How to deploy a Windows Server 2022 VM (CIT 470)

For example purposes, this article supposes the following:

- CIT 470 students *Kitty Cat* and *Puppy Dog* are assigned to Team 4, and their instructor's name is *Brigham Young*;
- They intend to deploy the server in their DMZ, and name it *T04-dmz-WS0*;
- They have a network diagram annotated with the following information:
  - They selected 172.16.4.0/24 as their DMZ's private IPv4 subnet;
  - They chose IP addresses 172.16.4.10 for the server and 172.16.4.1 for the firewall's DMZ gateway.

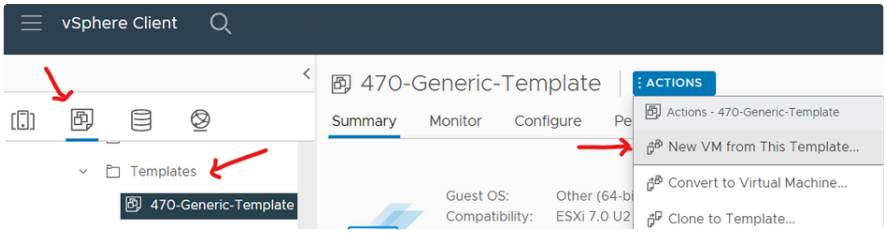
Instructions

Three stages for setting up a virtual machine:

1. Create the VM using vSphere, and edit its settings
2. Power-on the VM and install AlmaLinux OS
3. Restart the VM after installation and configure additional server settings
4. (Optional) Create a template clone of the VM, as an easy way to deploy an additional Windows server.

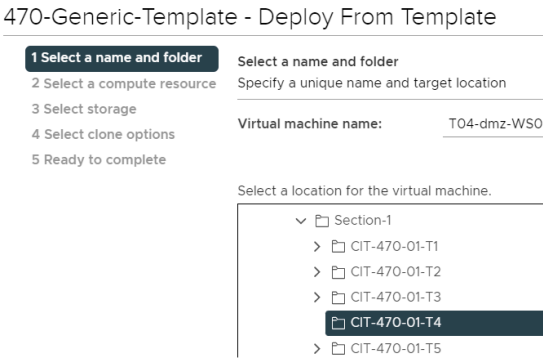
Stage 1: Create the VM using vSphere, and edit its settings

A generic template has been provided for you in the Templates subfolder. Select the generic template, then open the **Actions** menu and choose **New VM from This Template**:

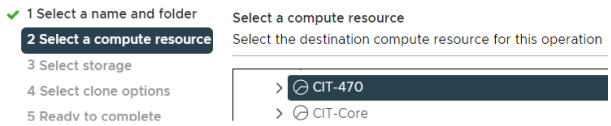


> There is more than one way to create a VM. Some students choose to select their team folder, then use the New Virtual Machine action.

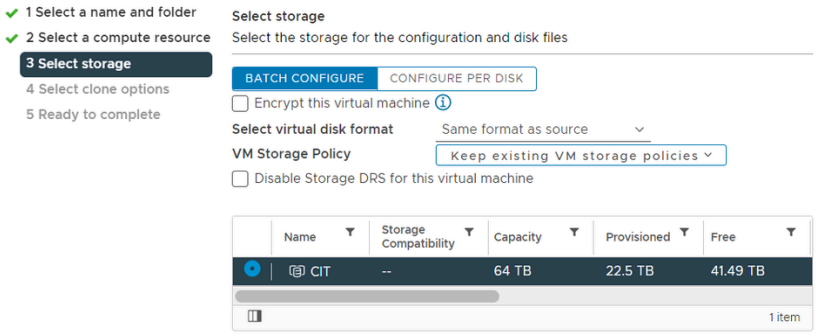
The "New VM" wizards are pretty easy to figure out. For step 1, enter the VM name and select the folder where it belongs. For example, here are Kitty's and Puppy's server name and assigned folder:



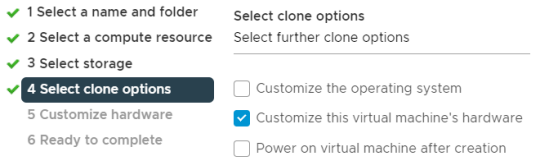
For steps 2 and 3, select the appropriate compute resource:



and storage resource:



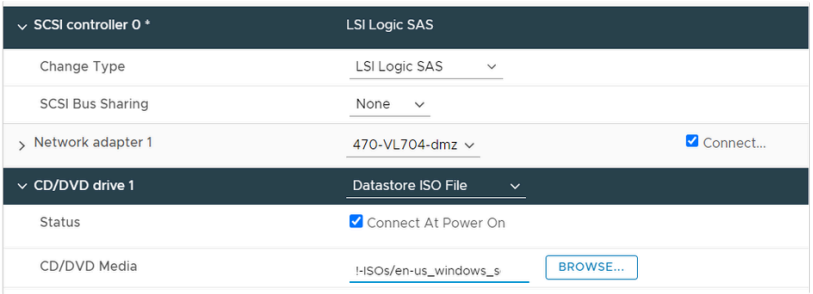
For step 4, activate the hardware customization option. This enables another configuration step in the wizard:



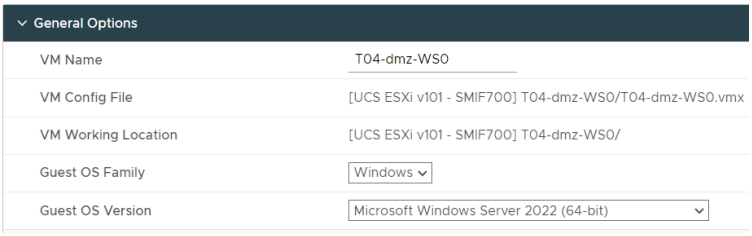
For the hardware settings step, you must configure these three items:

- In order to accomodate Windows Server 2022, you must upgrade the virtual SCSI controller to “LSI Logic SAS.” (The Windows installer *will fail to recognize* the generic template’s “LSI Logic Parallel” controller.)
- You must browse and select the correct VLAN for your VM’s network adapter.
- You must select an ISO for the virtual CD/DVD drive. (You will find the Windows Server 2022 installation ISO image in the storage resource named **v103**, in the **!-ISOs** subfolder.)

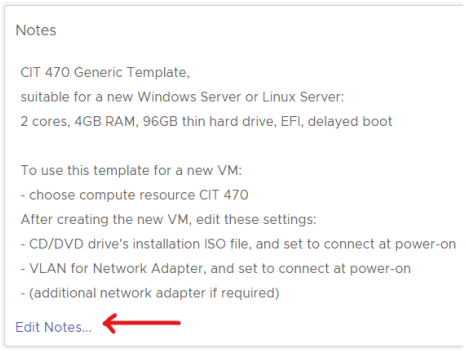
Make sure that both the network adapter and the optical device are set to **Connect At Power On**:



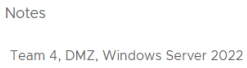
The last step is there to review and finish creating the VM. After that, there are two more items that should be adjusted in the new VM. Select it, and tap the **Actions** menu, choose **Edit Settings**, select the editor’s **VM Options** tab, expand General Options, and update the VM’s “OS family and version” settings.



Finally, after saving those changes, select the **Summary** tab and edit the notes field:



Please replace the generic template's notes with a short note about your own server VM:



At this point, the new VM should be ready to power on and begin the installation process. (If you aren't in a hurry, you might enjoy exploring other settings and options in the vSphere web interface before you power the new VM.)

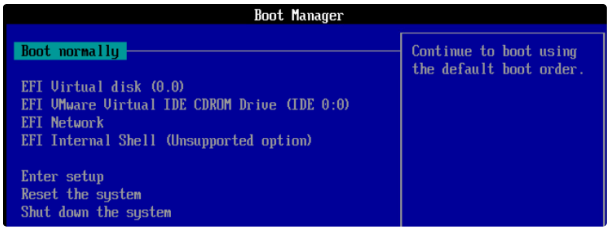
Stage 2: Power-on the VM and install its operating system

There's a convenient green triangle "power on" button to the left of the **Actions** menu, or you may instead select the **Power On** choice inside the menu. As soon as the VM starts up, immediately launch a console to interact with the new VM.

