Server. The main difference is that the vCenter Server Virtual Appliance is a preconfigured Linux-based virtual machine.

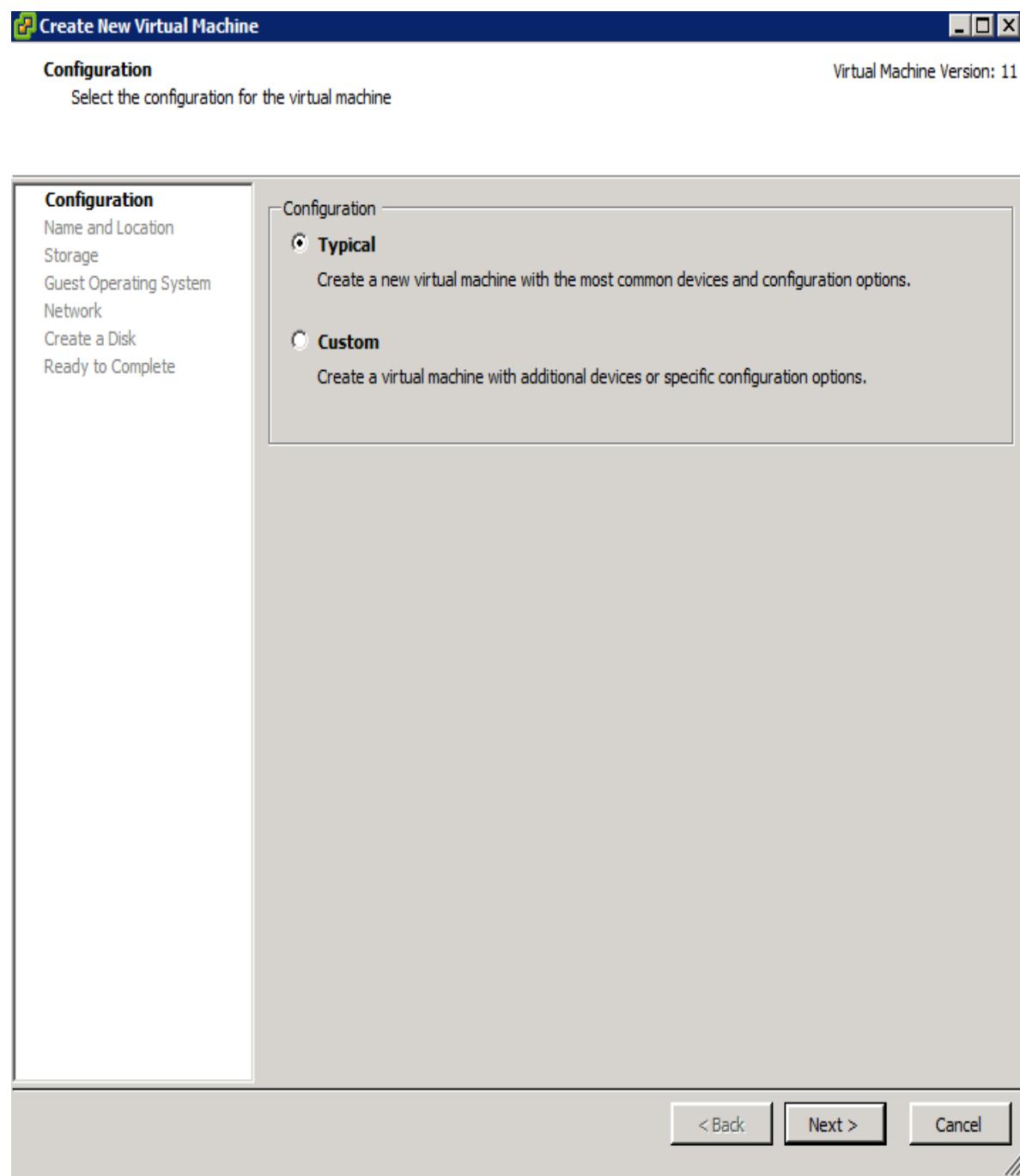
## **Differences of vCenter Server and vCenter Server Virtual Appliance**

- 1.** vCenter Server Virtual Appliance has additional services like Auto Deploy and Dynamic Host Configuration Protocol(DHCP). Many of the extra features on the Virtual Appliance are more cumbersome to install on the standard vCenter Server.
  
  
  
- 2.** vCenter Server Virtual Appliance operates in a Linux environment while the standard vCenter Server operates on a Windows environment.
  
  
  
- 3.** As vCenter Server Virtual Appliance operates in a Linux environment an SQL database will not work. You will need and Oracle or DB2 database instead. The same issue arises if you are using an Oracle or DB2 database and want to implement the standard Windows vCenter Server environment. In this case an SQL database is needed.
  
  
  
- 4.** The vCenter Server virtual appliance does not support IPv6 configurations. To implement IPv6 configurations the standard Windows vCenter Server environment is necessary.
  
  
  
- 5.** As the vCenter Server virtual appliance is a VM it is not possible to run on a physical system. If the environment you wish to use needs a physical system, the standard Windows based vCenter Server is required

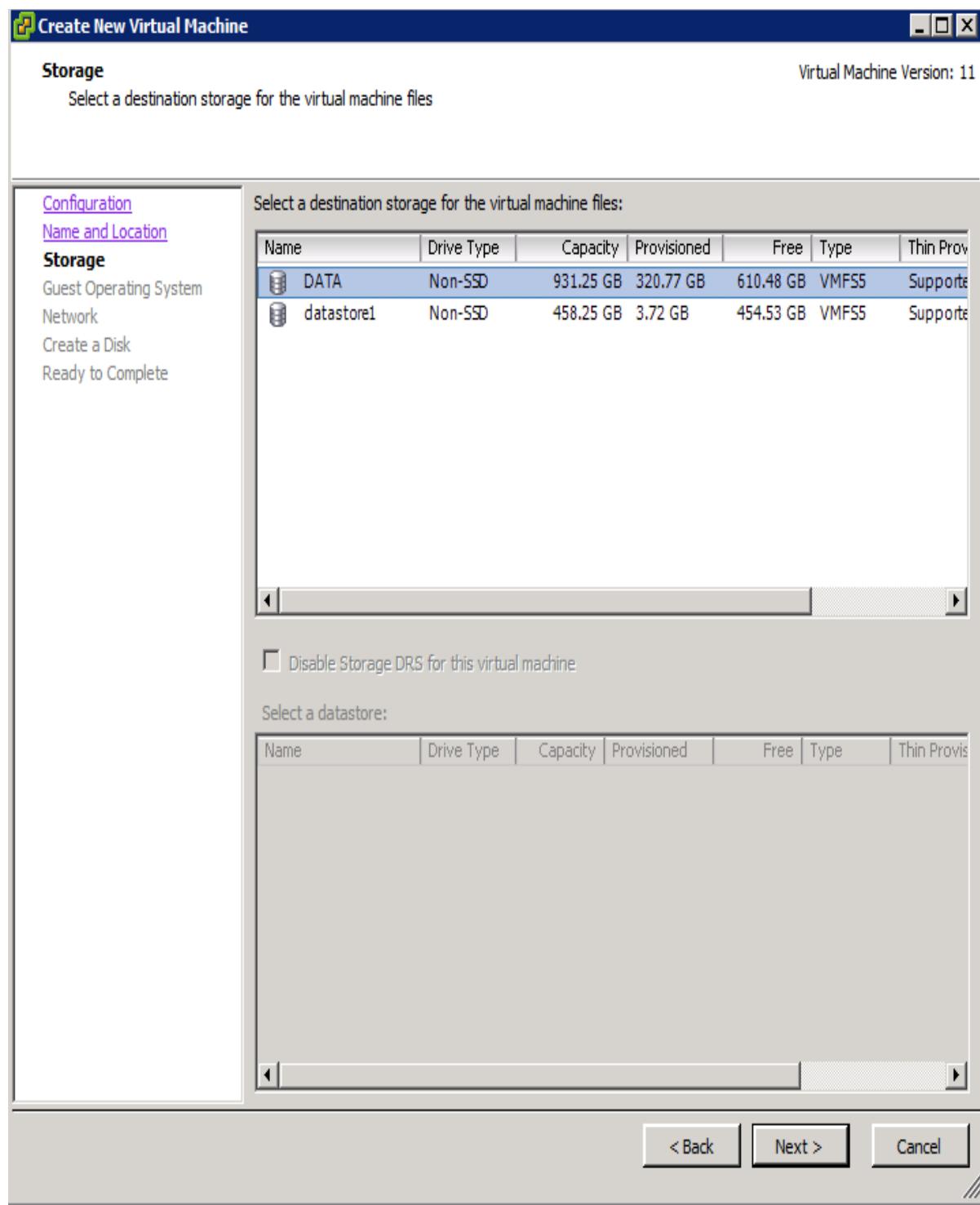
## **Machine 1**

The first machine is set up for Microsoft Windows 2008 Server running vCenter Server and all its dependent software.

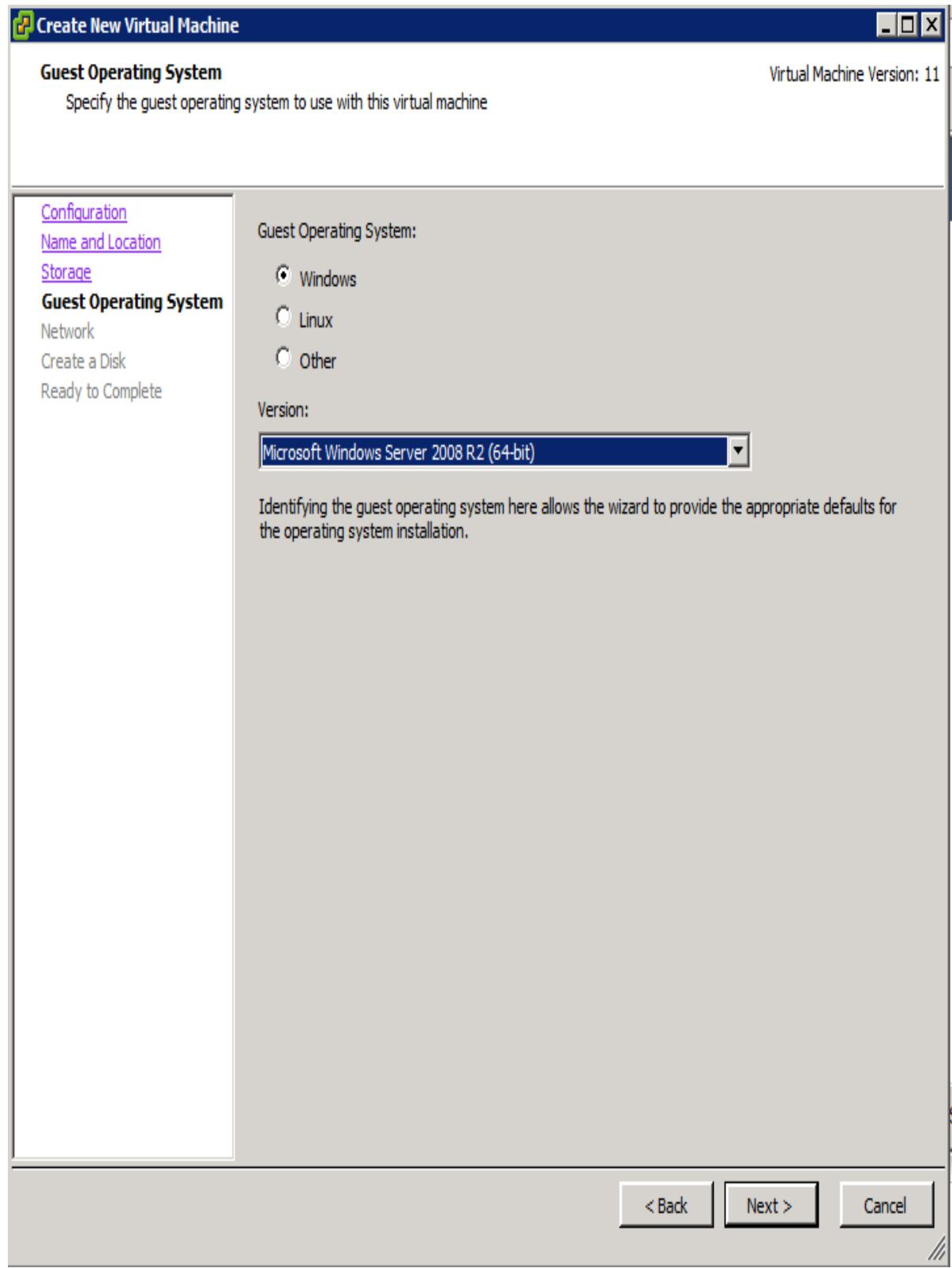
The first step is to choose the Typical setup when creating the VM.



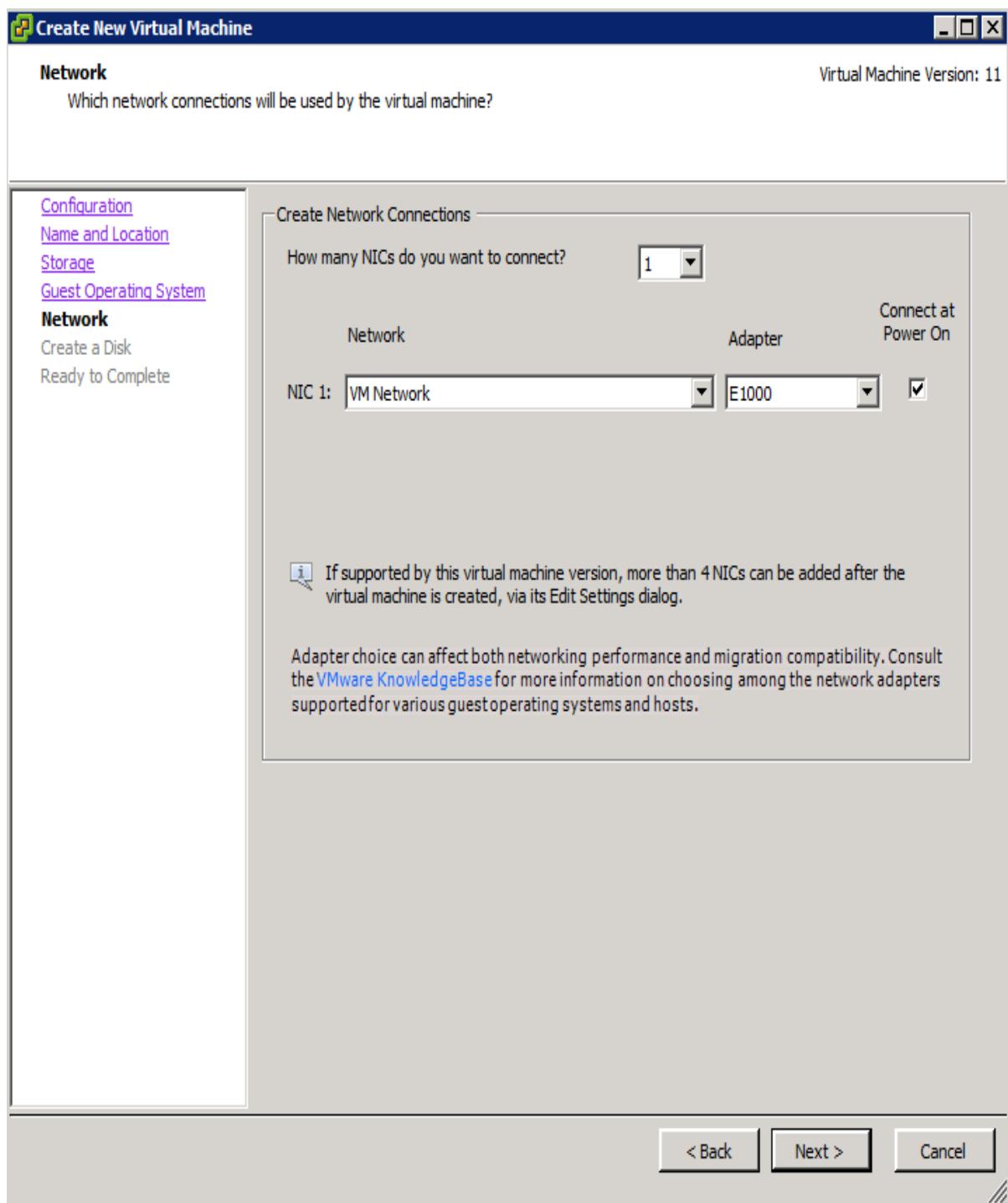
The name of the machine is set to something relevant in this case “Stephen Kohlmann – Machine 1 – Microsoft Windows 2008”. The location is set in to where you want the machine to reside. You then select the storage option in this case “DATA” is where we will be utilizing for storage.



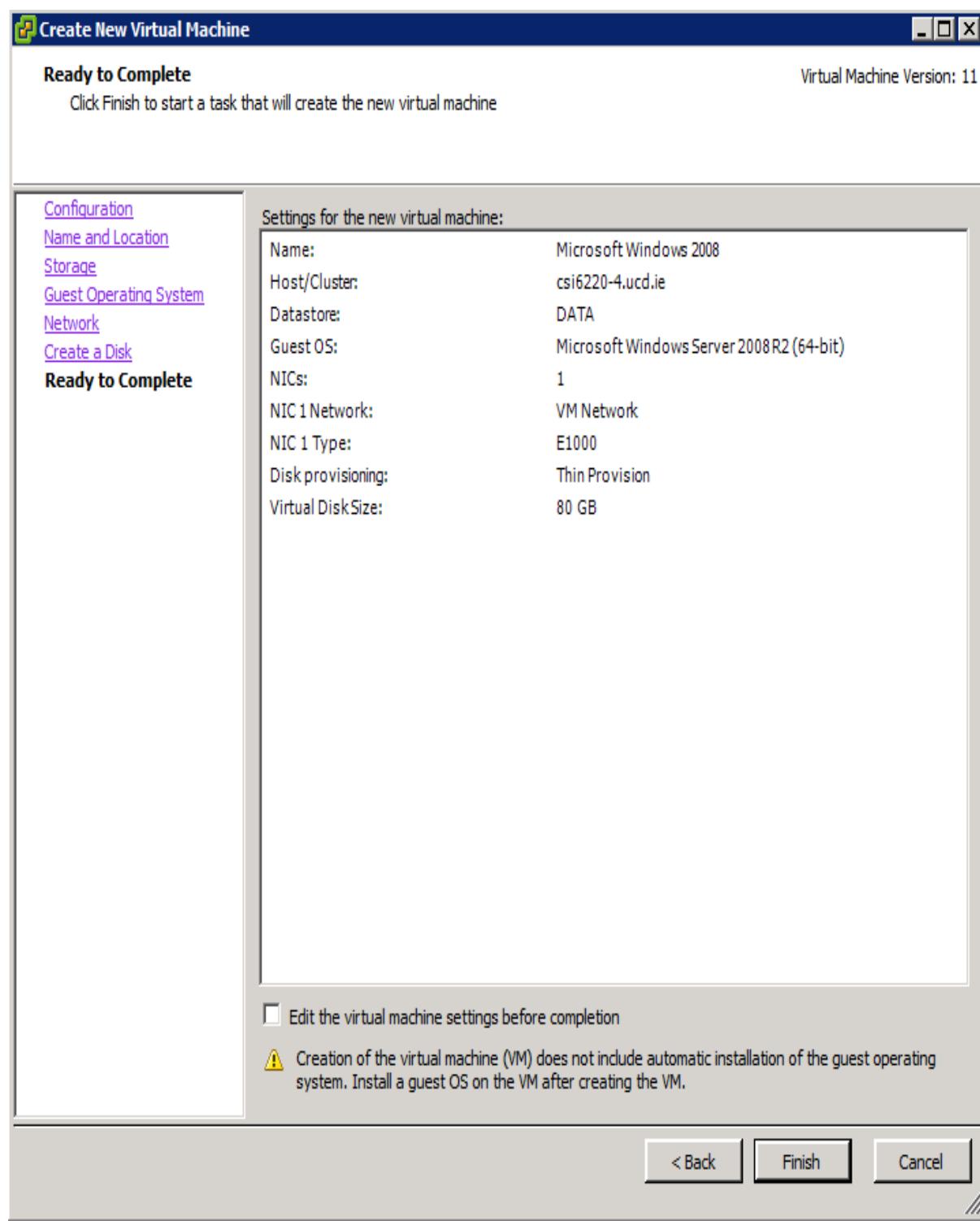
The guest operating system is Windows and the version is Microsoft Windows Server 2008 (64-bit)



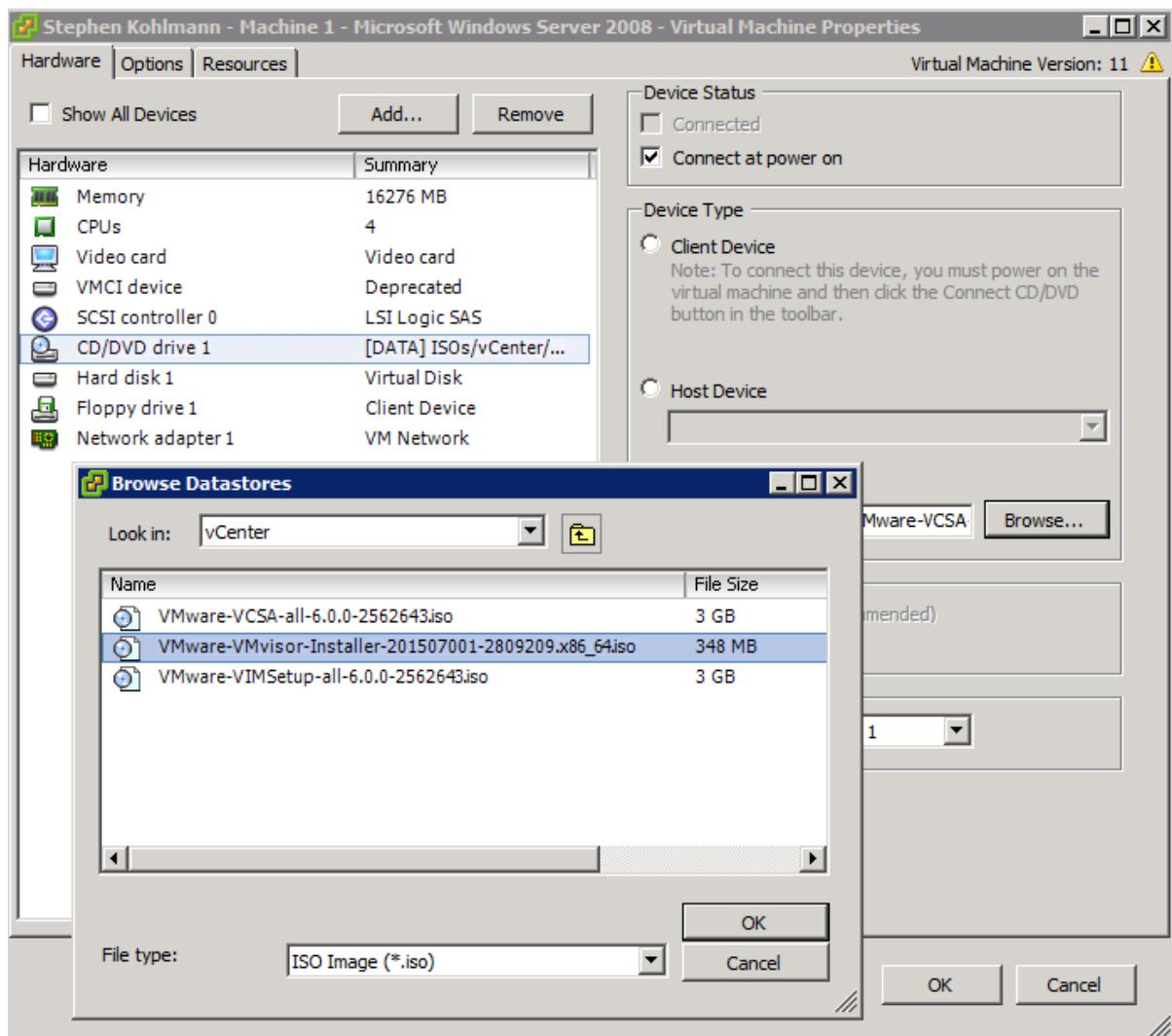
The network settings are left to default.



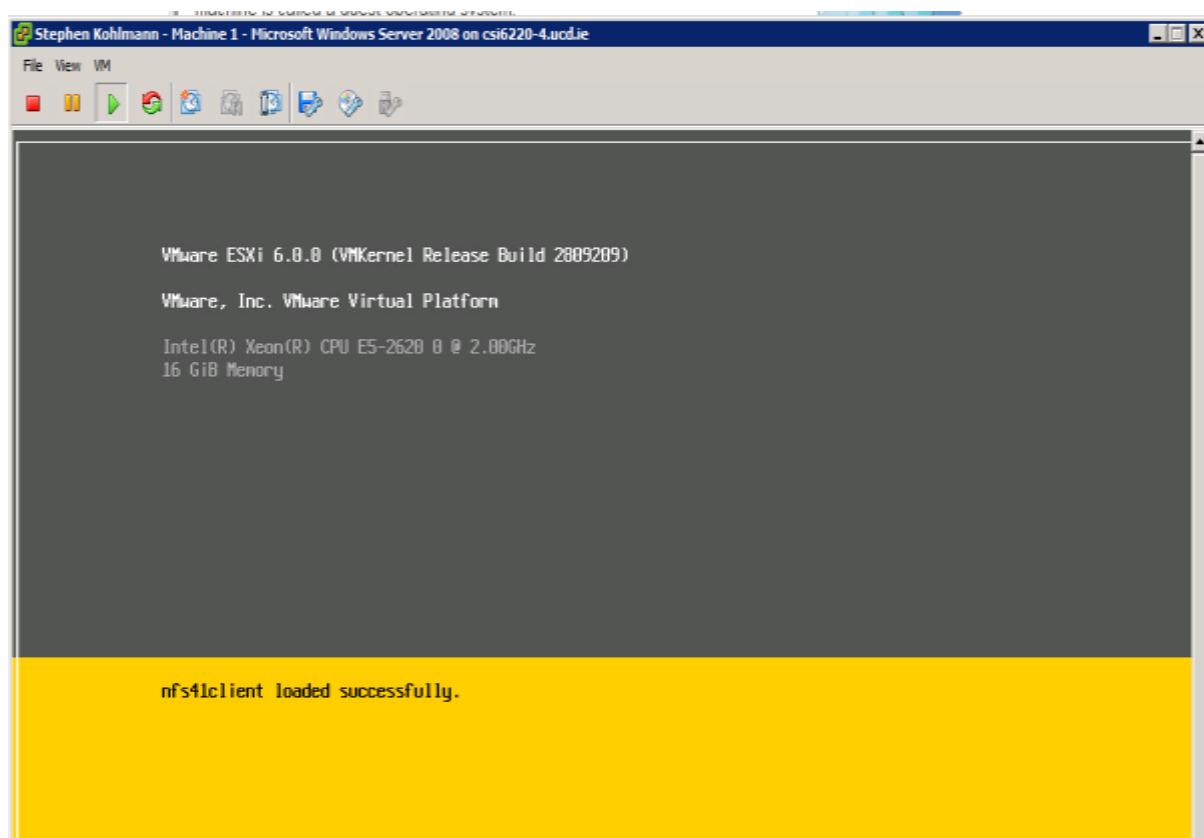
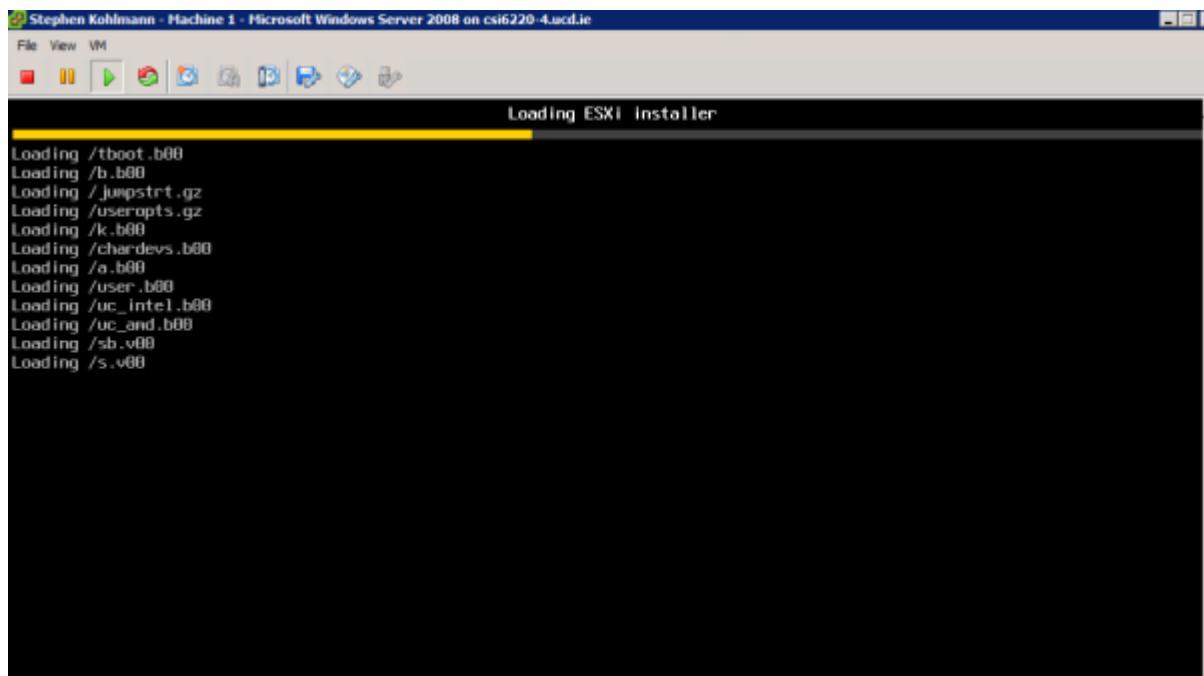
The VM is now ready complete and when you select Finish the VM is created.



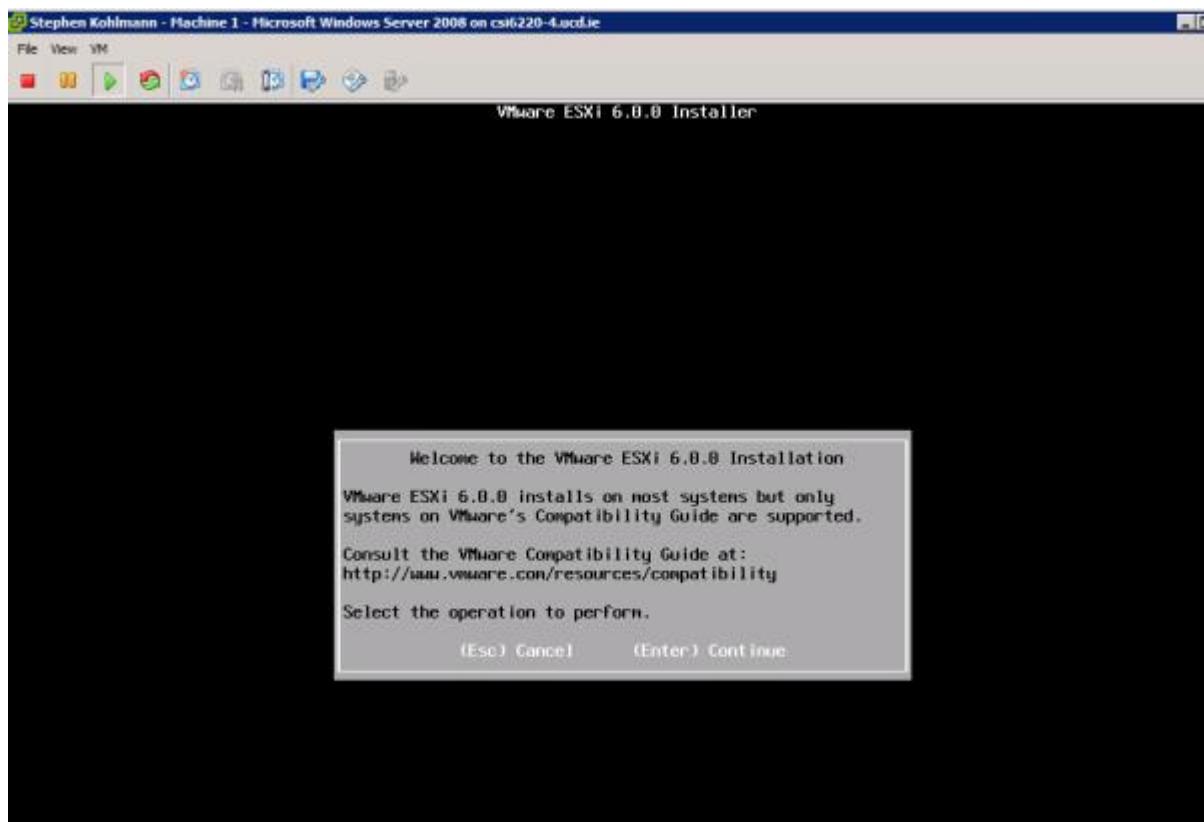
The next step is to point the VM to the ISO file “VMware-VMvisor-Installer-201507001-2809209.x86\_64.iso.”



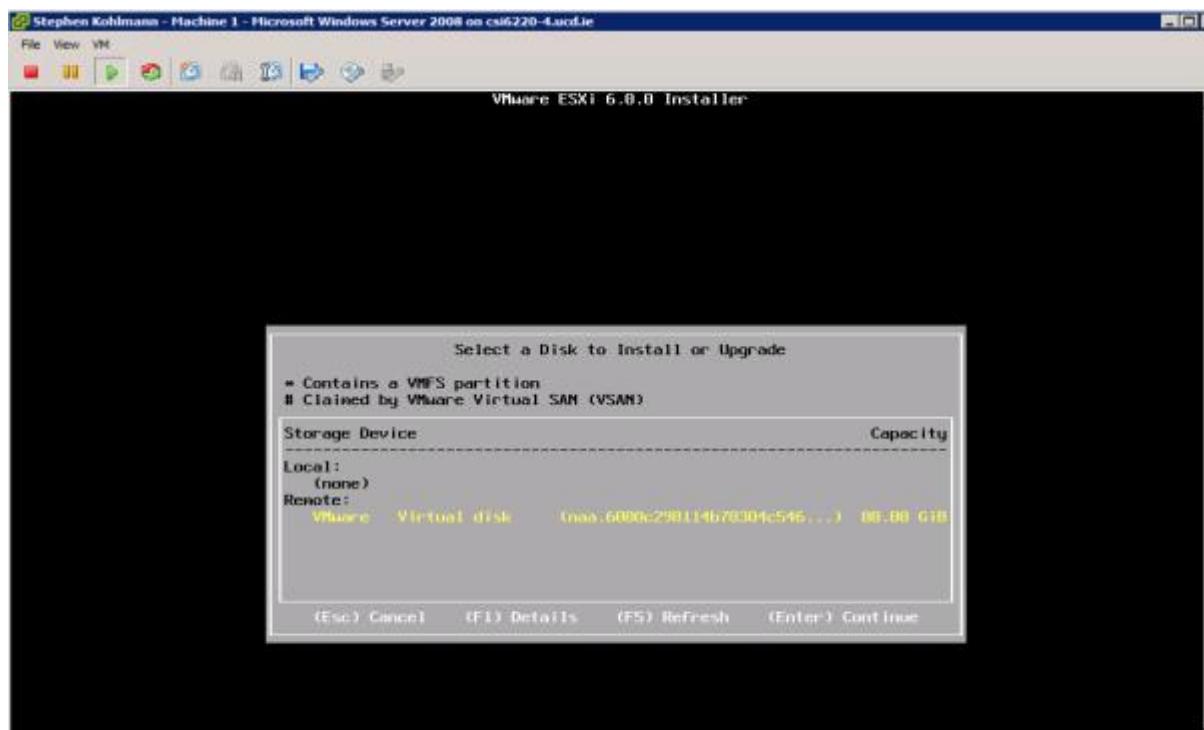
When the machine is powered on the installation wizard appears and you can proceed with the setup as follows.



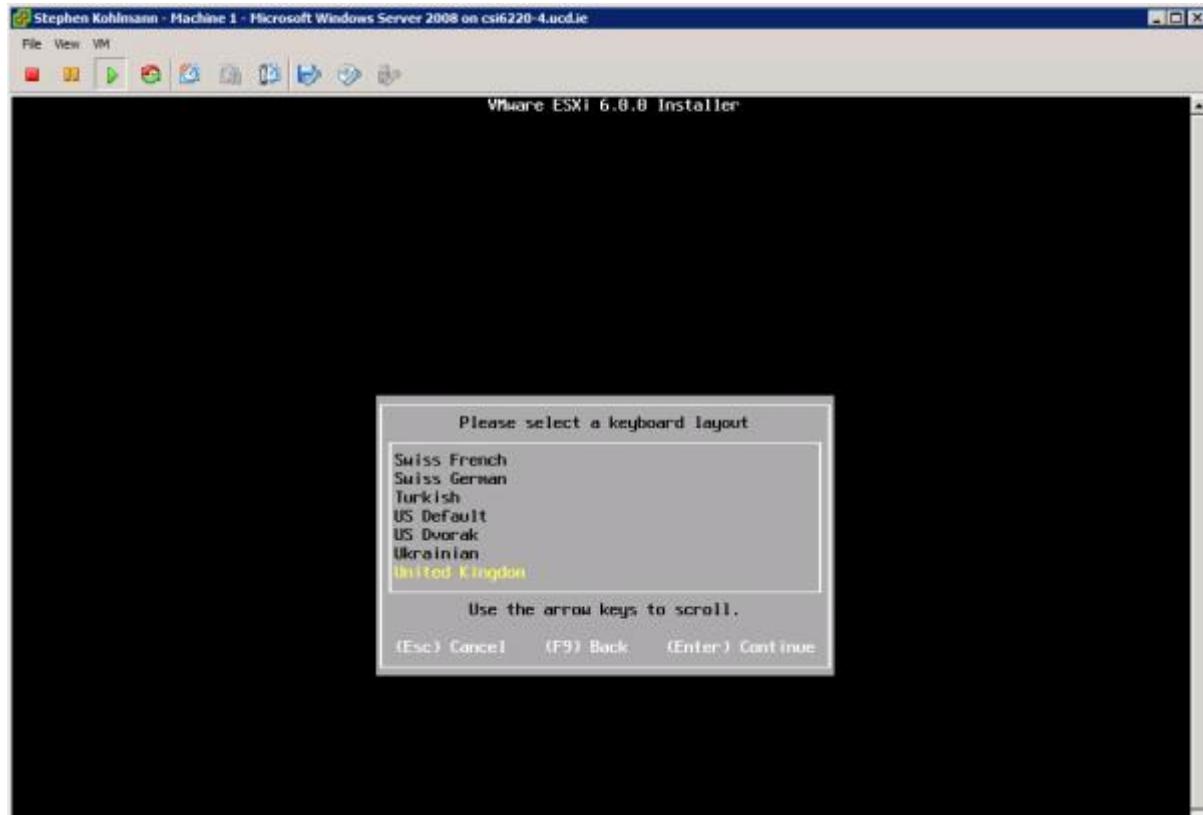
To start the installation process of VMware ESXi press (Enter) to continue.



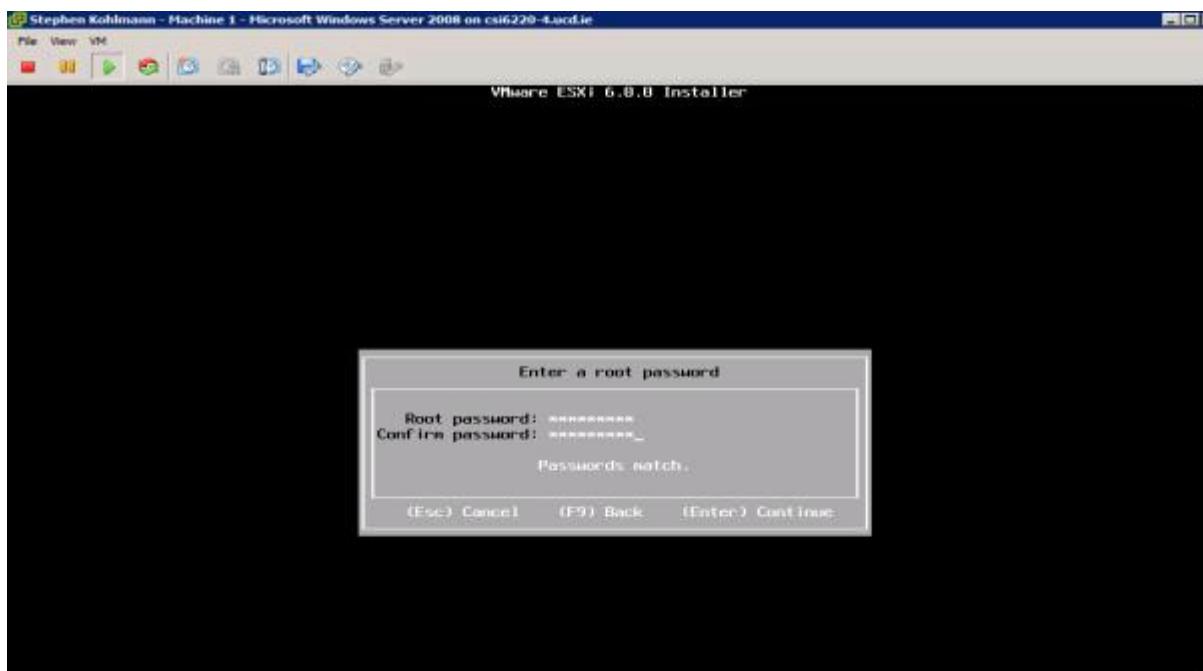
The next step is to select the virtual disk from the VM previously created.



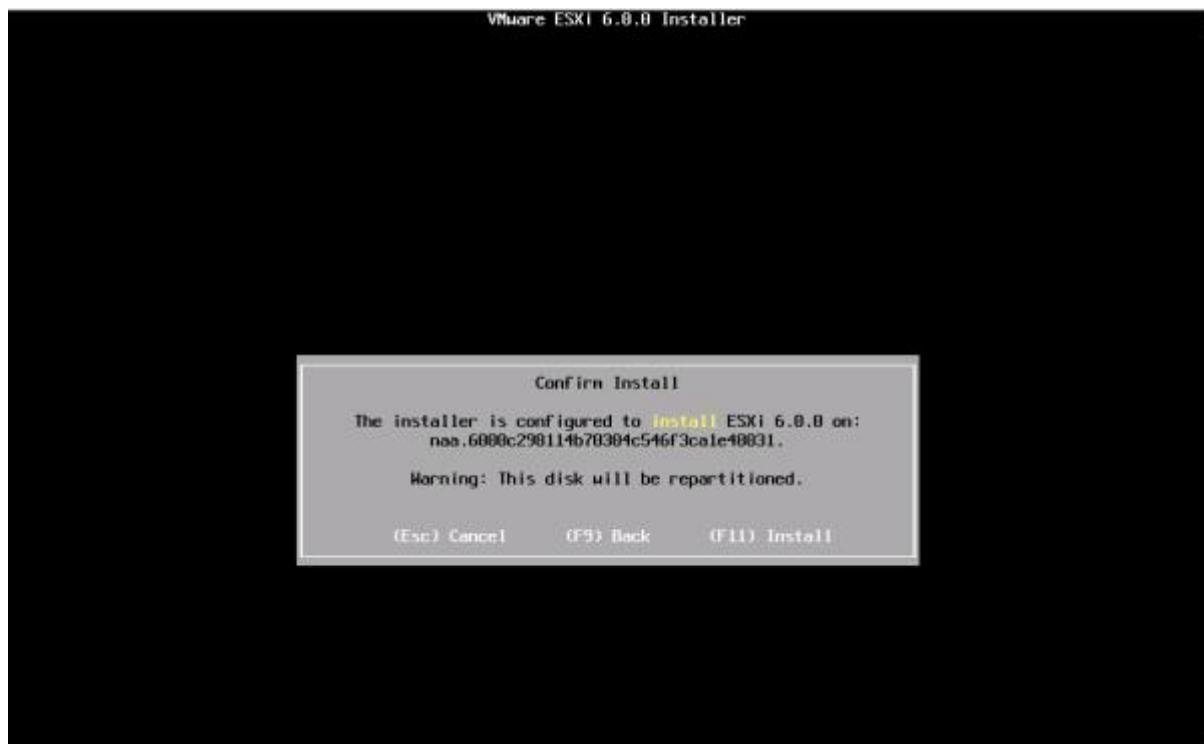
After the virtual disk is selected there is a prompt to select your preferred language.



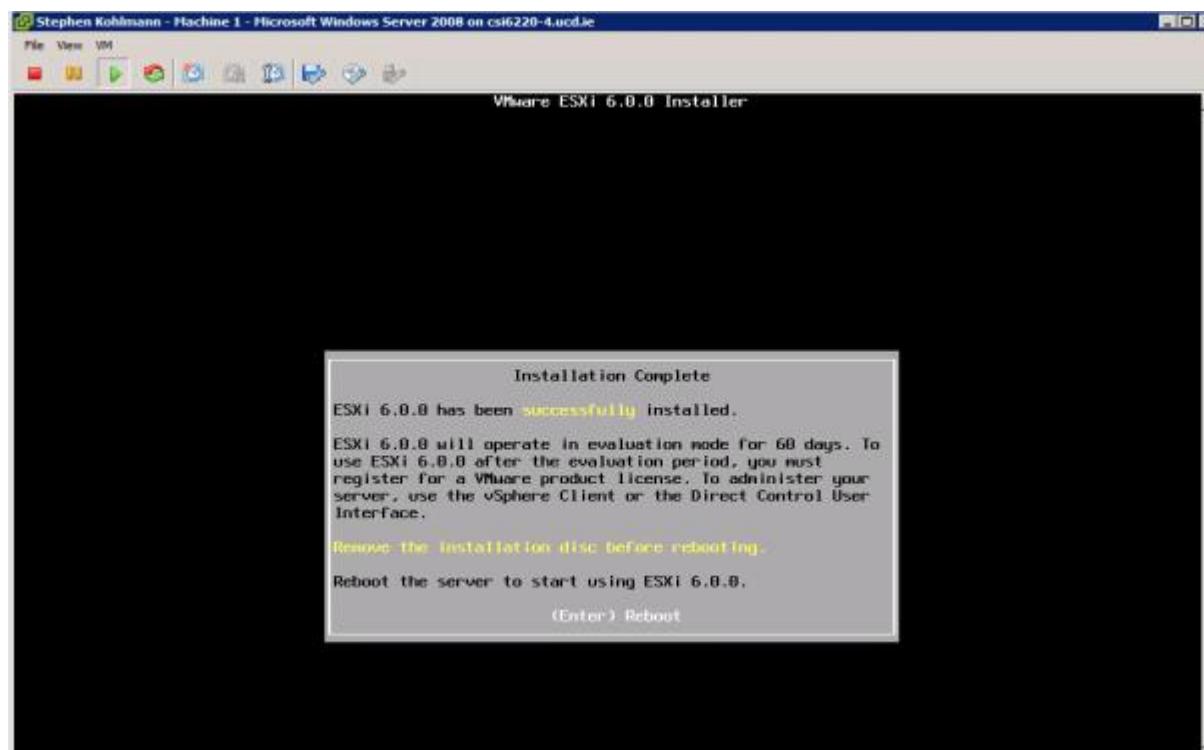
Following this you must assign a password for the root level of the server. In this case the password is **Pa\$\$w0rd\_**. When the password is entered and confirmed press (Enter) to continue the installation.



The following screen is the confirmation to go ahead with the installation.



The screen below shows the installation has completed. To start using ESXi press (Enter) to reboot the machine.



This screen shot below shows the server has been configured to the following settings...

**IP**

137.43.93.91

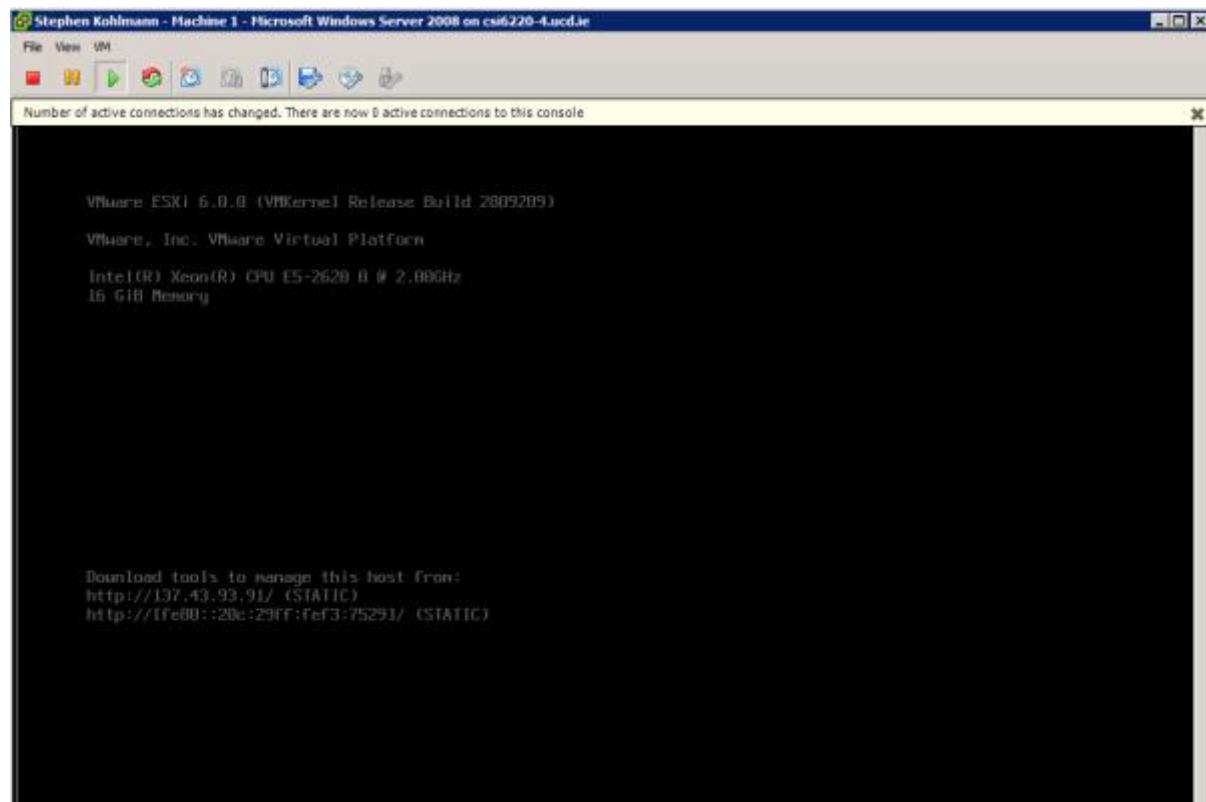
255.255.254.0

137.43.92.1

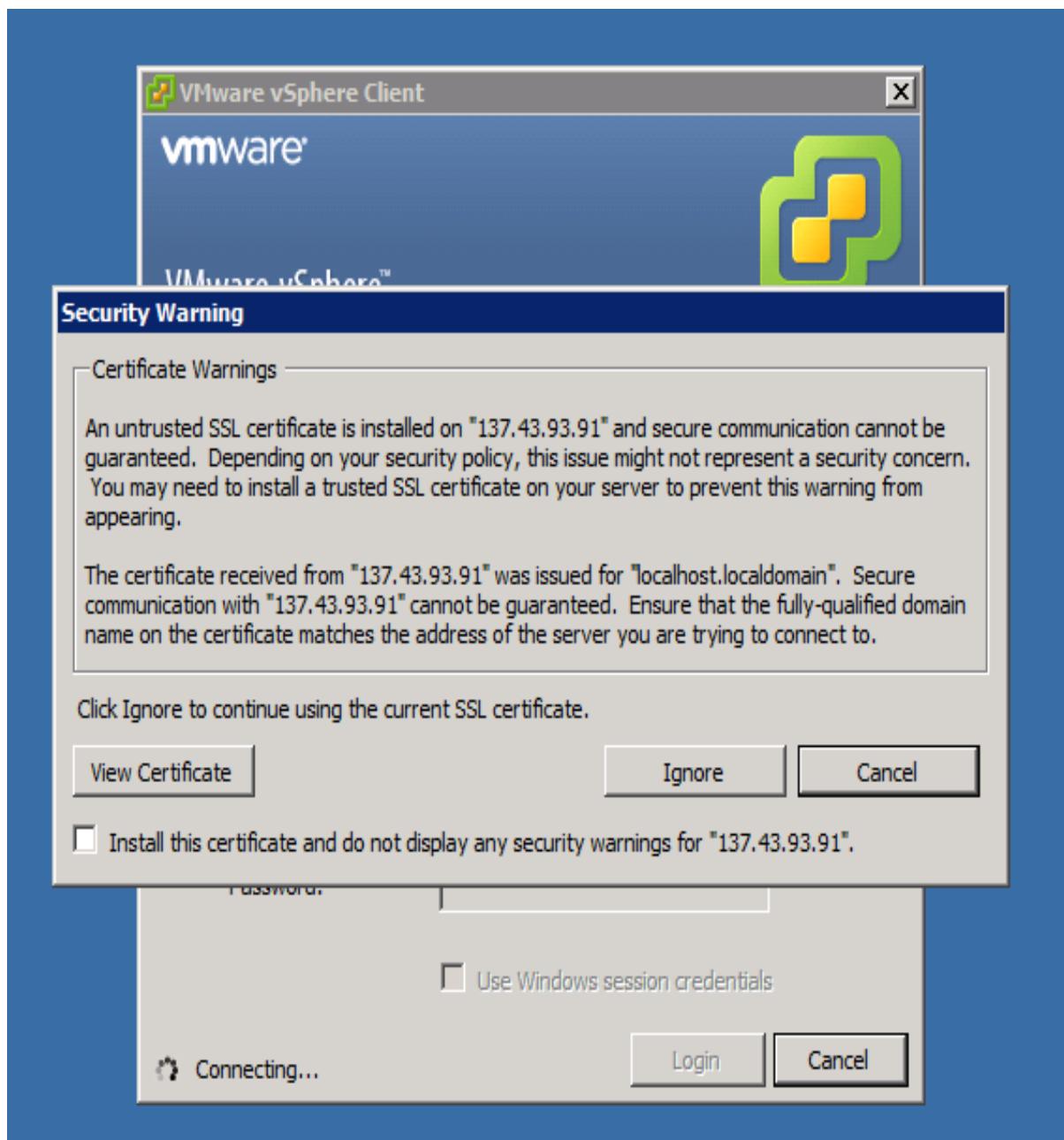
**DNS**

137.43.116.17

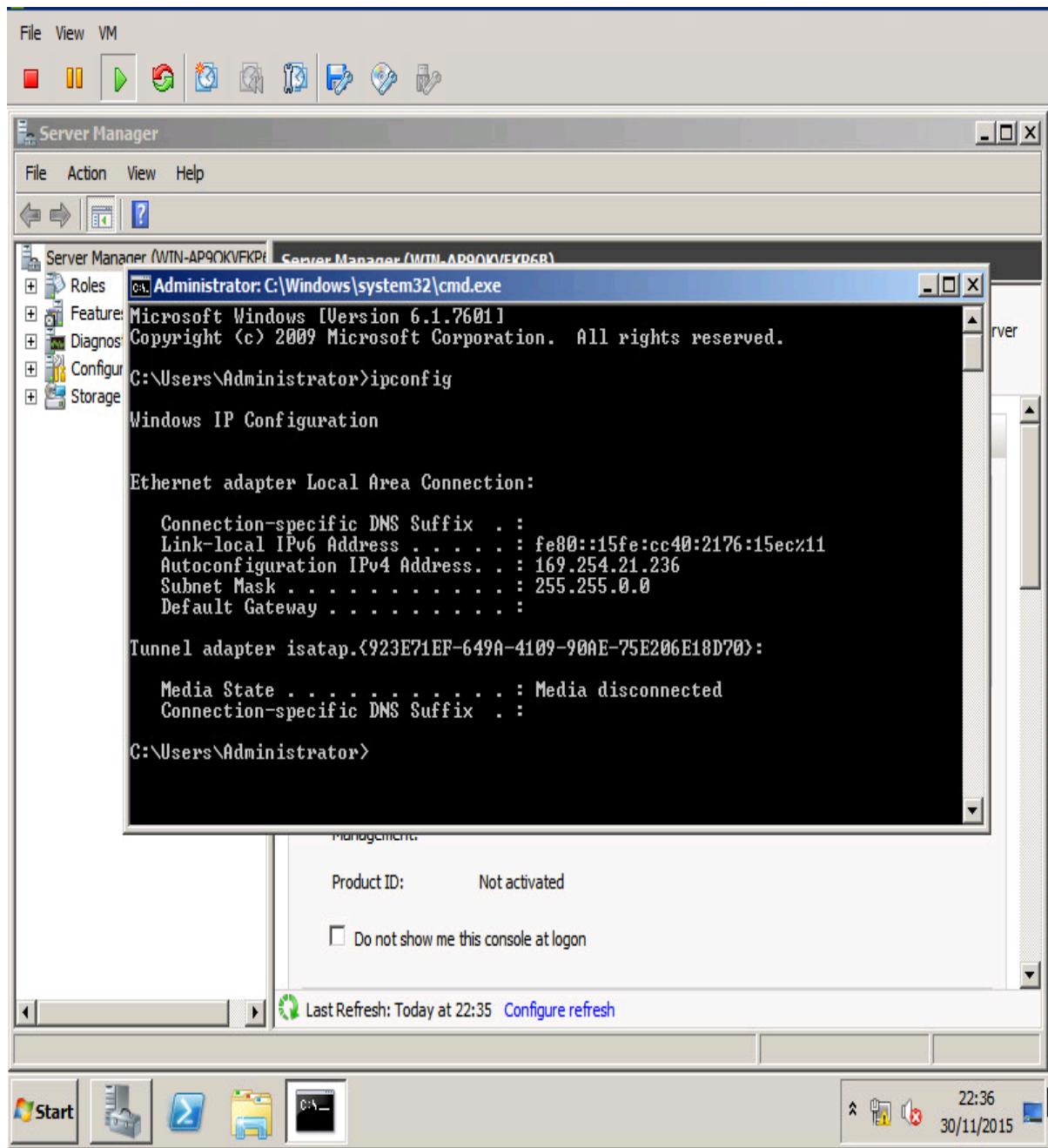
137.43.116.19



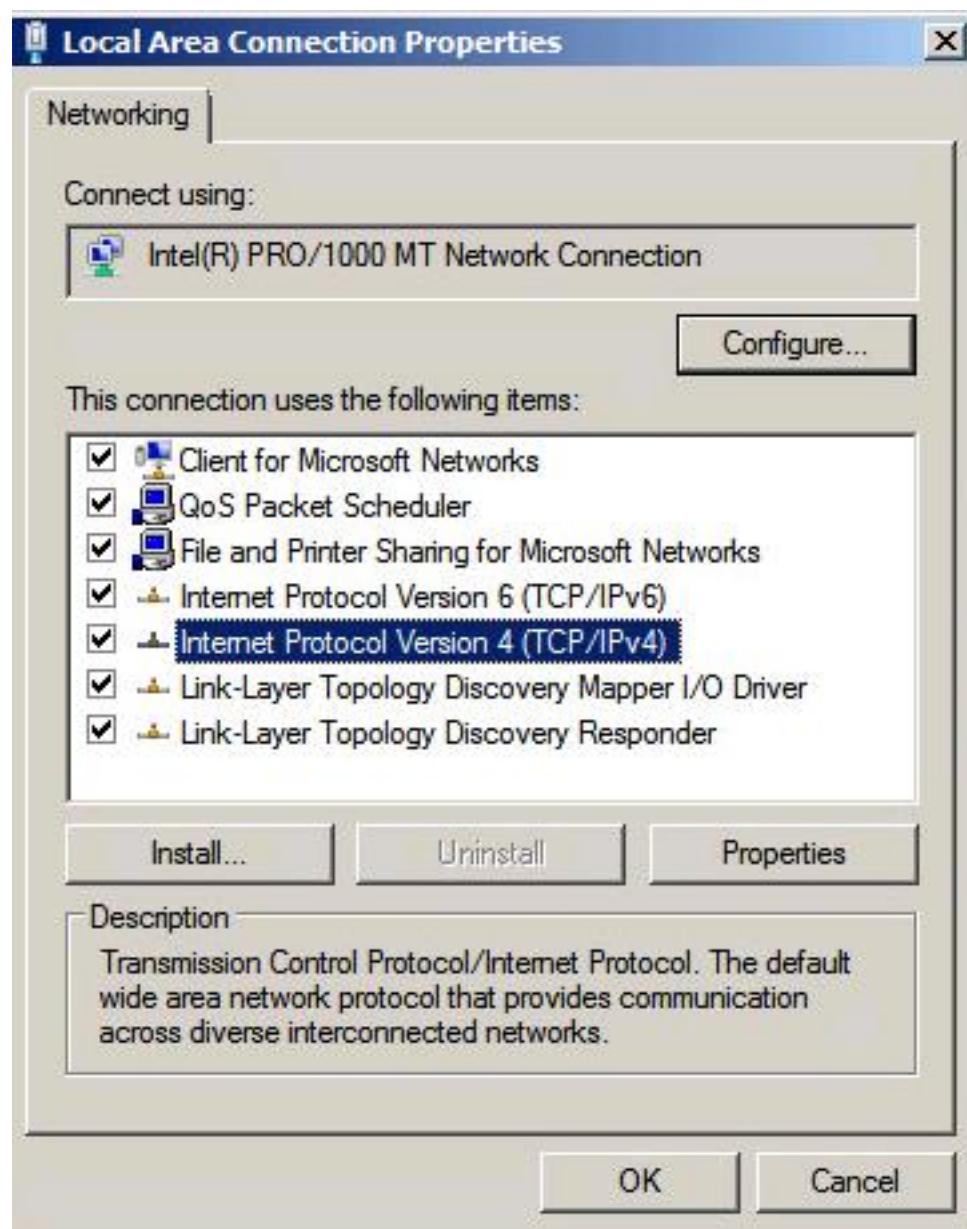
The screen shot below shows the certificate warning that pops up on the first login attempt to the server configured for Machine 1.



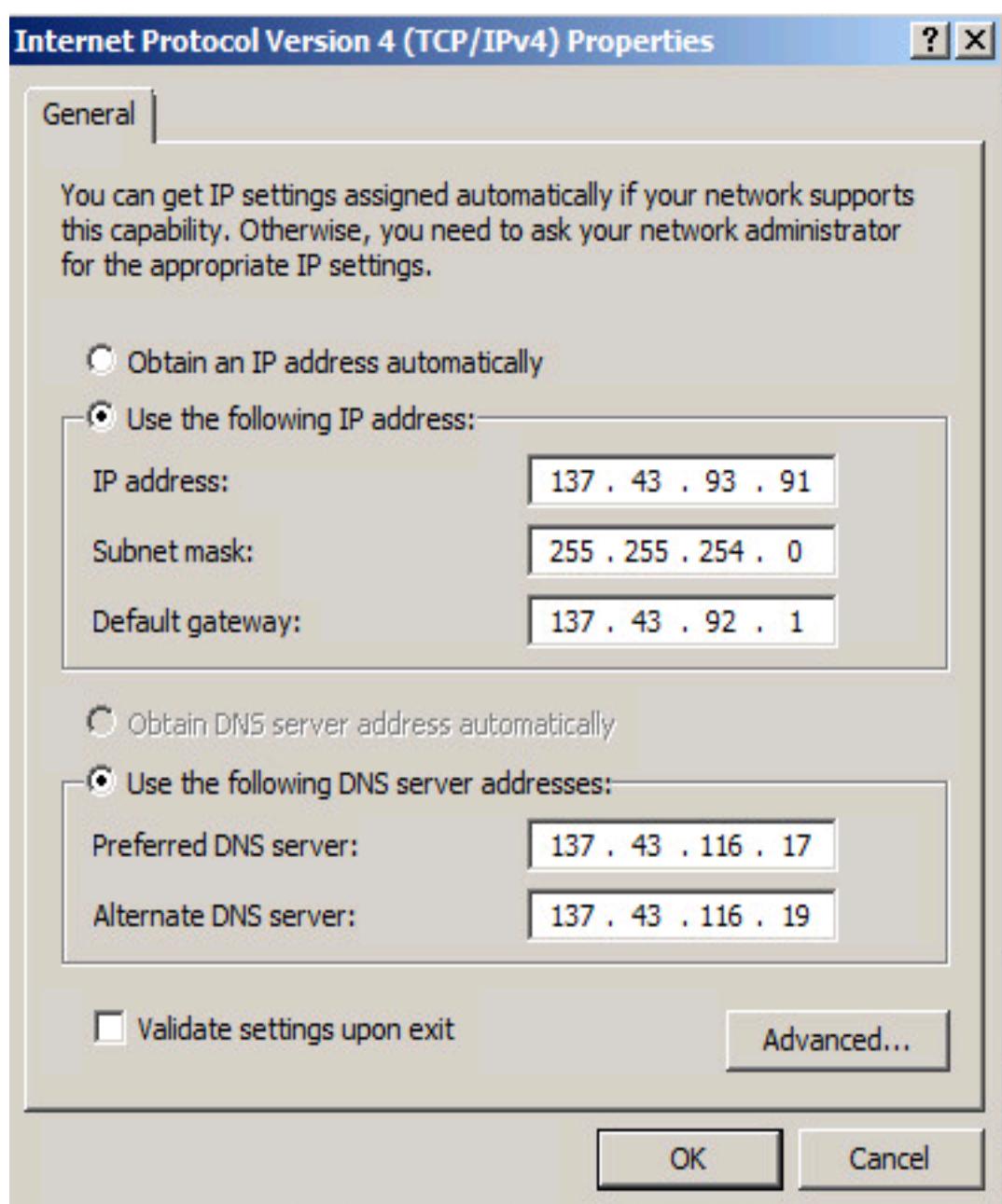
Open the command prompt to see the auto configured IPv4 address.



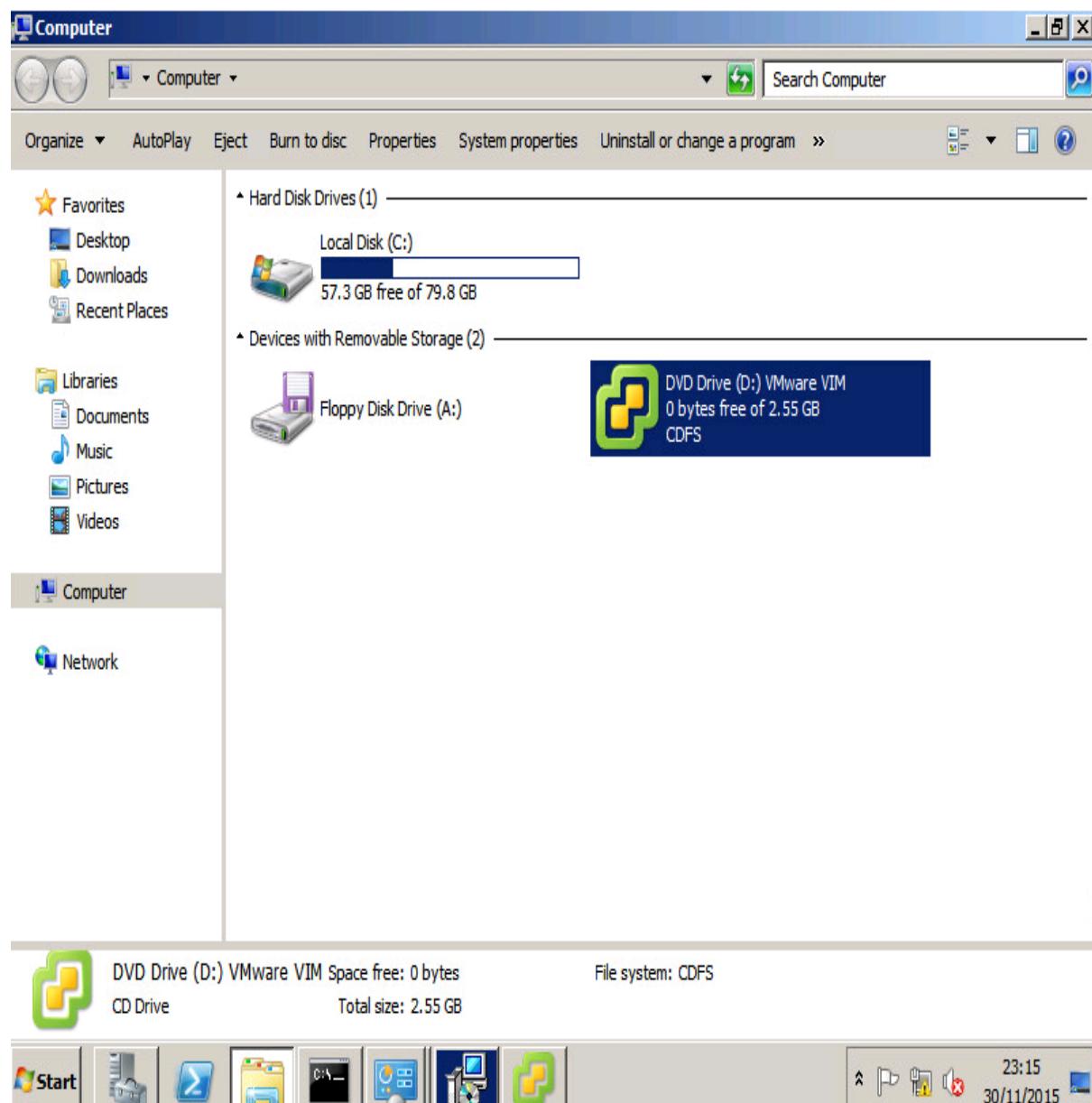
Open the IPv4 settings by double clicking on the icon.



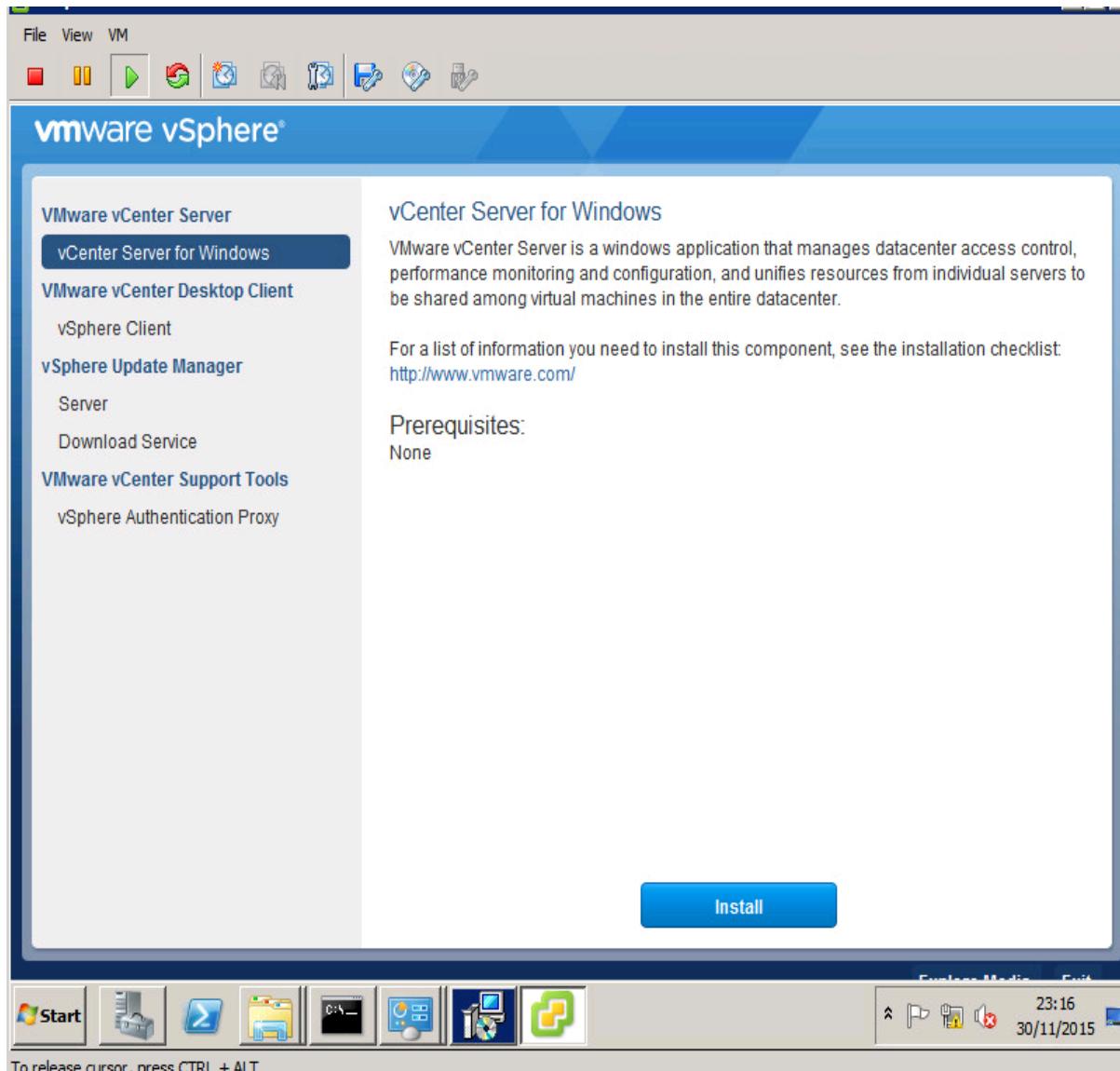
Enter in the details of the assigned server as below.

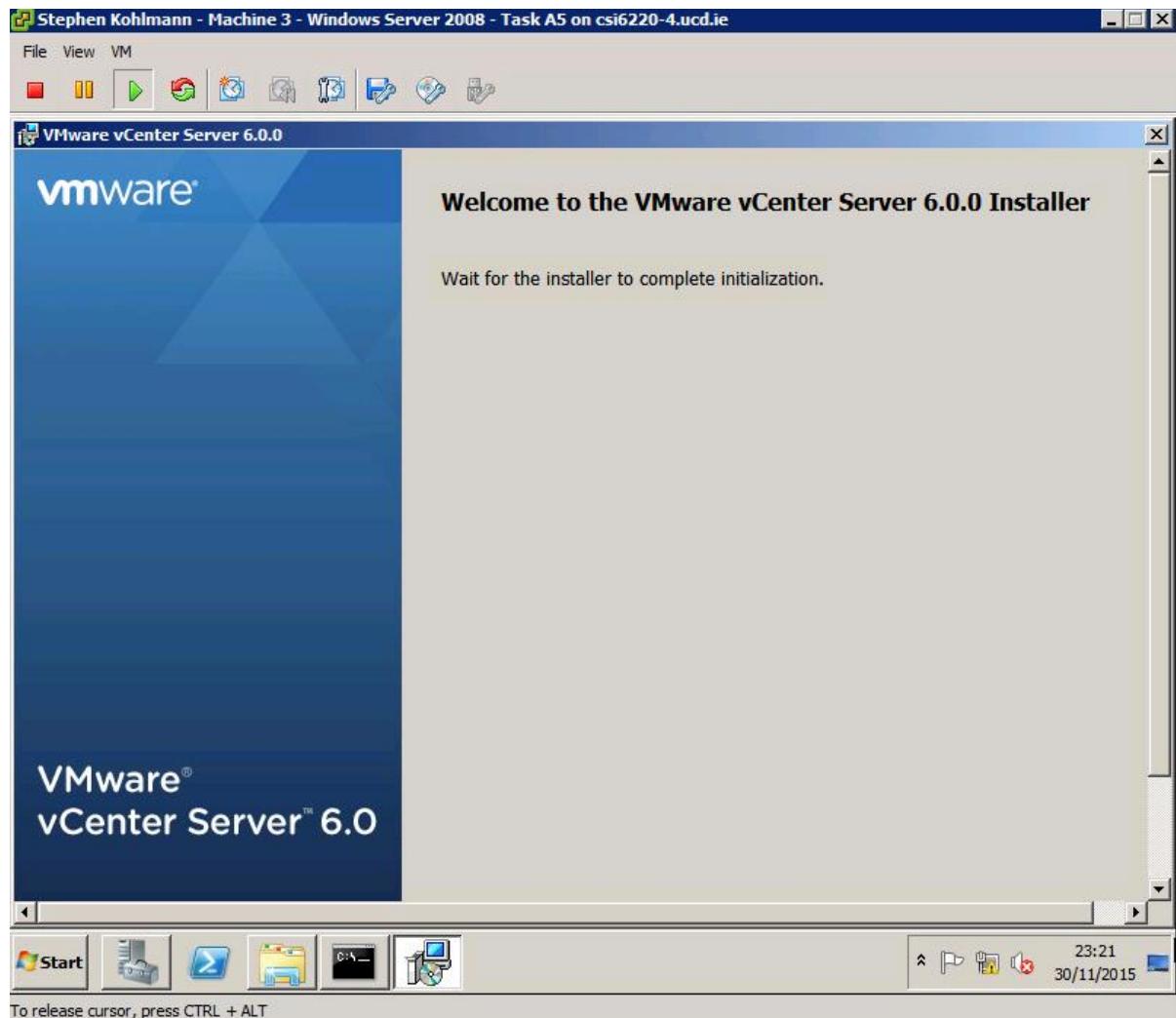


Navigate to the Computer and double click the DVD Drive below to start the vCenter installer.



Select vCenter Server for Windows and then click install. This will start the installation process for vCenter Server.





Above is a screenshot of the installer in process.

Read through and accept the terms and conditions to proceed.

The screenshot shows the 'VMware vCenter Server 6.0.0' interface with the title 'End User License Agreement'. A message at the top says 'Read the following license agreement before proceeding with the installation.' Below it is the 'VMWARE END USER LICENSE AGREEMENT' section. It contains two main paragraphs: one about the governing terms and another about important terms and conditions. The 'EVALUATION LICENSE' section follows, and then the 'DEFINITIONS' section, specifically item 1.1 and 1.2.

**VMWARE END USER LICENSE AGREEMENT**

PLEASE NOTE THAT THE TERMS OF THIS END USER LICENSE AGREEMENT SHALL GOVERN YOUR USE OF THE SOFTWARE, REGARDLESS OF ANY TERMS THAT MAY APPEAR DURING THE INSTALLATION OF THE SOFTWARE.

**IMPORTANT-READ CAREFULLY:** BY DOWNLOADING, INSTALLING, OR USING THE SOFTWARE, YOU (THE INDIVIDUAL OR LEGAL ENTITY) AGREE TO BE BOUND BY THE TERMS OF THIS END USER LICENSE AGREEMENT ("EULA"). IF YOU DO NOT AGREE TO THE TERMS OF THIS EULA, YOU MUST NOT DOWNLOAD, INSTALL, OR USE THE SOFTWARE, AND YOU MUST DELETE OR RETURN THE UNUSED SOFTWARE TO THE VENDOR FROM WHICH YOU ACQUIRED IT WITHIN THIRTY (30) DAYS AND REQUEST A REFUND OF THE LICENSE FEE, IF ANY, THAT YOU PAID FOR THE SOFTWARE.

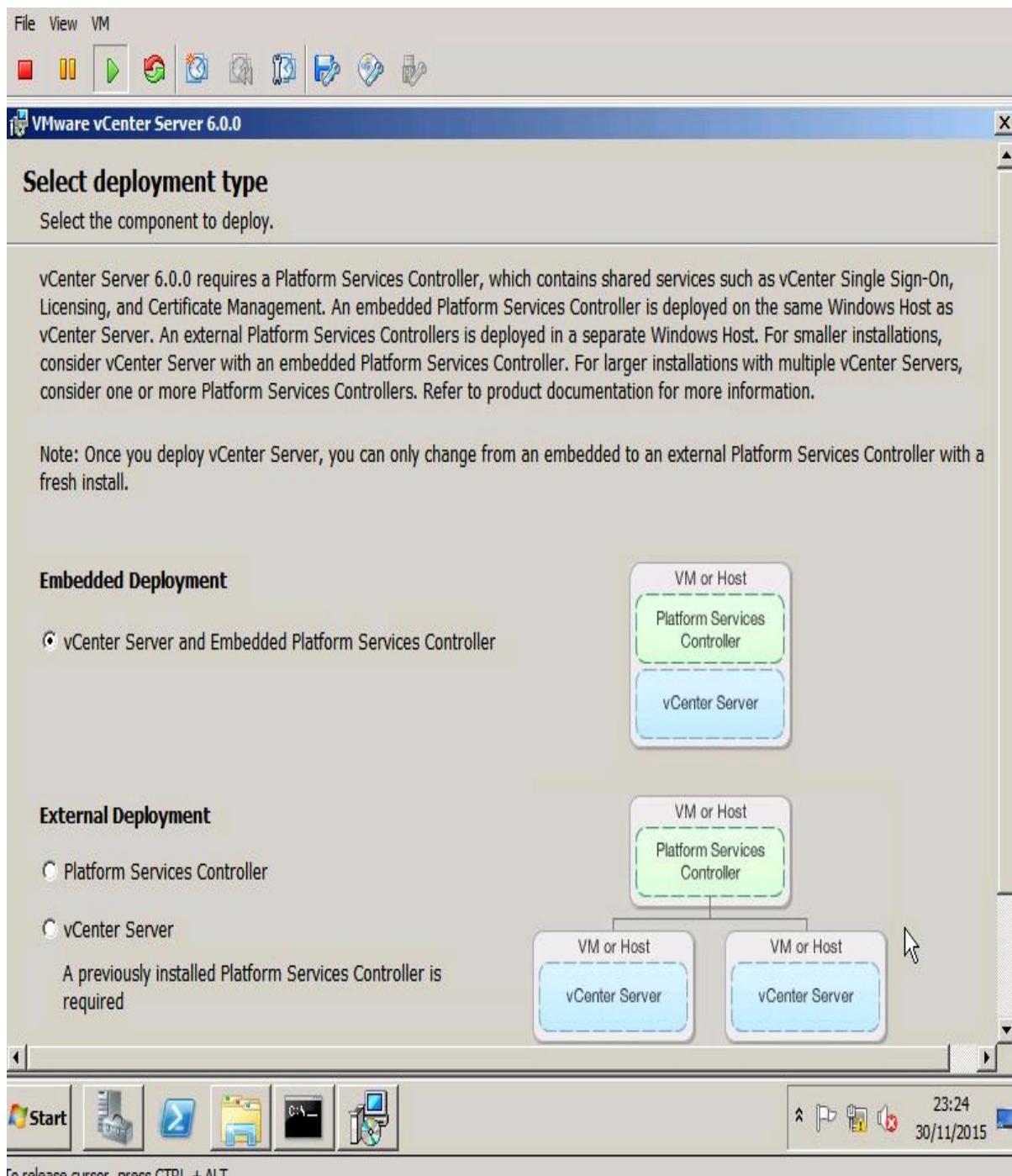
**EVALUATION LICENSE.** If You are licensing the Software for evaluation purposes, Your use of the Software is only permitted in a non-production environment and for the period limited by the License Key. Notwithstanding any other provision in this EULA, an Evaluation License of the Software is provided "AS-IS" without indemnification, support or warranty of any kind, expressed or implied.

**1. DEFINITIONS.**

1.1 "Affiliate" means, with respect to a party, an entity that is directly or indirectly controlled by or is under common control with such party, where "control" means an ownership, voting or similar interest representing fifty percent (50%) or more of the total interests then outstanding of the relevant entity (but only as long as such person or entity meets these requirements).

1.2 "Documentation" means that documentation that is generally provided to You by VMware with the Software, as revised by VMware from time to time, and which may include end user manuals, operation instructions, installation guides, release notes, and on-line help files regarding the use of the Software.

Select the appropriate deployment type depending on your environment in this case choose the embedded deployment type.



Create a new vCenter Single sign on domain. In this case the domain name is vsphere.local.

**vCenter Single Sign-On Configuration**  
Create or join a vCenter Single Sign-On domain.

**Create a new vCenter Single Sign-On domain**

Domain name:

vCenter Single Sign-On user name:

vCenter Single Sign-On password:

Confirm password:

Site name:

**Join a vCenter Single Sign-On domain**

Platform Services Controller FQDN or IP address:

vCenter Single Sign-On HTTPS port:

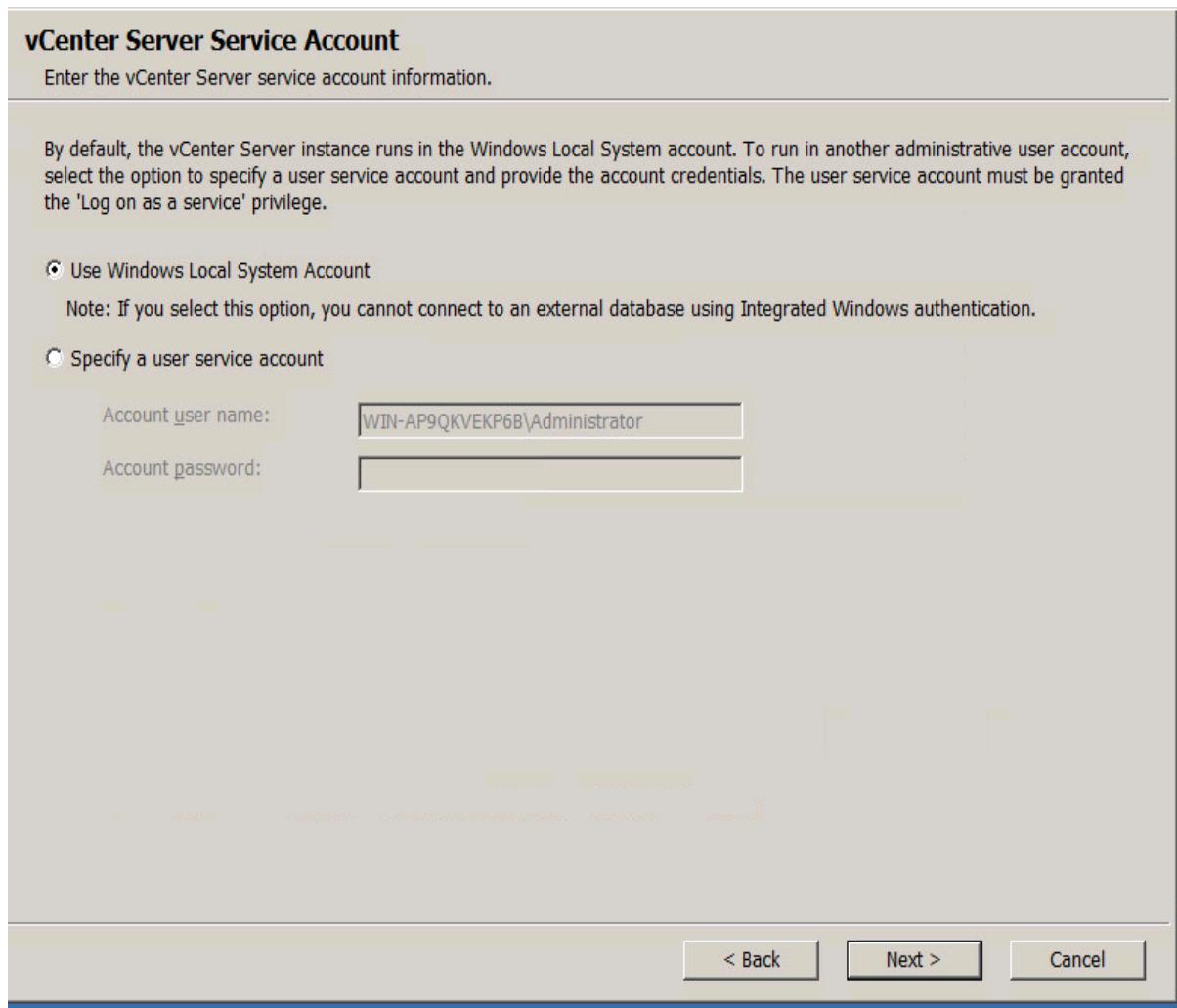
vCenter Single Sign-On user name:

vCenter Single Sign-On password:

**Note:** vCenter Single Sign-On configuration cannot be changed after deployment.

< Back    **Next >**    Cancel

Leave the default selection of Windows Local System Account for the vCenter Server Service Account.



Keep the database settings to the embedded type for this setup.

**Database Settings**

Configure the database for this deployment.

Use an embedded database (vPostgres)  
 Use an external database

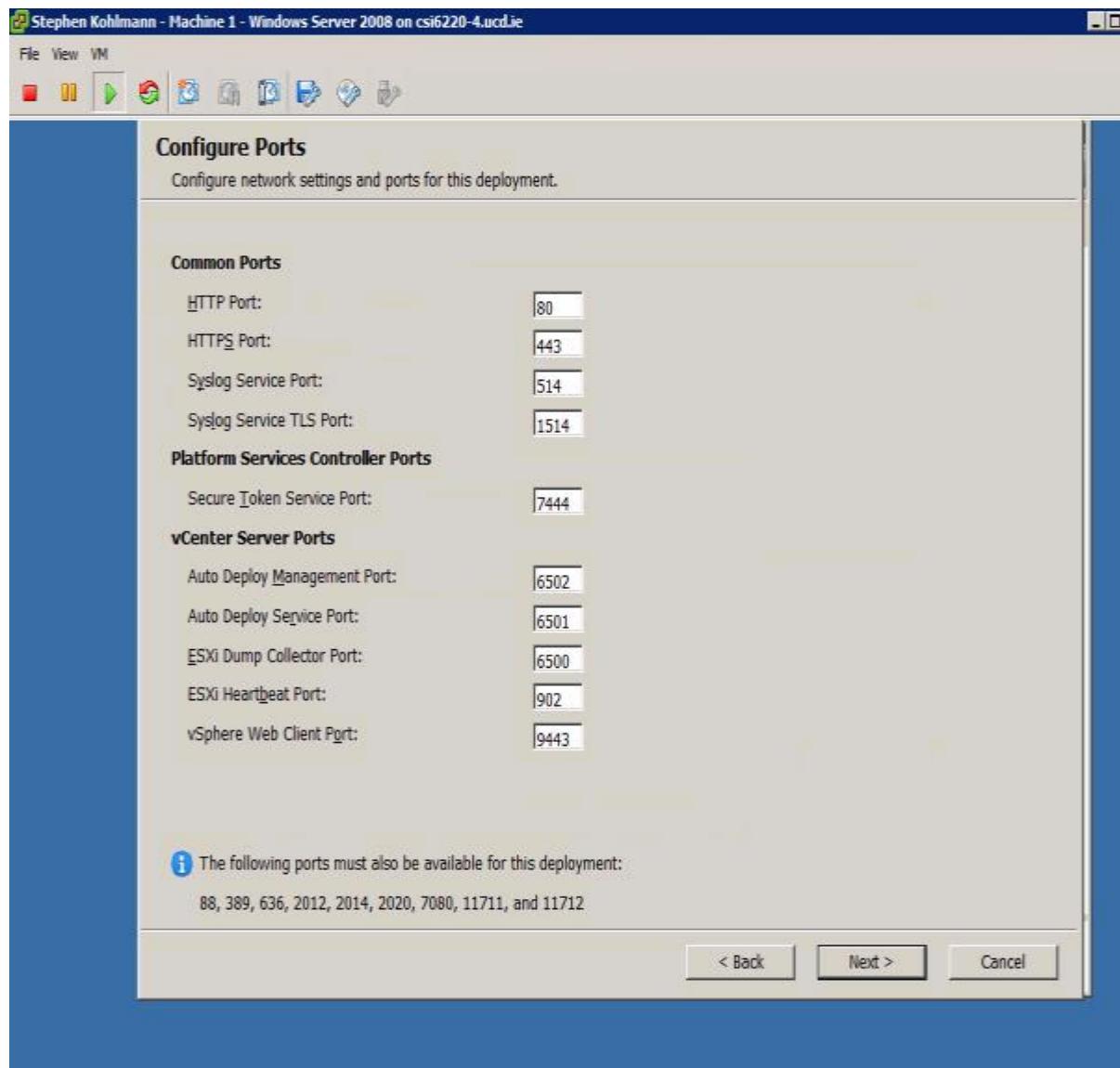
DSN Name:  Refresh

DB user name:

DB password:

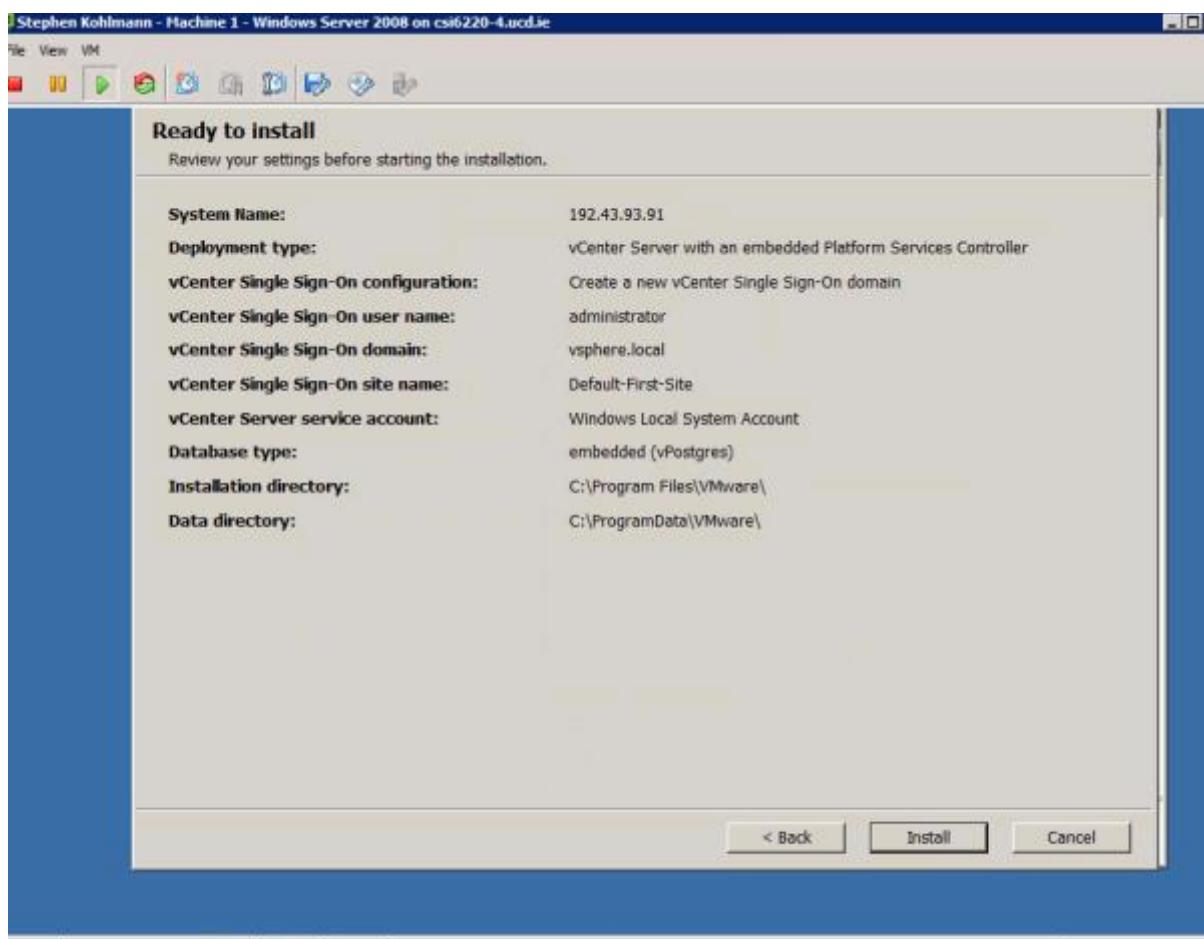
< Back Next > Cancel

This screenshot shows all port settings. It is advised to take note of these port settings for future reference.

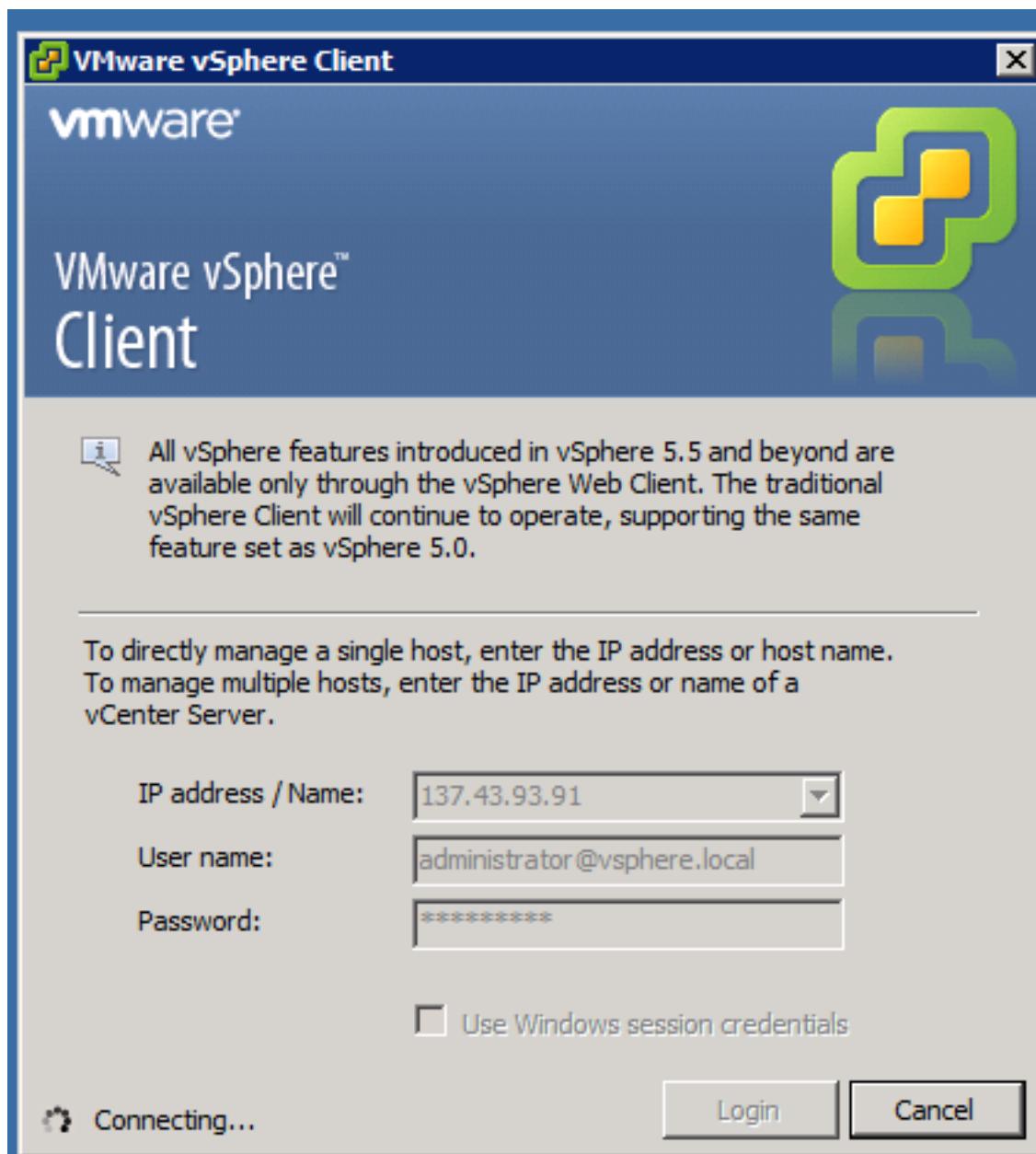


After clicking next, the ready to install screen appears.

Click install to continue.



Login to the vCenter Server via the vSphere client with the following credentials. The password is **Pa\$\$w0rd\_**.

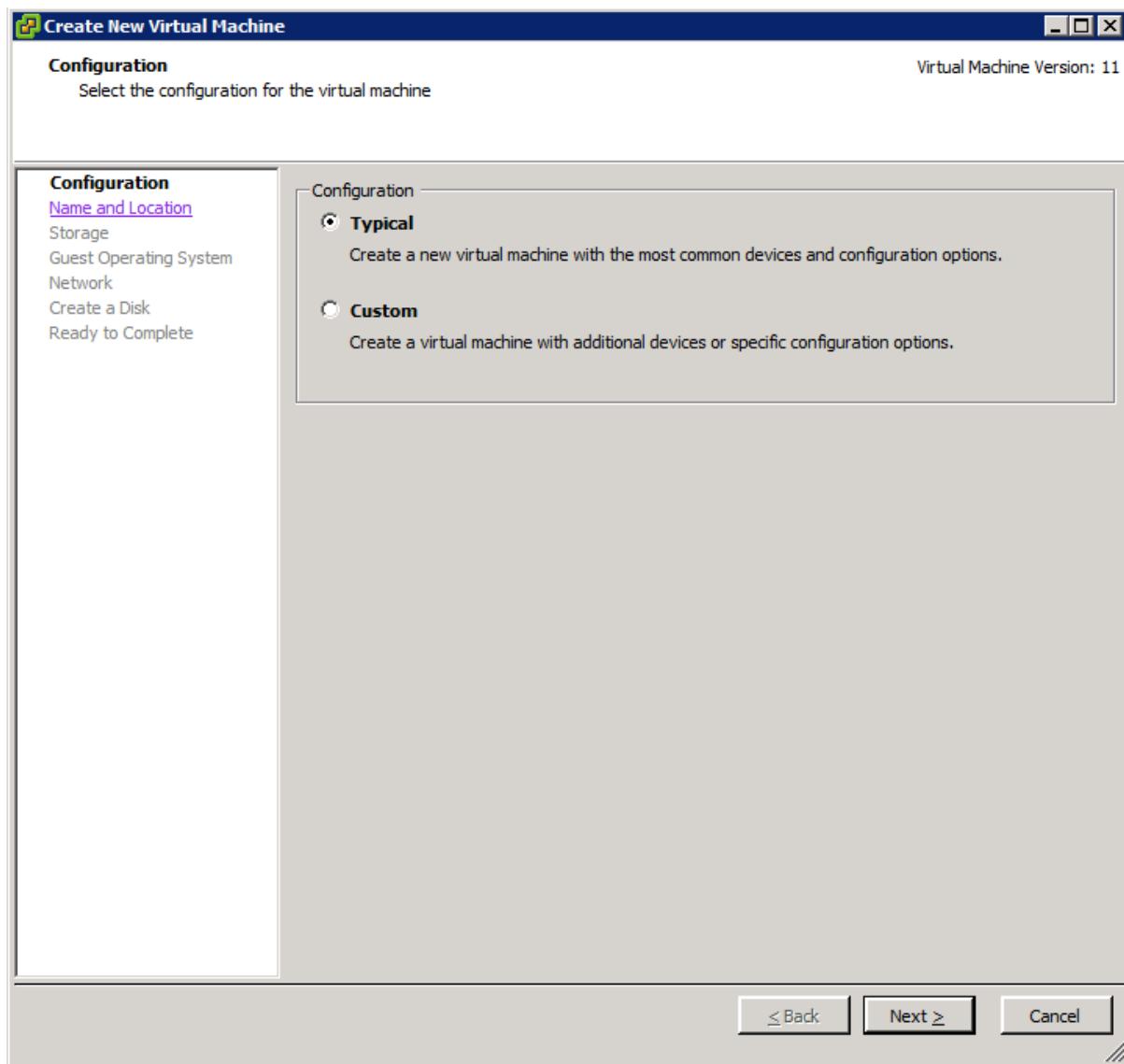


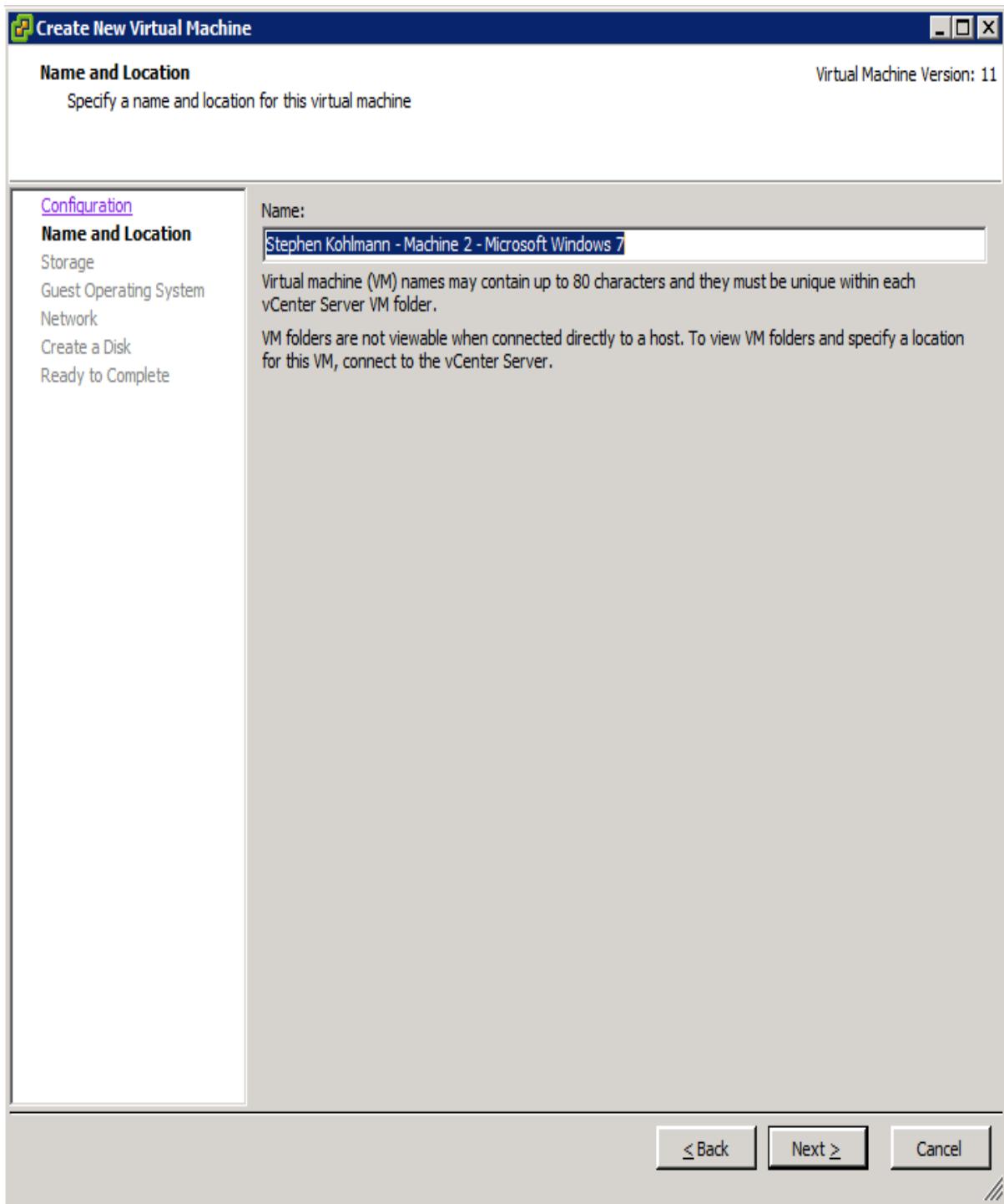
After login you will be presented with the following screen with access to vCenter Server.

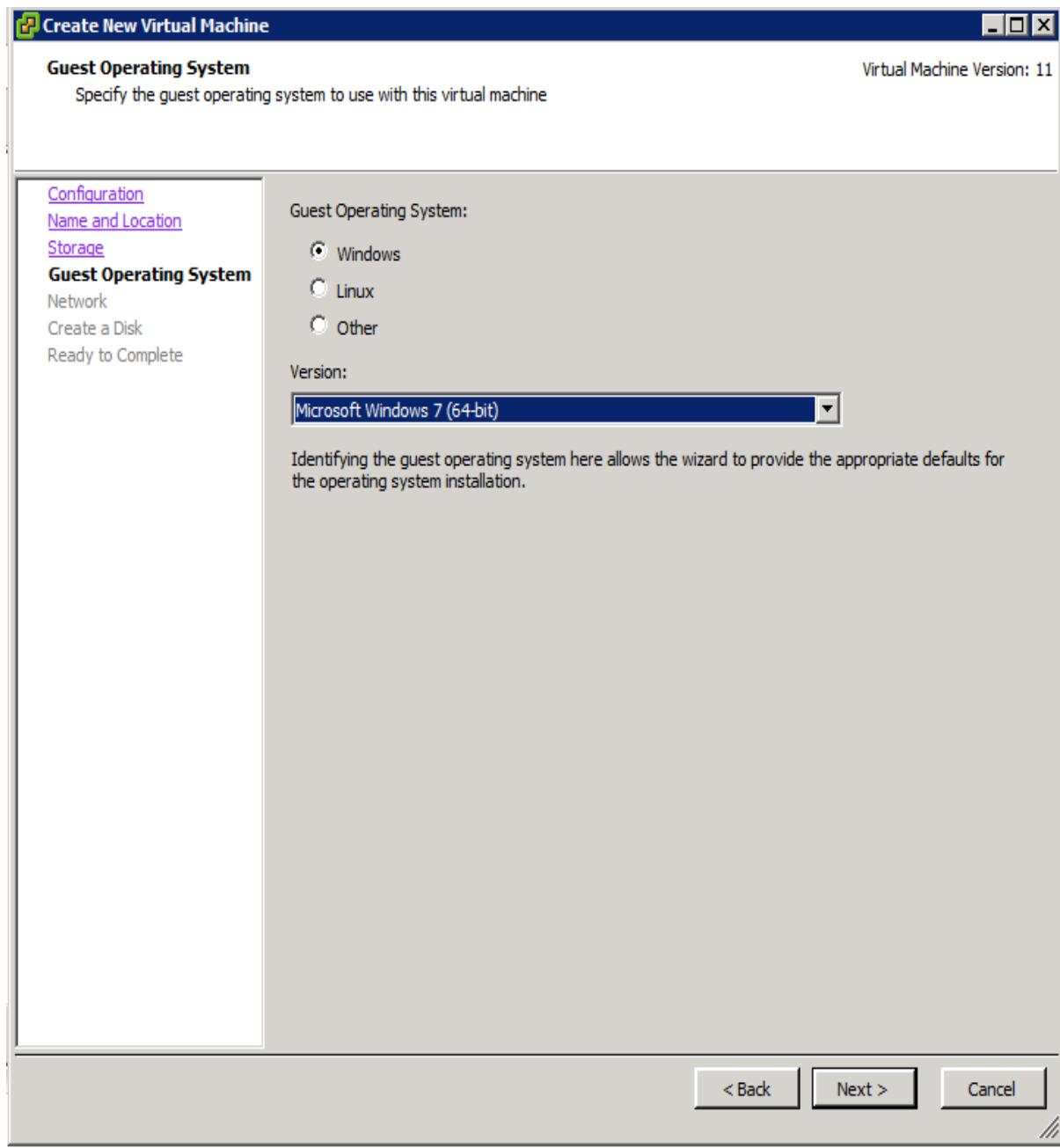
The screenshot shows the vSphere Client interface with the title bar "cs420-01-vm6.ucd.ie - vSphere Client". The menu bar includes File, Edit, View, Inventory, Administration, Plug-ins, and Help. The breadcrumb navigation shows Home > Inventory > Hosts and Clusters. A search bar "Search Inventory" is on the right. The main content area is titled "cs420-01-vm6.ucd.ie, 137.43.93.91 VMware vCenter Server, 6.0.0, 2559268". Below this are tabs for Getting Started, Datacenters, Virtual Machines, Hosts, Tasks & Events, Alarms, Permissions, and Maps. A "close tab" link is at the top right of the main content area. A numbered list of steps is displayed: 1 Create a datacenter, 2 Add a host, 3 Add a virtual machine, and 4 Complete set-up. A "Welcome to vCenter Server" message states: "You're ready to set up vCenter Server. The first step is creating a datacenter." It explains that a datacenter contains hosts and virtual machines. A callout box says "To get started, click Create a datacenter." Below this is a diagram showing a "Datacenter" represented by a yellow rectangle containing two "Host" servers, each with three "Virtual Machines". A client computer icon is shown connected to one of the hosts. At the bottom left is a "Recent Tasks" section, and at the bottom right is a search bar "Name, Target or Status contains: ▾".

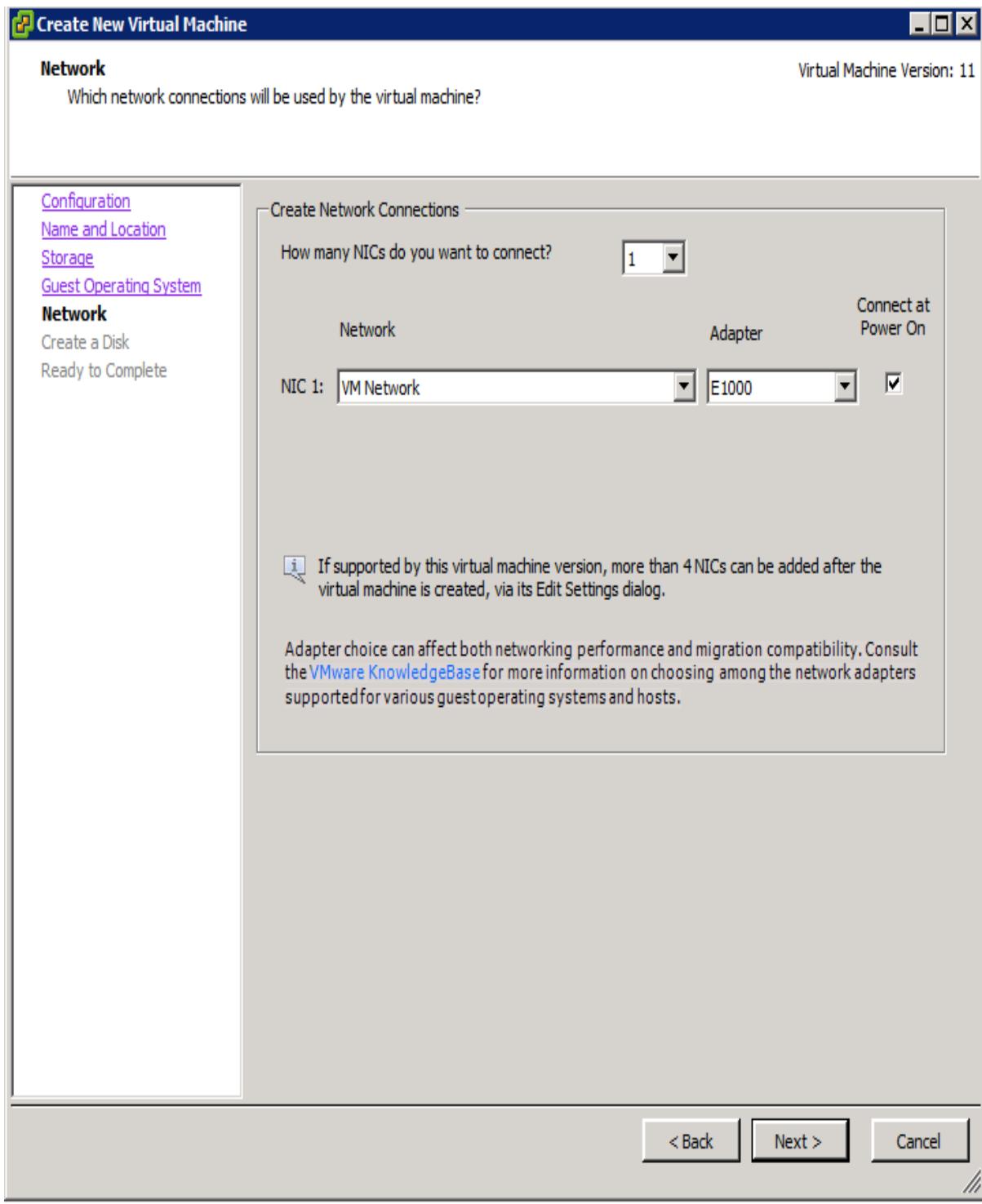
## **Machine 2**

This Machine is set up to Microsoft Windows 7 for use as a vSphere Client. The following set up is the same as Machine 1 above. Some of the settings vary from Machine 1 such as the name “Stephen Kohlmann - Machine 2 – Microsoft Windows 7” and the version “Microsoft Windows 7 (64Bit)”.









**Create New Virtual Machine**

**Create a Disk**  
Specify the virtual disk size and provisioning policy

Virtual Machine Version: 11

[Configuration](#)  
[Name and Location](#)  
[Storage](#)  
[Guest Operating System](#)  
[Network](#)  
**Create a Disk**  
Ready to Complete

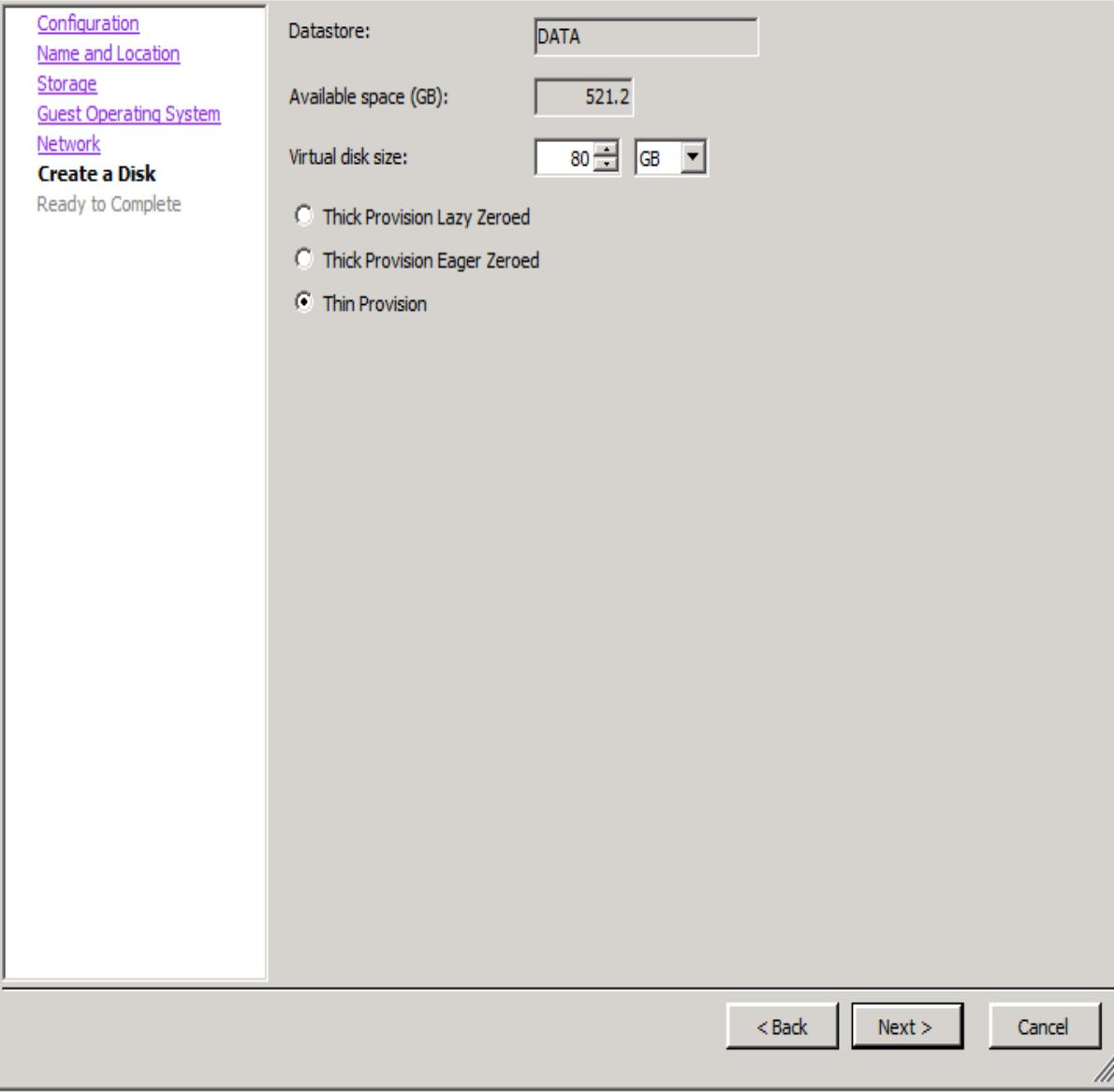
Datastore: DATA

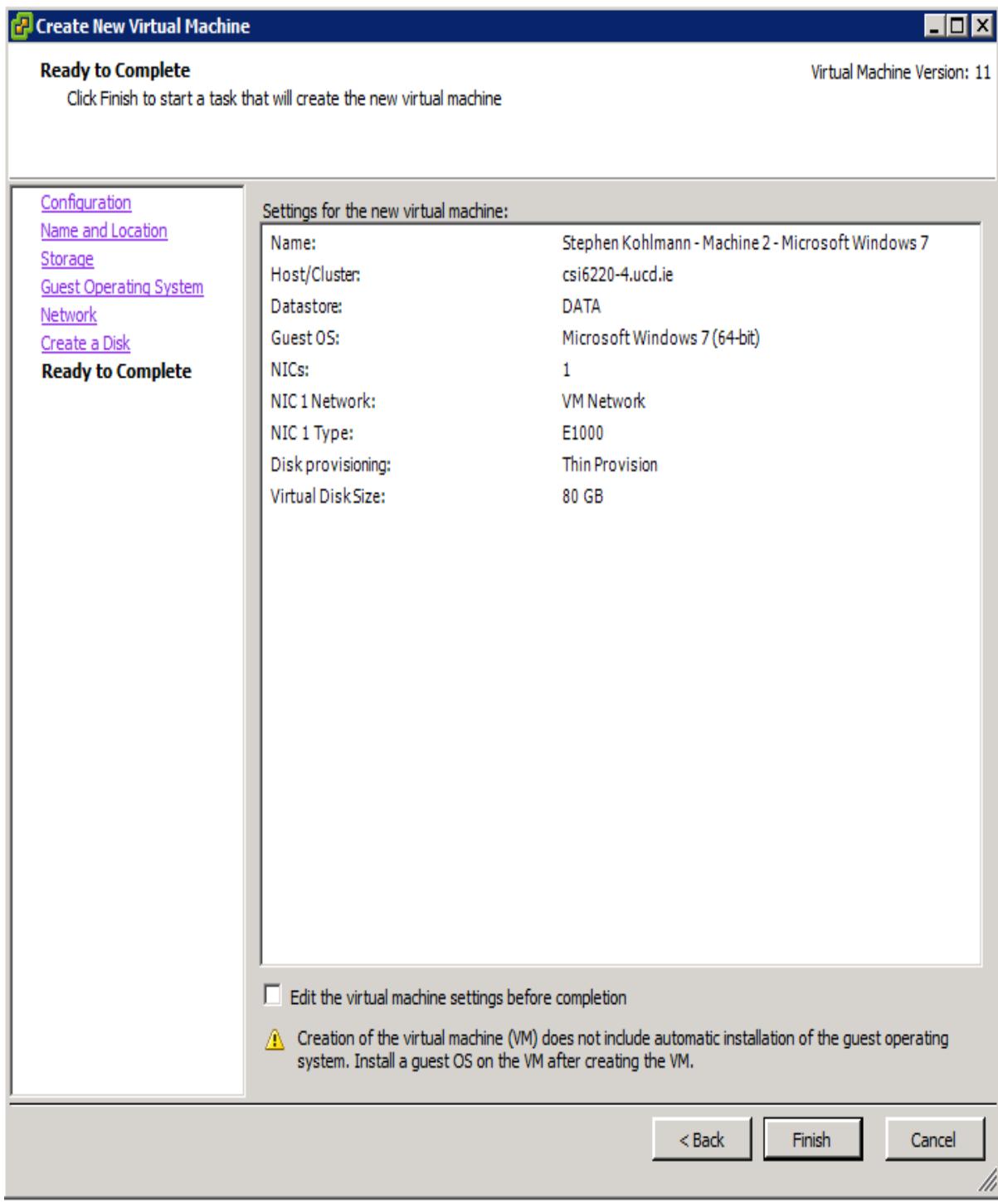
Available space (GB): 521.2

Virtual disk size: 80 GB

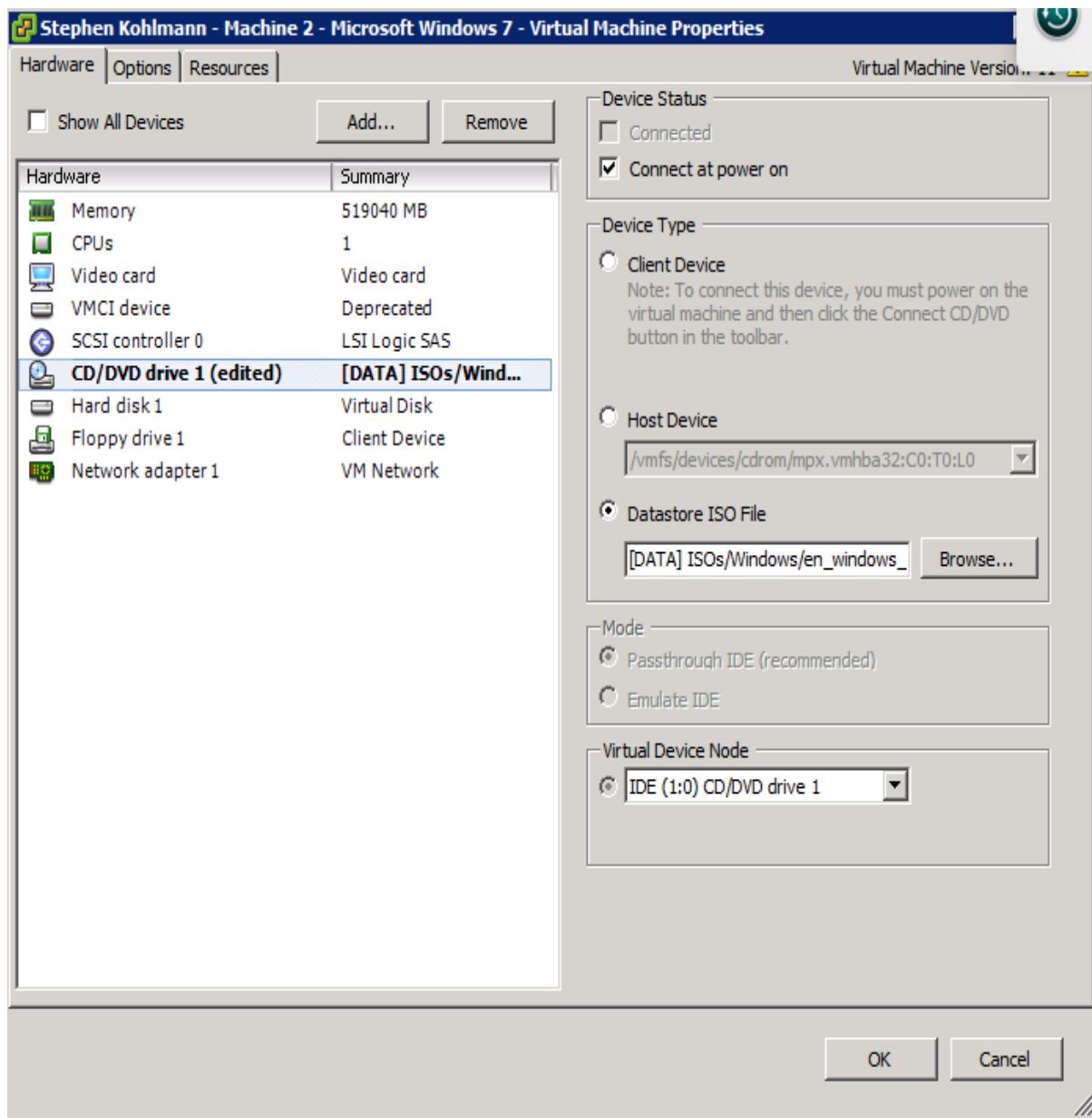
Thick Provision Lazy Zeroed  
 Thick Provision Eager Zeroed  
 Thin Provision

< Back    Next >    Cancel

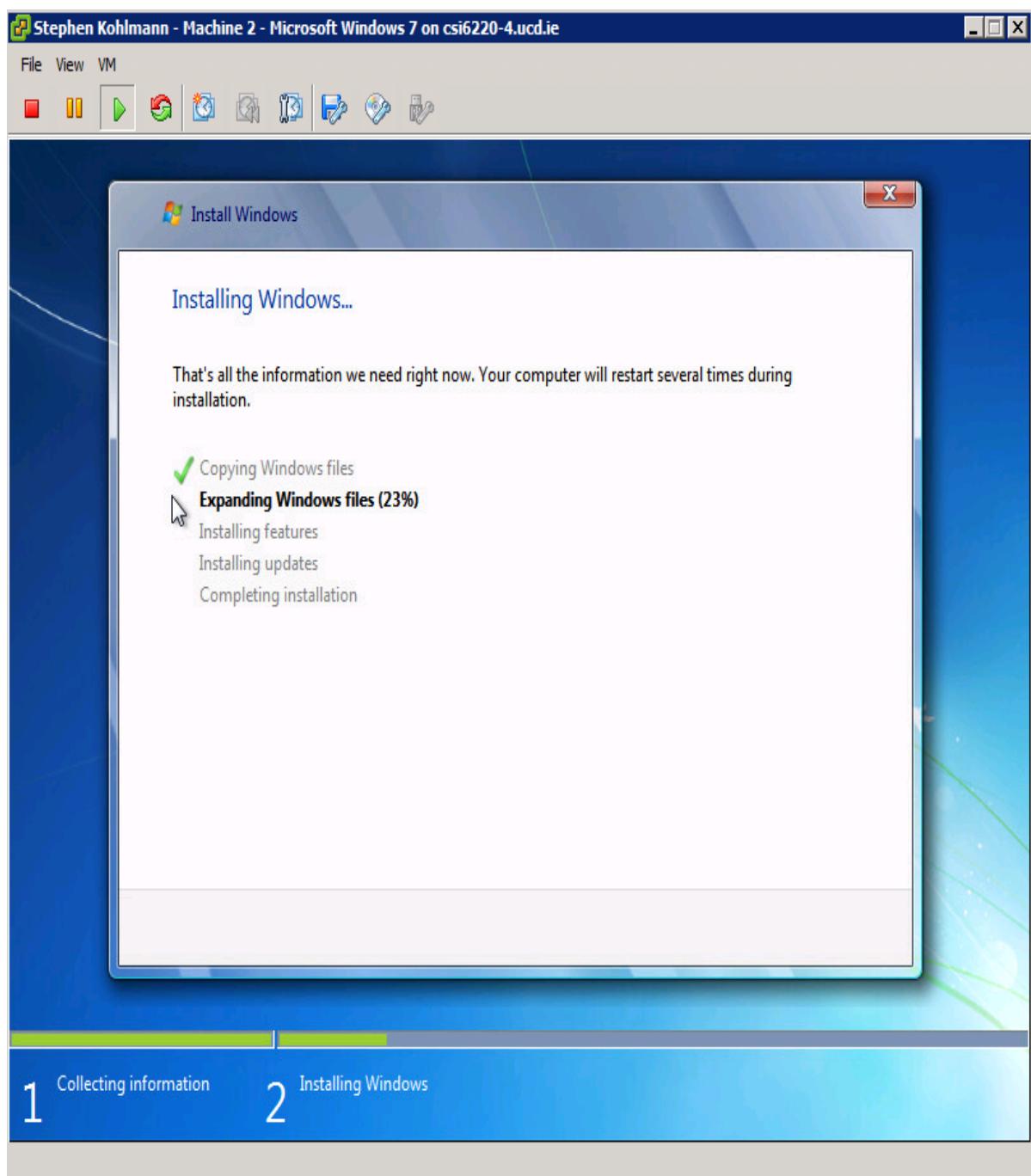




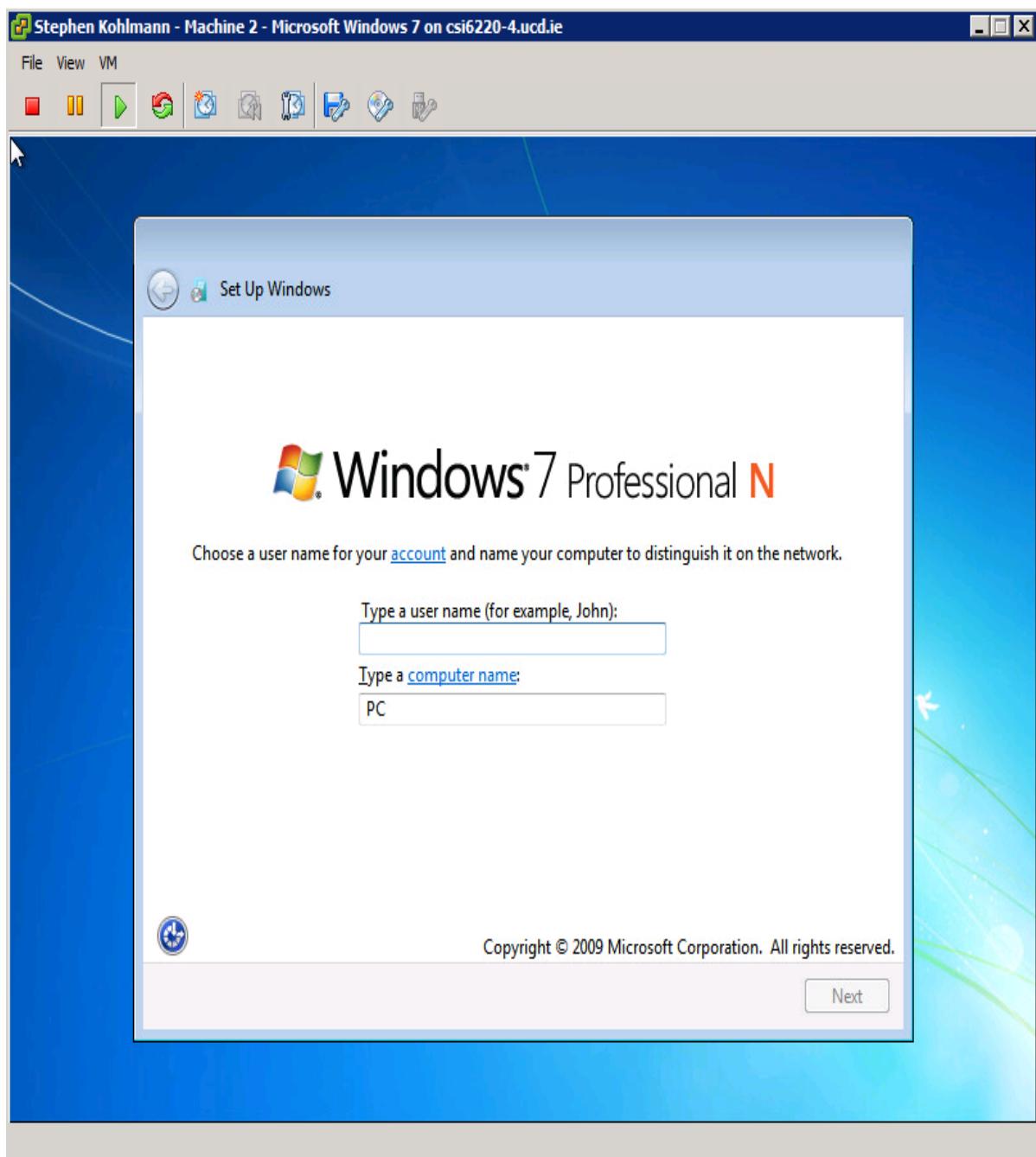
Before powering on the machine edit the virtual machine settings and add the Windows 7 ISO and make sure connect at power on is selected. If it is not selected the machine will not boot to the operating system.



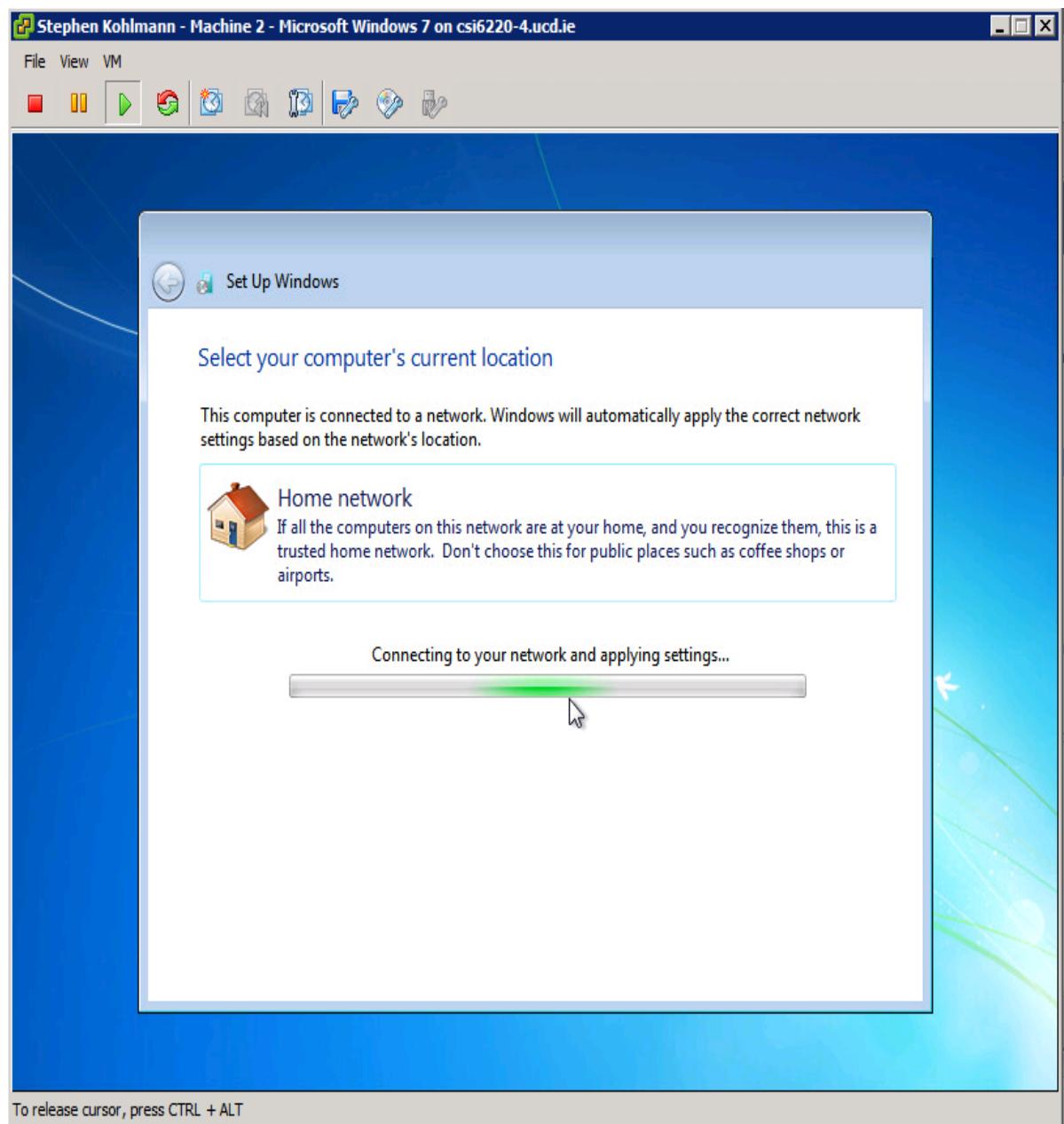
When the virtual machine is powered on Windows will begin the installation process.



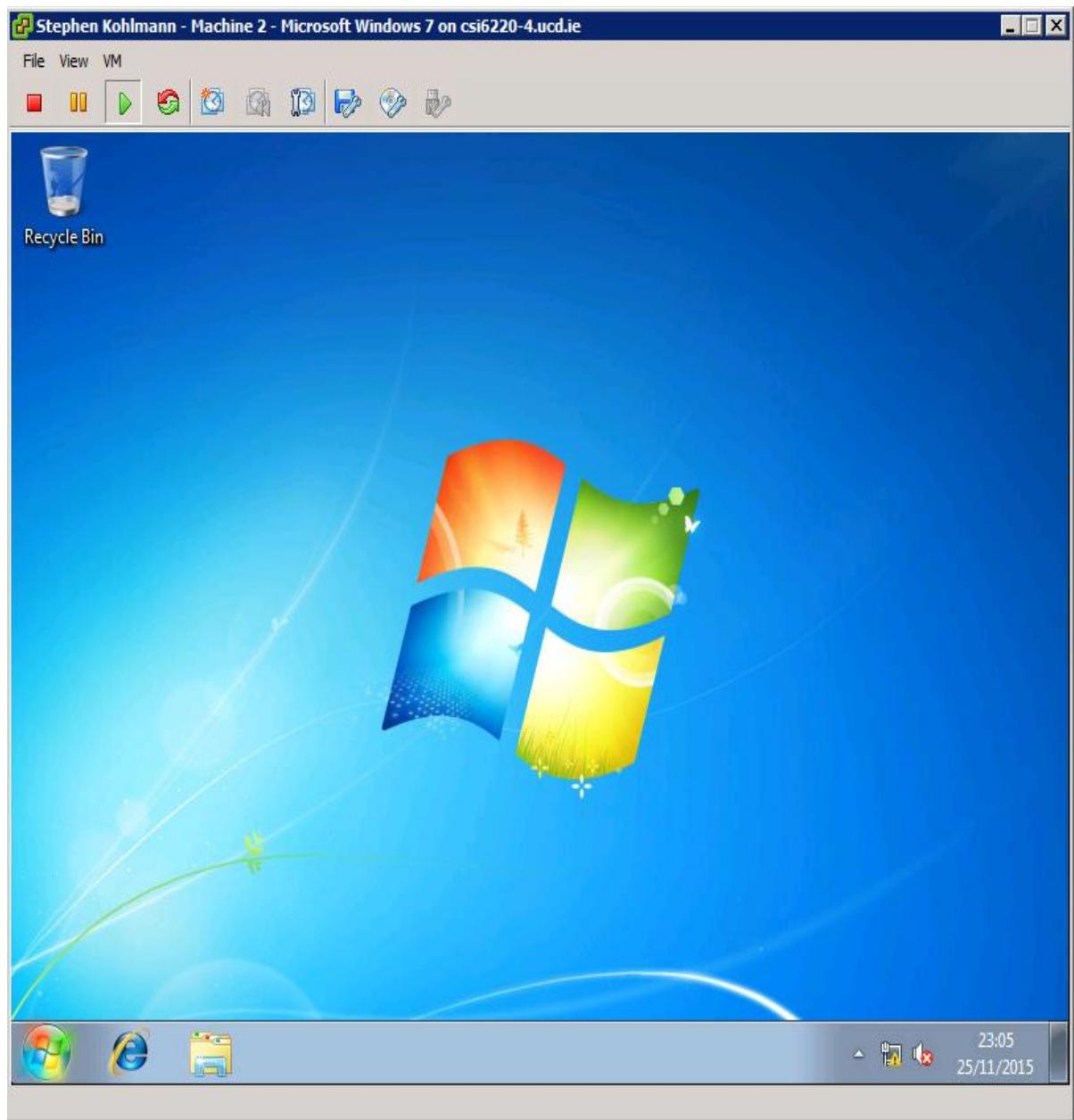
To finish the set up Windows you will be prompted to enter in a computer name. Enter in something relevant to the organization or user.



Select home network and continue and the machine will connect to the network and apply settings.



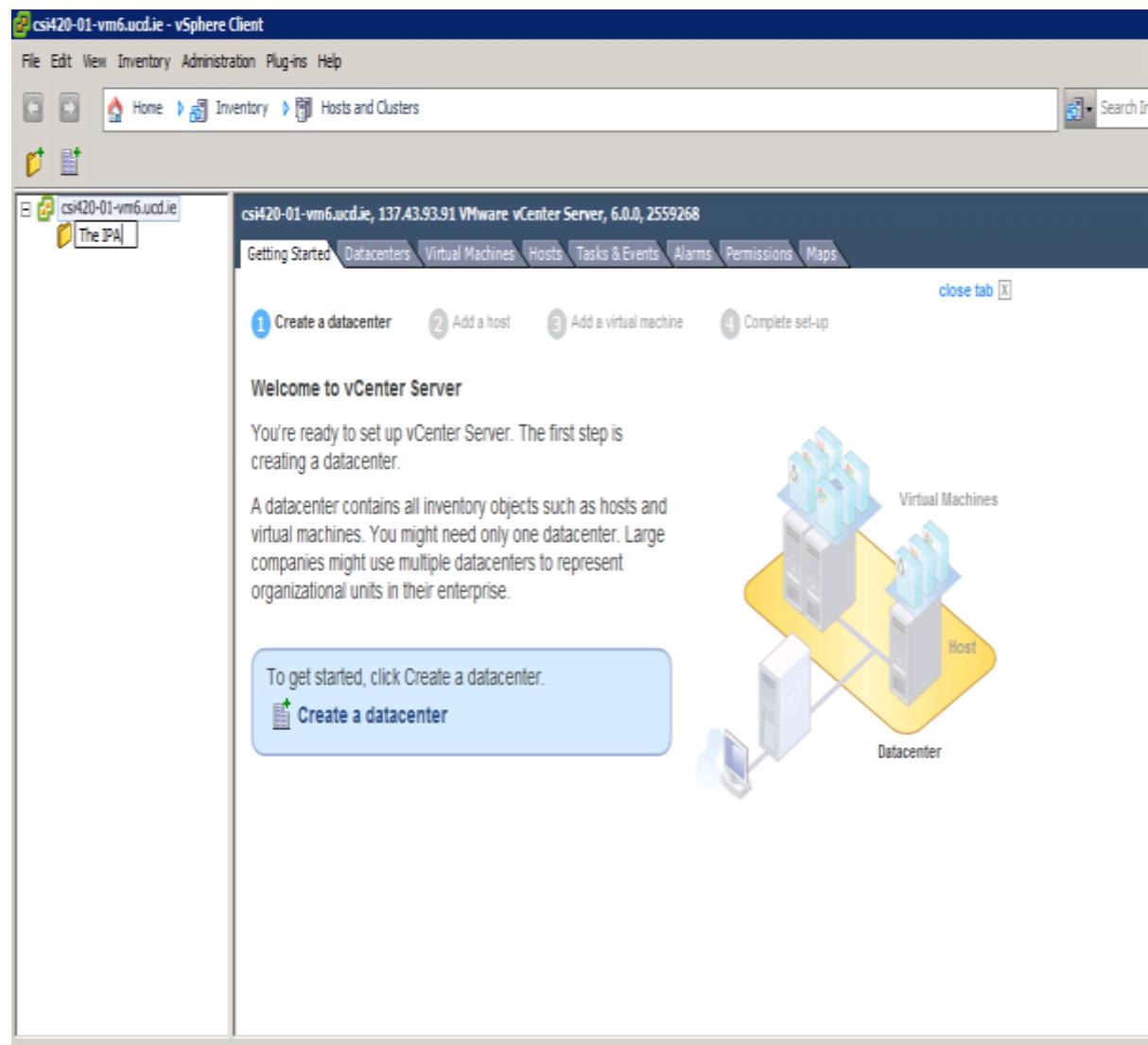
The Windows 7 installation is now complete and the desktop appears within the virtual machine.



## A. 3

An Environment within vCenter server to mimic a chosen organization and add the ESXi host which you have been assigned to this environment.

Create a folder to represent your chosen environment. As I will be using the ESXi host assigned **csi6220-4.ucd.ie** and this assignment is through the IPA I am naming my folder The IPA.



The next step is to create a datacenter and rename it in relation to your environment. In this case I have named the datacenter **DatacenterIPA**.

File Edit View Inventory Administration Plug-ins Help

Home > Inventory > Hosts and Clusters Search Inventory

cs420-01-vm6.ucd.ie DatacenterIPA

The IPA DatacenterIPA

DatacenterIPA

Getting Started Summary Virtual Machines Hosts IP Pools Performance Tasks & Events Alarms Permissions Maps close tab

1 Create a datacenter 2 Add a host 3 Add a virtual machine 4 Complete set-up

### Add a host

A host is a computer that uses virtualization software, such as ESX or ESXi, to run virtual machines. Adding a host to the inventory brings it under vCenter Server management.

You need a computer running ESX or ESXi software. If you don't have ESX or ESXi software, visit the [VMware Web site](#) for information about this product.

To add a host, you need to know the location of the host on the network and the administrative account (typically Administrator or root).

To continue vCenter Server setup, click Add a host.

[Add a host](#)

Virtual Machines

Host

Datacenter

Name	Target	Status	Details	Initiated by	Requested Start Ti...	Start Time	Completed Time
Rename datacenter	DatacenterIPA	Completed		VSPHERE LO...	07/12/2015 15:48:28	07/12/2015 15:48:28	07/12/2015 15:48:28
Rename datacenter	NewDatacenter	Completed		VSPHERE LO...	07/12/2015 15:47:47	07/12/2015 15:47:47	07/12/2015 15:47:47
Create datacenter	cs420-01-vm6.ucd.ie	Completed		VSPHERE LO...	07/12/2015 15:47:33	07/12/2015 15:47:33	07/12/2015 15:47:33

Recent Tasks Name, Target or Status contains ▾

Tasks Alarms Evaluation Mode: 56 days remaining VSPHERE

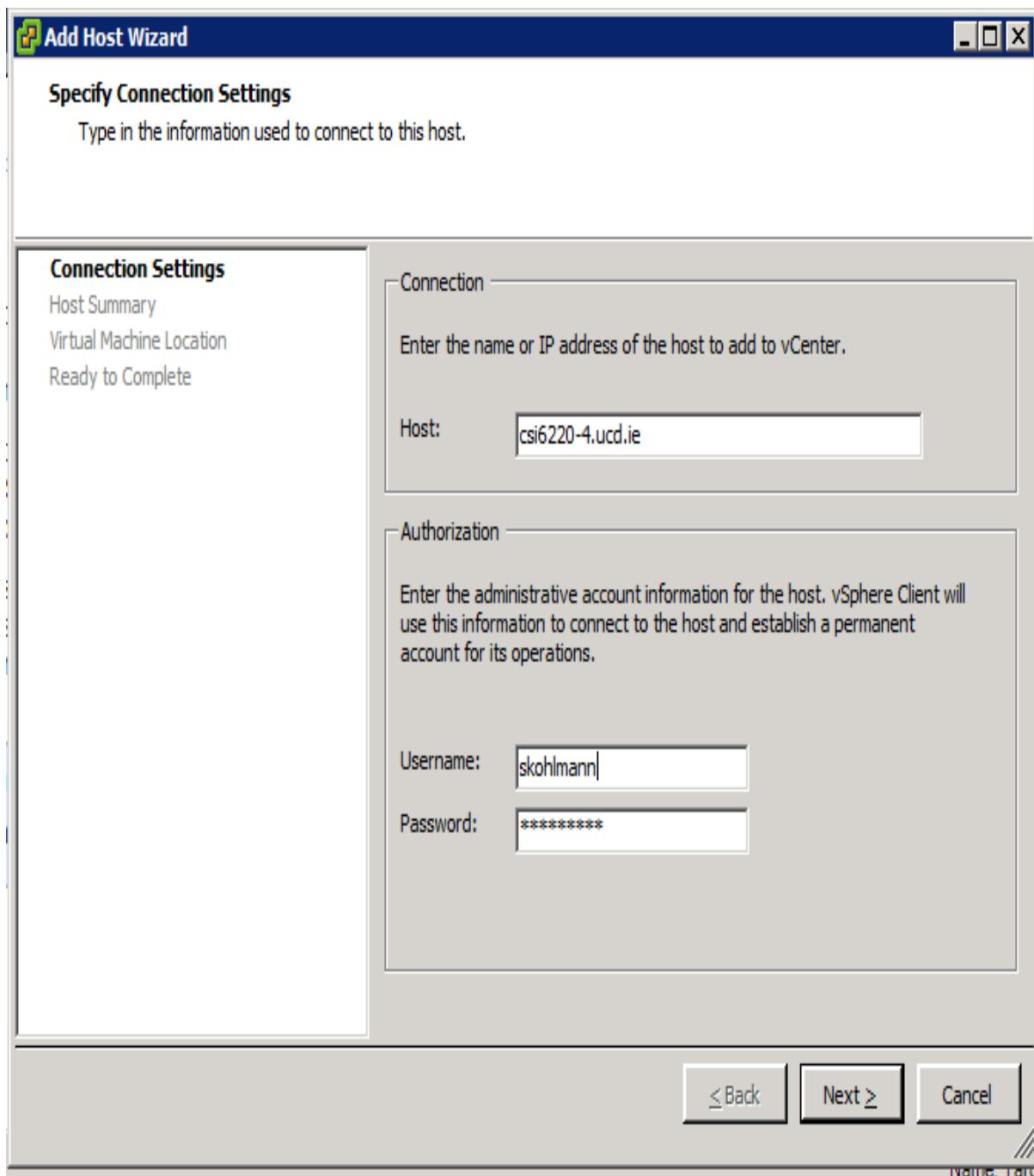
Start

Add your new datacenter to the folder you have created as below.

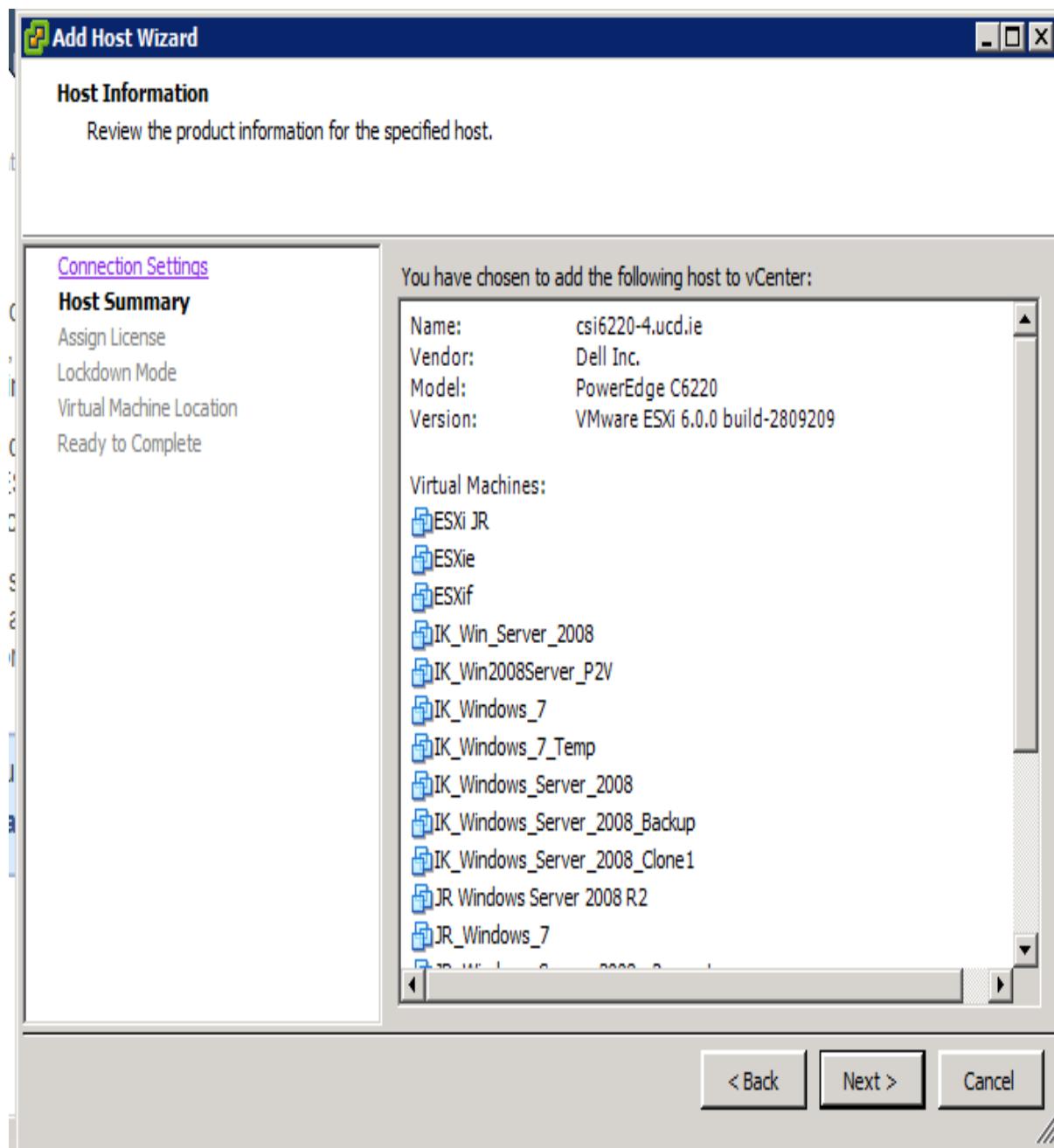
The screenshot shows the vSphere Client interface with the title bar "csi420-01-vm6.ucd.ie - vSphere Client". The navigation bar includes File, Edit, View, Inventory, Administration, Plugins, and Help. The breadcrumb path is Home > Inventory > Hosts and Clusters. A search bar is present. On the left, a sidebar shows a tree structure with "csi420-01-vm6.ucd.ie" expanded, revealing "The IPA" and "DatacenterIPA". The main content area is titled "DatacenterIPA" and has tabs for Getting Started, Summary, Virtual Machines, Hosts, IP Pools, Performance, Tasks & Events, Alarms, Permissions, and Maps. The "Getting Started" tab is selected. It displays four steps: 1. Create a datacenter (disabled), 2. Add a host (selected), 3. Add a virtual machine (disabled), and 4. Complete set-up (disabled). A callout box says "To continue vCenter Server setup, click Add a host." with a button labeled "Add a host". To the right, there is a diagram illustrating the relationship between Virtual Machines, Host, and Datacenter. Below the main content is a "Recent Tasks" table.

Name	Target	Status	Details	Initiated by	Requested Start Ti...	Start Time	Completed Time
Move entities	The IPA	Completed		VSPHERE.LO...	07/12/2015 15:49:06	07/12/2015 15:49:06	07/12/2015 15:49:16
Rename datacenter	DatacenterIPA	Completed		VSPHERE.LO...	07/12/2015 15:49:28	07/12/2015 15:49:28	07/12/2015 15:49:28
Rename datacenter	New Datacenter	Completed		VSPHERE.LO...	07/12/2015 15:47:47	07/12/2015 15:47:47	07/12/2015 15:47:47

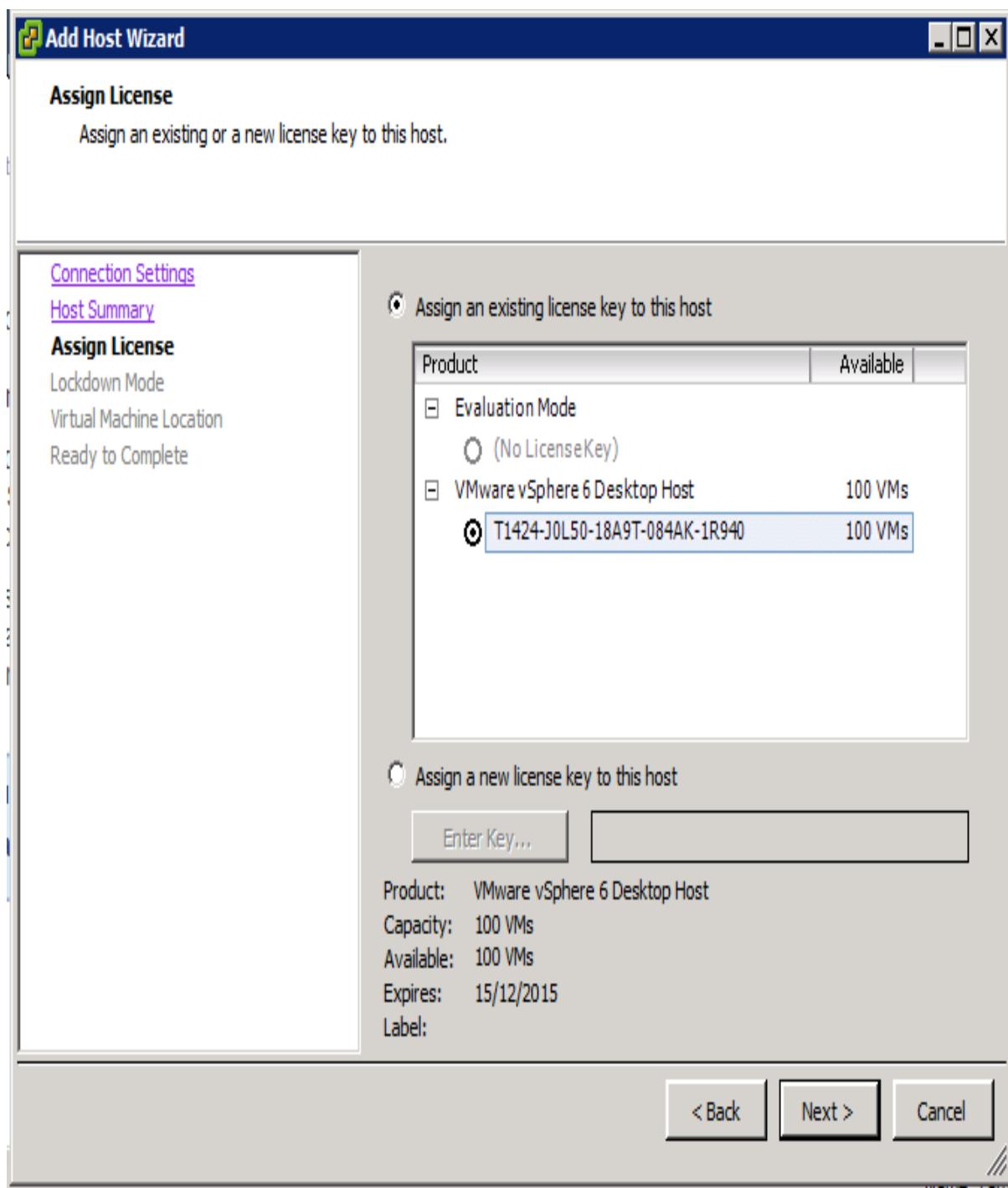
Next we want to add a host and in this case I will be adding the host assigned to me with the following details. Host: **csi6220-4.ucd.ie** Username: **skohlmann** Password: **Pa\$\$w0rd\_**



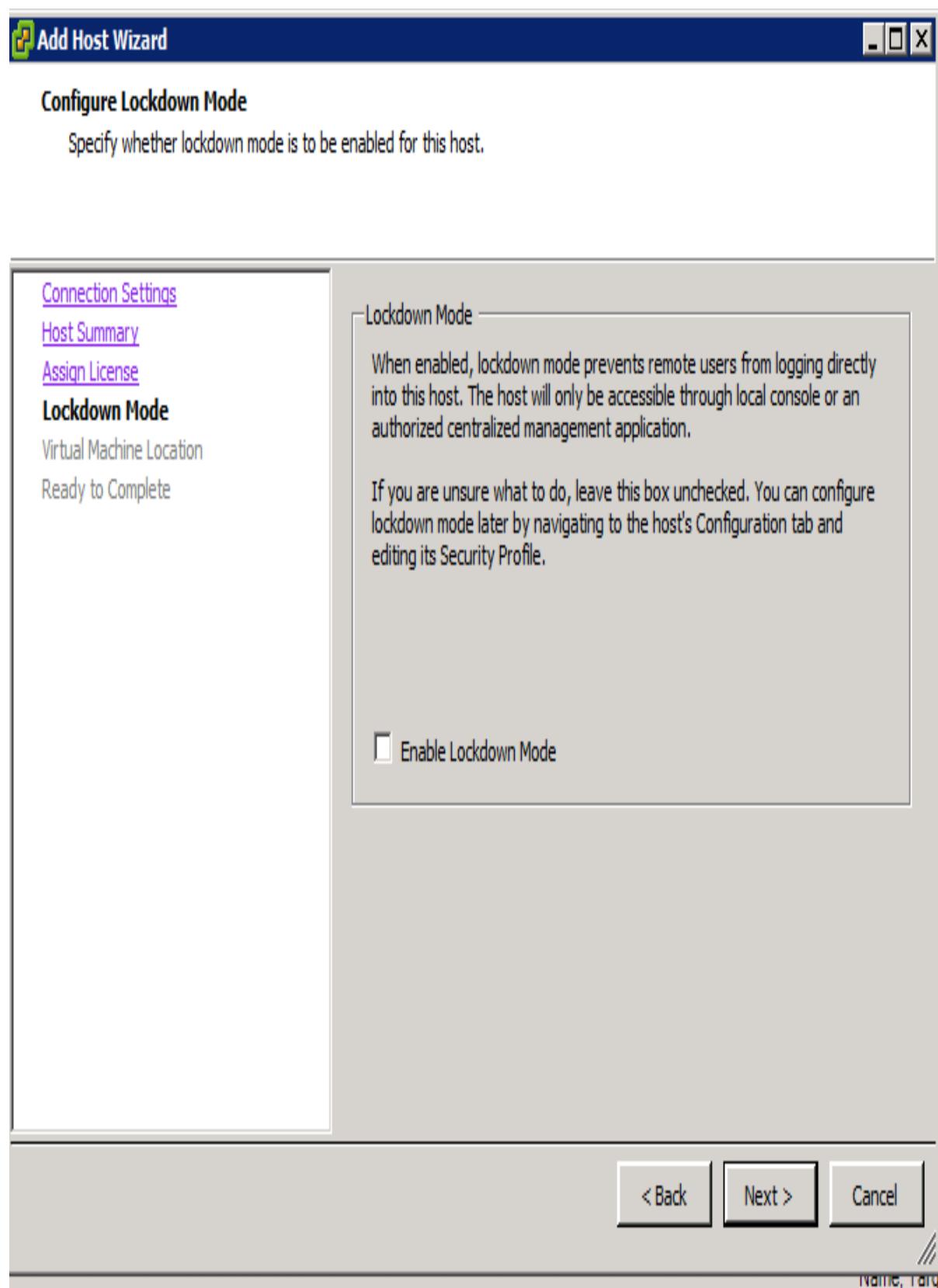
Click next to see the host summary. Here you will see all the virtual machines currently on the host.



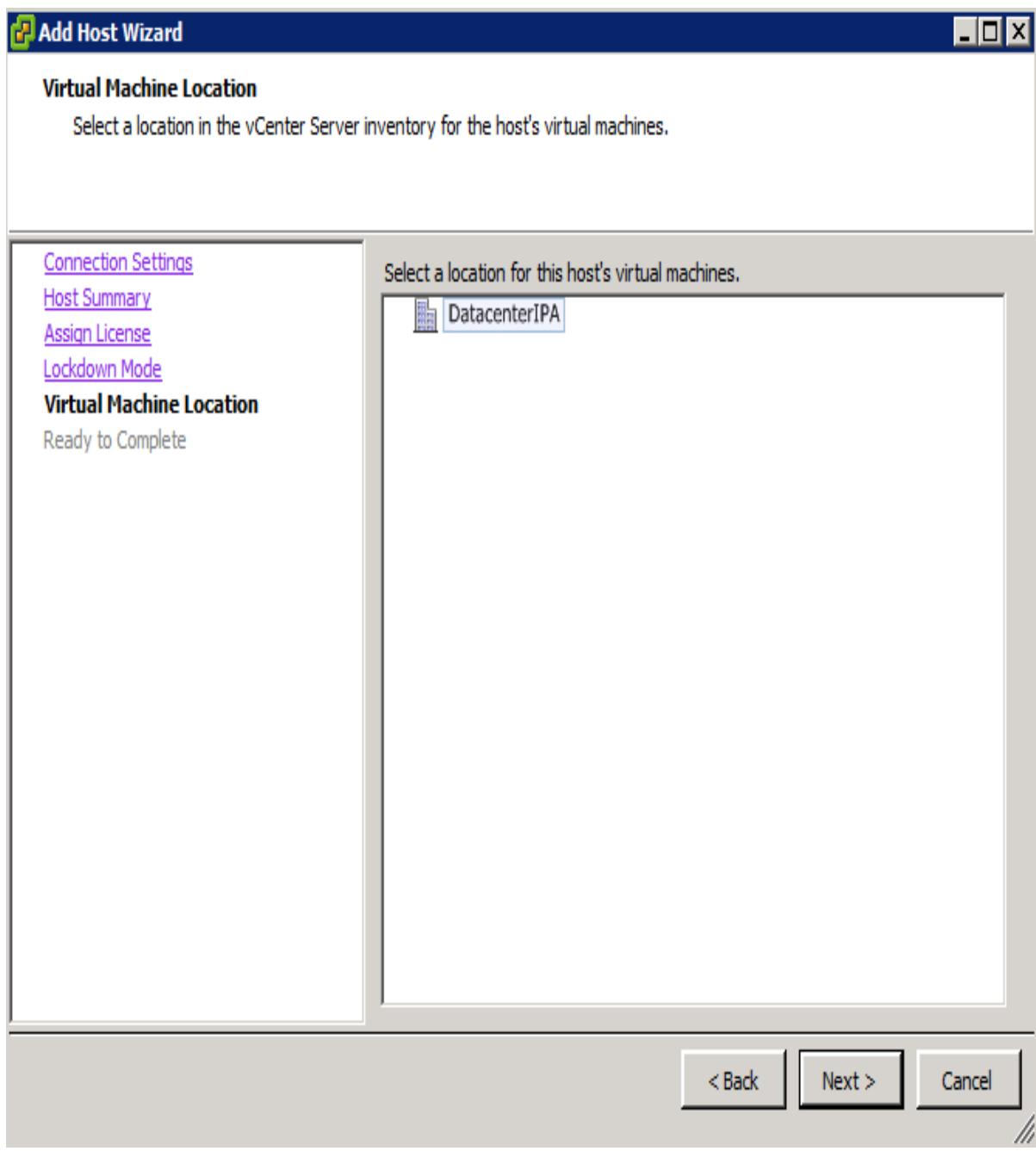
The next step is to assign a license key to the host. In this case I am selecting an existing licence.



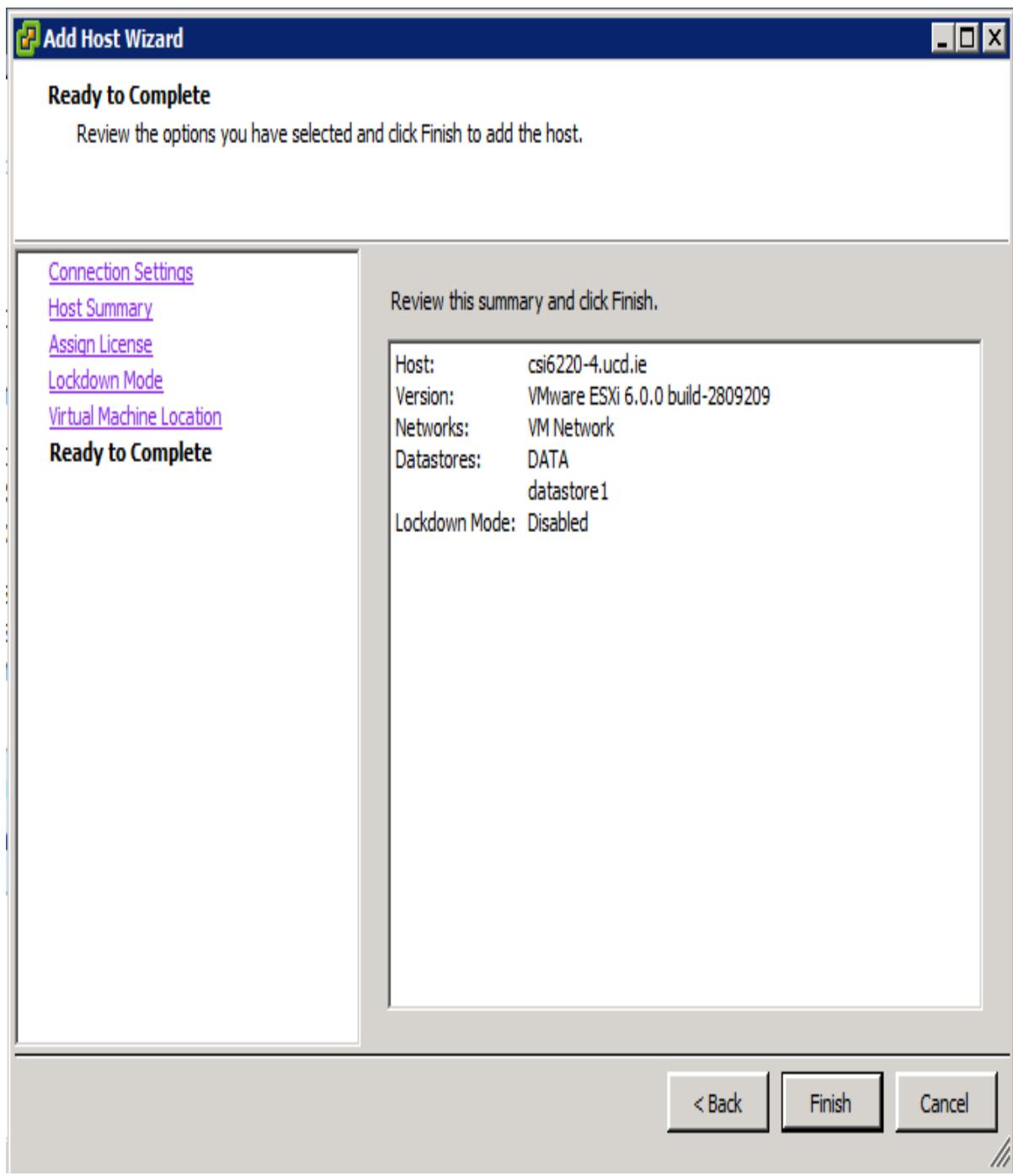
On the next screen you will be prompted to enable lockdown mode. Don't select this as we want to be able to access the host remotely.



Here we select the location in the vCenter Server inventory for the hosts virtual machines.



The final stage of the host wizard allows you to review the settings in place. Once you are happy click finish to add your host.



When the host is added you will see the following layout in vCenter Server.

The screenshot shows the vSphere Client interface with the title bar "csi420-01-vm6.ucd.ie - vSphere Client". The menu bar includes File, Edit, View, Inventory, Administration, Plugins, and Help. The top navigation bar shows Home > Inventory > Hosts and Clusters, with a "Search Inventory" field. On the left, the navigation tree displays "DatacenterIPA" under "The IPA", which contains "DatacenterIPA" and "csi6220-4.ucd.ie". The main content area is titled "DatacenterIPA" and shows the "Getting Started" tab selected. It includes four numbered steps: 1. Create a datacenter, 2. Add a host, 3. Add a virtual machine, and 4. Complete set-up. Step 2 is highlighted with a blue circle. A message says "You have added a host." Below it, text states "Hosts run virtual machines. The next step is adding a virtual machine to the host. The host must be selected to add a virtual machine." A callout box points to the left navigation tree with the instruction "Select your newly added host in the inventory on the left.". To the right, there is a diagram illustrating the relationship between Datacenter, Host, and Virtual Machines. The bottom section shows a "Recent Tasks" table with two completed entries:

Name	Target	Status	Details	Initiated by	Requested Start Ti...	Start Time	Completed Time
Add standalone host	DatacenterIPA	Completed		VSPHERE LO...	07/12/2015 15:59:15	07/12/2015 15:59:15	07/12/2015 15:59:35
Move entities	The IPA	Completed		VSPHERE LO...	07/12/2015 15:49:16	07/12/2015 15:49:06	07/12/2015 15:49:06

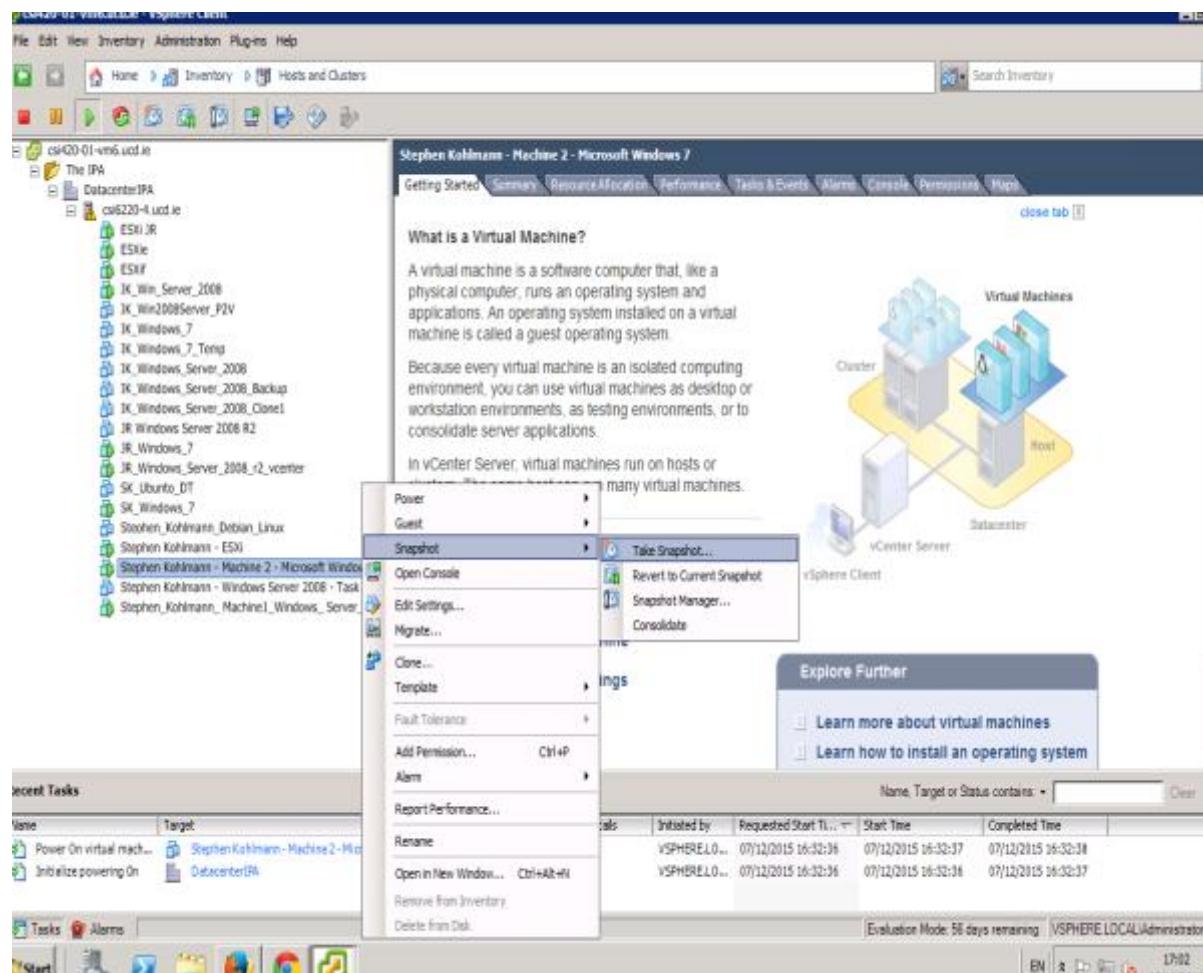
At the bottom, there are tabs for Tasks and Alarms, and a status bar indicating "Evaluation Mode: 56 days remaining" and "VSPHERE". The bottom navigation bar includes icons for Start, Home, Inventory, Hosts and Clusters, Performance, Tasks & Events, Alarms, Permissions, and Maps, along with language and search options.

## A. 4

### ***Creating a Snapshot***

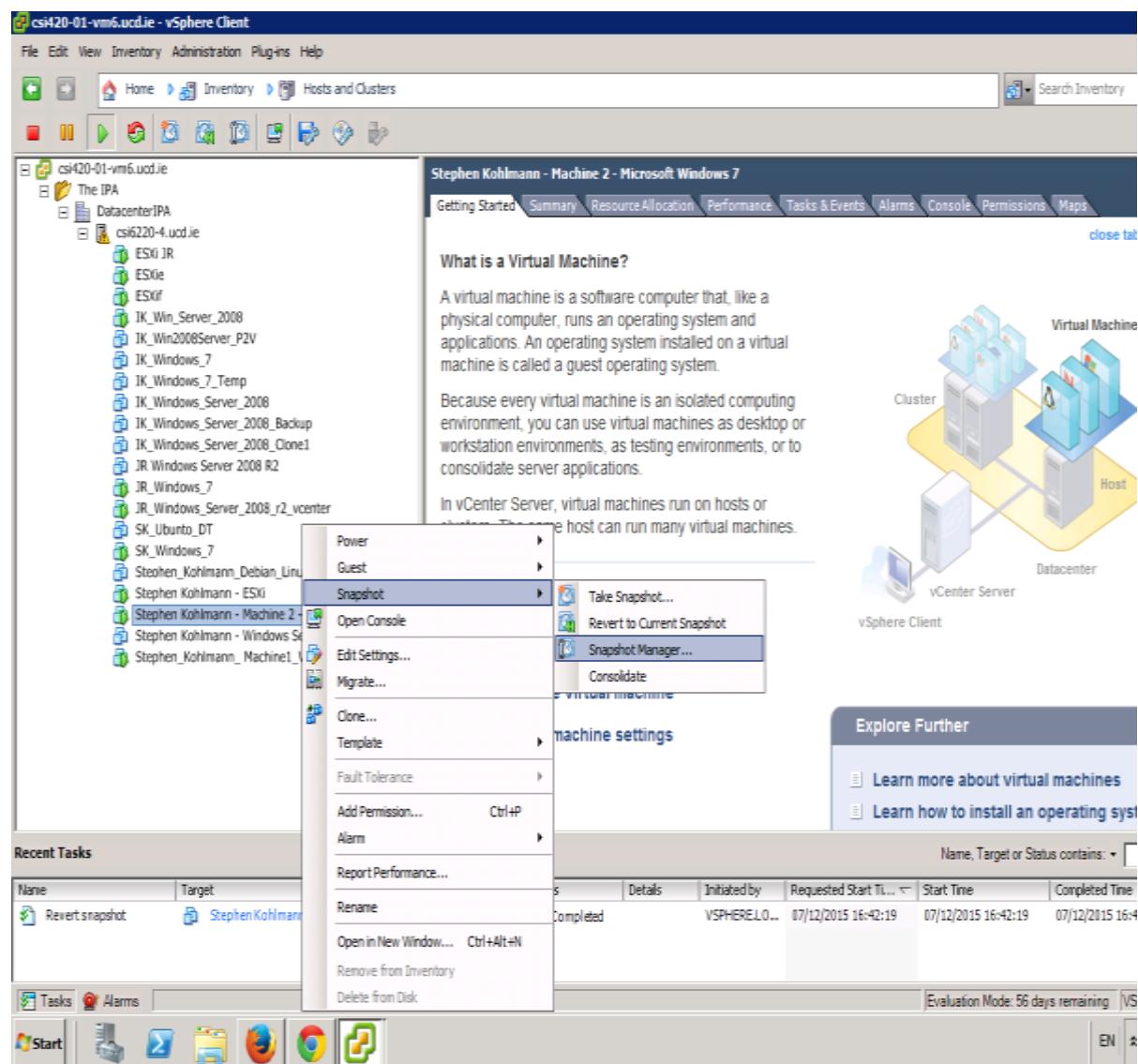
When a snapshot is taken it is picture of your system at that point in time. This includes all hard drive data and the configurations for the virtual machine. It is important to note that overtime was taken a snapshot file increases in size as the machine is used. For this reason, snapshots are not recommended for backups. A snapshot file only contains changes that have taken place on the virtual machine since the snapshot was taken.

Creating a snapshot is a simple process done by selecting the VM you wish to take a snapshot of followed by selecting Inventory, Virtual Machine, Snapshot, Take Snapshot. Snapshots are most commonly used when a system updates are needed. This helps an IT administrator have a quick failsafe to revert to if something goes wrong during an update.

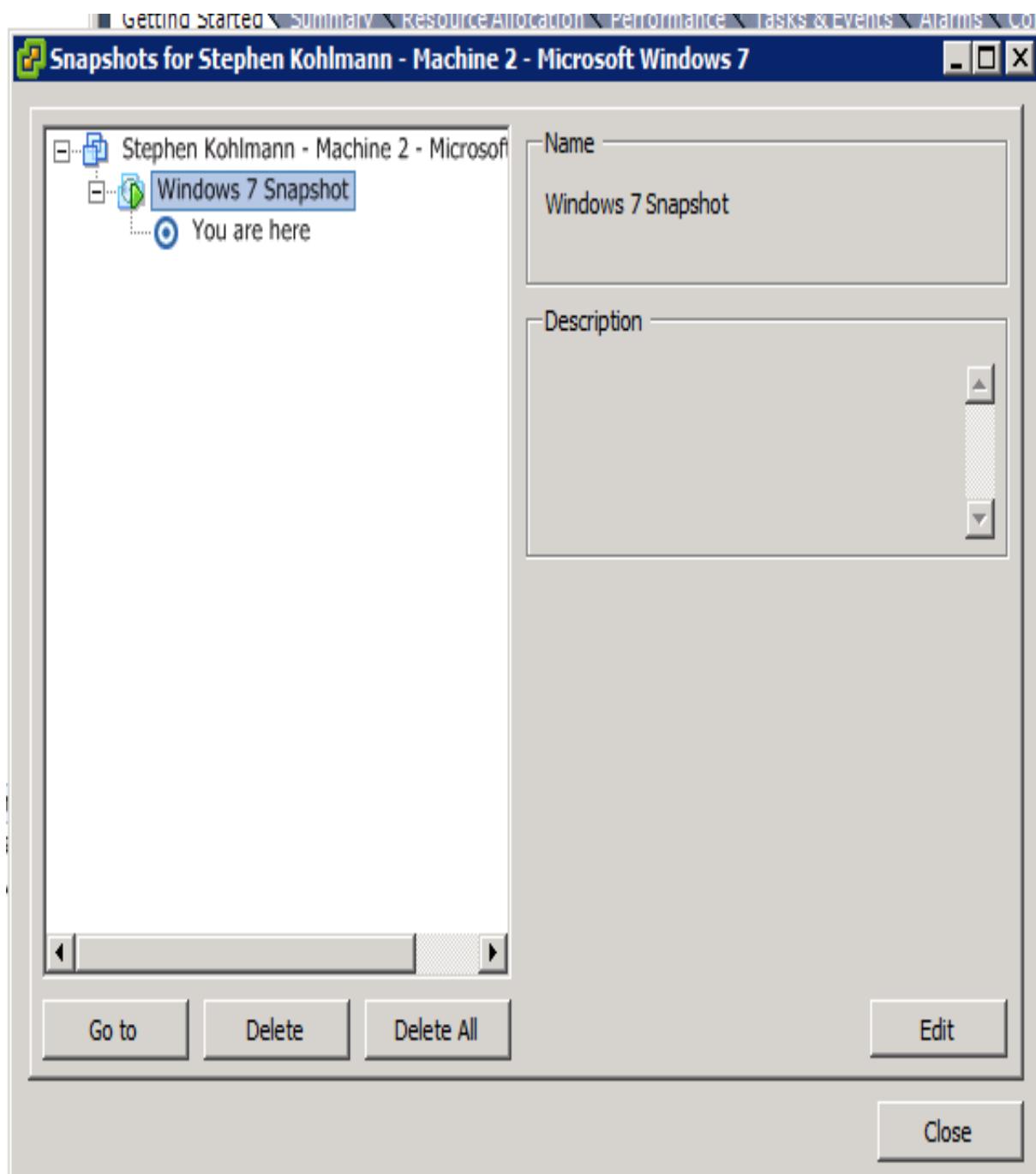


## Managing a Snapshot

The snapshot manager allows you to review snapshots you have created for the active virtual machine. In the snapshot manager you have options such as revert, delete and rename a snapshot. To open the snapshot manager right click on the machine select snapshot and then snapshot manager.



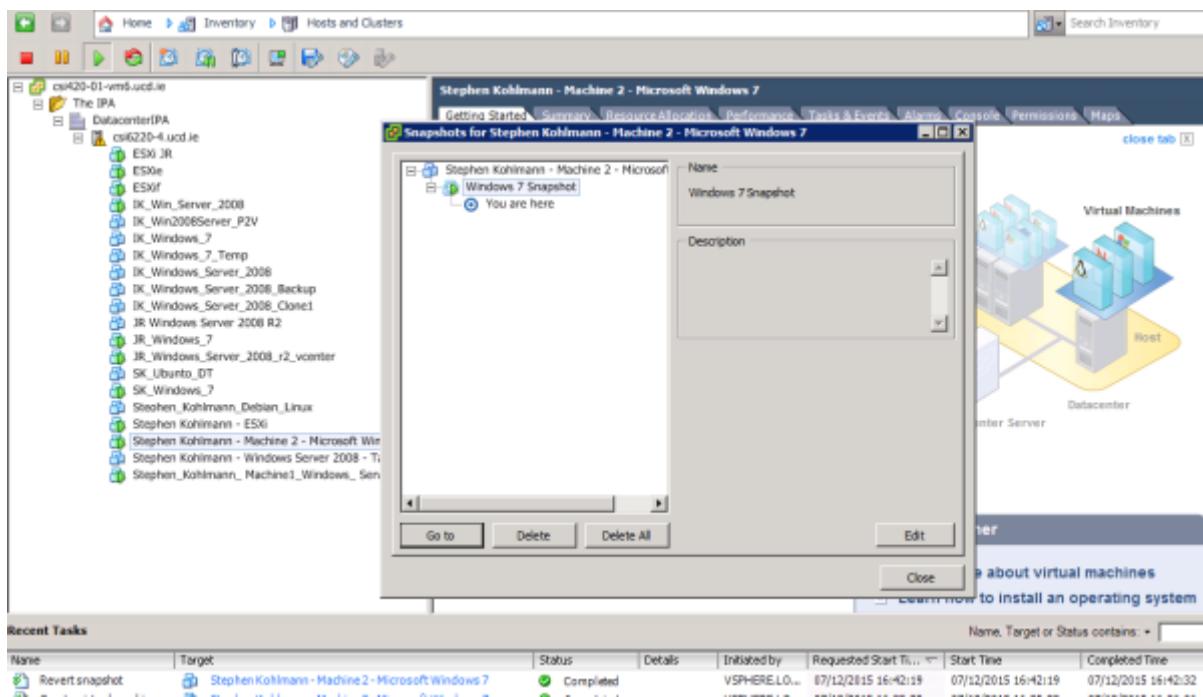
This will then open up the screen below displaying all snapshots for the current machine. In this case the machine is Stephen Kohlmann – Machine 2 – Microsoft Windows 2007.



## **Reverting to a Snapshot**

The option to revert to a snapshot can be used if a process running on the virtual machine has failed. It is important to note that any information on the original virtual machine since the snapshot was taken can not be accessed. It is recommended to have your data backed up elsewhere so that if reverting to a snapshot is necessary your data can still be accessed from another source.

To revert to a snapshot, select the snapshot in the snapshot manager then select Go to. A confirmation box appears as below and when you select “Yes” the process of reverting to the snapshot will show up in the task manager.



## A. 5

### **Gold Image**

A gold image is another name for a template of a virtual machine, desktop, server made through. In short a gold image is actually a clone of the current virtual machine. The primary purpose of a gold image is save time for creating multiple virtual machines. A gold image stops repetitive configurations on virtual machines and eliminates inconsistencies when setting up new machines.

### **Template**

A template is an exact replica of a virtual machine that allows an administrator to clone, convert or deploy multiple virtual machines. When an OVF or OVA template is created it includes all of the virtual machine's details. Templates are highly beneficial to IT administrators as they save time and avoid errors when configuring virtual machines. Another benefit of a template is they can be used as backups for virtual machines.

The main difference between a Gold Image and a Template is that a Gold Image is the highest in the hierarchy of Templates. For example, a template Hierarchy could be as follows

1. Gold Image
2. Template 1
3. Template 2 Backup
4. Template 3 Updates

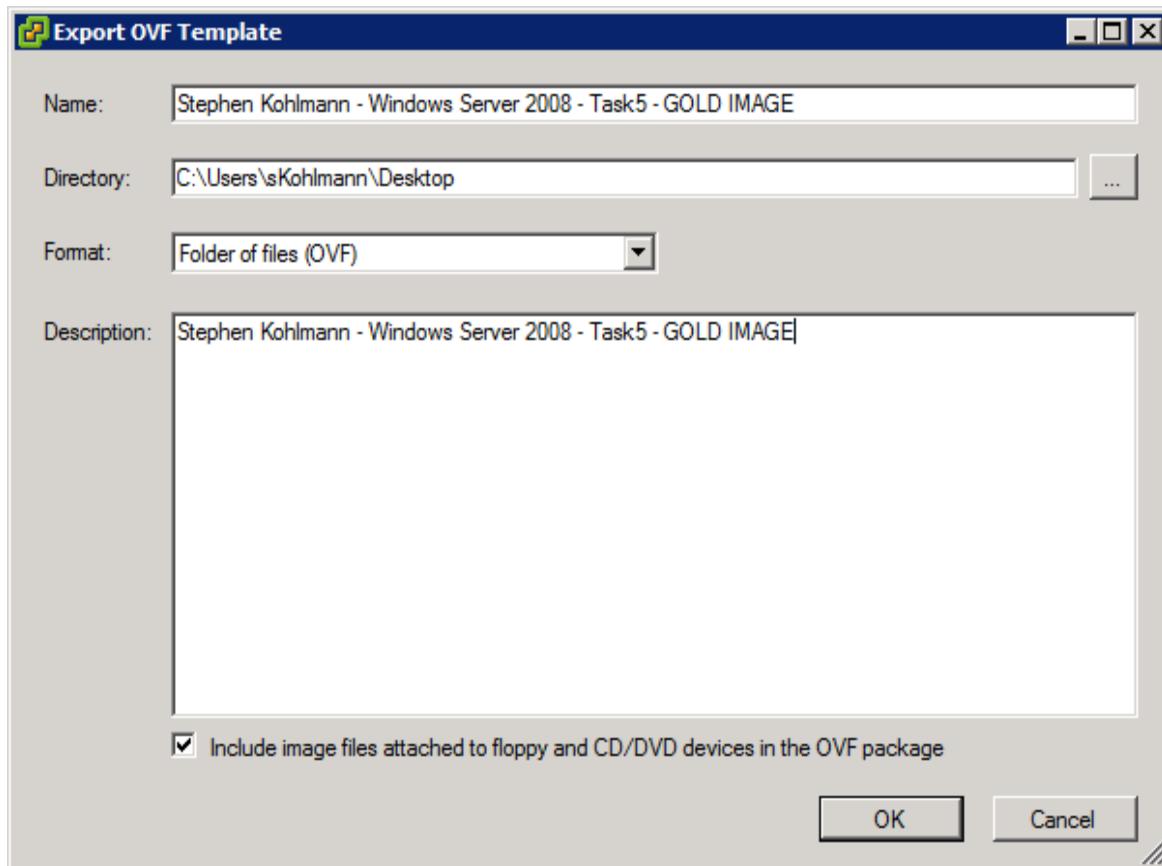
The main point to understand is that a Gold Image is always the fail safe and standard settings that an IT administrator can use.

To export an OVF template go to File, Export and click Export OVF Template.

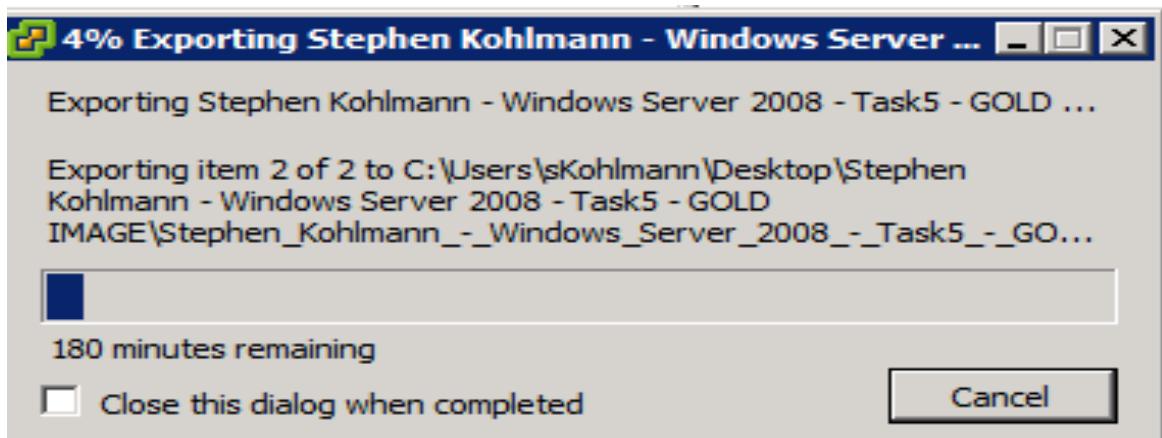
The screenshot shows the vSphere Client interface with the title bar "csi420-01-vm6.ucd.ie - vSphere Client". The "File" menu is open, displaying options like "New", "Deploy OVF Template...", "Export", "Report", "Print Maps", and "Exit". The "Export" option is expanded, showing "Export OVF Template..." as the selected item, along with "Export Events...", "Export List...", "Export Maps...", and "Export System Logs...". To the right of the menu, a window titled "Stephen Kohlmann - Windows Server 2008 - Task A5" is visible, showing sections for "What is a Virtual Machine?", "Basic Tasks" (with "Power on the virtual machine" and "Edit virtual machine settings"), and "Recent Tasks". The "Recent Tasks" table lists two completed tasks: "Power Off virtual mach..." and "Power On virtual mach...", both targeting "Stephen Kohlmann - Windows Server 2008 - Task A5".

Name	Target	Status	Details	Initiated by	Requested Start Ti...
Power Off virtual mach...	Stephen Kohlmann - Windows Server 2008 - Task A5	Completed		VSPHERE.LO...	07/12/2015 17:03:14
Power On virtual mach...	Stephen Kohlmann - Windows Server 2008 - Task A5	Completed		VSPHERE.LO...	07/12/2015 16:53:19

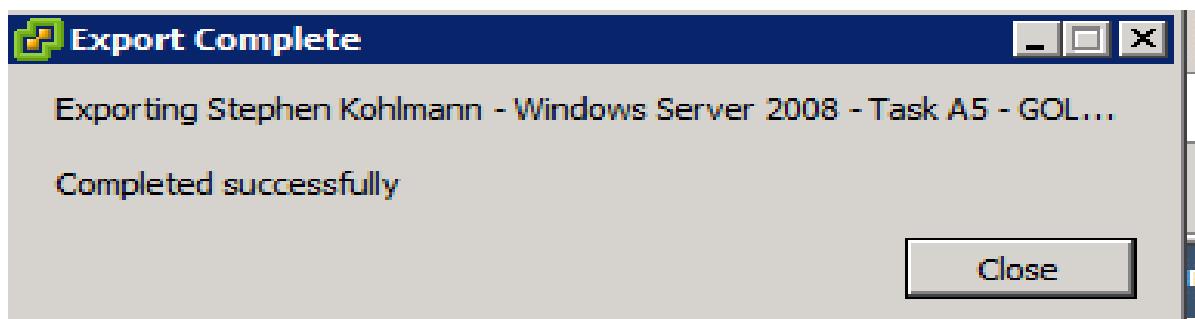
This brings you to the screen below where you can name your template. In this case a Gold Image is been created so I am adding “GOLD IMAGE” to the name for clarity. Press “OK” to start exporting the template.



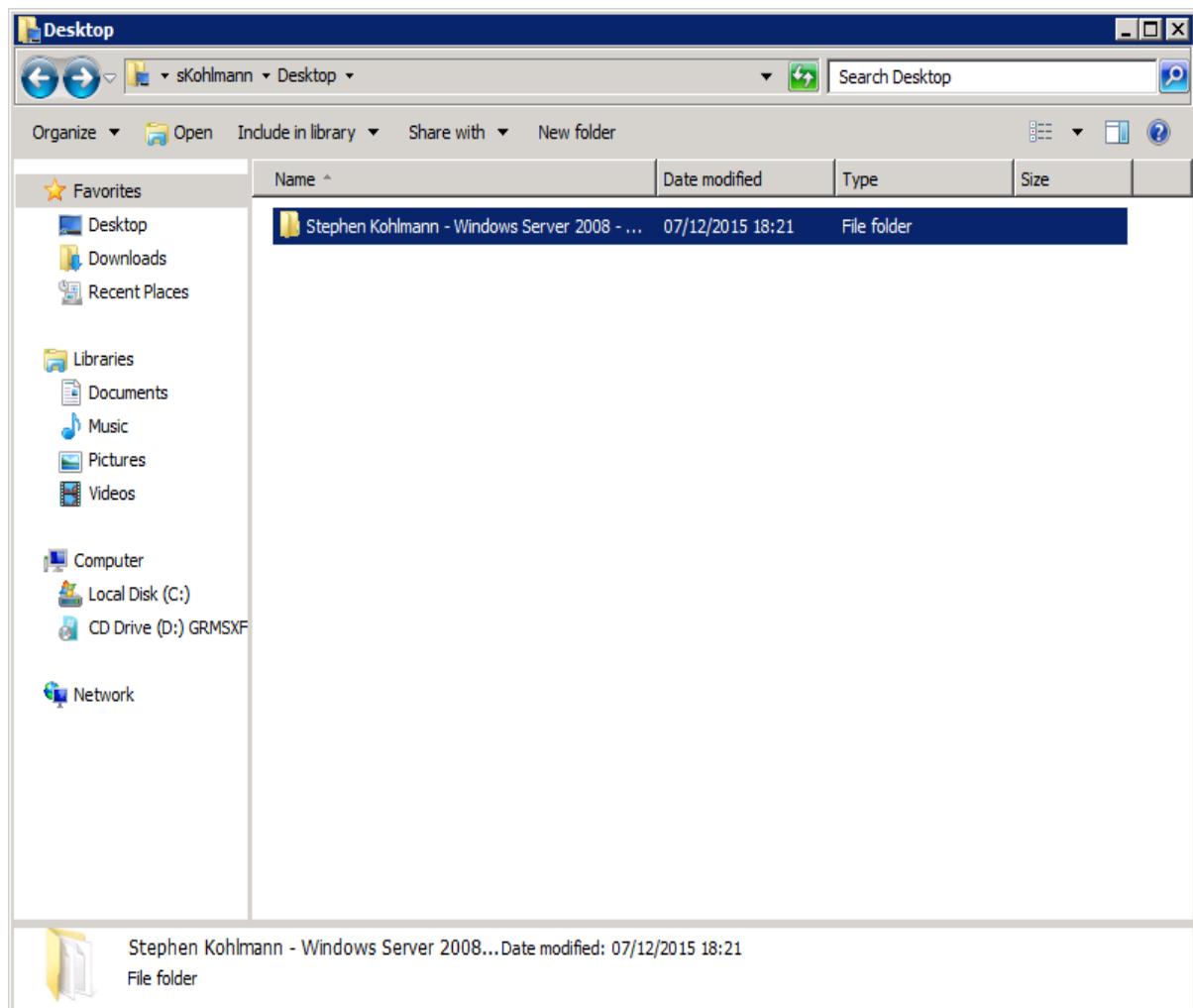
The export may take sometime and this will be shown in a small pop up box as below



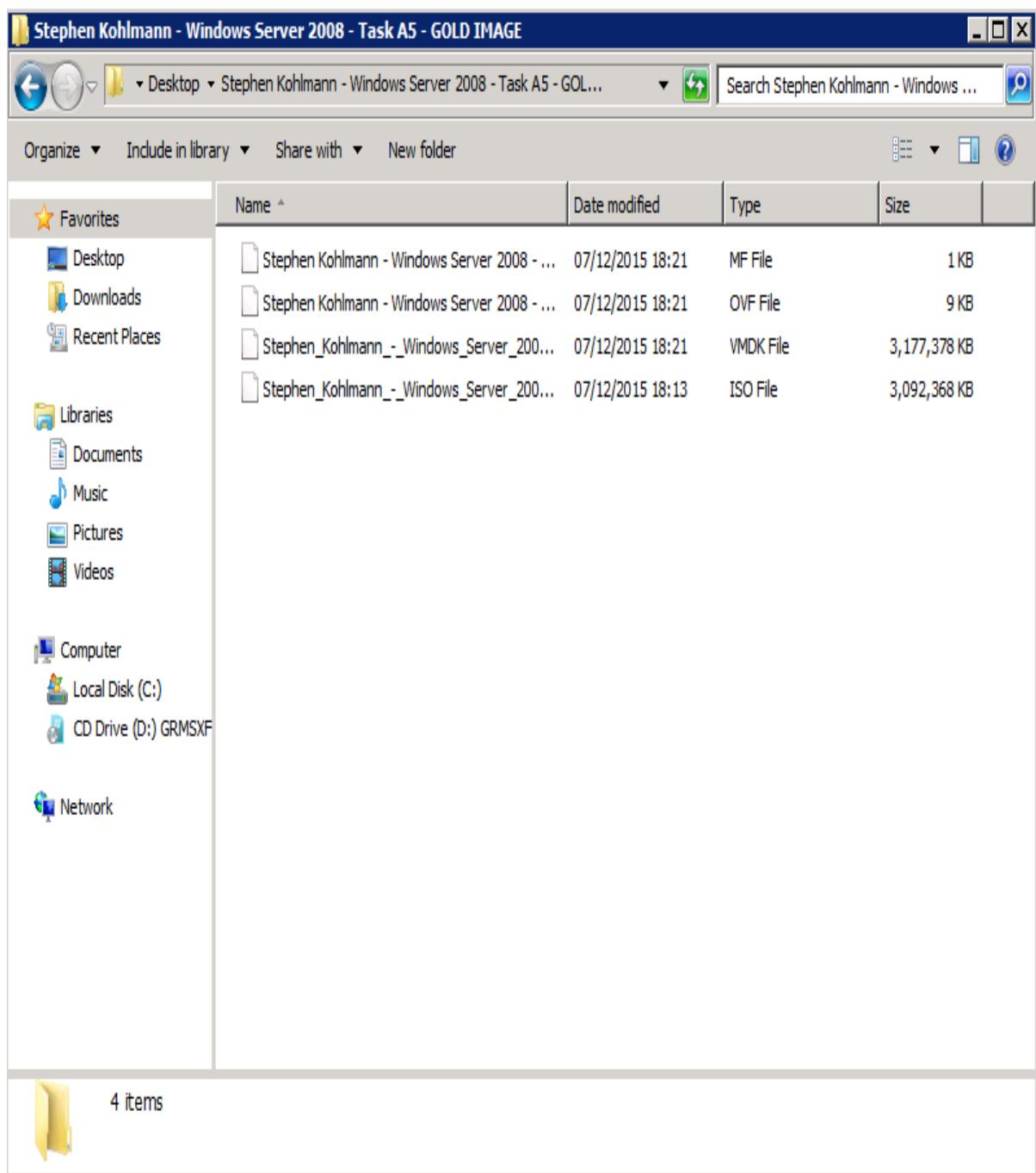
When the export has completed you will see the pop up box below.



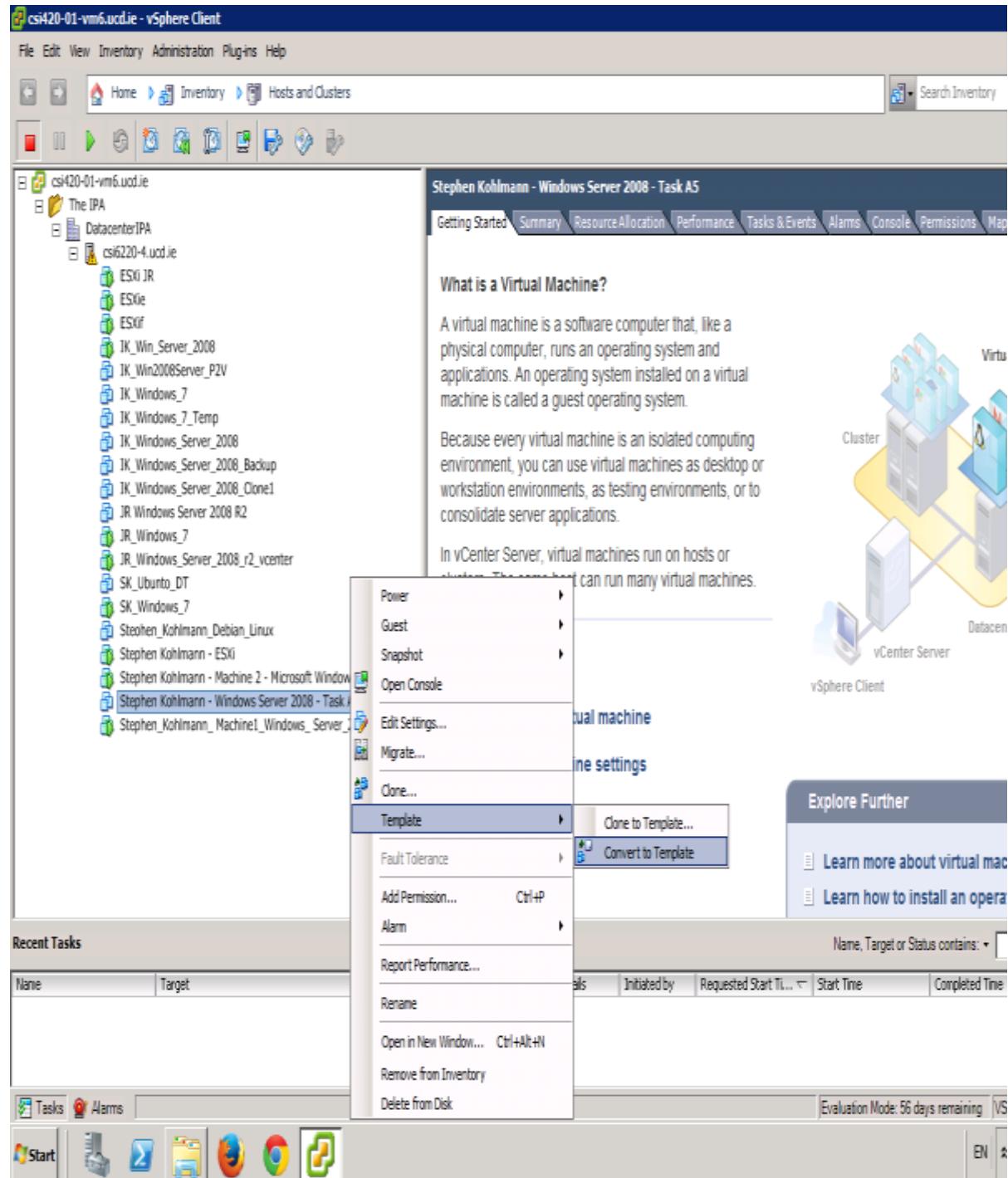
To ensure that the export has completed successfully navigate to the file path where you saved the export to. For ease I exported the template to the desktop. The path is C:\Users\skohlmann\Desktop\. Double click on the folder to show the contents.



If the export has completed successfully you should see four files as below. Your files will have a different name but the file types MF, OVF, VMDK and ISO should be all present.



After you have confirmed that the export has completed navigate to the machine you exported in vCenter Server. From here right click the machine select “template” and then “convert to template”



When the machine has been successfully converted to a template you will see a small page icon beside the machine name as follows.



Stephen Kohlmann - Windows Server 2008 - Task A5

The template is listed in your environment within the list of virtual machines as below.

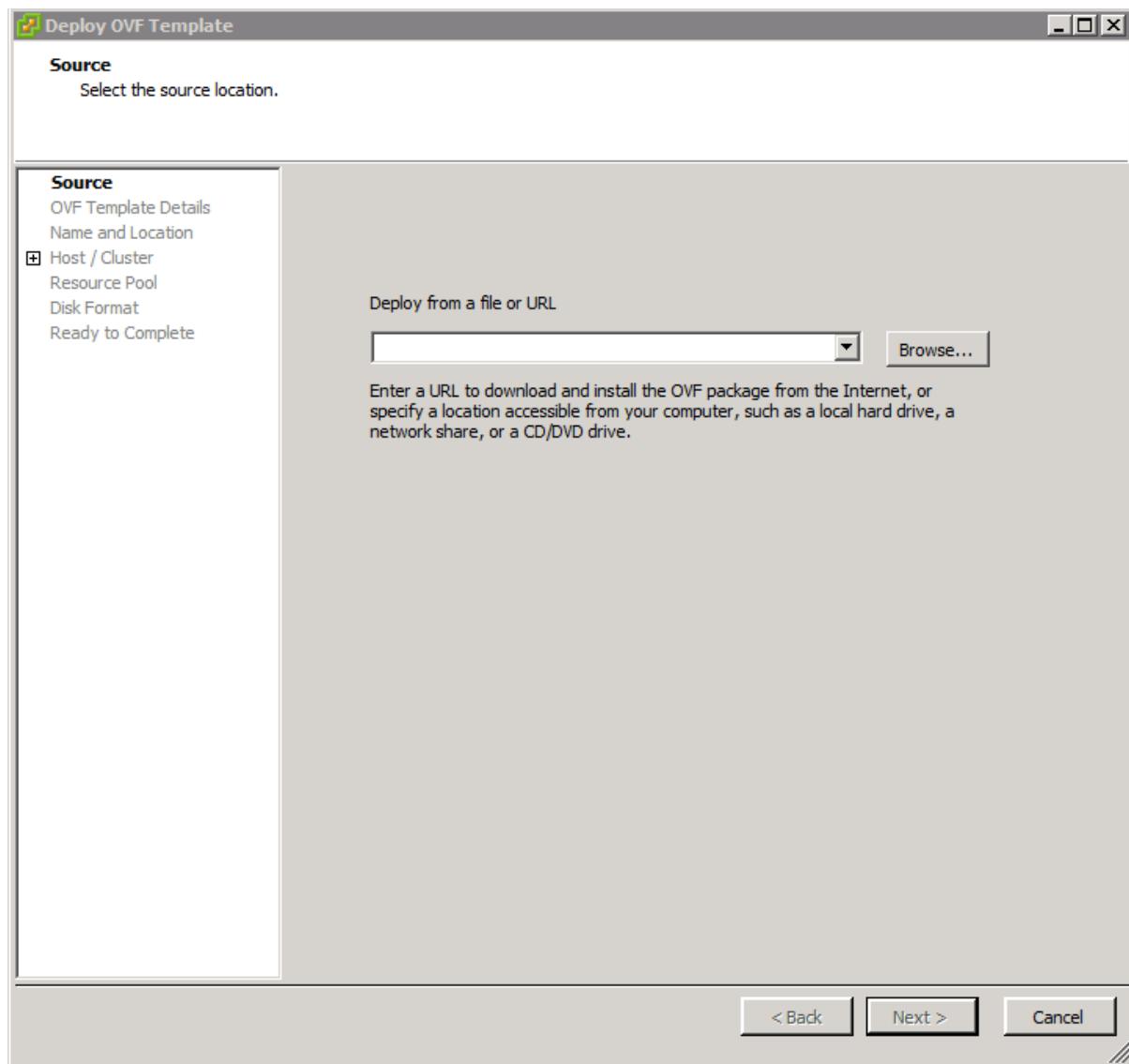
The screenshot shows a list of virtual machines and templates. The list includes:

- Steohen\_Kohlmann\_Debian\_Linux
- Stephen Kohlmann - ESXi
- Stephen Kohlmann - Machine 2 - Microsoft Windows 7
- Stephen Kohlmann - Windows Server 2008 - Task A5
- Stephen\_Kohlmann\_ Machine1\_Windows\_ Server\_2008

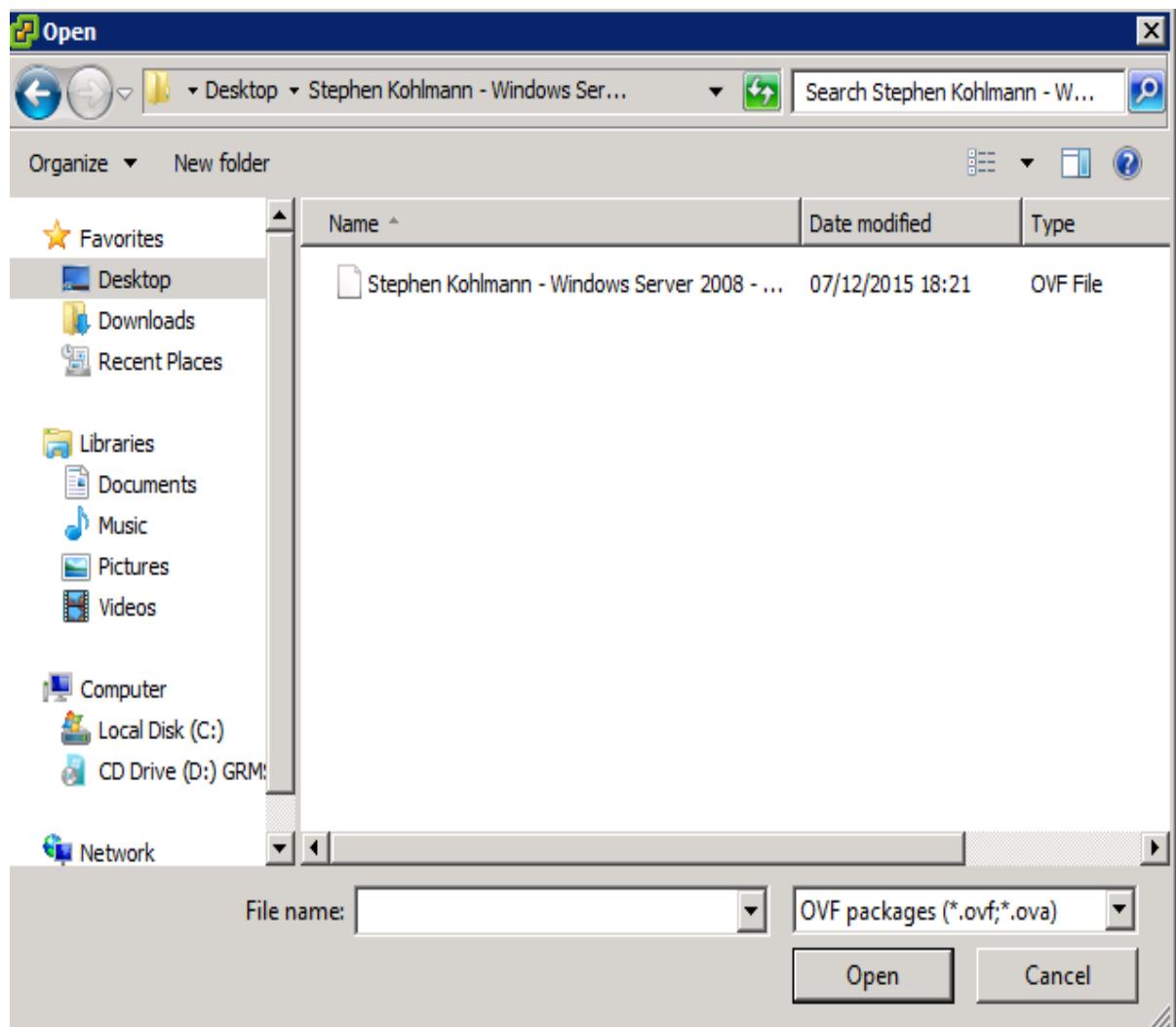
A mouse cursor is hovering over the fourth item in the list, "Stephen Kohlmann - Windows Server 2008 - Task A5". Below the list, there is a toolbar with buttons for "Target" and "Create new virtual machine as template". The "Create new virtual machine as template" button is highlighted in blue, indicating it is the active or selected option.

## A. 6

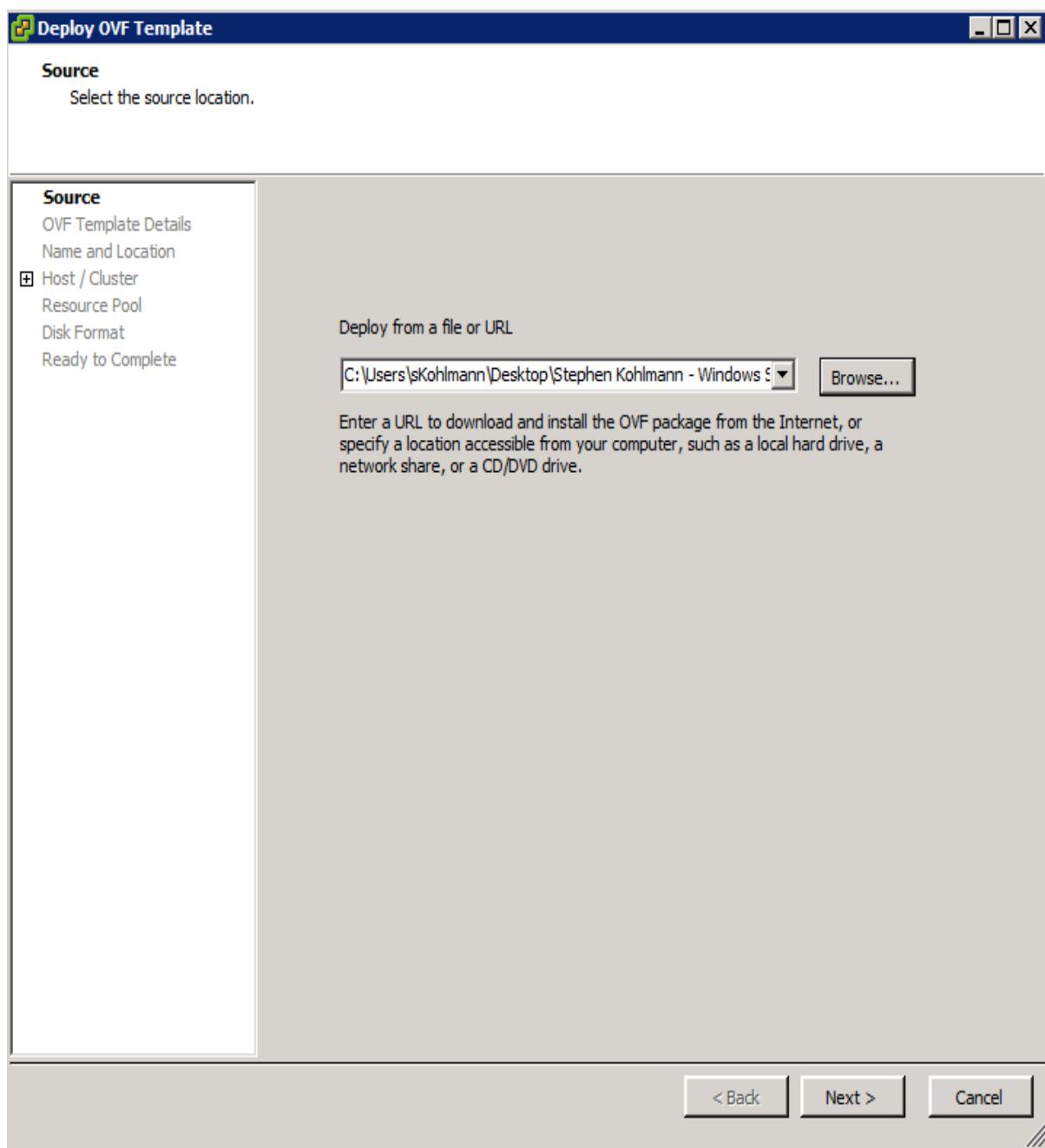
In the following steps the OVF template created in step 5 will be deployed. The first step is to go to “File” in vCenter Server and then “Deploy OVF Template”. This will bring up the following screen. Select “Browse” to search for the .OVF file



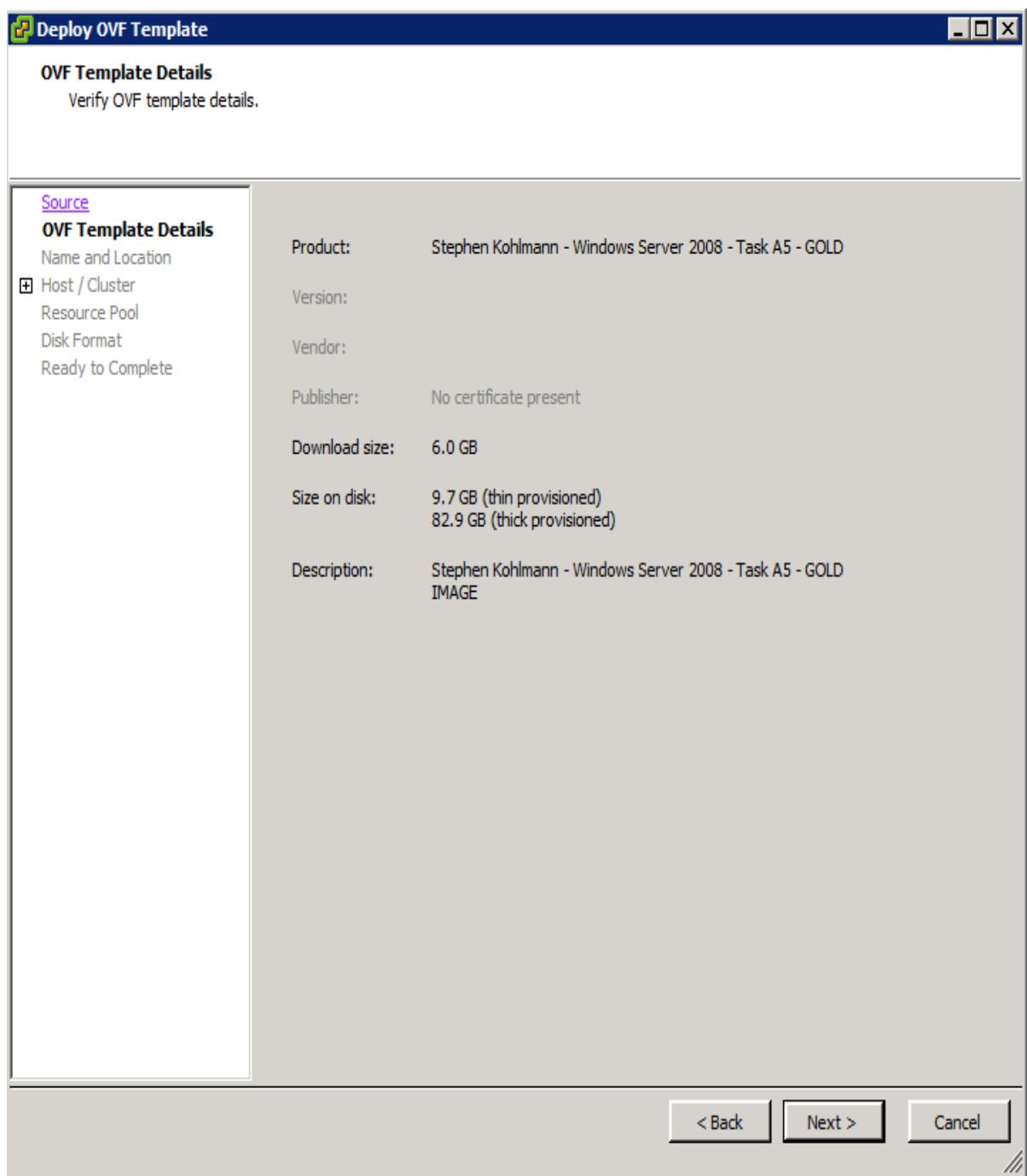
Select the desired file below and click open. In this case there is only one file but it is possible to have many templates.



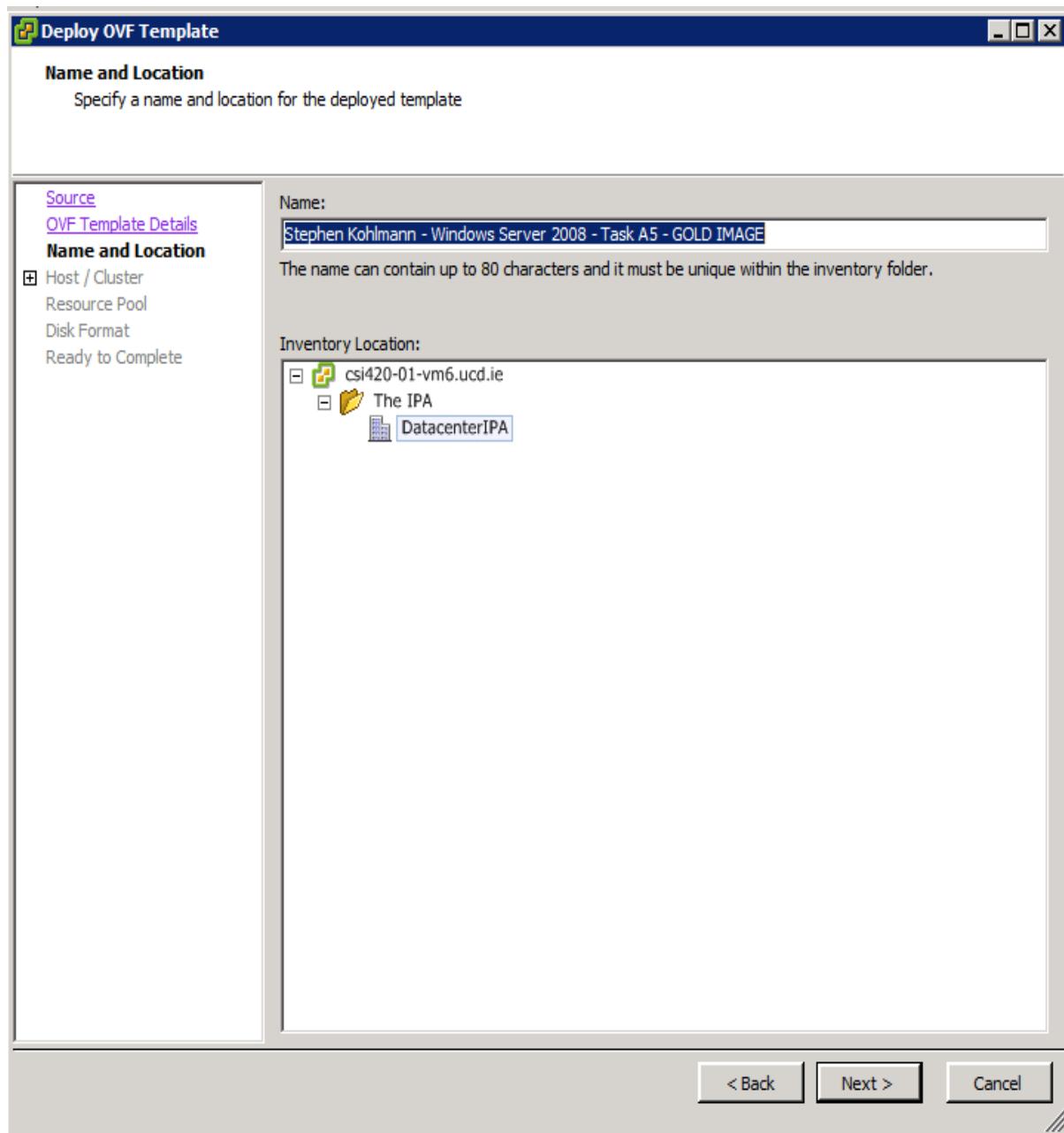
When the file or URL have been entered select next.



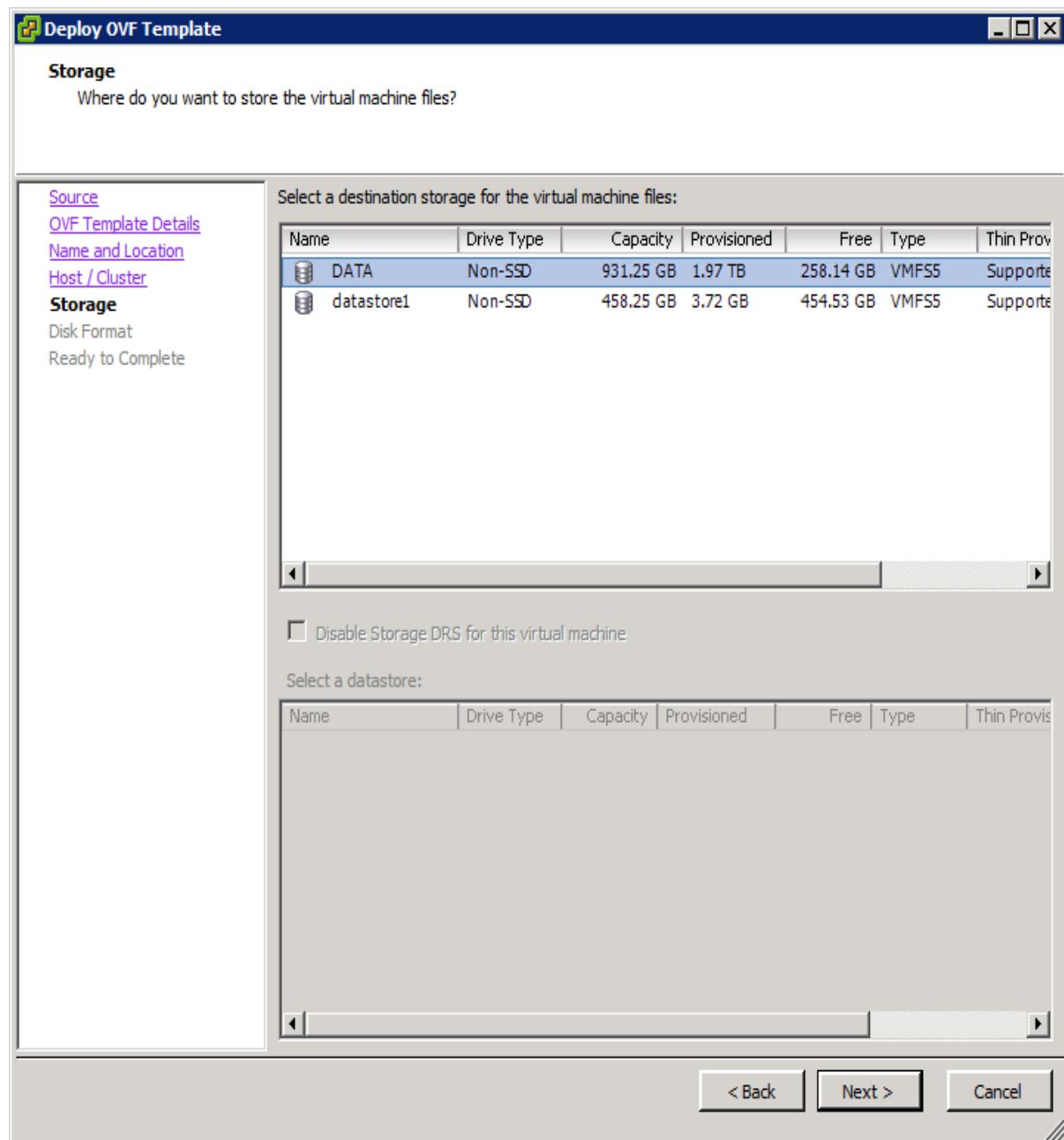
Review the OVF template details and click next to proceed.



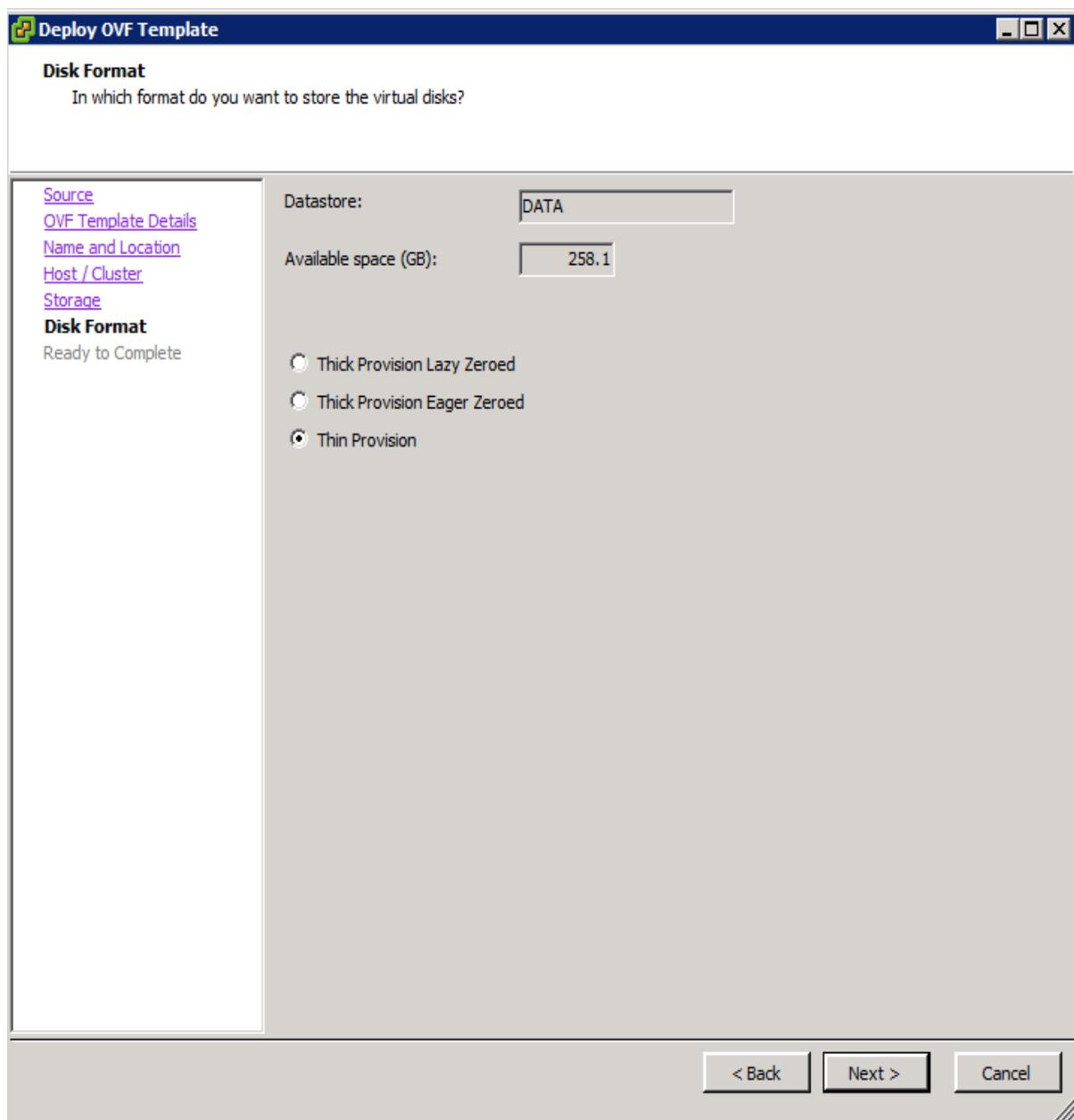
Choose the name and location for the template to be deployed. Click next to continue.



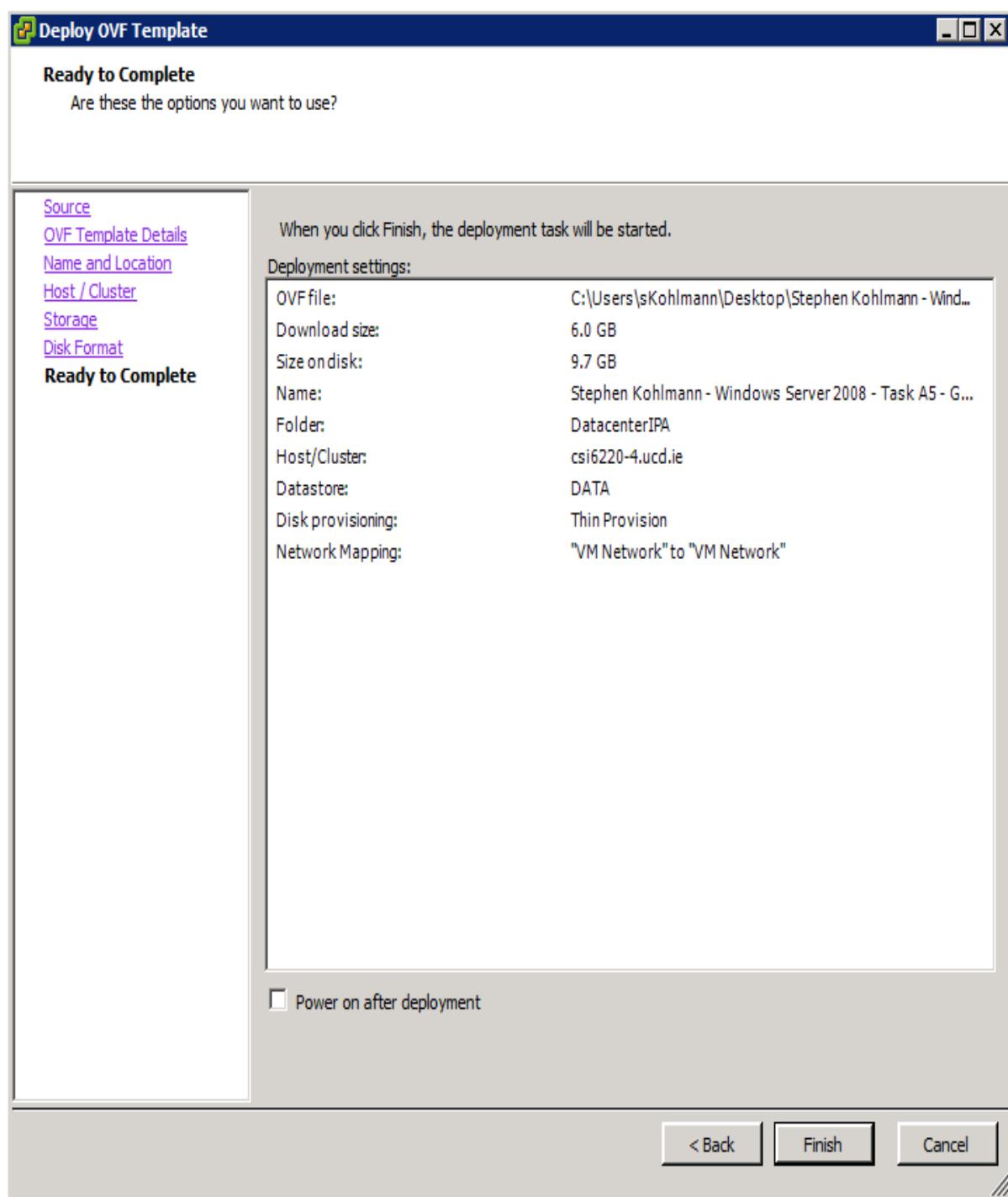
Choose the storage area where you would like to deploy the template. Depending on your environment you may have one or multiple datastores to choose from.



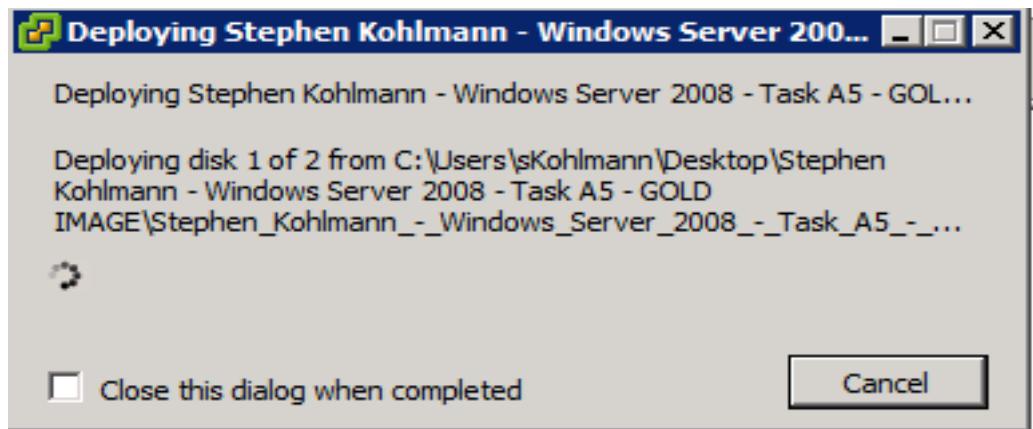
In the disk format option choose “Thin Provision” and then click next to review the setup.



Review the machine settings and click “Finish” to deploy the template.



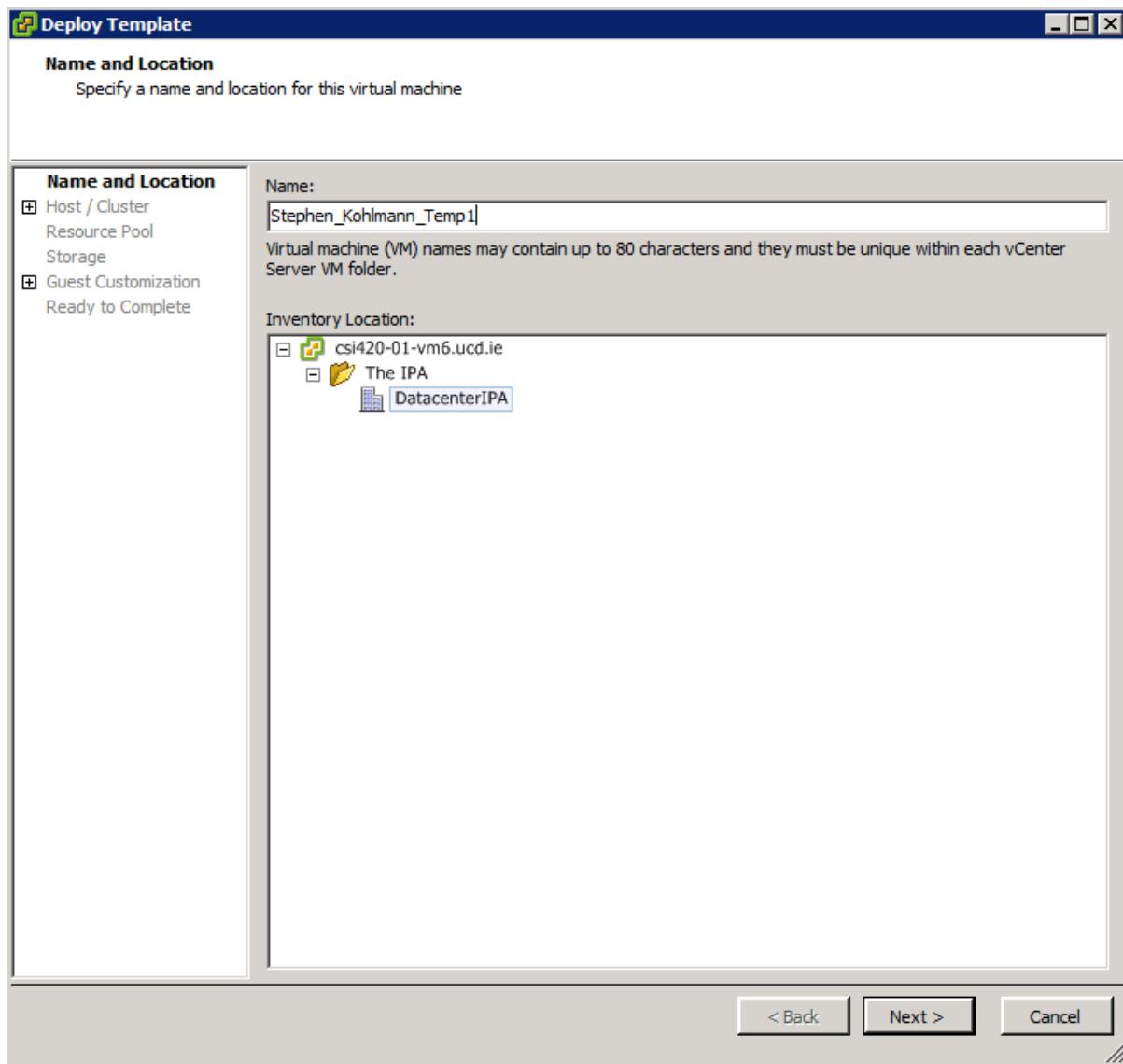
As the deployment of the machine runs in the background you will see the following pop up window.



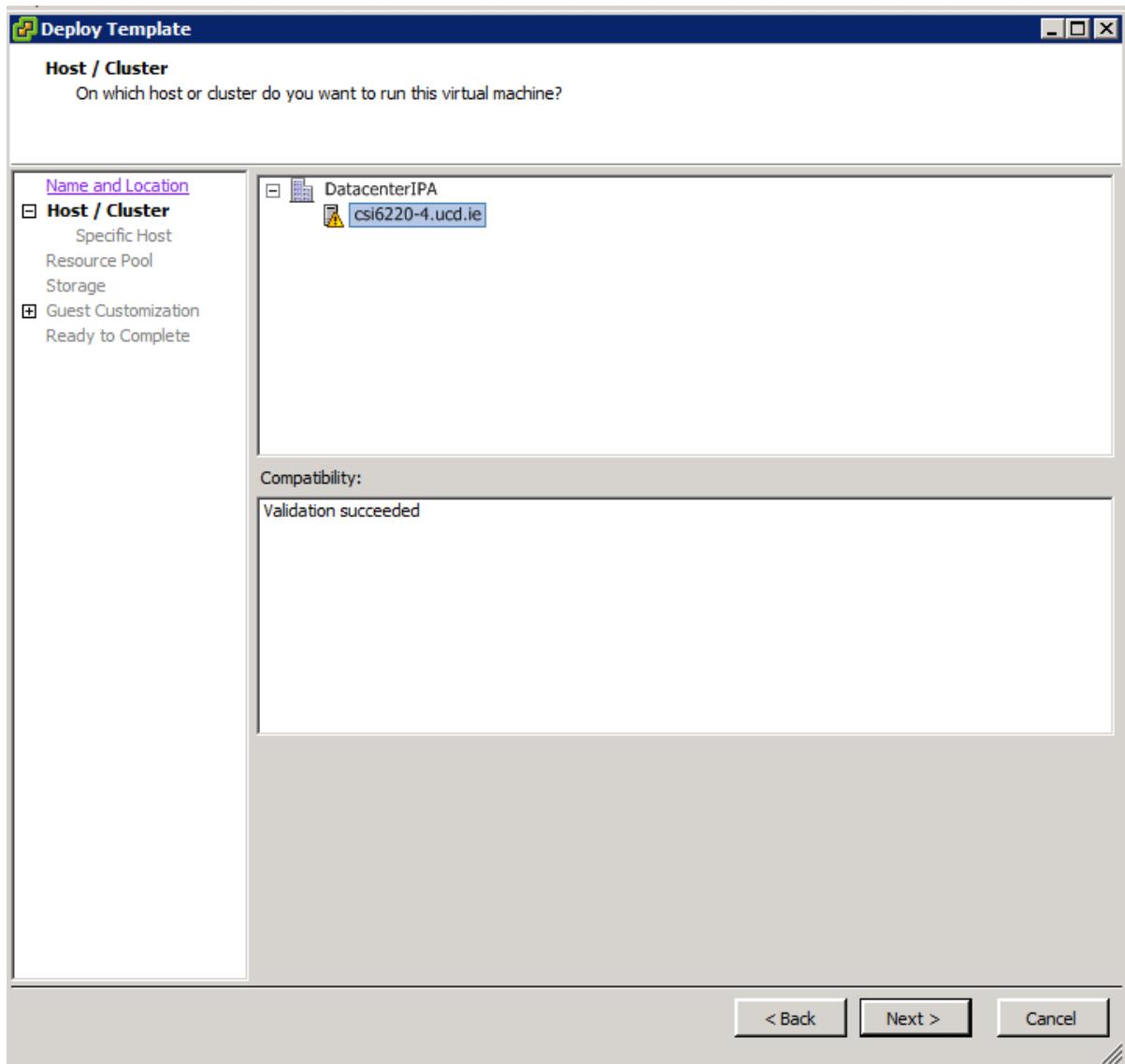
When the machine has been successfully deployed to the environment you will see the following pop up box.



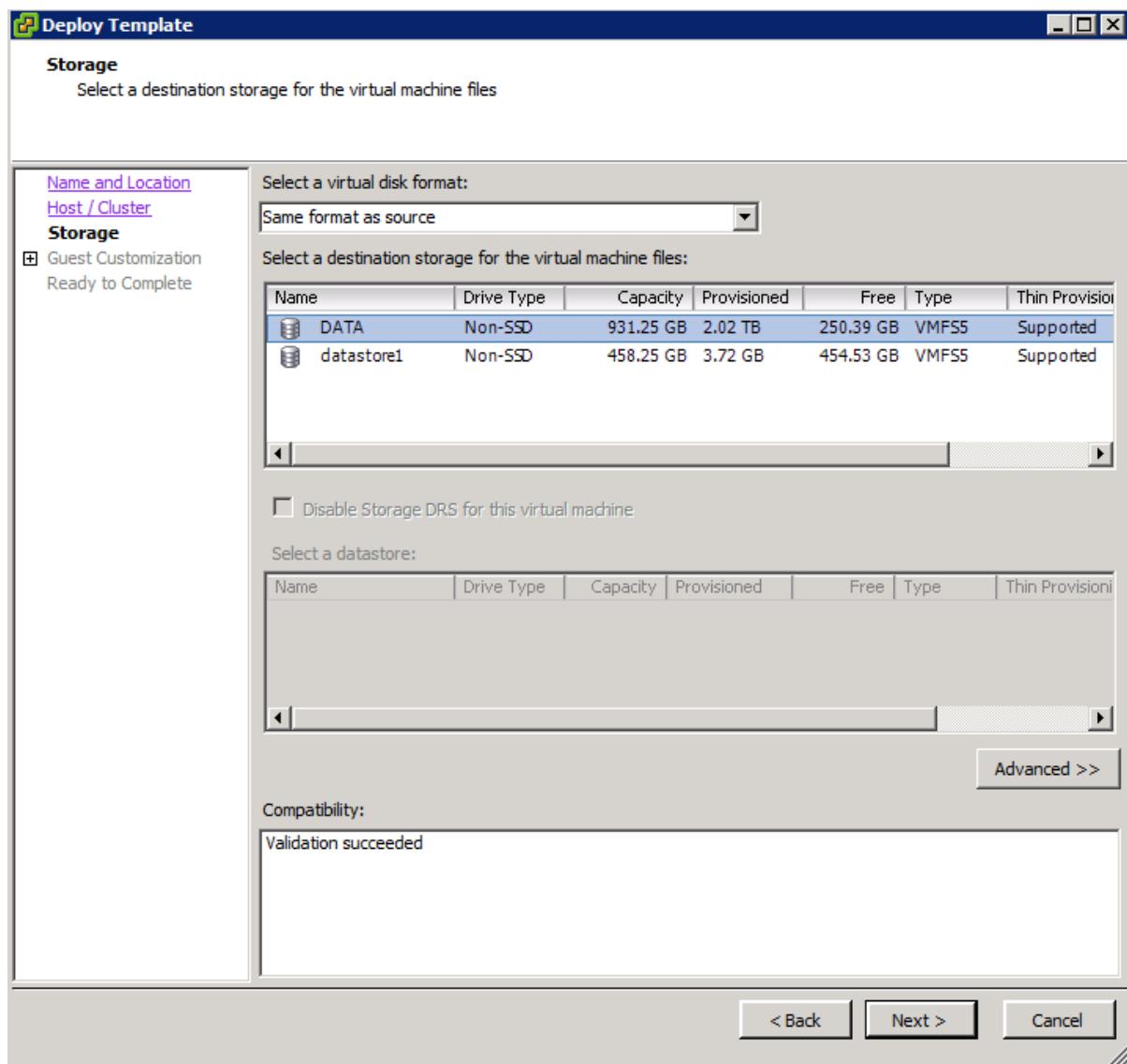
The next step is to select the template from vCenter Server, right click the template and select “Deploy Virtual Machine from this Template”. The next step will be to name the virtual machine and select the location for deployment.



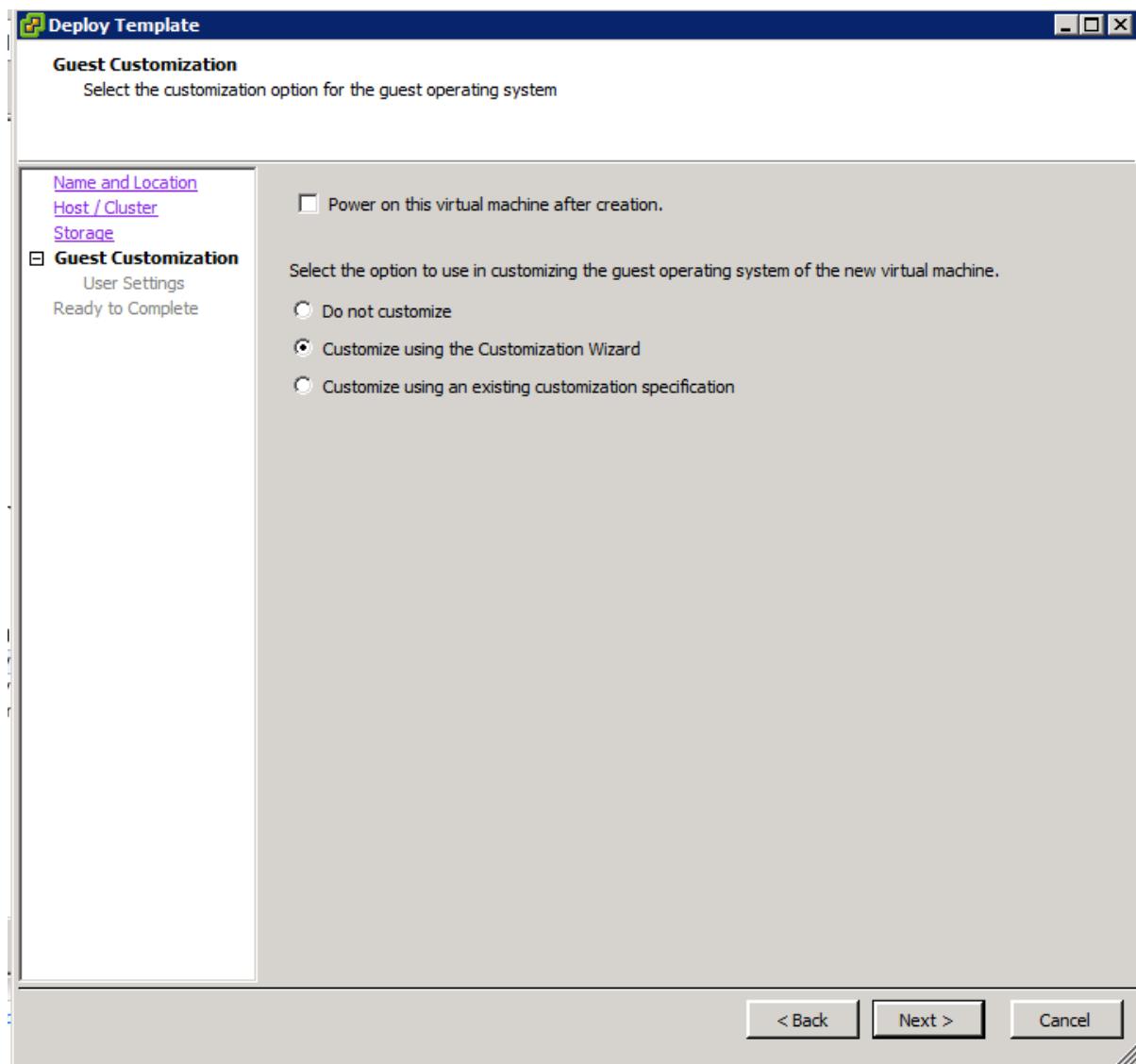
Choose the host and cluster you would like to deploy to and then click next to continue.



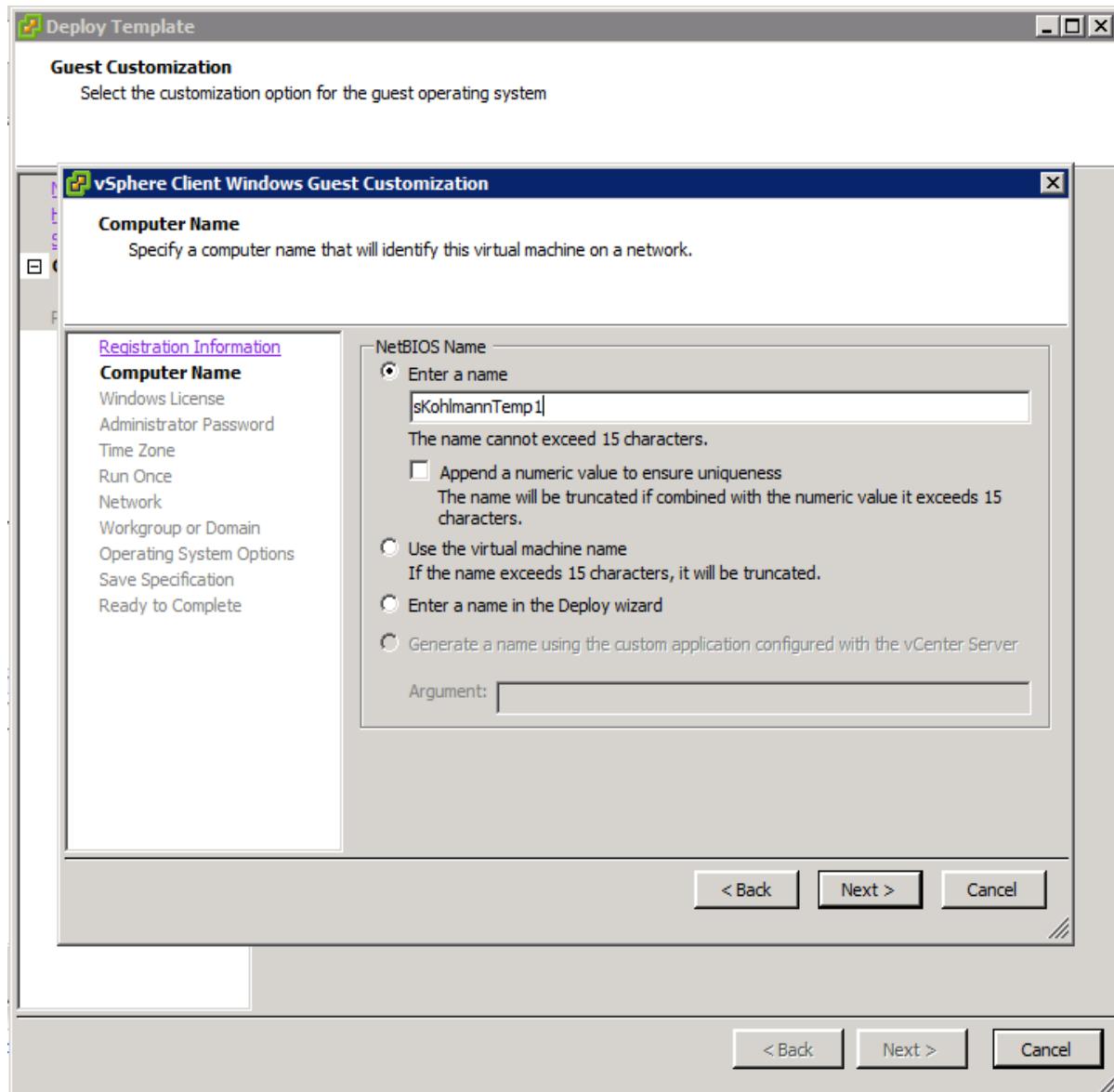
Choose the preferred datastore for the deployment and click next to continue.



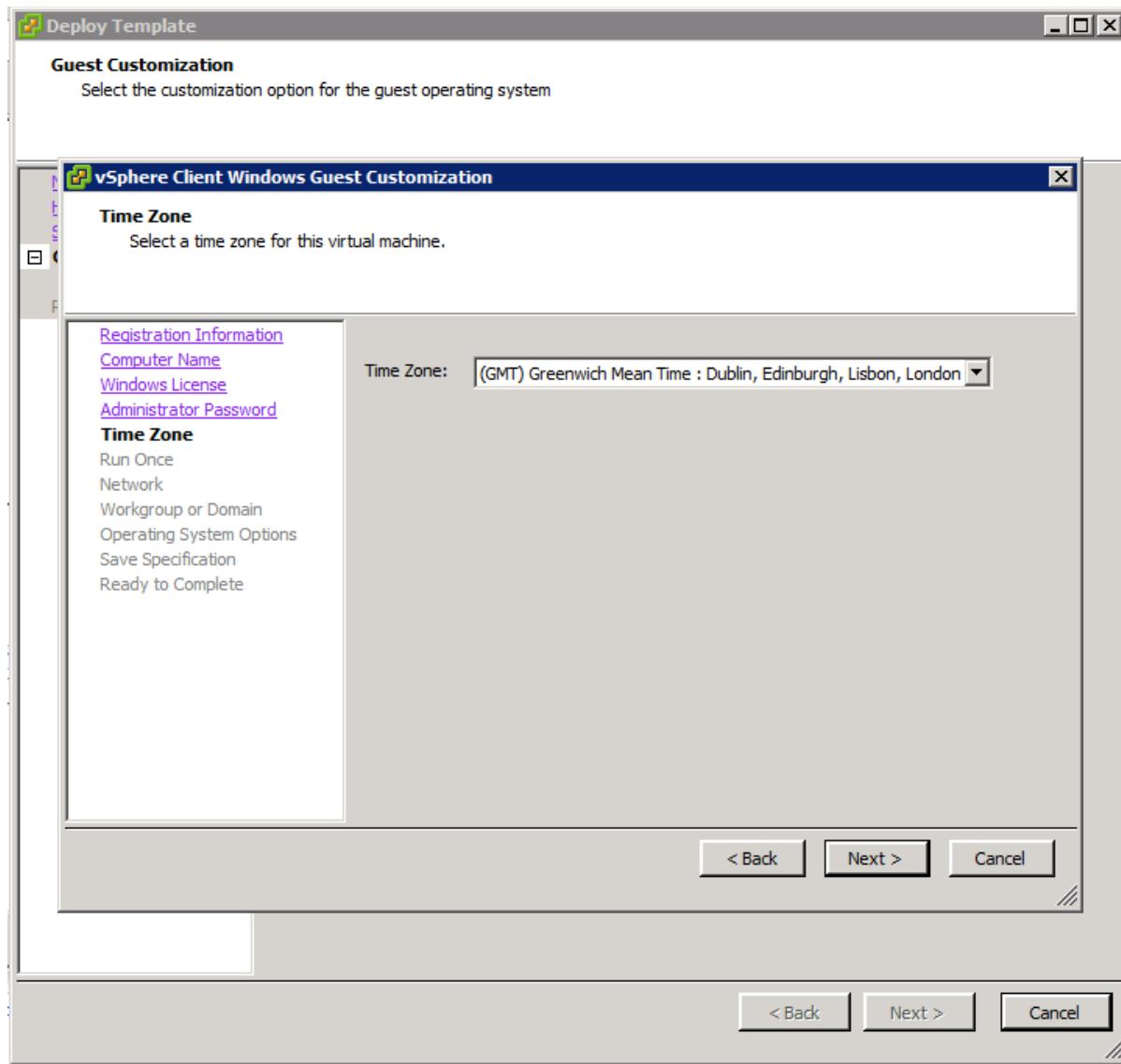
Select “Customize using the Customization Wizard” and click “Next” to continue.



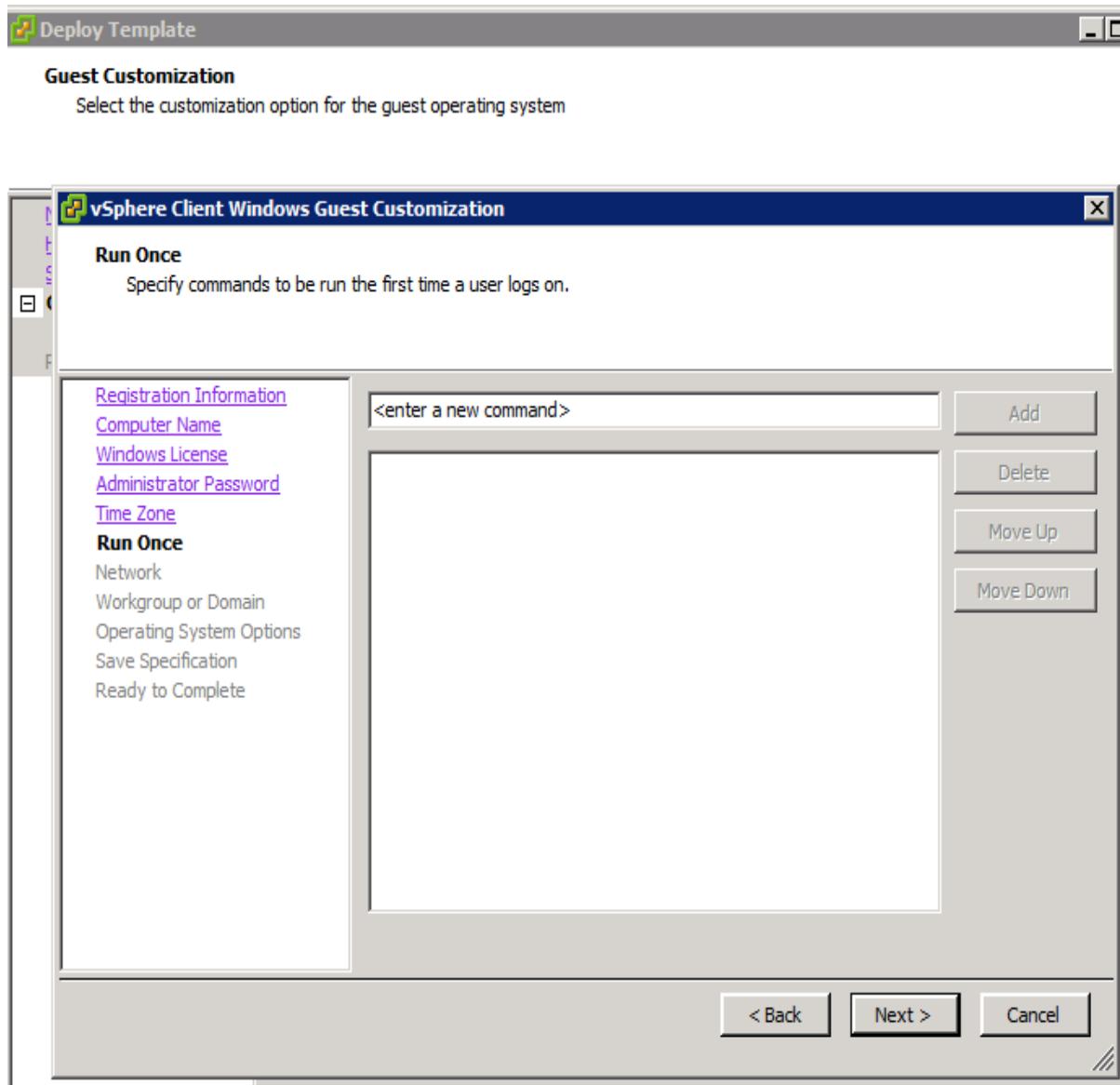
Choose an identifiable name for the machine in this case I named the virtual machine **sKohlmannTemp1**.



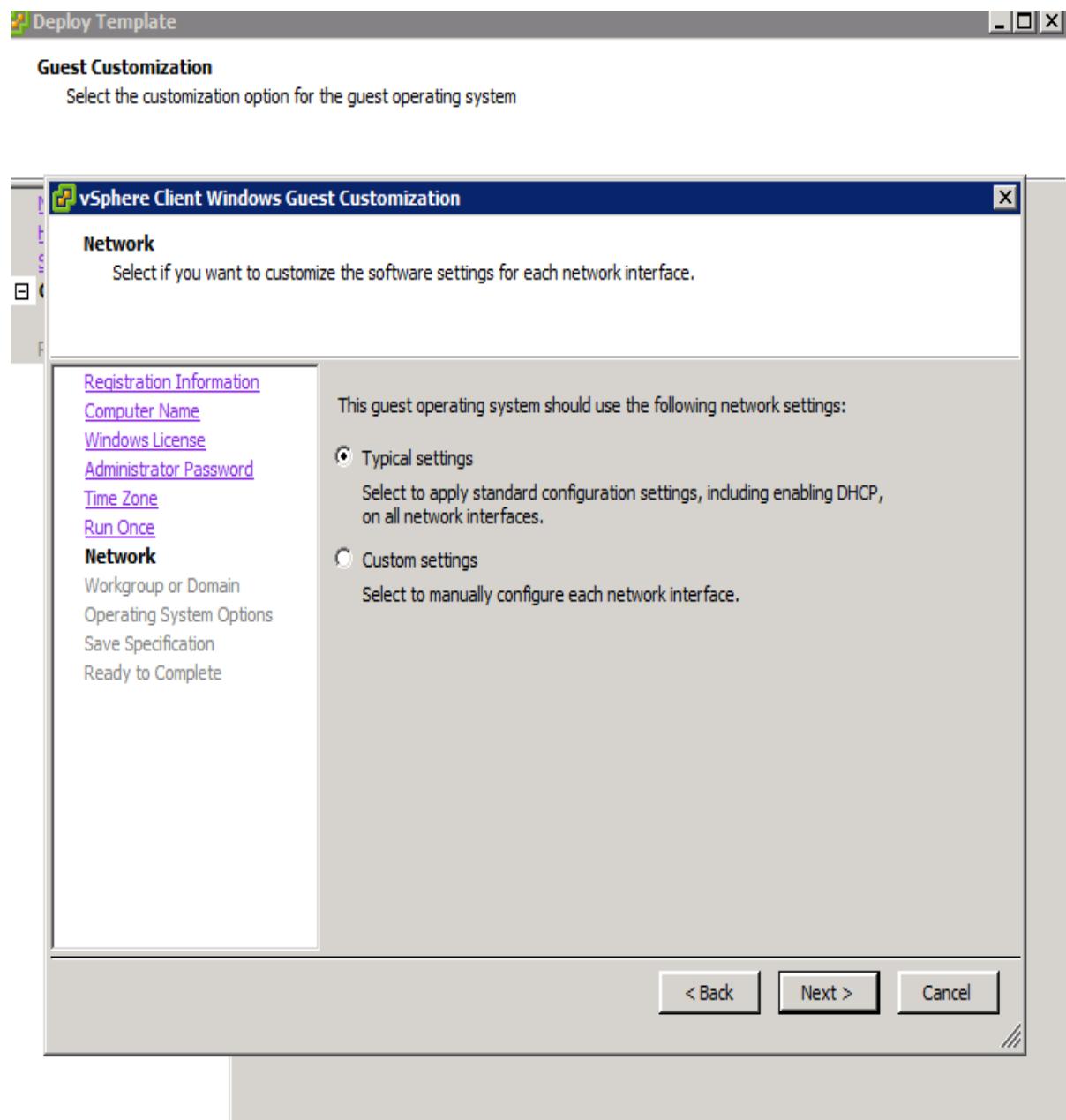
After creating the administrator password in this case **Pa\$\$w0rd\_** select the time zone and click next to continue.



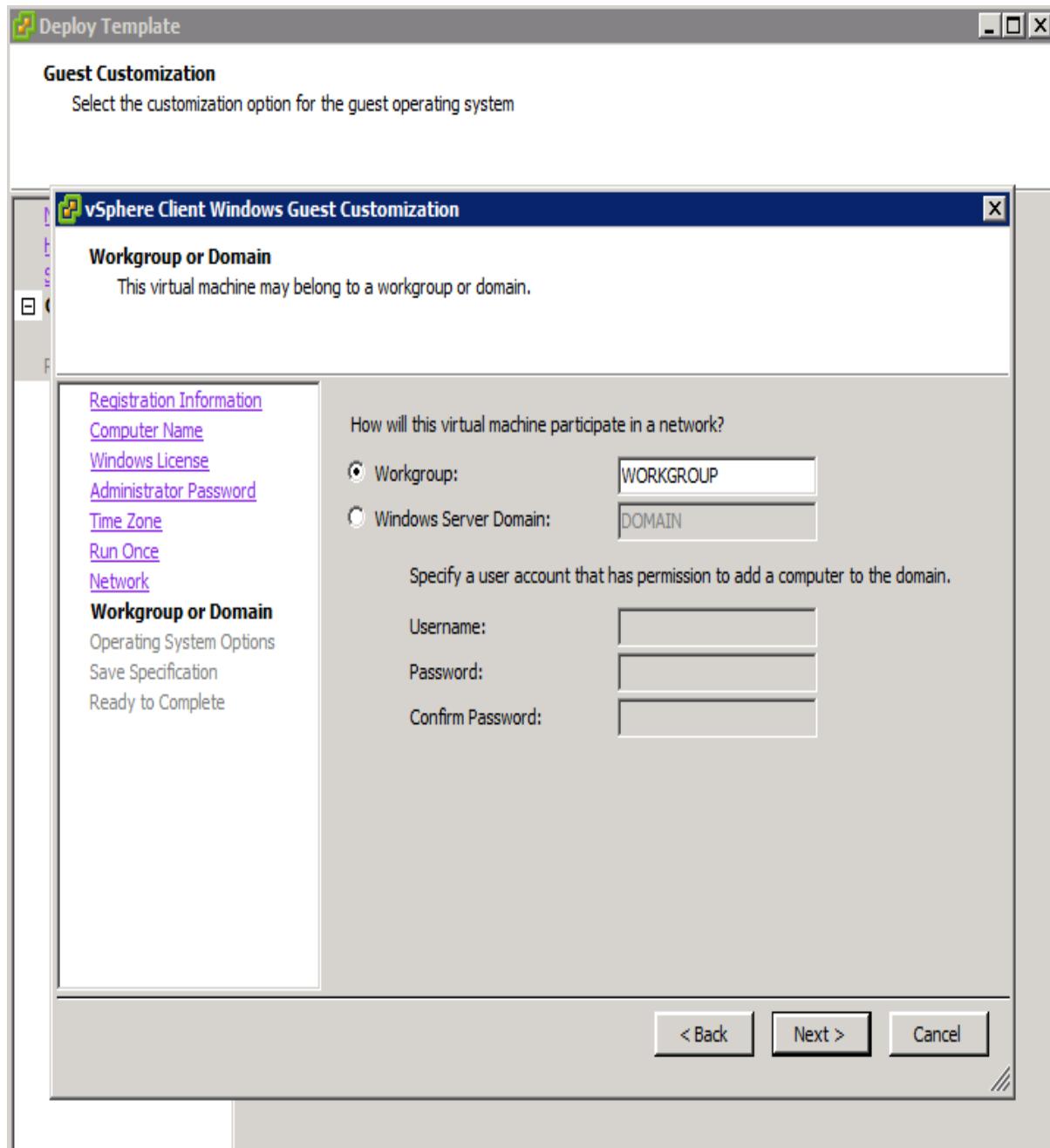
The Run Once option allows you to select specific commands to run when a user logs in. It is only optional and in this case I have not added any.



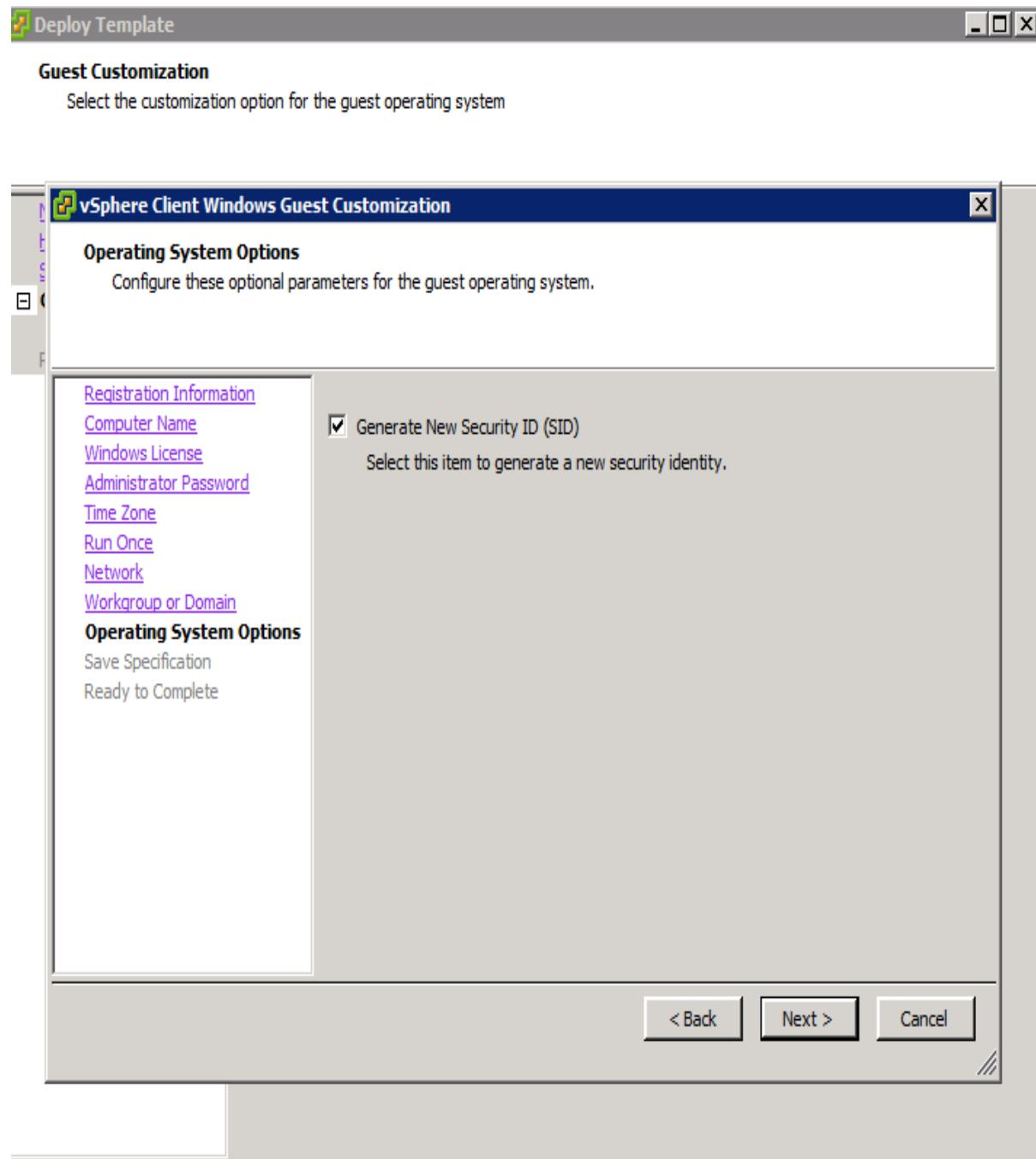
For the Network select the “Typical settings”.



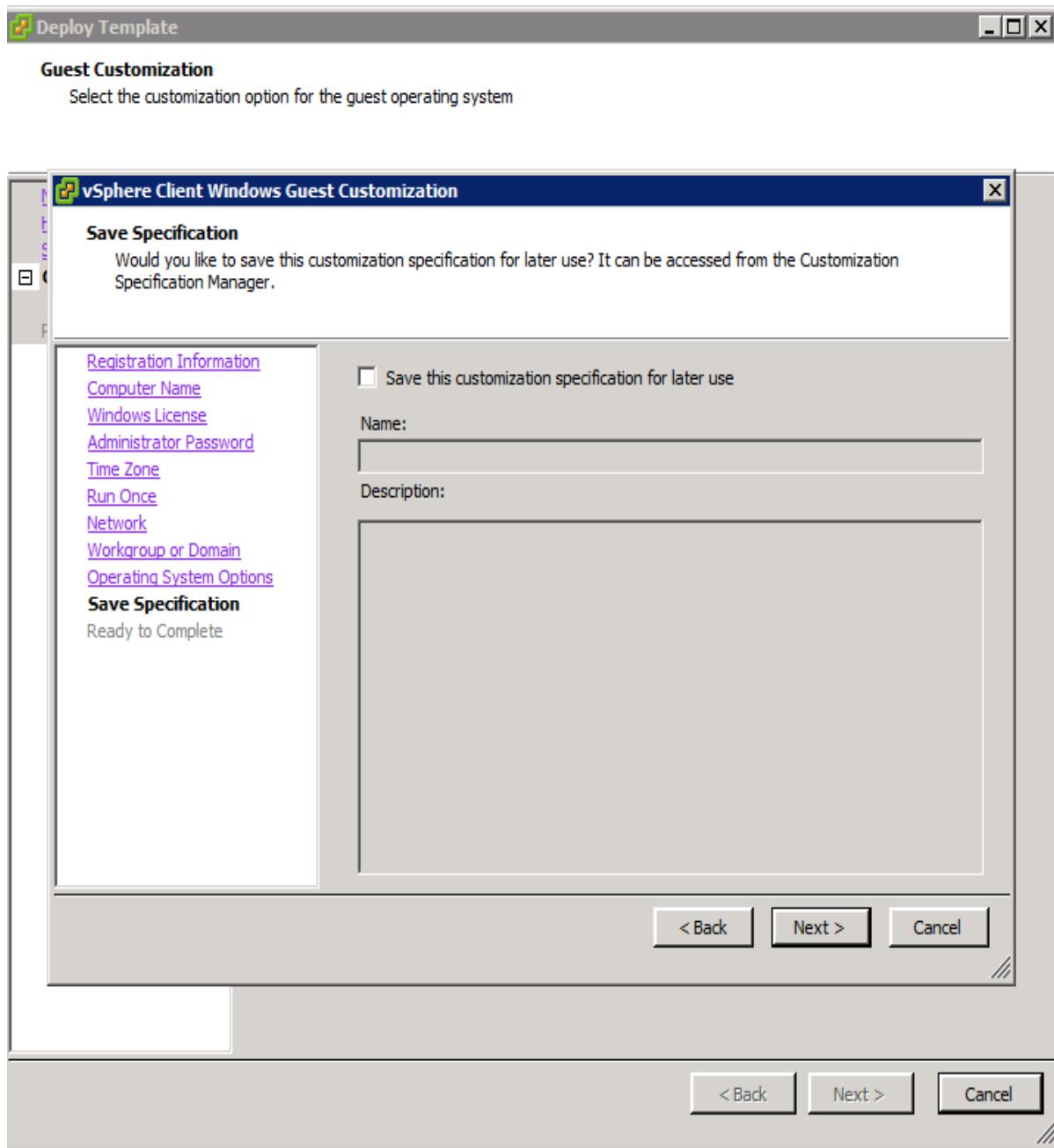
Select a workgroup or domain depending on your configurations. In this case I have selected "WORKGROUP".



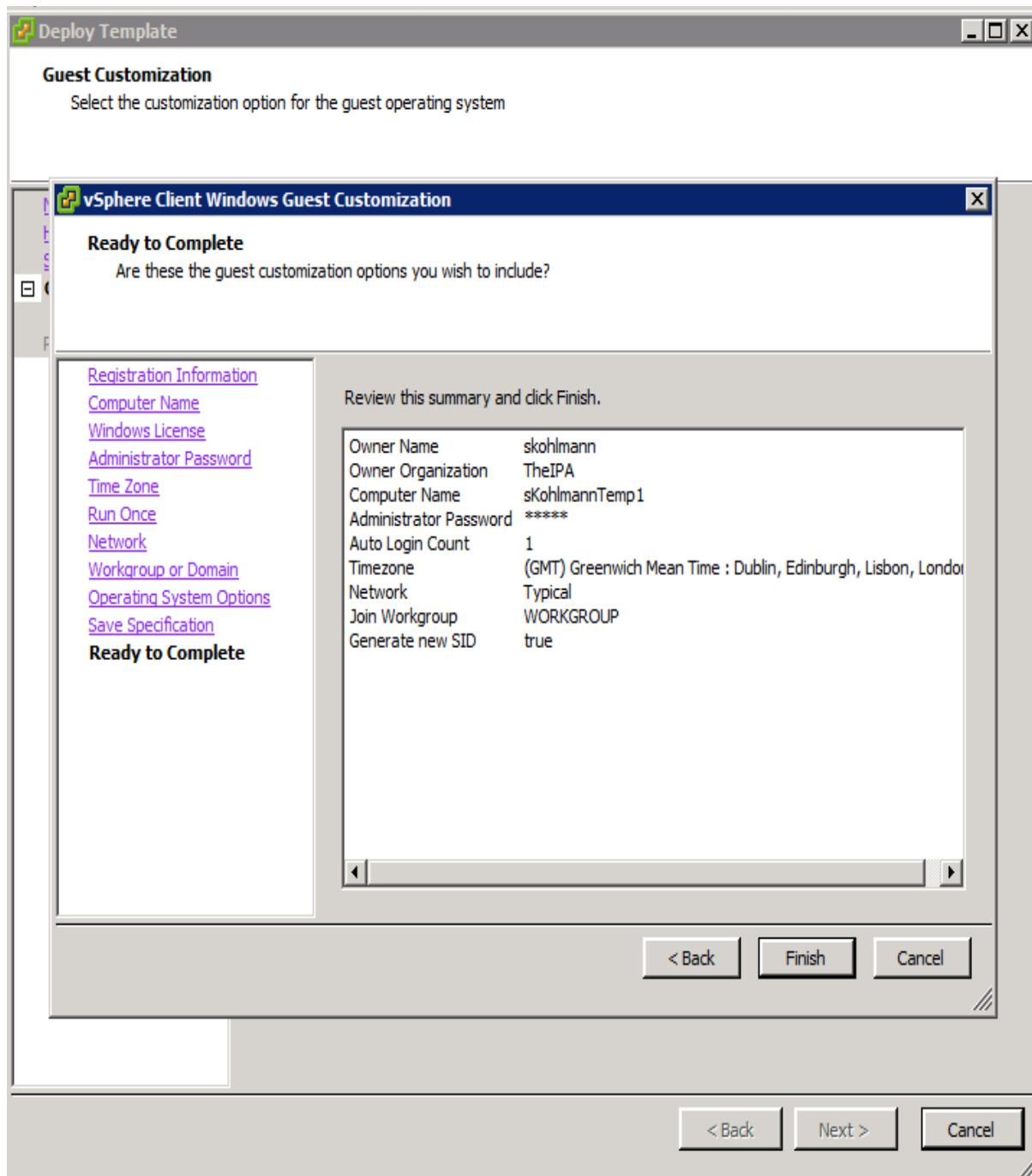
Click "Generate New Security ID (SID) and click next to continue



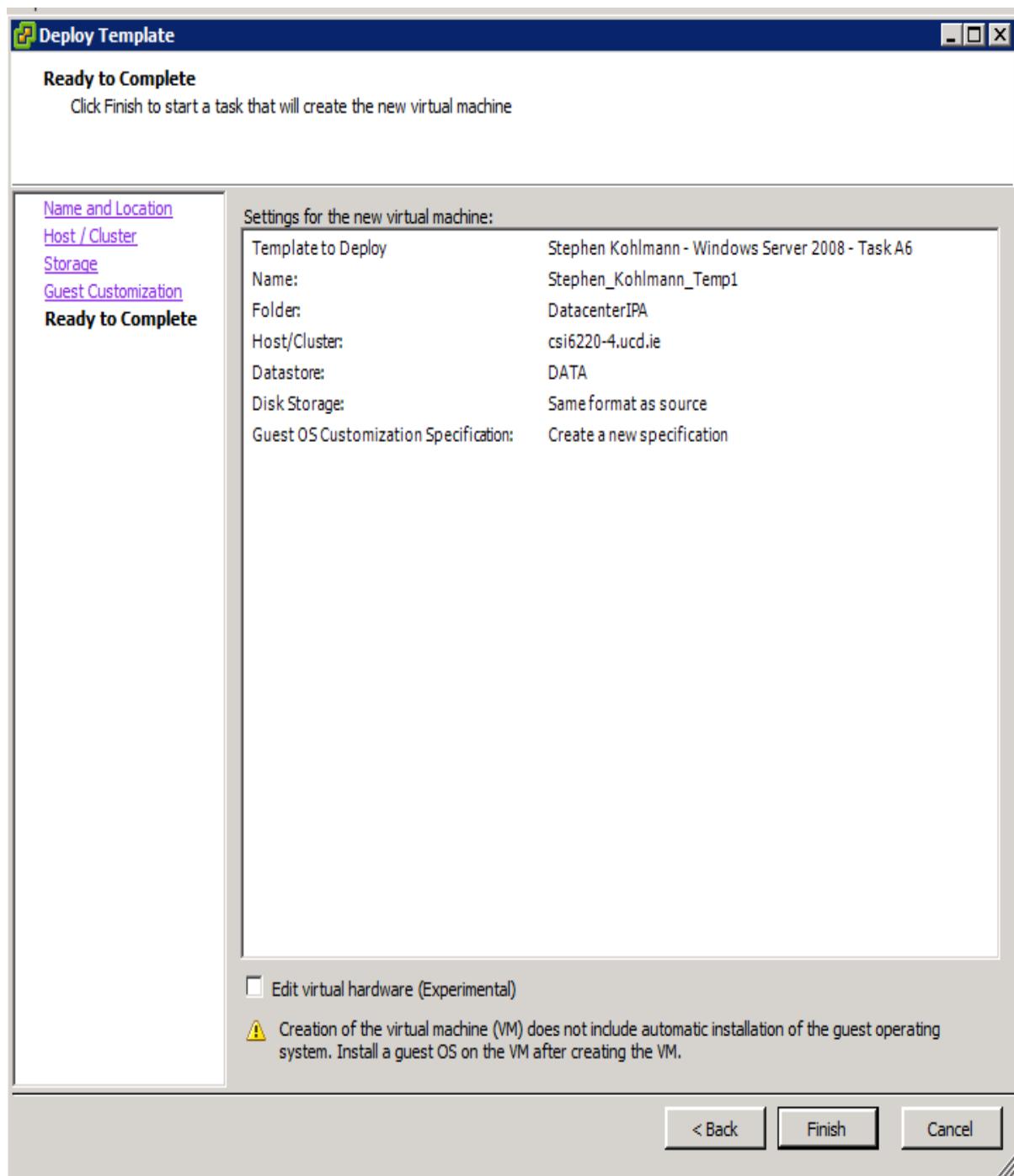
The next screen gives you the option to save the specific customization that has been made. If you choose to save the customization you can name it and put a description in for ease of administration if you choose to use this configuration again.



Review the configurations and settings for the guest customization and click “Finish” to complete.



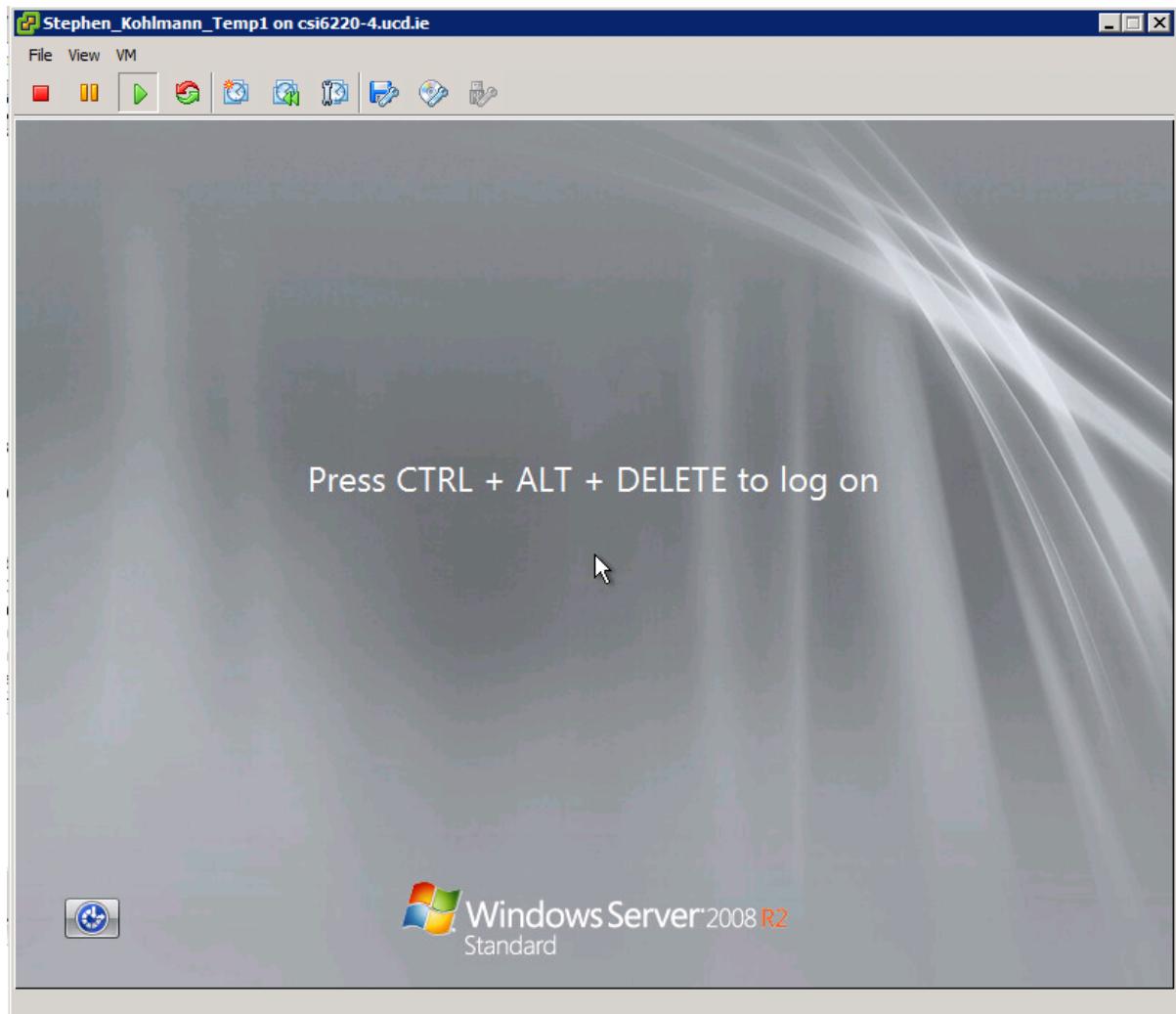
Click "Finish" to deploy the template.



When the template deployment has been completed you will see your machine listed below. In this case Stephen\_Kohlmann\_Temp1.



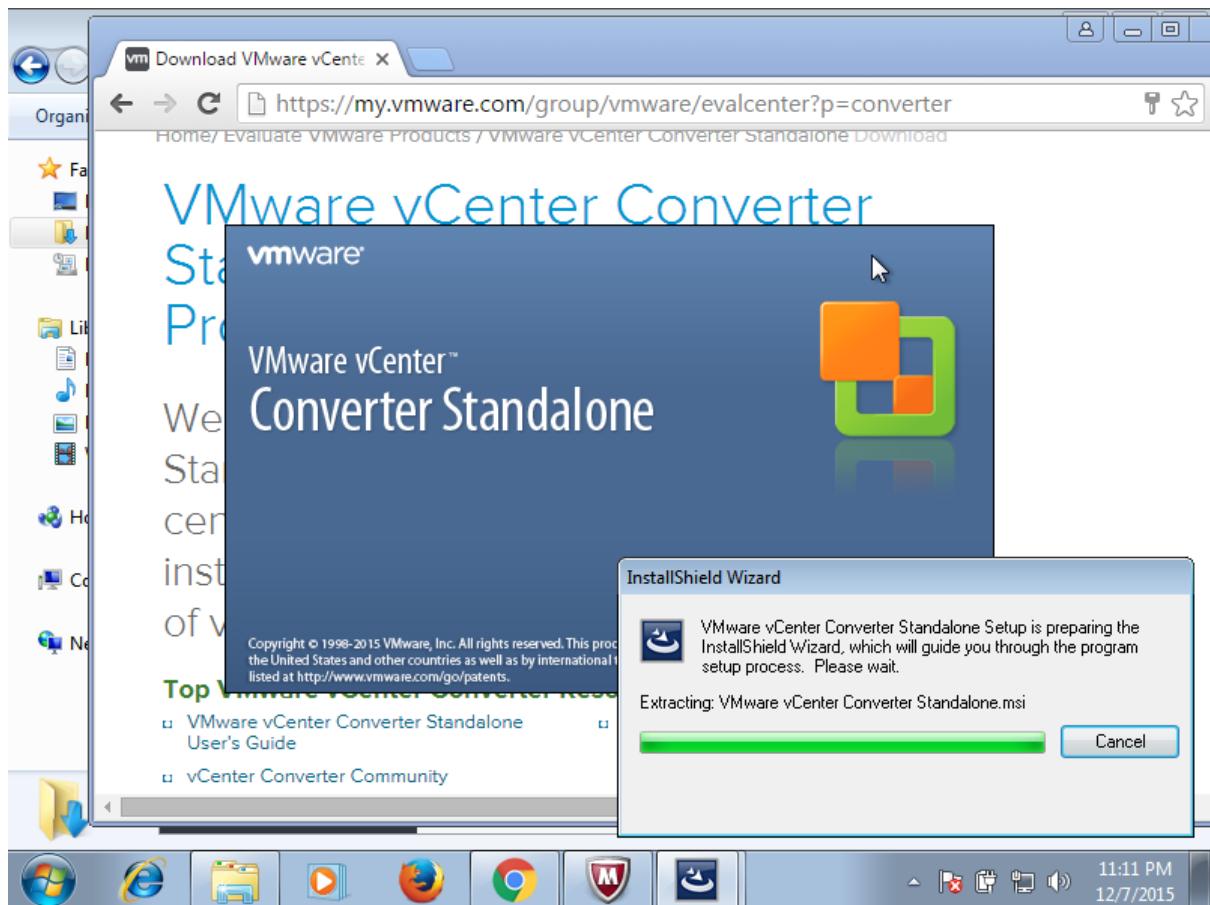
Like any of the virtual machines created so far when you power on the machine you will see the relevant operating system login options. In this case you will see the screen below when you select “Power on virtual machine”.



## A. 7

The following steps document the process of converting a physical machine to a virtual machine. These steps were done on a separate Windows 7 installation I have on Virtual Box.

The first step is to download the VMware vCenter converter from the VMware download center.

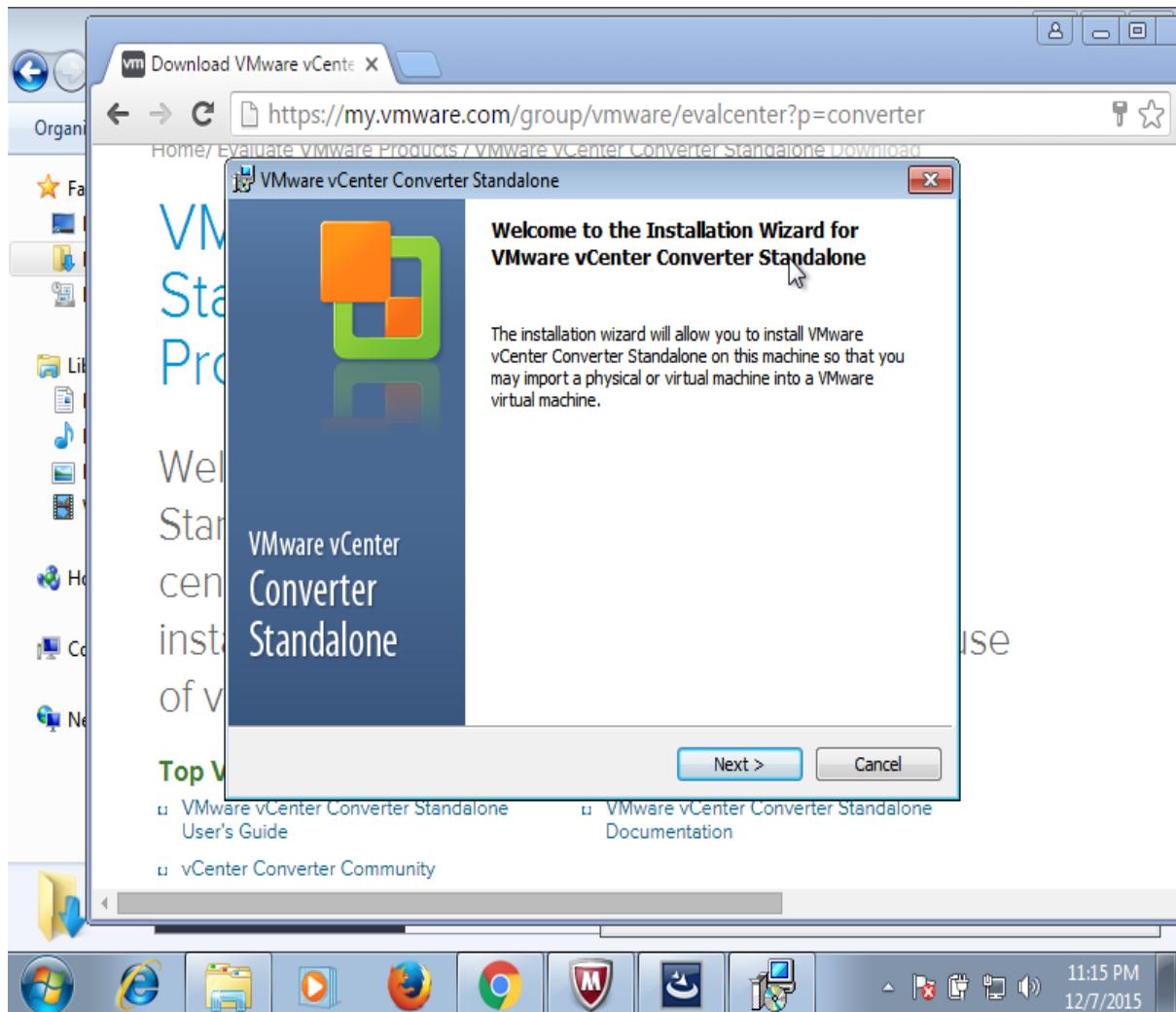


When the download has completed you will see something similar to this screen below.

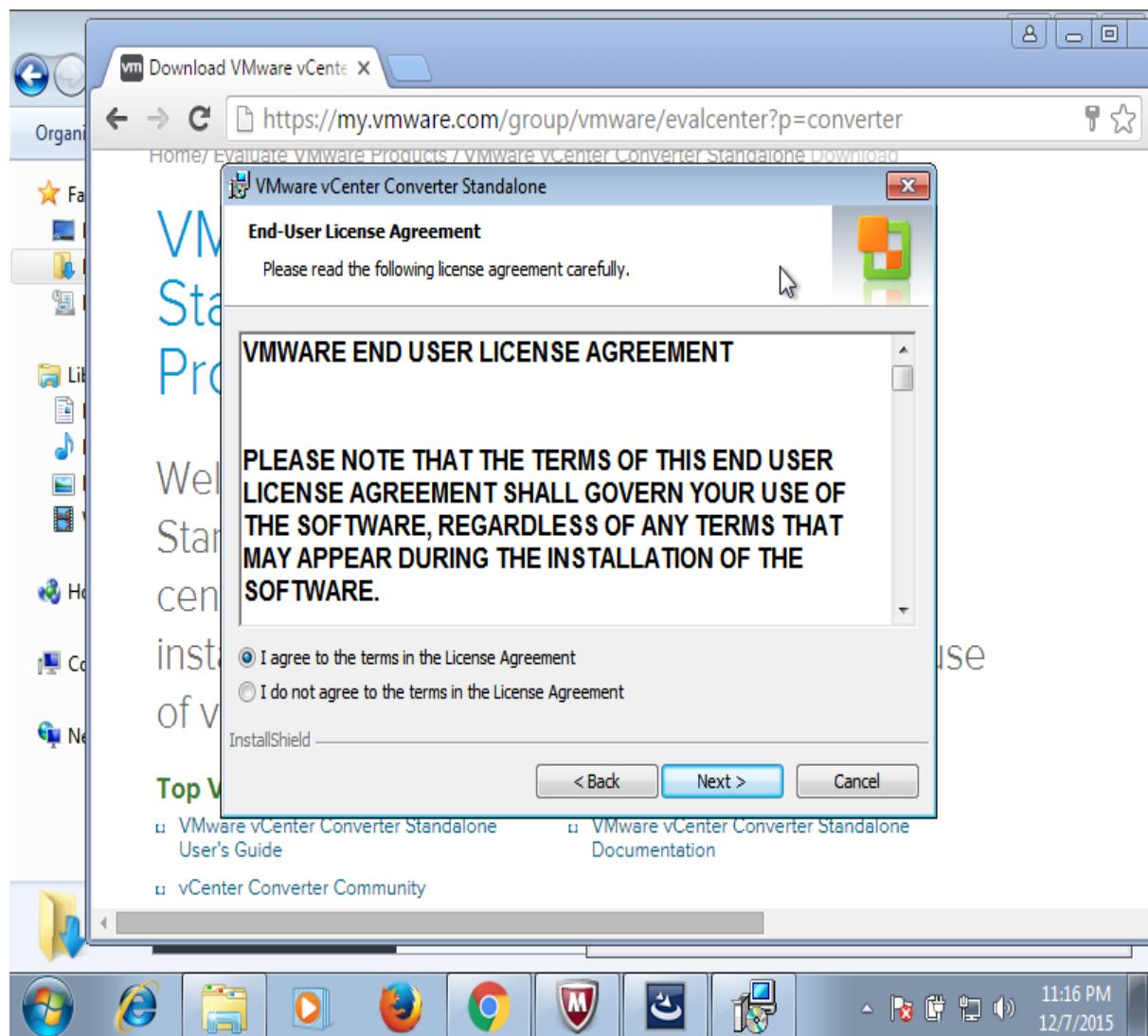
Double click the download to start the installation.



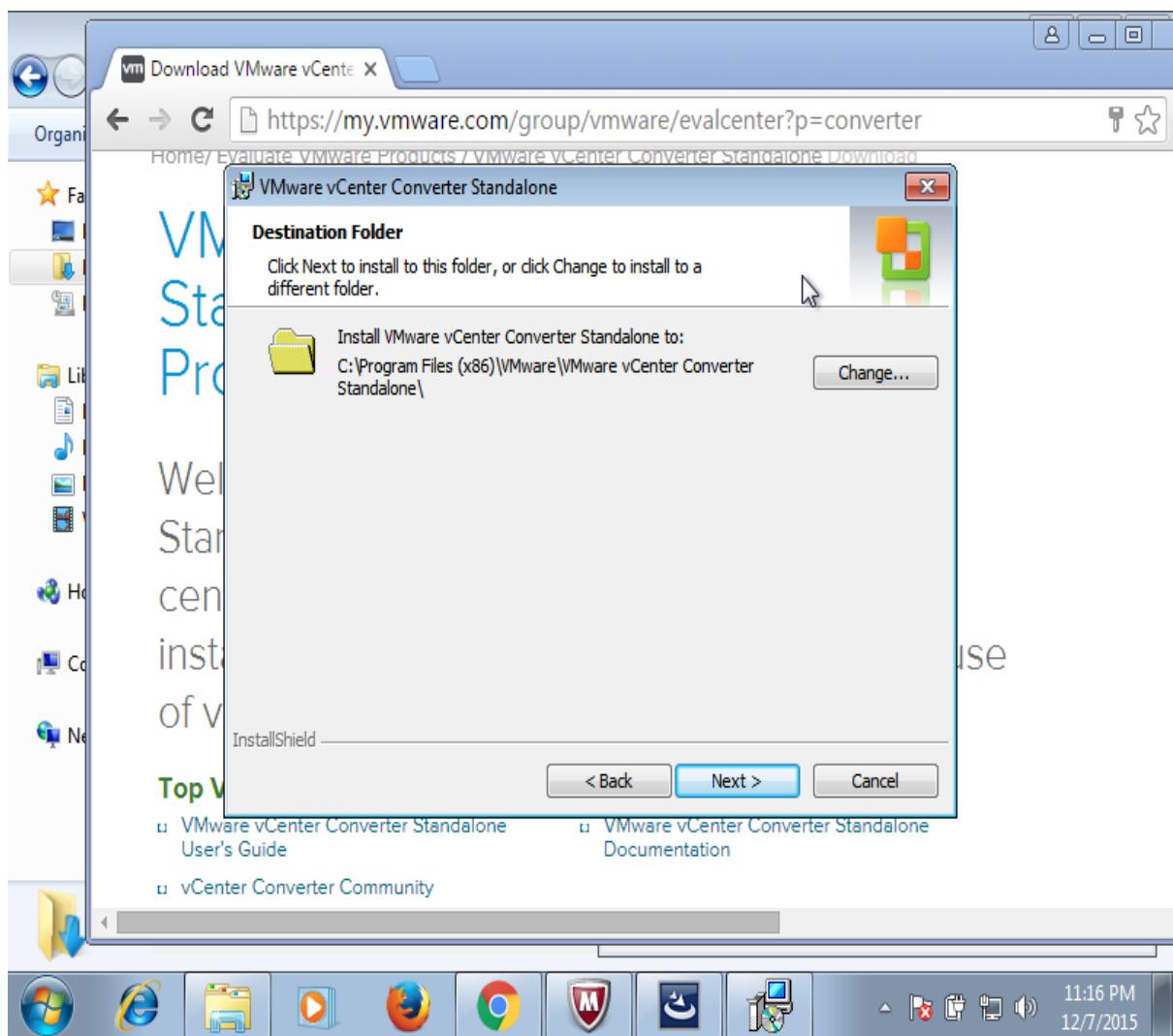
The installation wizard pops up as below. Click next to start the installation.



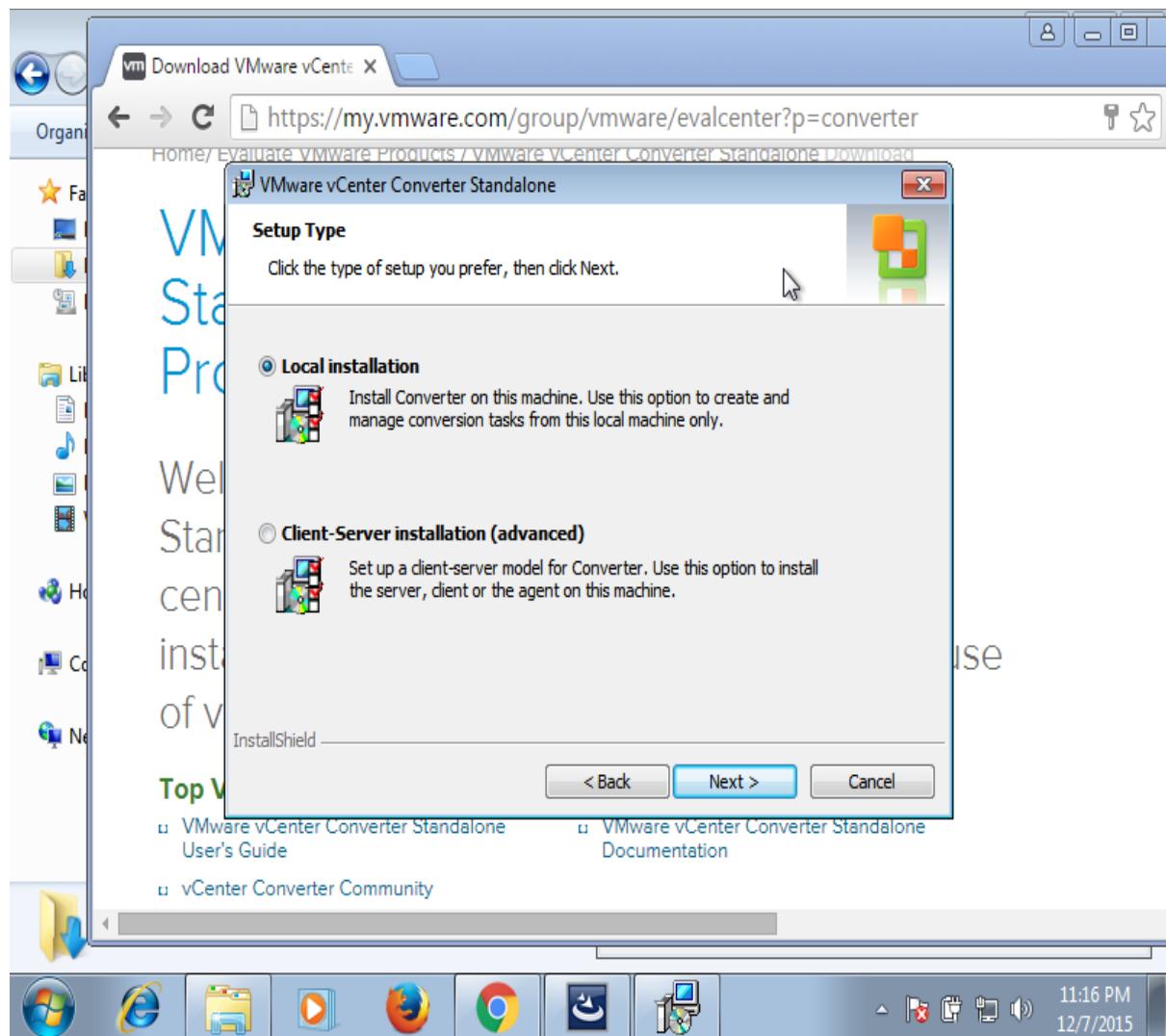
Agree to the license terms and click next to continue.



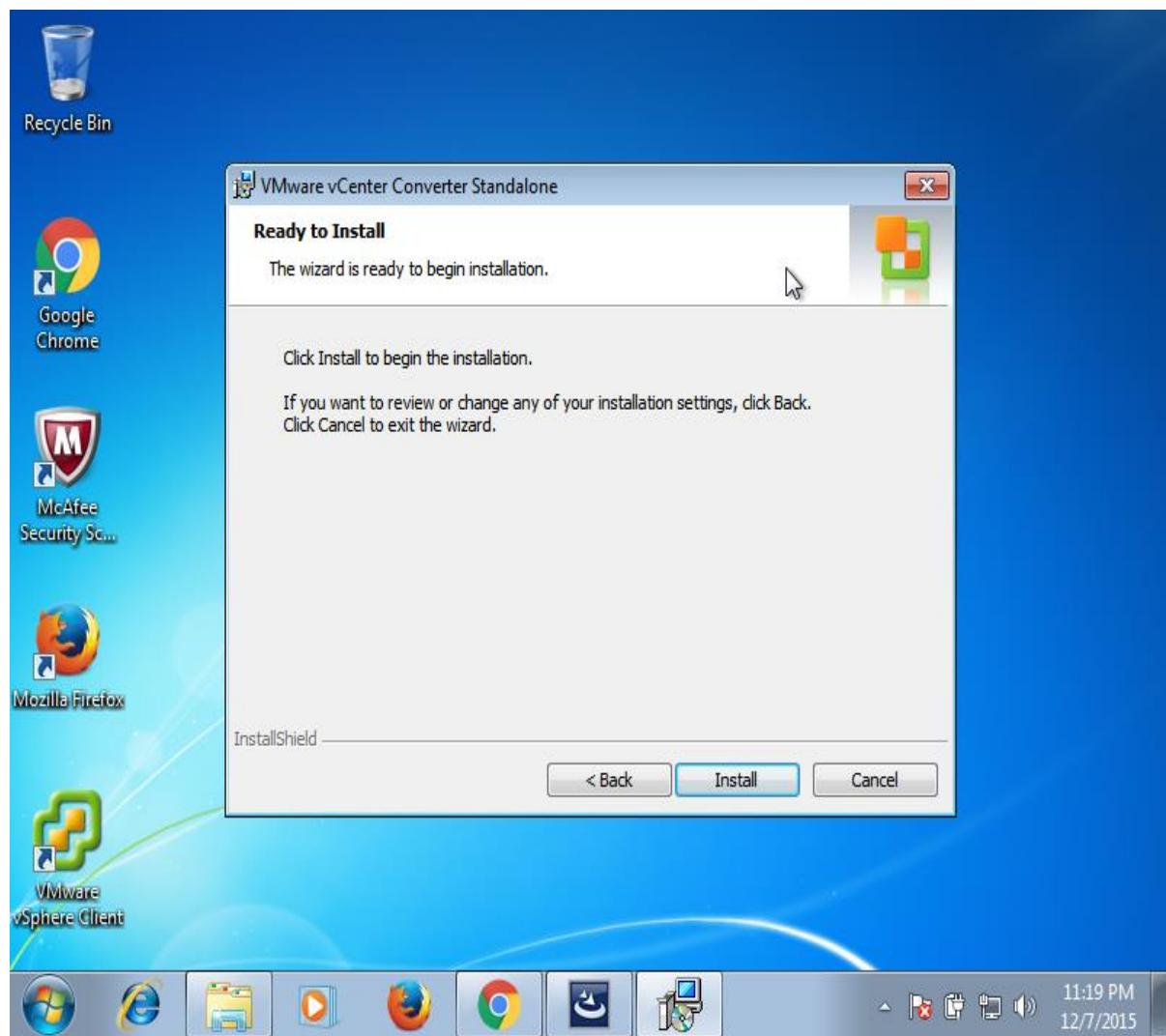
Select the destination folder for the installation.



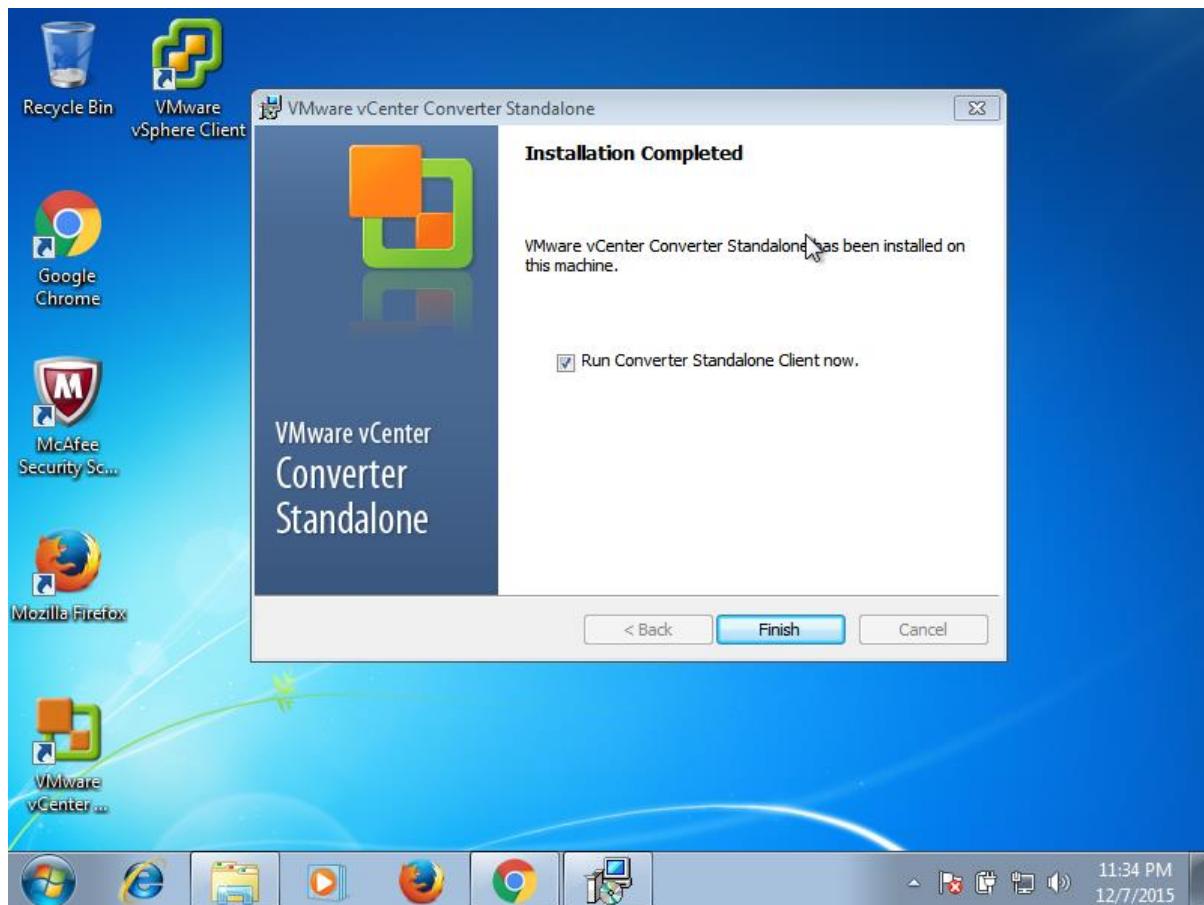
You will see two options for the type of installation. In this case “Local Installation” is chosen as I want to specifically convert this machine.



Click "Install" to begin the installation.



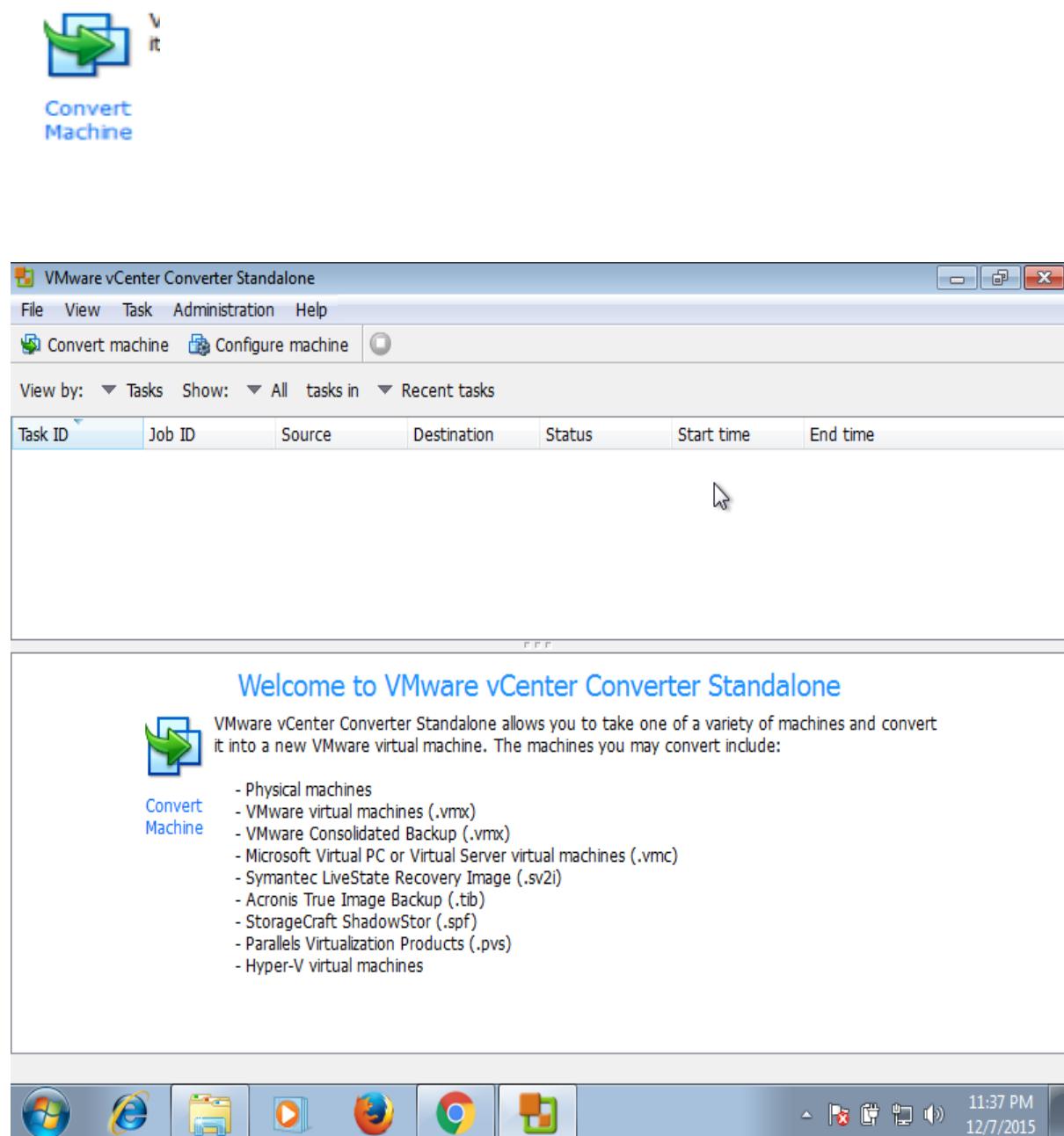
When the installation completes you will see the screen below and the VMware Converter icon will be on the desktop.



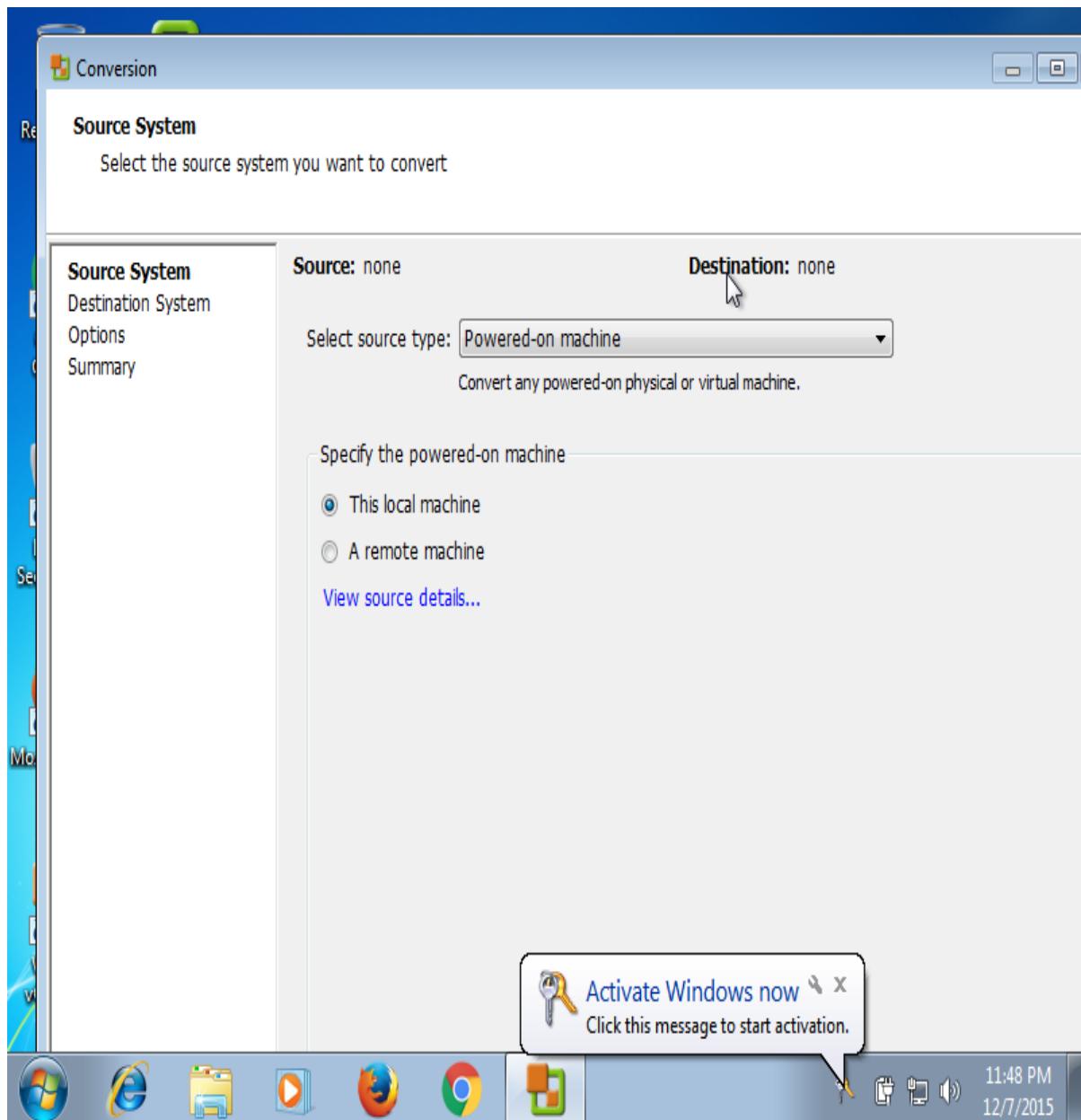
Double click the desktop icon to open the converter.



When the program opens you will see the screen below. To continue and convert a machine select the convert machine icon below.



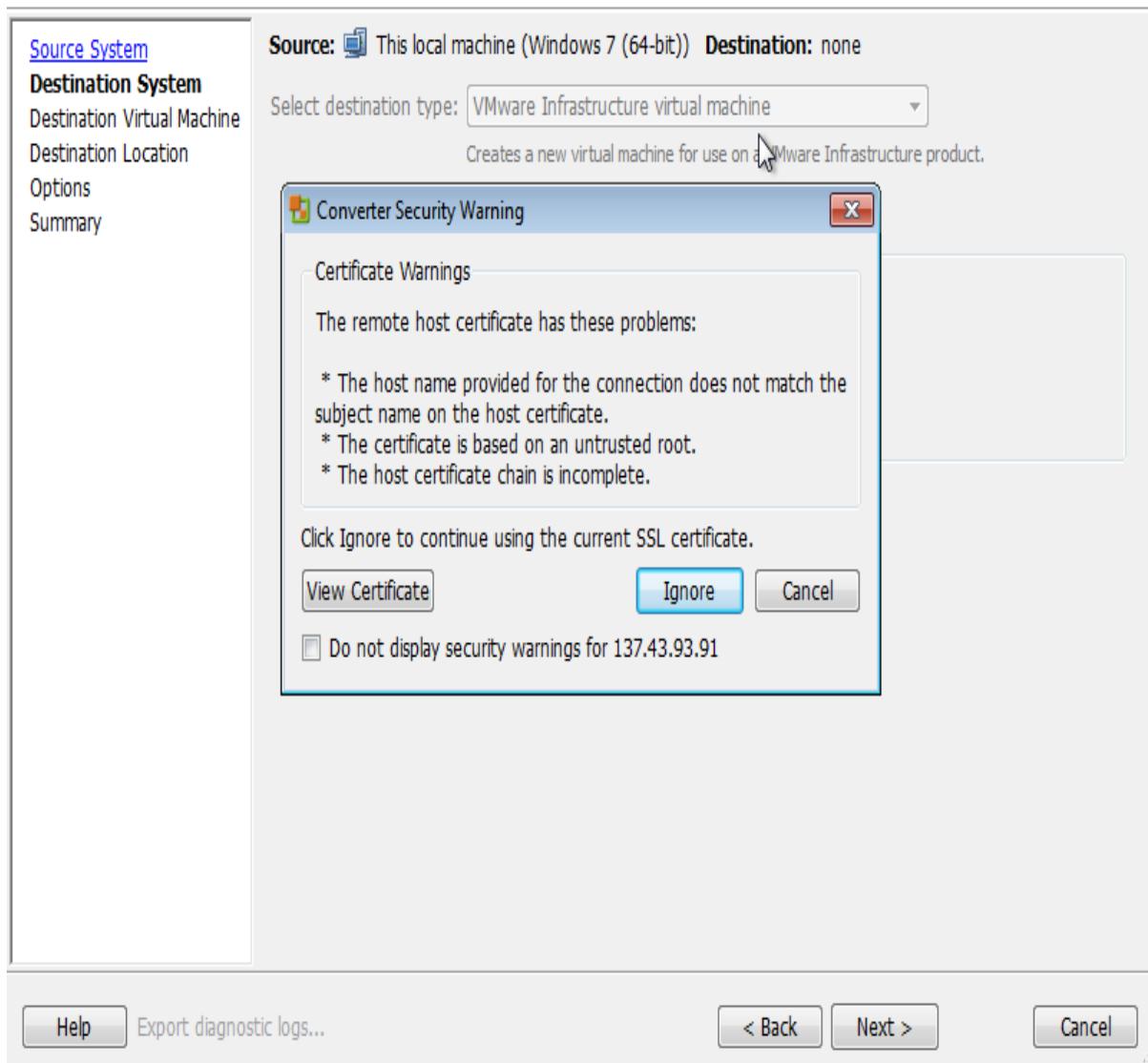
As the machine to be converted is the local machine select “This local machine” and select the source type as “Powered-on machine”



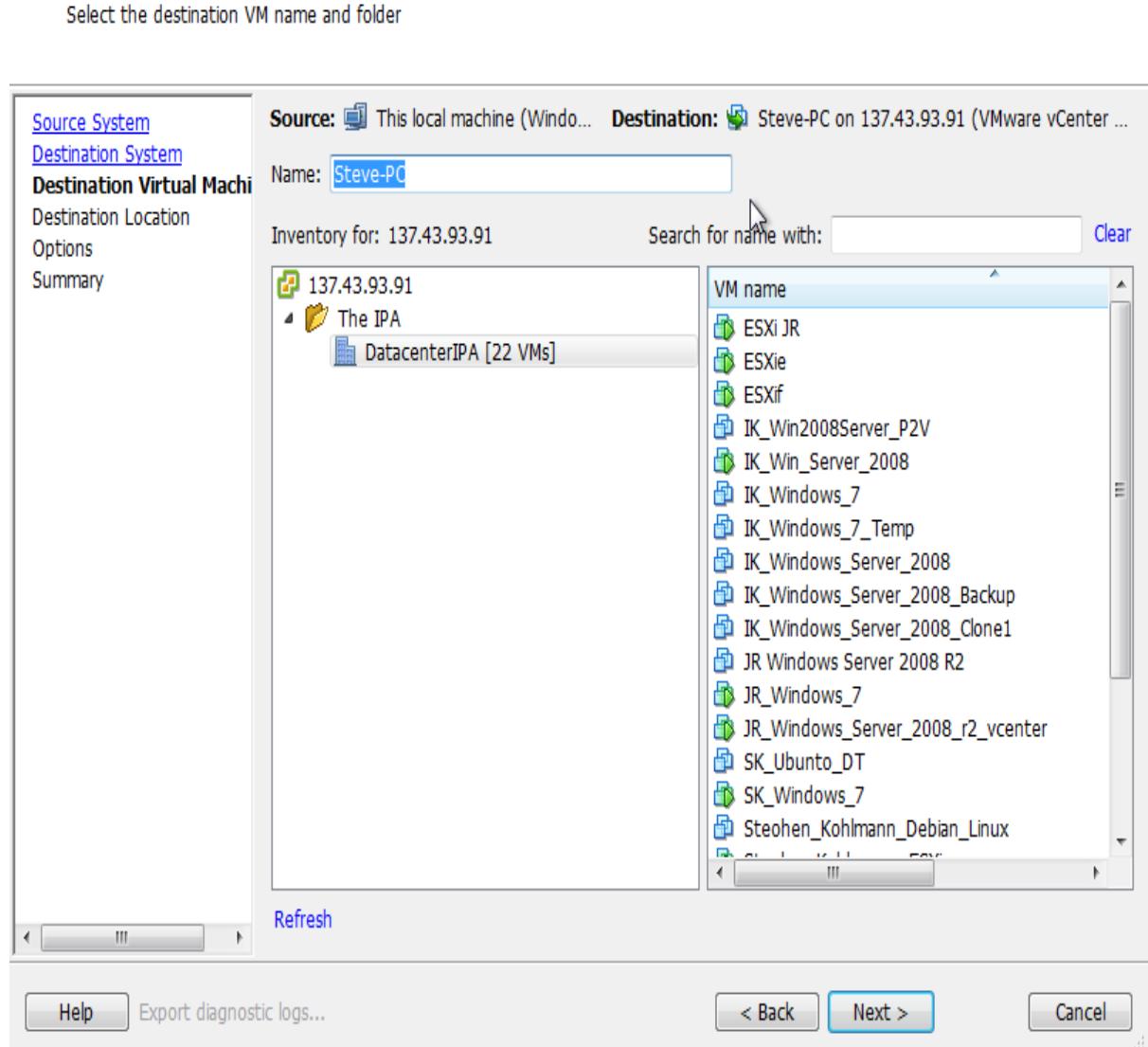
Click ignore to continue using the current SSL certificate.

### Destination System

Select a host for the new virtual machine



After entering the credentials for your server you will see screen similar to this. Basically the source and destination are now linked.



This step allows you to select the destination location for the new virtual machine.

### Destination Location

Select the location for the new virtual machine

Source System      Destination: Steve-PC on 137.43.93.91 (VMware vCenter ...)

Destination System      Destination Virtual Machine

Destination Location

Options      Summary

Inventory for: 137.43.93.91      Total source disks size: 25 GB

Datastore

DATA

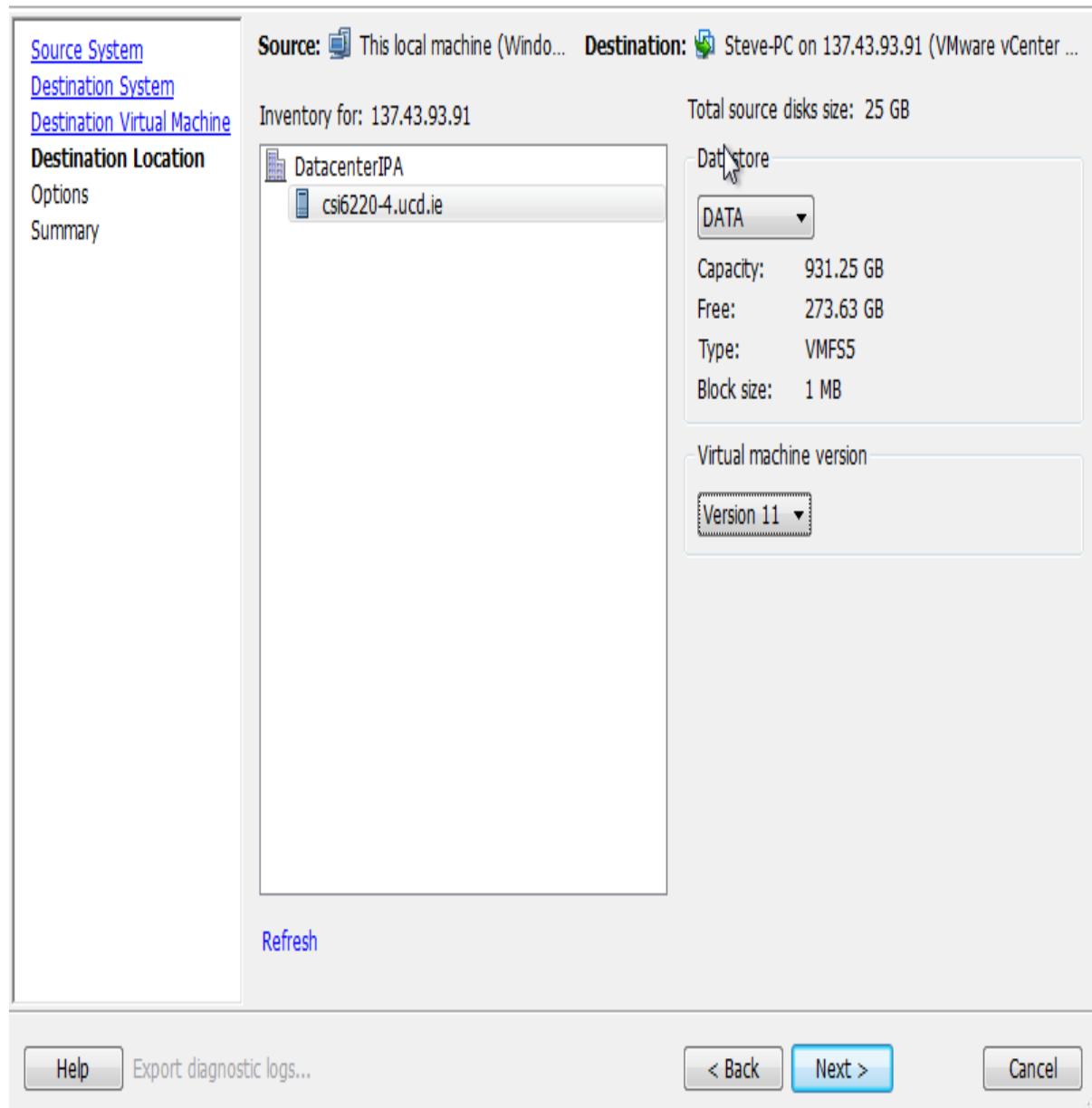
Capacity: 931.25 GB      Free: 273.63 GB      Type: VMFS5      Block size: 1 MB

Virtual machine version

Version 11

Refresh

Help      Export diagnostic logs...      < Back      Next >      Cancel



The following screen shows a review of the options selected. Once all is correct click next to view the summary of the conversion about to take place. On the summary screen proceed with the conversion.

### Options

Set up the parameters for the conversion task

The screenshot shows the 'Options' screen of the VMware Converter. On the left, a sidebar lists navigation links: Source System, Destination System, Destination Virtual Machine, Destination Location, Options, and Summary. The 'Options' link is currently selected. The main pane displays the conversion configuration:

**Source:** This local machine (Windows 7 Pro) **Destination:** Steve-PC on csi6220-4.ucd.ie (VMware vCenter...)

Click on an option below to edit it.

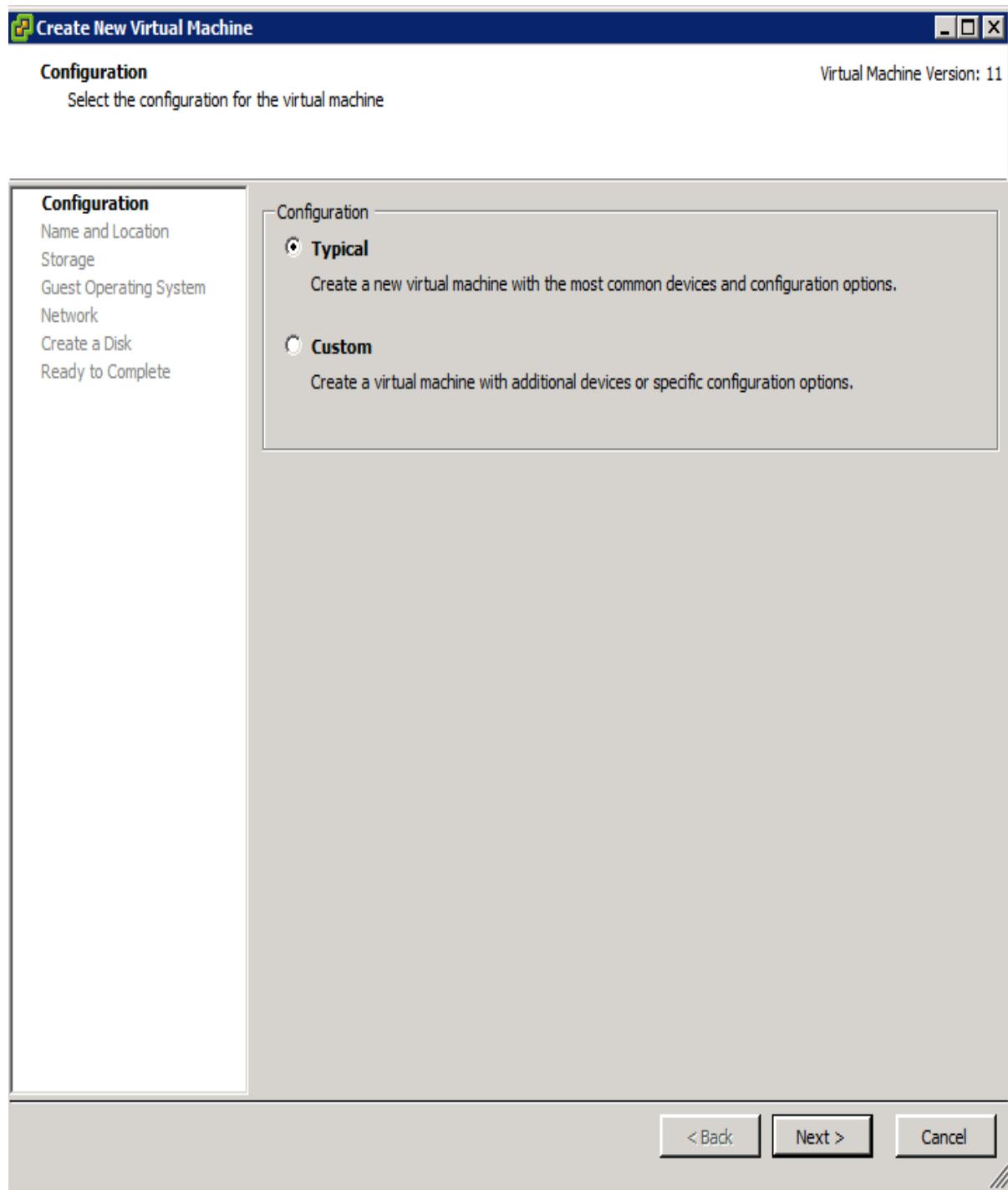
**Current settings:**

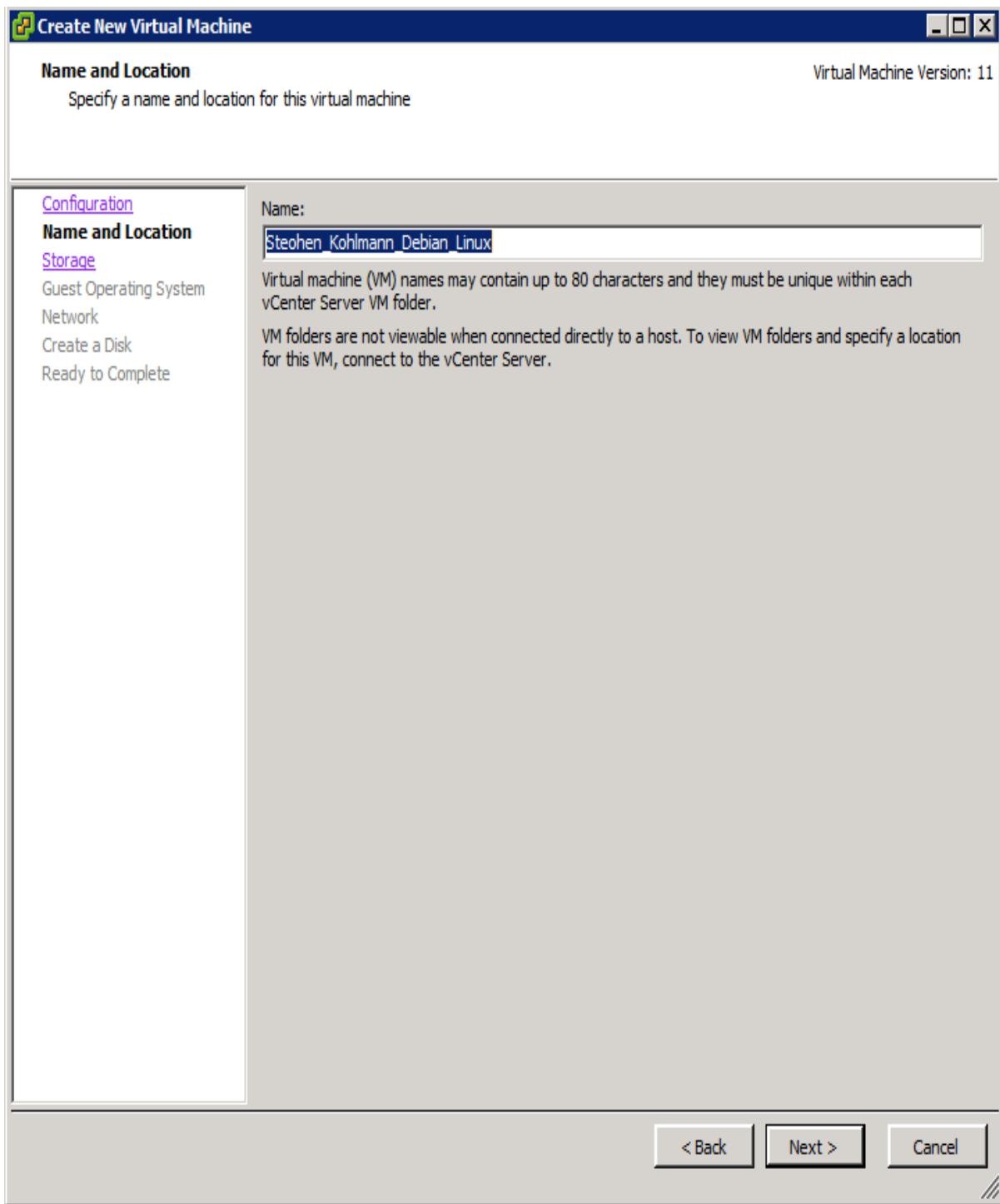
- Data to copy**
  - Copy type: Volume-based
    - <\\?\Volume{8e73f943-8ce6-11e5-8a9c-806e6f6e6963}\>: 100 MB
    - <C:>: 24.9 GB
- Devices**
  - vCPUs: 1 (1 sockets \* 1 cores)
  - Disk controller: SCSI LSI Logic SAS
  - Memory: 1GB
- Networks**
  - NIC1: VM Network
- Services**
  - Total: 150 service(s)
- Advanced options**
  - Synchronization: Disabled
  - Synchronize: N/A
  - Final synchronization: N/A
  - Power on destination: No
  - Install VMware Tools: No
  - Customize Guest OS: No
  - Remove Restore Checkpoints: Yes
  - Reconfigure: Yes

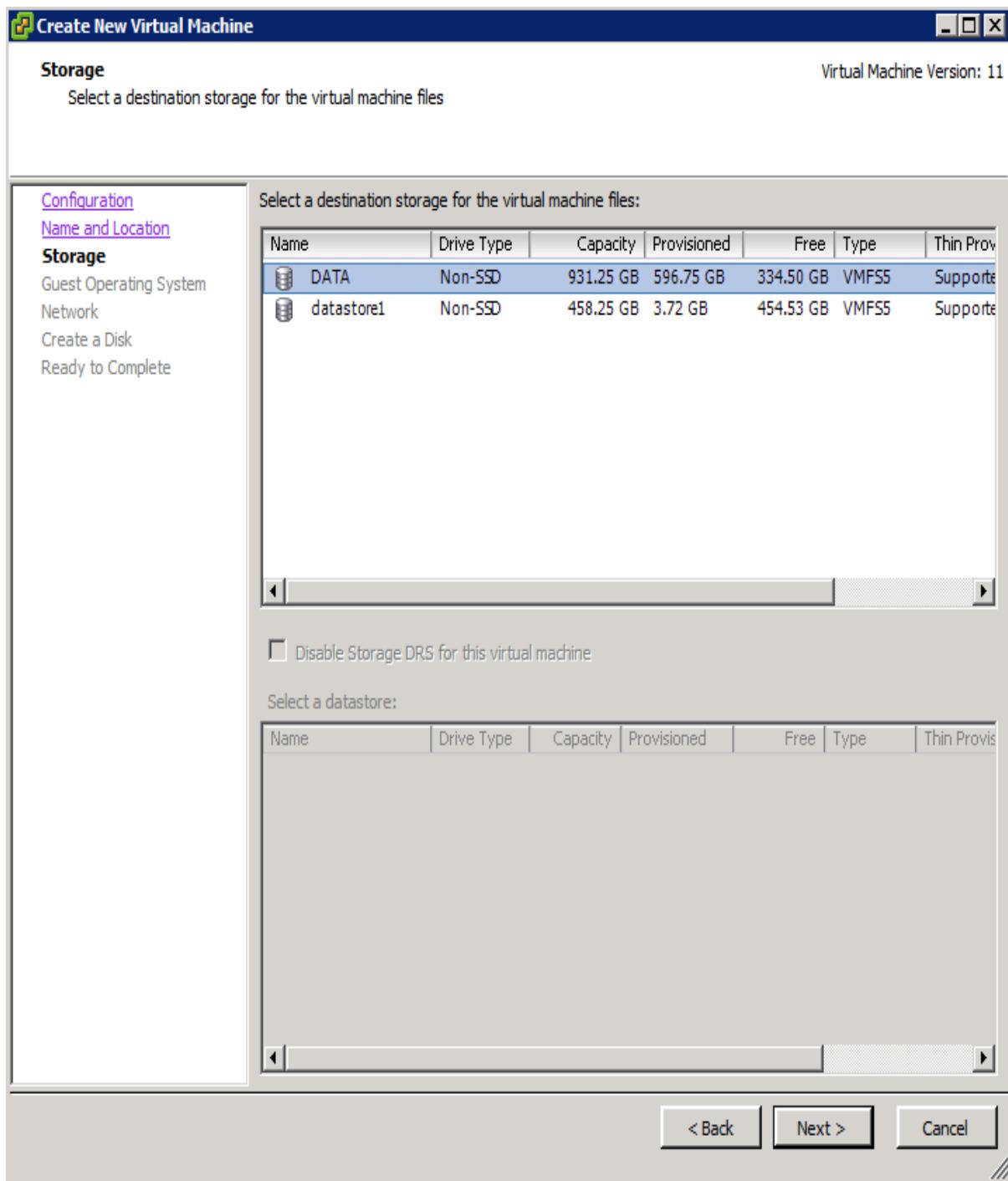
At the bottom, there are buttons for Help, Export diagnostic logs..., Back, Next >, Cancel, and a small '...' button.

## A. 8

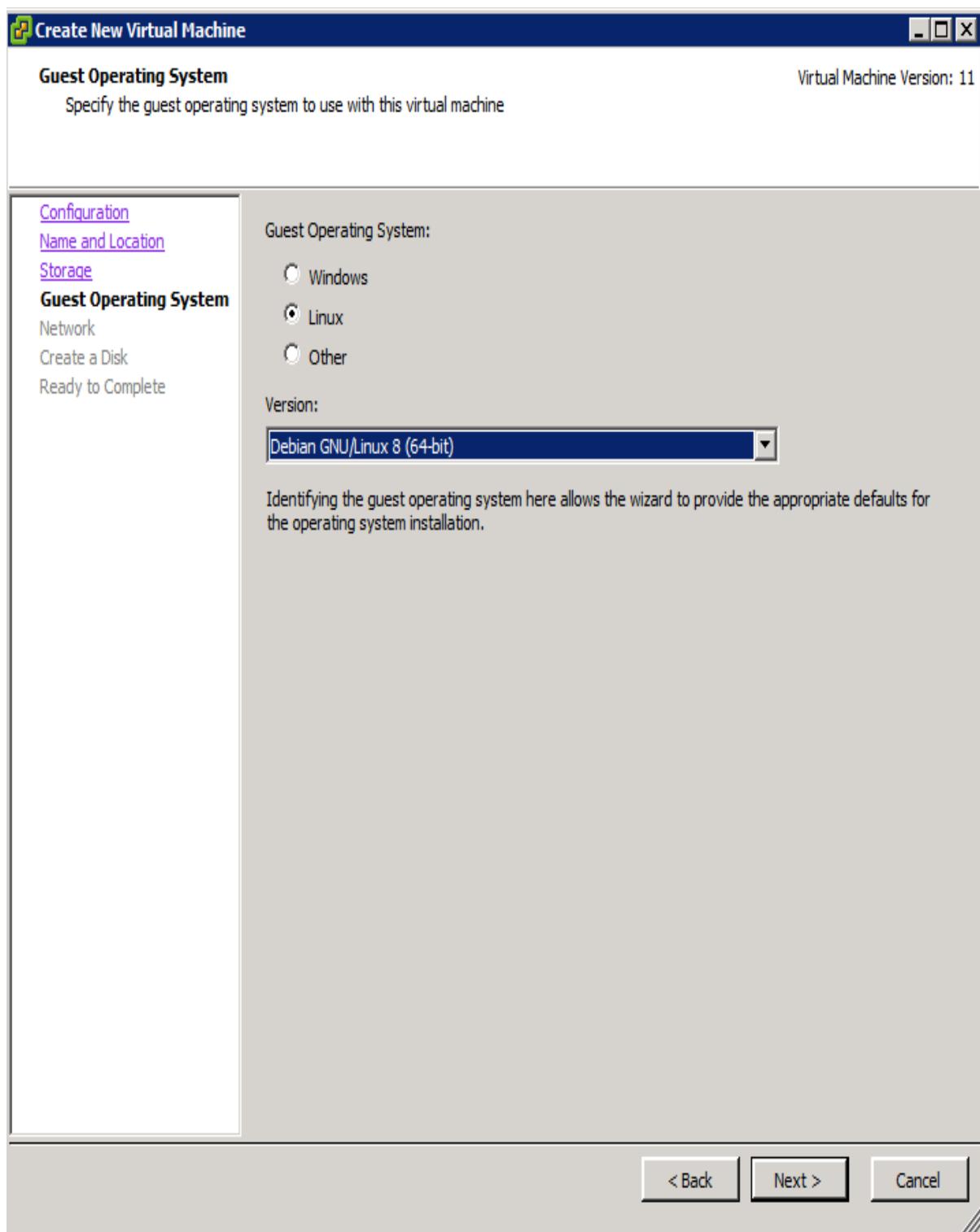
In this task I am creating a new Virtual Machine with a Linux operating system. The following steps are the same as were used to create machine 1 and 2 from task 2.

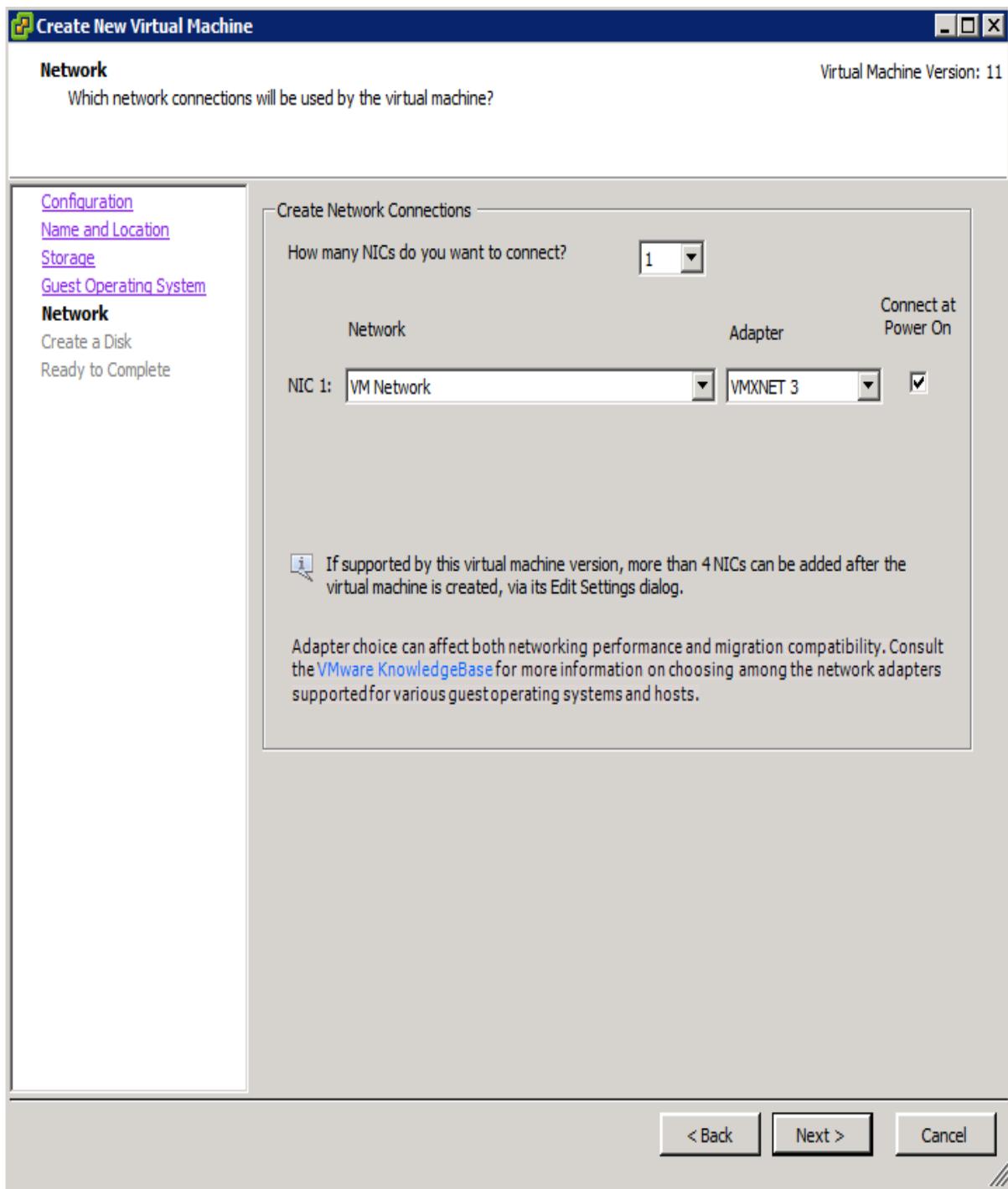


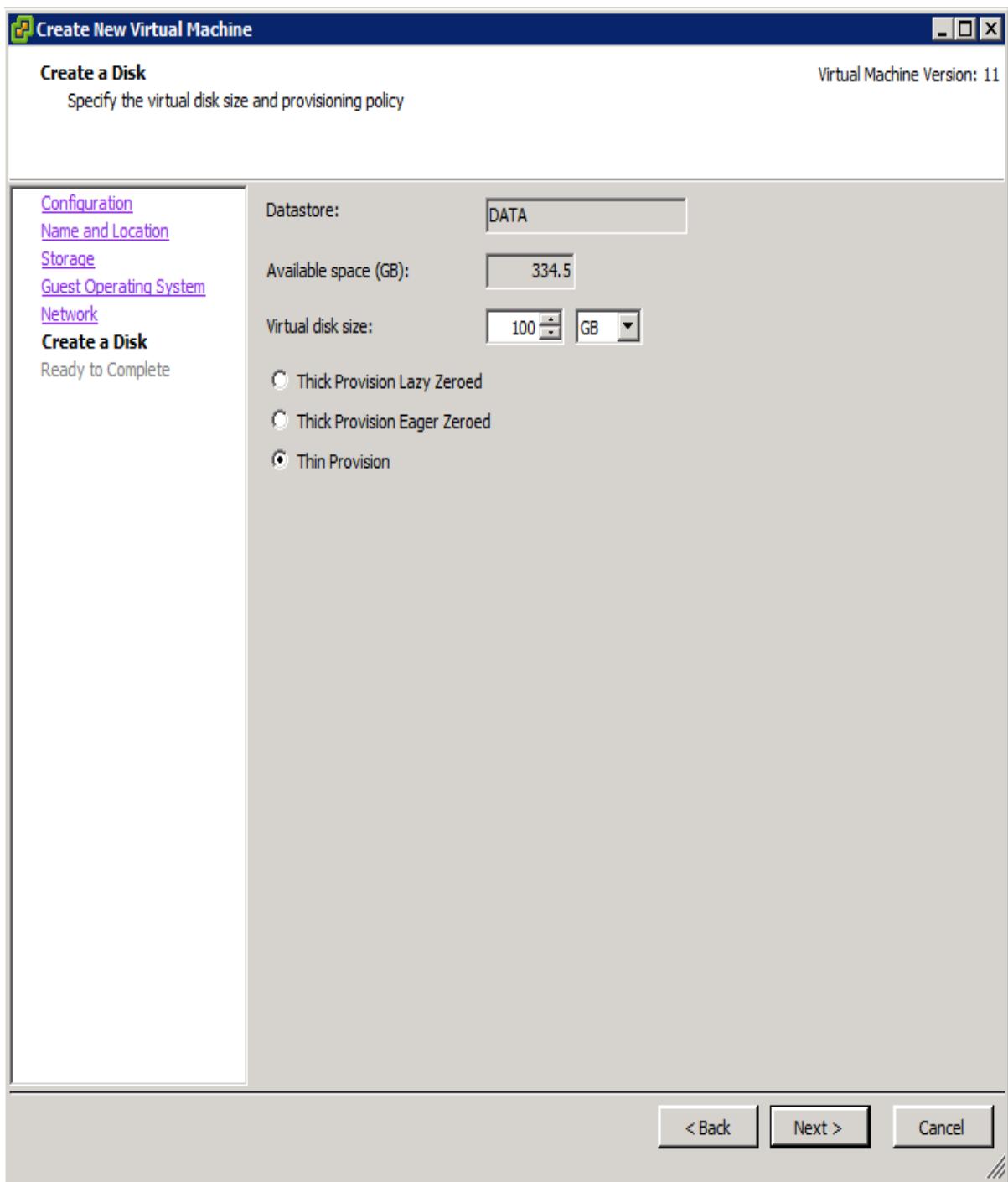


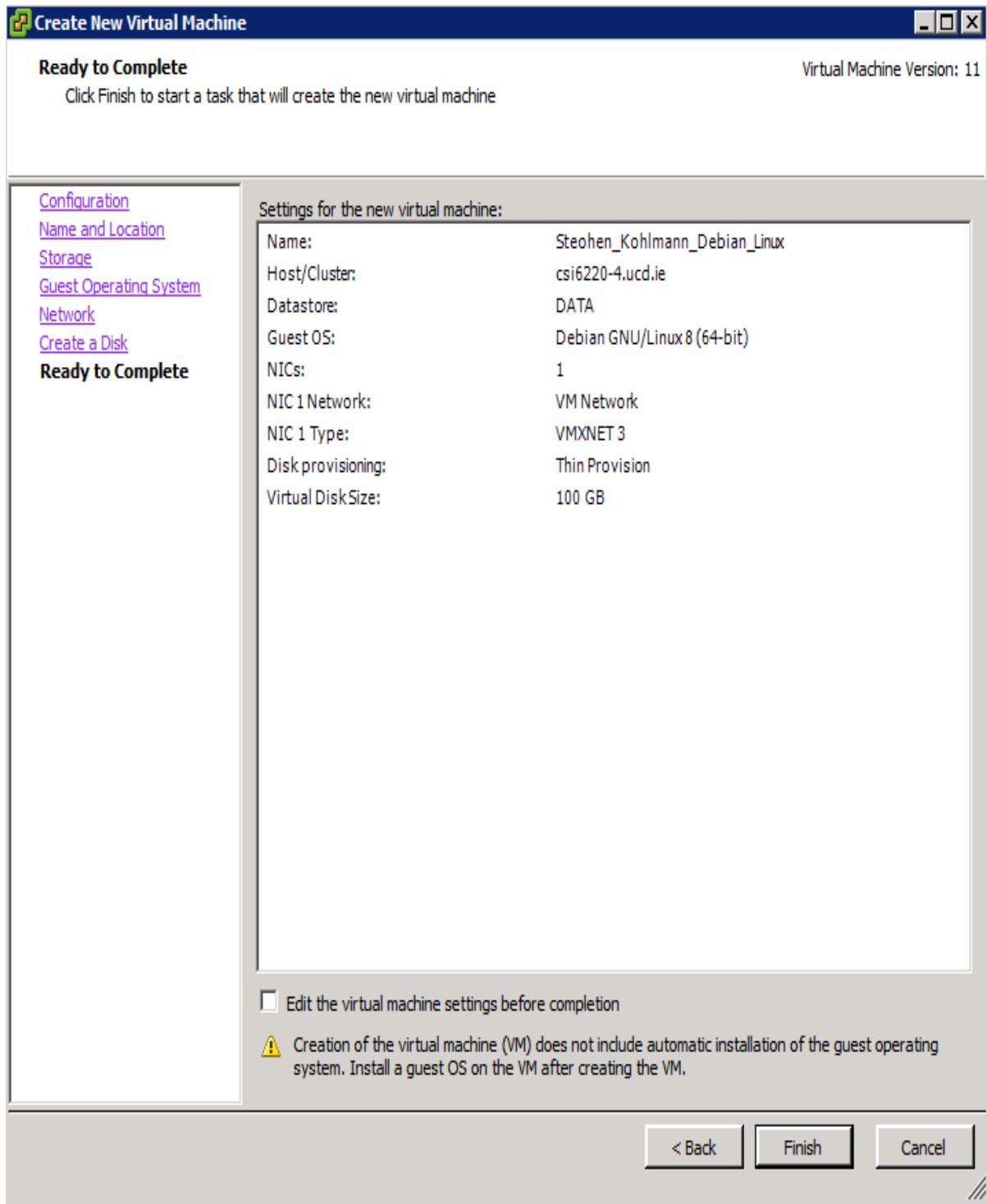


The difference here is that you select the guest OS to be Linux and then select the Linux version to match your ISO.

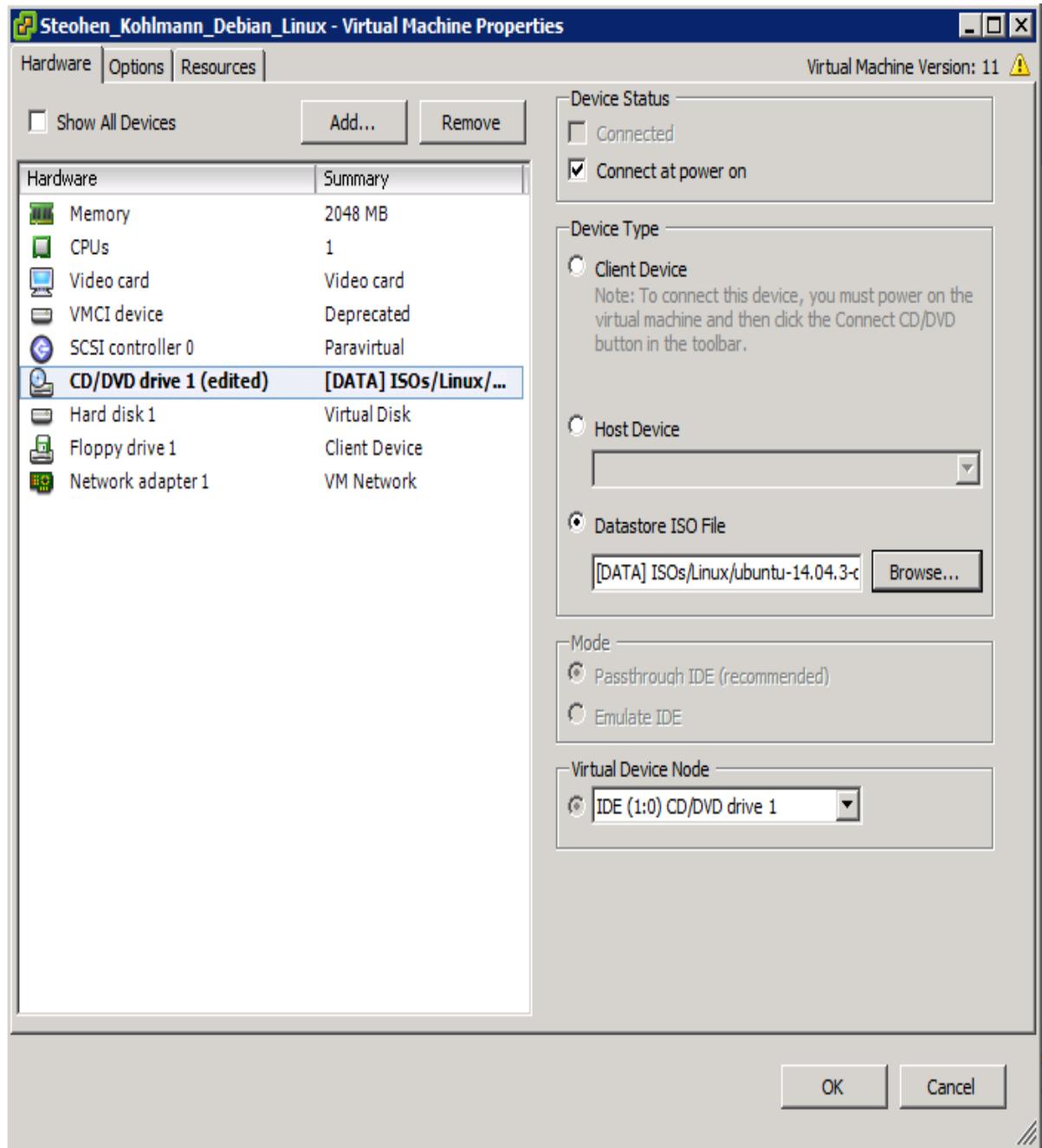






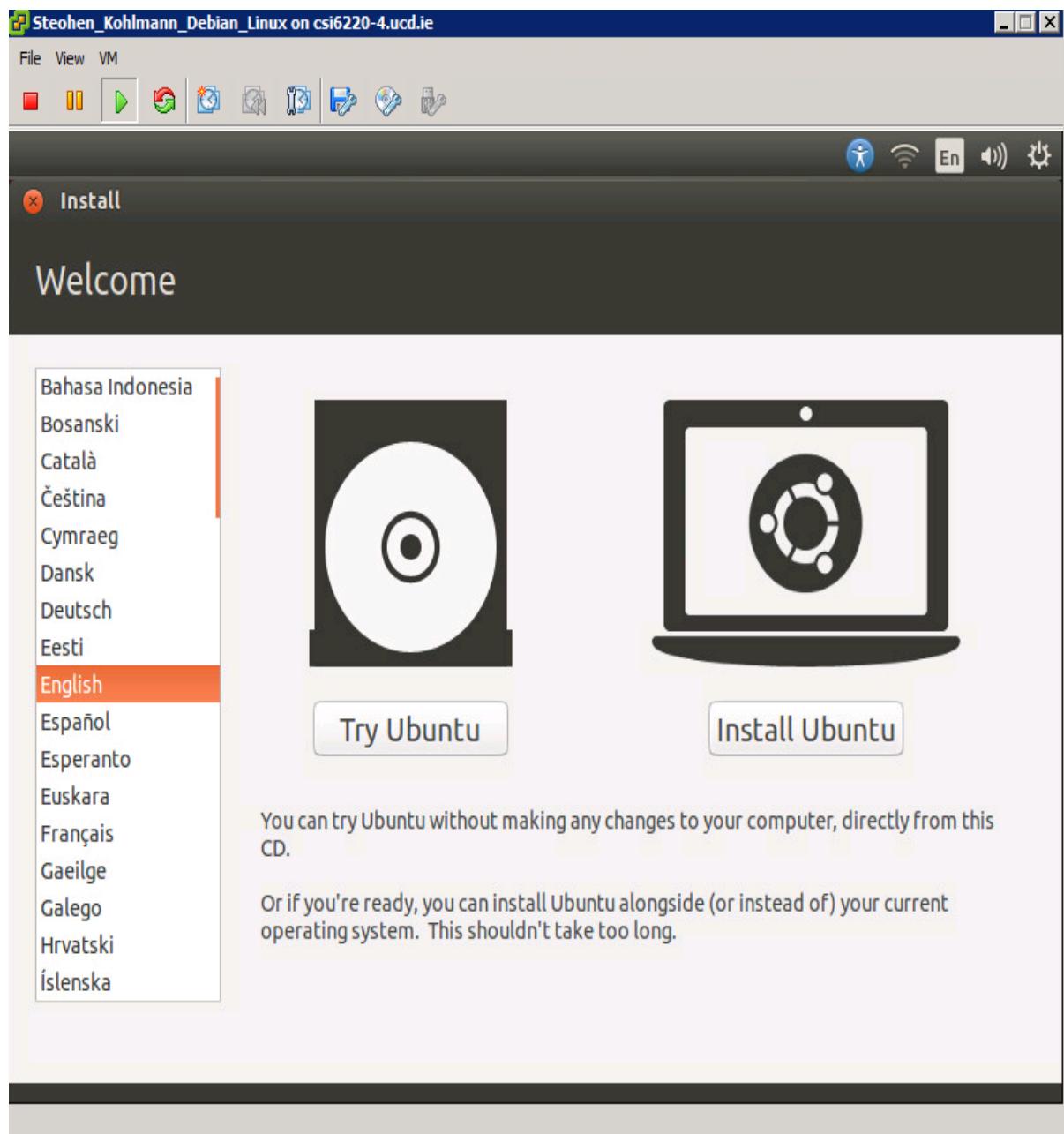


Before powering on the machine edit the virtual machine settings by selecting to connect the Linux ISO when the machine is powered on.

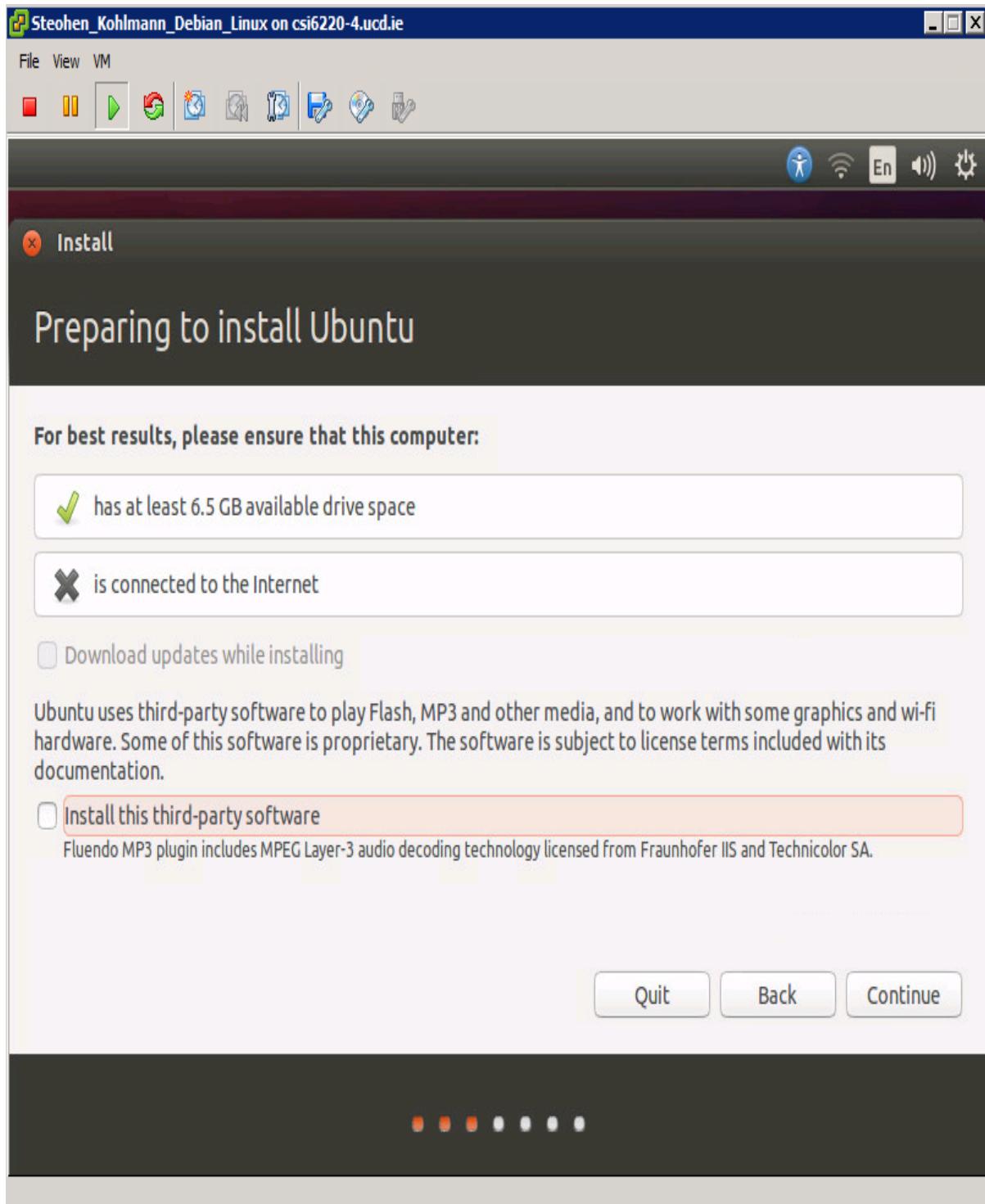


When the machine is powered on you will see the following installation screen.

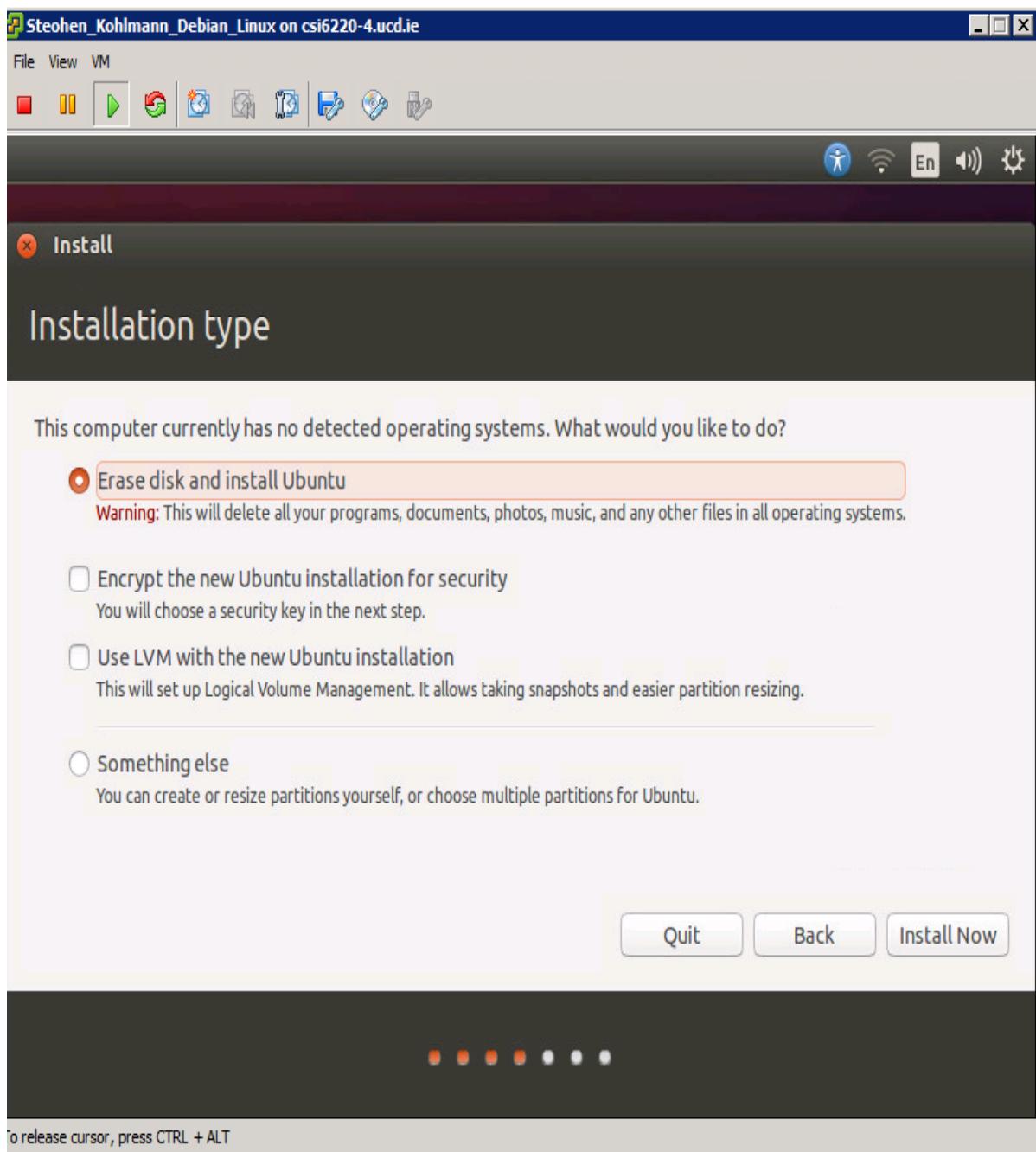
As we want to install Linux select the Install Ubuntu option to continue.



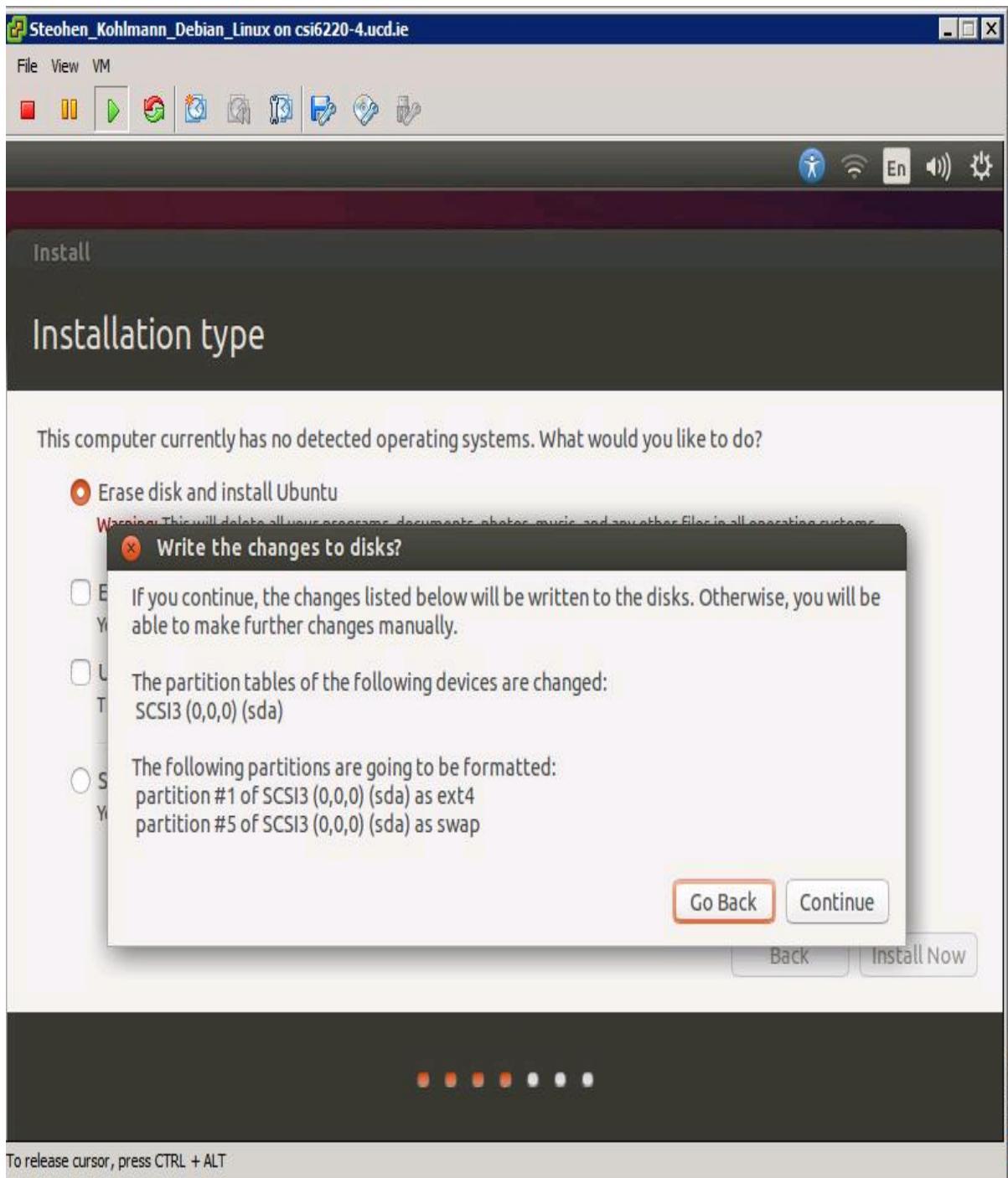
In the next window you are suggested to connect to the internet to get the best results from the installation. This is not a pre-requisite to run the installation. Press continue to proceed with the installation.



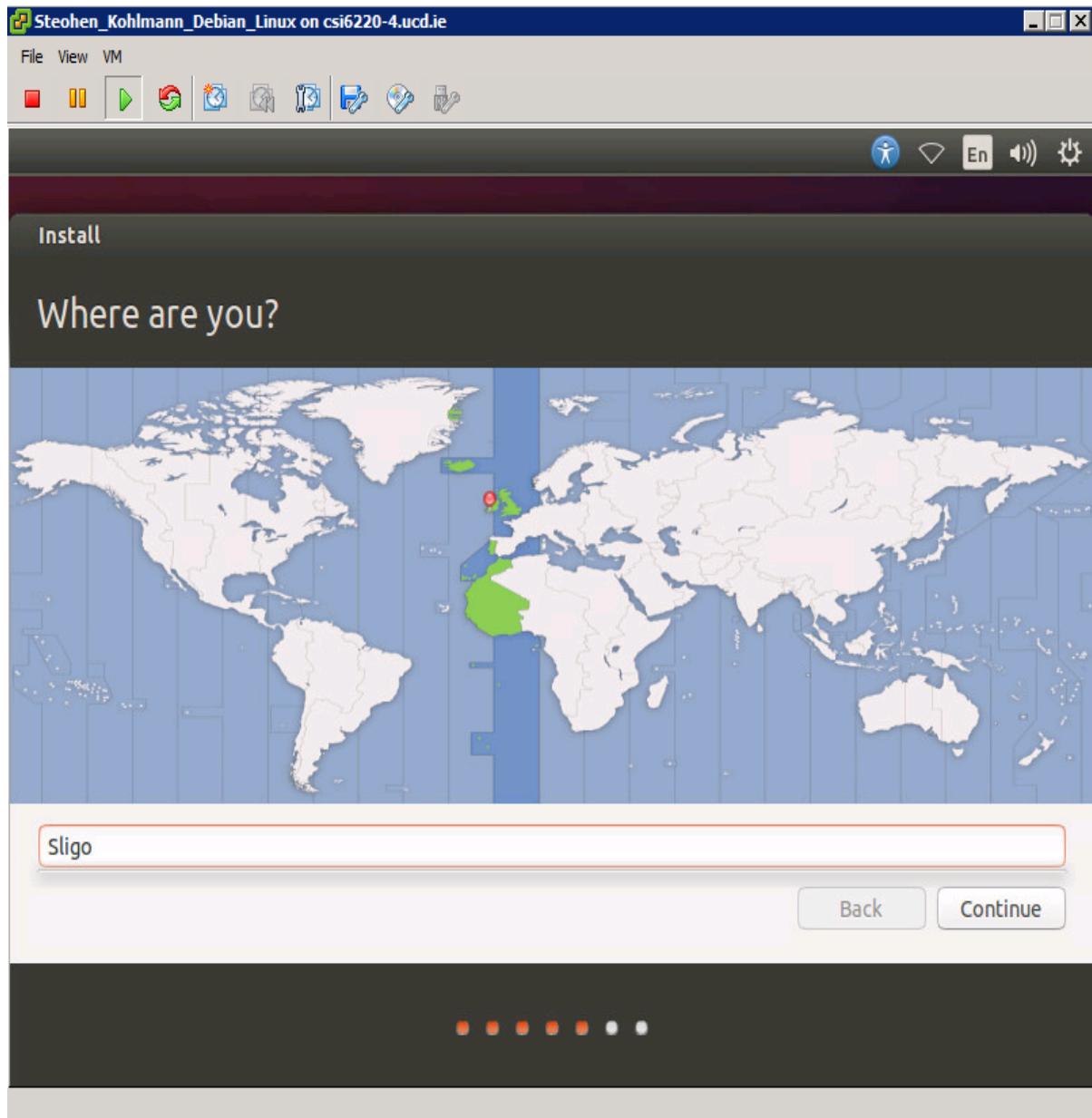
The following window gives you four installation types to choose from. As this is a fresh install select “Erase disk and install Ubuntu”.



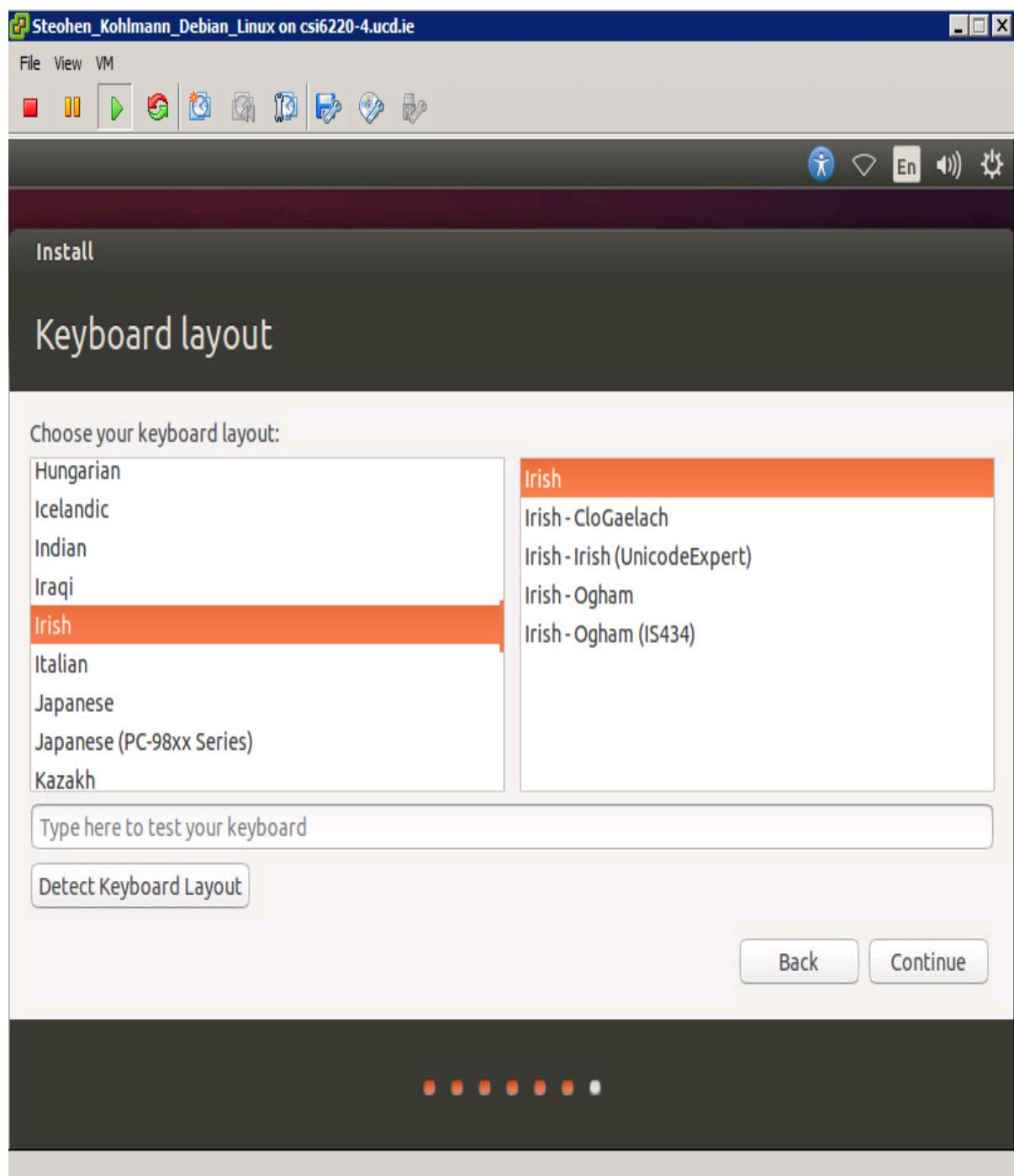
When you click this a pop up window shows the details of the partition changes. Select “Continue” to proceed.



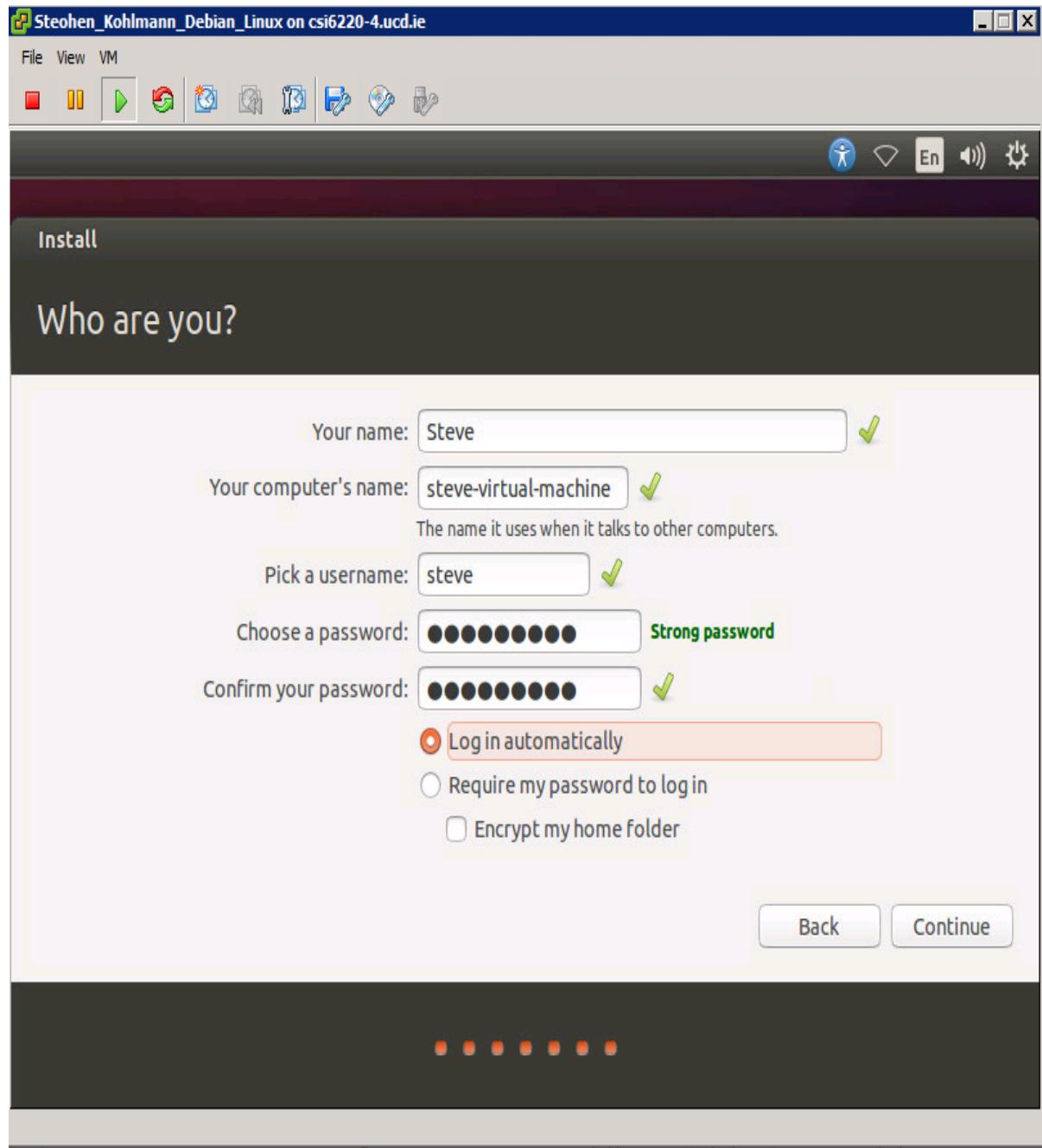
The next stage in the process is to select your location. You can do this in two ways, either by using the GUI and dragging the slider to the country of choice on the globe or by typing the text of your city or country in the text box below the world map.



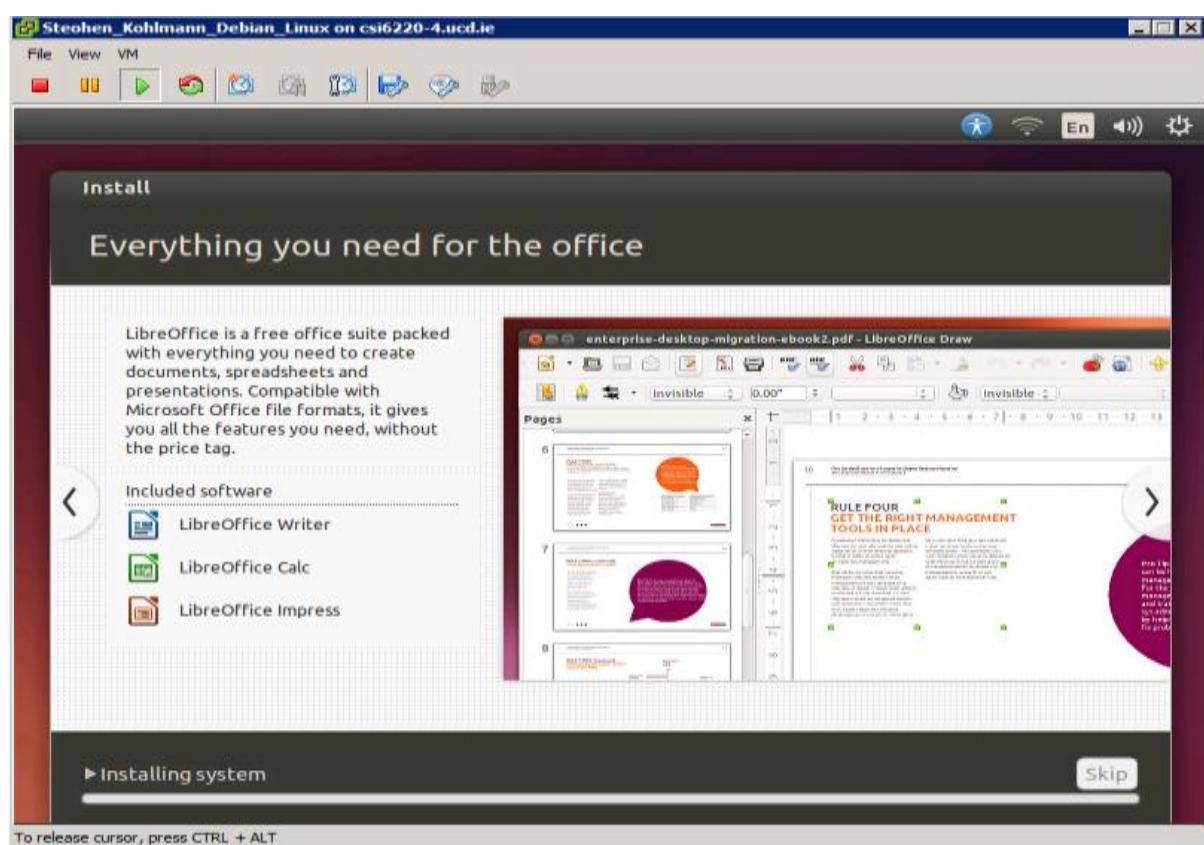
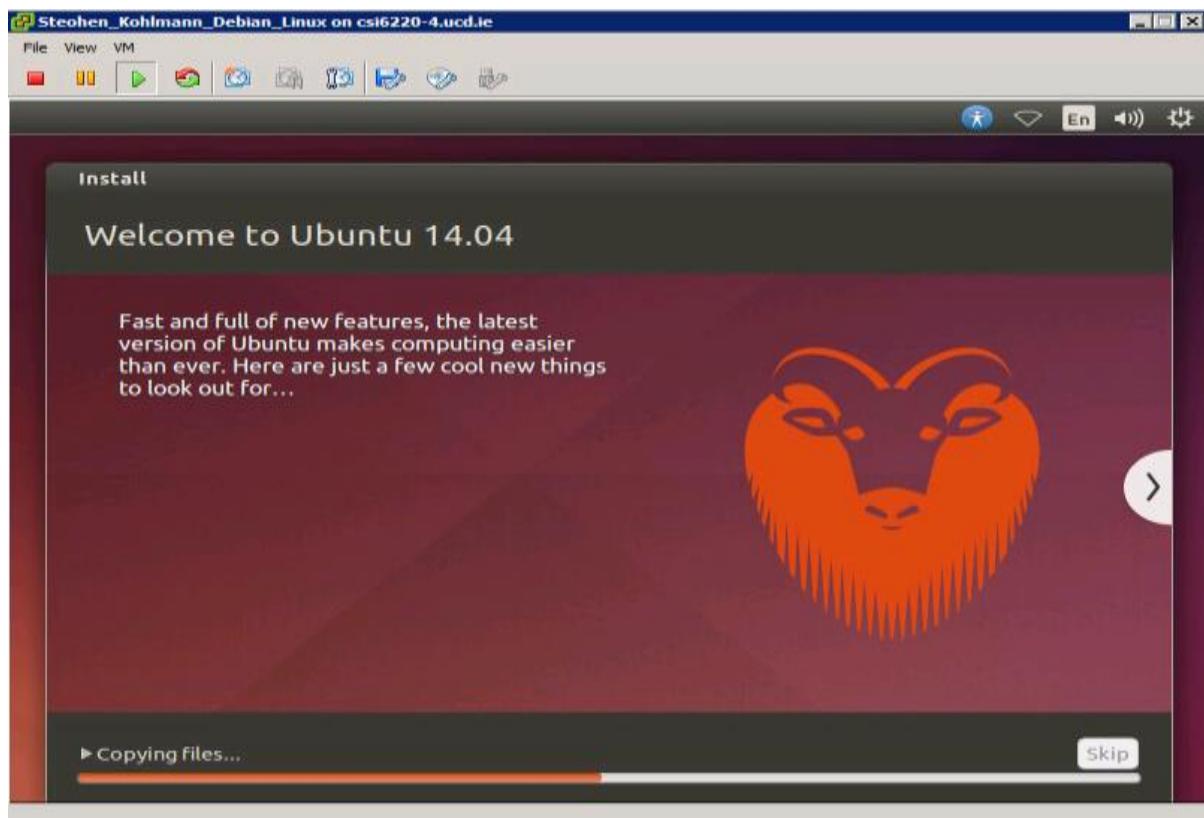
The second last stage is to select the keyboard layout.



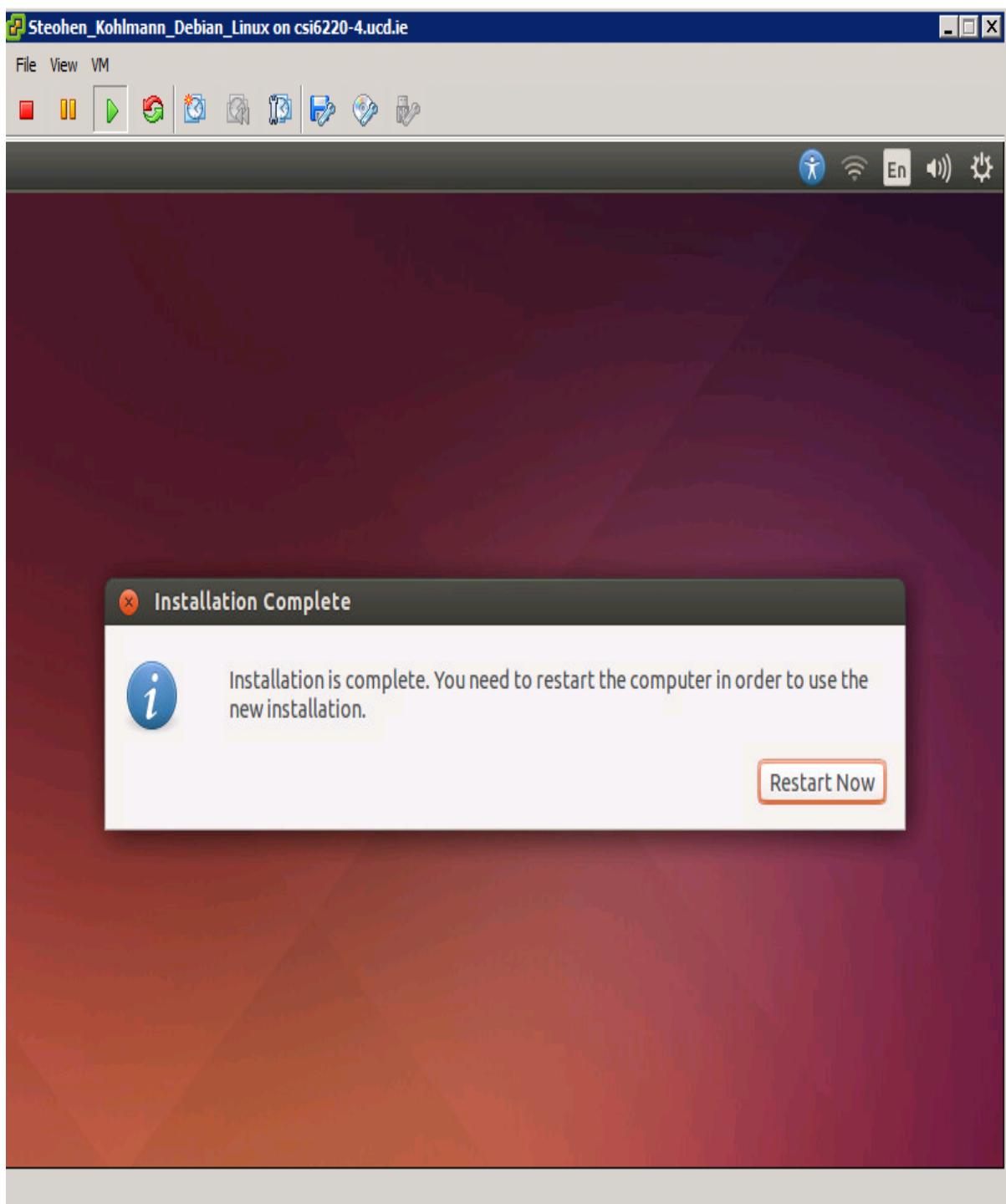
The final details to enter is the name of the machine and a password. You can choose to login automatically or require password. For the purposes of the assignment and ease of loading the machine I selected to login automatically.



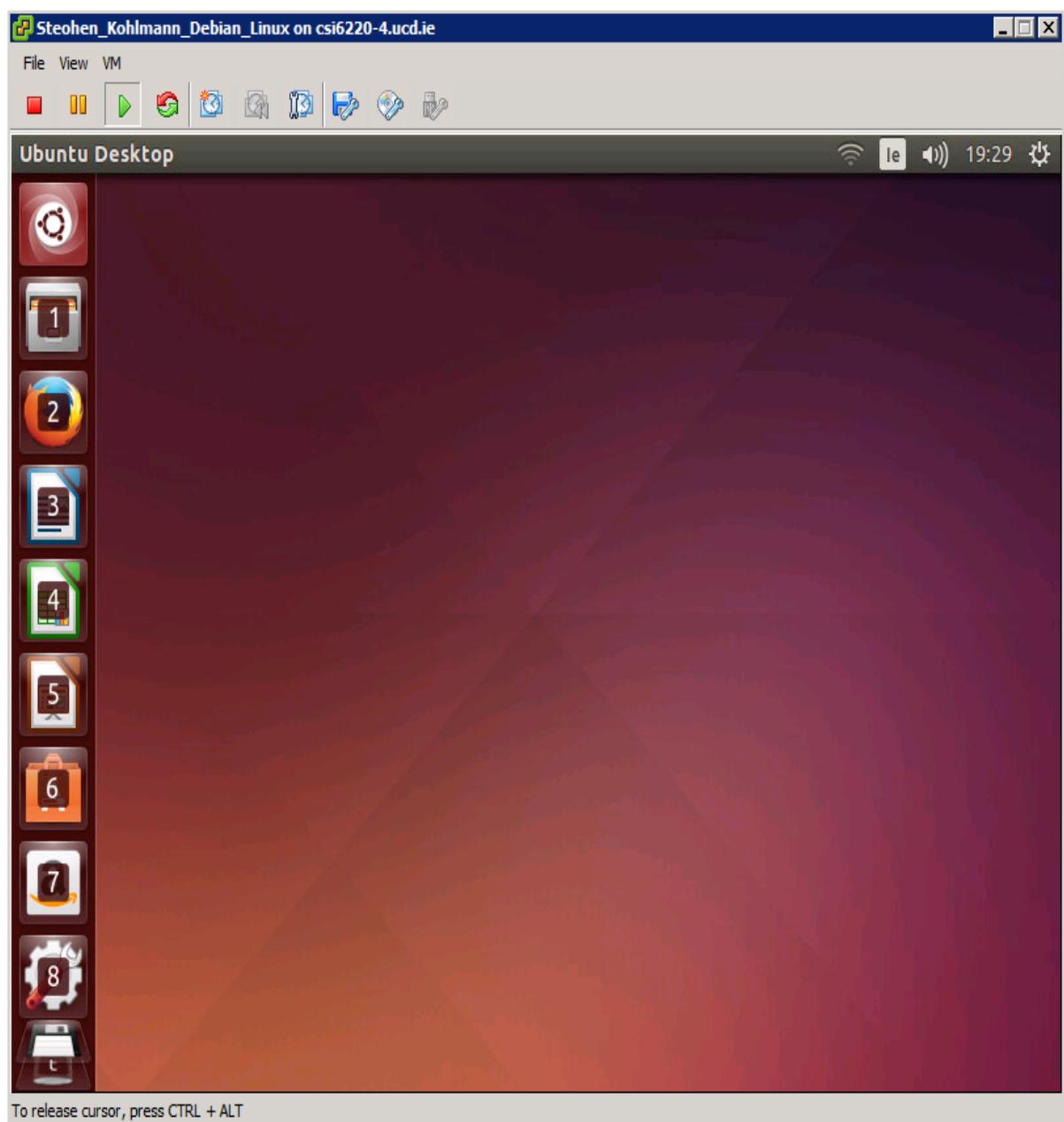
You should see the following screens below when the installation is running.



When the installation has completed you will see a pop window with the option to restart the machine. You must restart the machine to use the new installation.



When the restart has completed you will see the Ubuntu desktop. There will be no user name or password prompt on this occasion as the automatic login option was chosen.



## A. 9

This task is an introduction to virtualization and the various environments available. The introduction aims to give a novice a better understanding of virtualization and how an implementation can help a business environment reduce costs and decrease administration time.

### **Intro**

With the exponential increase in the size of modern day computer systems coupled with client demands for cost effective secure and scalable storage the cloud has become the obvious solution. Many companies have opted for implementing a complete virtual environment including virtual servers, virtual storage and virtual desktops. Companies who have not yet implemented virtualization have many options for migrating their data such as the two virtualization methods described below [1]. It is important for the consumer to know the various types of virtualization available to them before implementing a virtual system. Below is an explanation of the various types of virtualization environments available.

### **Client-Hosted Desktop**

Client-Hosted desktop virtualization is the process of running one or many machines within another machine. The one or many machines are referred to as virtual machines and the machine they run on is referred to as the local or host machine. The relationship between the machines can also be referred to as a client-host relationship whereby the client is the virtual machine(VM) and the host is the local machine e.g. Laptop or PC. Some of the key advantageous and disadvantageous are explained below.

### ***Advantages***

- With a Client-Hosted Desktop environment you can run any operating system within a virtual machine (VM) on any physical host machine that has an operating system (OS) installed. E.G Running a Linux OS on a VM while the host machine is running Windows.
- The client-host environment supports offline users. Where a business environment does not have continuous network connectivity or if the applications that the business require will work better using the local resources of each machine the client-host environment is the perfect solution.
- Offers a great way to use various operating systems and test software suites without any effect on the local machine. You simply create a snapshot after installing and configuring the virtual machine, and then you install anything you want, and then you can roll it back to the snapshot as if nothing ever happened. [2]
- If implemented in a large enterprise the client-host environment offers increased reliability because each virtual machine would only be dependent on its local host machine and not dependent on an external server.

### ***Disadvantages***

- Although more reliable as mentioned above if the client-host environment is implemented at an enterprise level the initial cost for each OS license would bring the cost of implementation up. Depending on the budget a Virtual Desktop Infrastructure (VDI) maybe a better option.
- Storage is limited to the host machine which means that every host machine will need to be of a high spec with plenty of excess storage available. The amount of storage depends on what applications will be utilized on the VM but if any applications are heavyweight you can run into problems. It is possible to create more virtual storage when setting up a VM but when the local storage is exceeded the VM will crash.

-User experience and degraded performance. [3] For example last year when taking the SQL/Database for the MSc all our assignments were done through Virtual Box running Ubuntu. When using a MacBook, the virtual machine software (Virtual Box) would cause the Kernel task on my local machine to overload which would make both the local machine and virtual machine to run extremely slowly and sometimes even crash.

### **(VDI) Virtual Desktop Infrastructure**

Implementing a virtual desktop infrastructure (VDI) is the practice of hosting a new operating system within a virtual machine that runs on a central server. What this means is that the desktop you see on your local machine is removed and placed in a shared hosting environment like a central server. What this allows is a single server to run many virtual machines which in turn allows a business to run many desktops in a virtual machine on the same server. A single user can also access a machine outside the datacenter by utilizing a remote desktop protocol such as Microsoft Remote Desktop Protocol(RDP) for Mac.

When using an RDP connection, it is important that a secure connection is established and that accounts are password protected. The implementation of a VDI environment is quite abstract and can raise concerns over security issues for IT administrators who are unfamiliar with the environment. Learning about virtualization technologies and their respective features will help curb this concern. Implementing security in a virtual environment is not too different to a physical environment whereby firewalls, user names, passwords, accessibility, roles, permissions and anti-virus software needs to be set up.

A VDI environment is sometimes referred to as server-based computing and is a variation of the client-host model [4]. The VDI model has been implemented by many large organizations who in the past would have used the server-based model offered by companies such as Microsoft.

### ***Advantages***

- Virtual Desktop Infrastructure (VDI) allows ease of troubleshooting as in generally the VDI is implemented on one system only.
- With a Virtual Desktop Infrastructure (VDI) implemented multiple desktops can be hosted remotely. This in turn decreases the administration time for changes across the network as updates can be rolled out across the network from one place rather than each individual machine
- After the initial outlay of a VDI environment the cost of running the network is reduced due to elements such as the need for less physical servers and storage. [5]

### ***Disadvantages***

- Multiple users can be effected by server-side problems. Therefore, everyone using that server or that image will be effected if an error occurs in the system. As a failsafe it is a good idea to set up redundant servers.
- System Administrators need to learn the VDI software and how to implement individual features on each machine. Users who require their own personalization settings may cause image proliferation, which can be more difficult to manage than using separate workstations.
- A large initial outlay for a server is needed. The alternative of purchasing PCs in bulk or a few at a time maybe a more viable option.
- When a single user is working in a VDI environment they need a constant connection to the network. RDP is a solution to access the environment from any location but the connection must still be maintained.

## **Differences between Desktop Virtualization methods**

Desktop virtualization (Client-Hosted) is the process of running a virtual machine on your desktop computer. An easy way to think about this approach is with the phrase “a machine within a machine”. This process allows a user to have a VM that has a different operating system than their host machine e.g. a Windows VM on a MAC host. The main difference between Client-Hosted virtualization and a Virtual Desktop Infrastructure (VDI) is that a VDI is a data center technology that passes multiple hosted desktop images to remote users.

The VDI is an alternate model to traditional desktop computing whereby the desktop operating system is removed from a local computer and is placed into a shared hosting environment. An example of this would be a cloud hosting data center. The Client-Hosted model does not remove the operating system from the host machine like the VDI model. Although the terms Desktop Virtualization (Client-Hosted) and Virtual Desktop Infrastructure (VDI) do not sound that different it is important to note that they are in fact both very different technologies.

## **Reference**

<http://www.wseas.us/e-library/conferences/2009/genova/ACS/ACS-40.pdf> [1]

<http://searchservervirtualization.techtarget.com/definition/virtual-desktop-infrastructure-VDI> [2]

<http://www.sysprobs.com/disadvantages-virtualization-opinion> [3]

<http://www.howtogeek.com/206286/stop-testing-software-on-your-pc-use-virtual-machine-snapshots-instead/> [4]

<http://www.whitehatvirtual.com/blog/bid/334816/Top-5-Benefits-of-Desktop-Virtualization> [5]