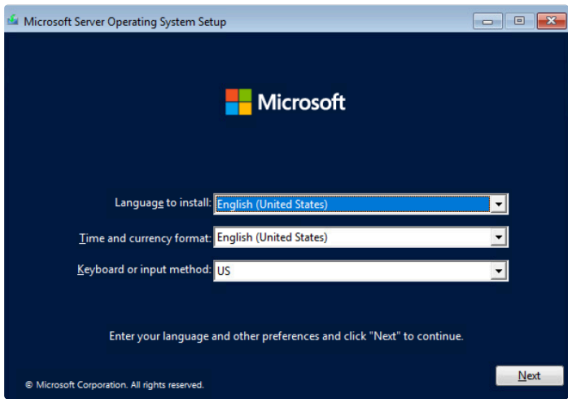
> Most students prefer to launch a remote console instead of a web console, *particularly while using it to install a Windows VM*. To do so, you must download and install VMware's remote console software. (If you purchased and installed a copy of VMware Workstation or VMware Fusion, or if you downloaded and installed a free VMware Player product, one of those may also function as your remote console.)

If you select a remote console (highly recommended), your browser opens your console software. If you select a web console, it opens in a new browser tab or window. You will briefly see this Windows Installer startup message:

You will need to click or tap once on the console, so that your subsequent keystrokes operate the guest VM inside the console rather than operate your host system and web browser. If you are fast enough, you will see the installer start up when you press a key. However, if it times out before you can strike a key, wait a few moments and you will see VMware's boot manager interface:



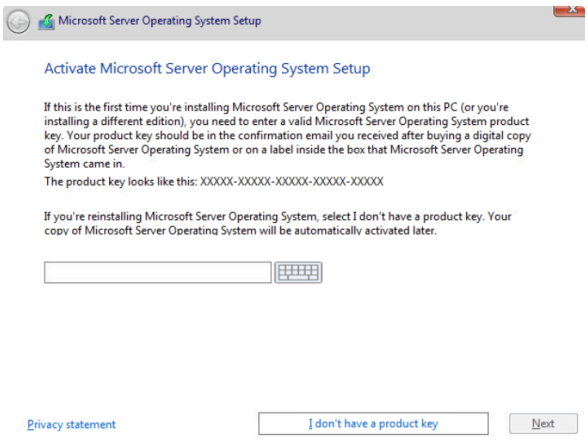
If you see this screen, hit the [Enter] key to “Boot normally,” and you will soon see the “Press any key to boot from CD or DVD…” message again, hopefully with enough time to successfully tap a key and proceed to the Windows Server setup form:



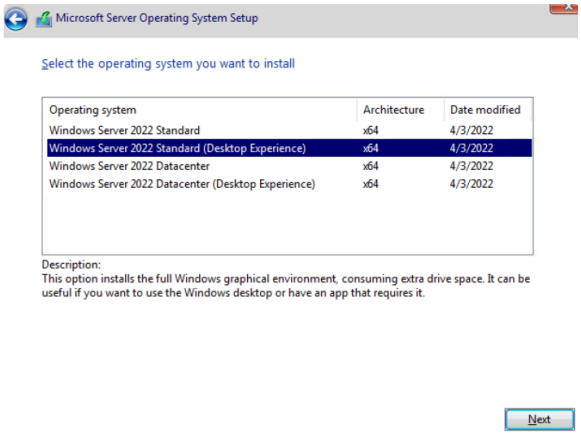
In a remote console, you should be able to use your mouse and keyboard to work your way through the installation process, but in a web console, your mouse pointer almost certainly won’t work through the web interface. Web Console users will need to use keystrokes (arrow keys, [Tab], [Shift]+[Tab], and [Enter]) to navigate.

> Challenge: even if you are using a remote console, try navigating the Windows Installer using your keyboard only, without using the mouse. Keyboard navigation and shortcuts are worthwhile skills for every IT professional. They can be quite helpful to troubleshoot malfunctioning systems and for rapidly selecting menu items in most applications, so it’s a good idea to practice keyboard controls.

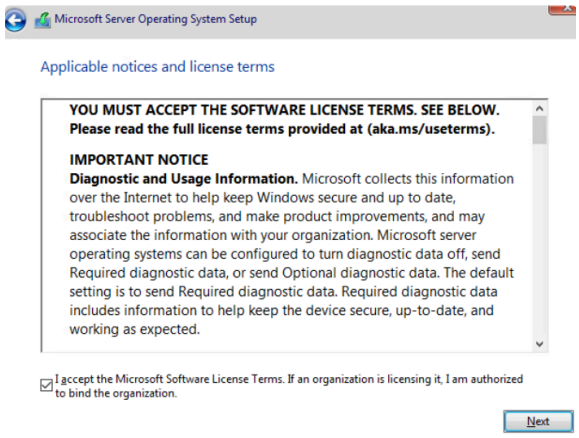
Our semester will end before Microsoft’s “no license” trial usage time interval expires, so we won’t need to apply a product activation key to our lab VMs. Hit [Tab] until **I don’t have a product key** is selected (or press [Alt]+I) and hit [Enter]:



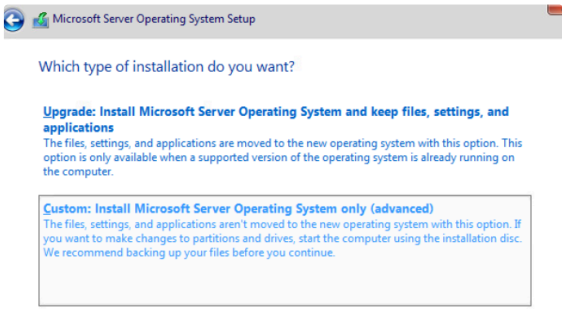
When you reach the OS selection form, make sure you select “Desktop Experience” so that you will be able to use the familiar Windows graphical user interface:



The next screen shows Microsoft's license terms. As mentioned before, we are using unlicensed free-trials for our student labs. Read through the terms as much as you deem necessary, [Tab] to the acceptance statement and [Space] to check the box, then [Tab] (or Alt+N) and [Enter] to proceed:

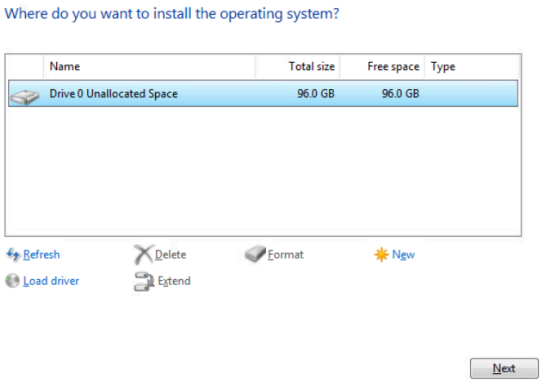


This is a new installation, not an upgrade to an existing machine, so select **Custom**:



For the next step, if you do not see a drive with unallocated space, you need to power off the VM, edit its settings, and make sure to upgrade the virtual SCSI controller to "LSI Logic SAS."

Otherwise, if you *do* see "Drive 0 Unallocated Space," then just press [Alt]+N or select "Next."

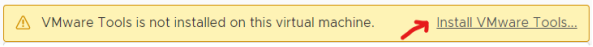


Installation of the operating system will proceed. During installation you will be prompted to enter and re-enter a password for the local Administrator account.

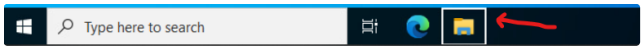
Important: provide a *secure* way to share the root password among team members, such as a secure password manager app.

Restart the VM after installation and configure additional server settings

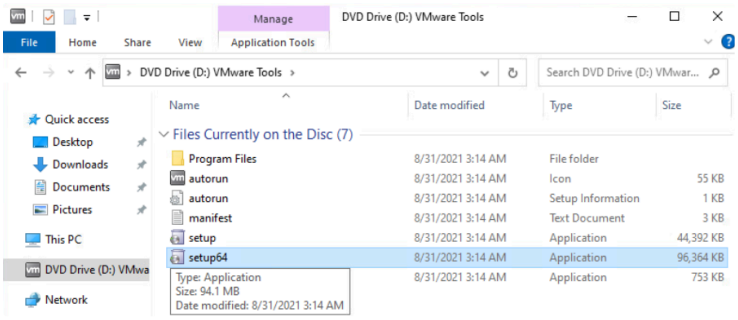
After the installation is complete and the VM is rebooted, log in with your new Administrator account. Then go back to vSphere, find this alert message, and click or tap “Install VMware Tools:”



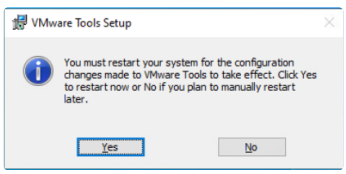
This will connect a *different* virtual optical disk image to the VM. Back in your VM’s web console, experiment with arrow keys, [Alt]+[Space], [Alt]+[Tab], [Tab], and [Shift]+[Tab] keystrokes until you figure out how to close any running applications and highlight the File Explorer in the Windows Task Bar:



Then hit [Enter] to launch File Explorer. Now experiment with arrow keys and [Tab] until you highlight the DVD Drive and also highlight the “setup64” file on that drive’s optical disk image. Then press [Enter] again:

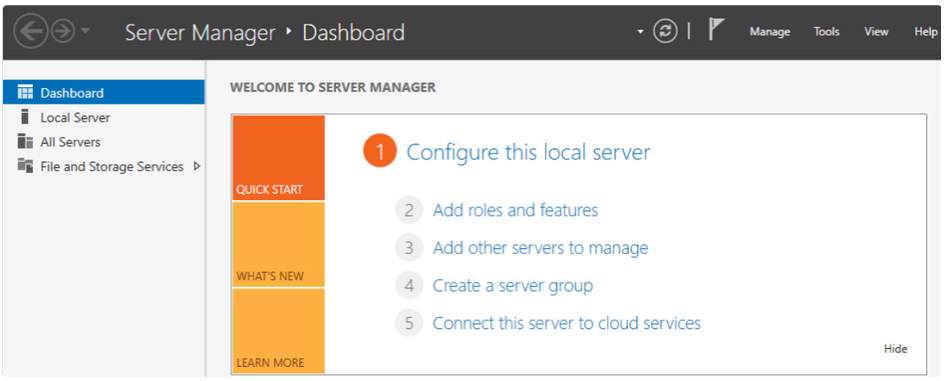


This will launch the VMware Tools installer. After installing VMware Tools, restart the VM again:

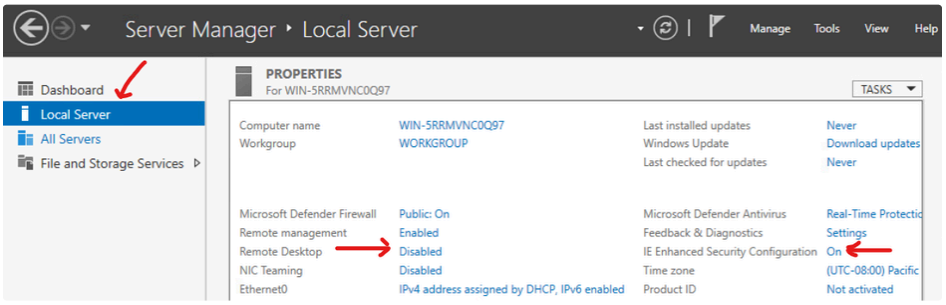


Now that VMware Tools is installed, web console users will finally be able to use the mouse to navigate the Windows graphical user interface. (This will be a welcome convenience if you’re getting tired of doing everything with the keyboard alone!)

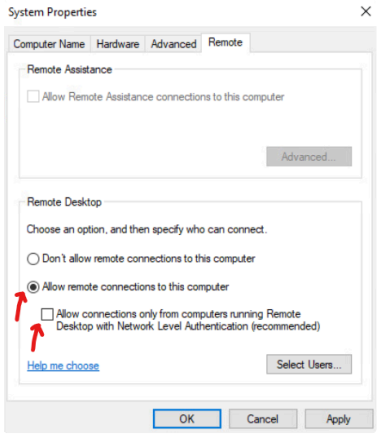
There are a few more items to configure on the server. If it's not already visible, launch the Server Manager application:



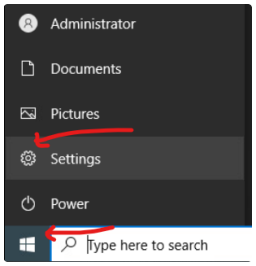
Select **Local Server** in the menu on the left. There are a couple of inconvenient security settings that should be changed to make the server easier to operate. First, find the "IE Enhanced Security" property in the right column, and change it from "on" to "off" This change removes a barrier that blocks most web sites when an Administrator uses a web browser. Next, find and select the "Remote Desktop" property to the left of the "IE Enhanced Security" property:



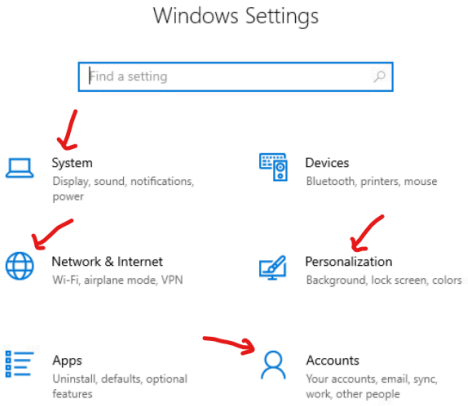
When you see a "System Properties" dialog, select the option to **allow remote connections to this computer**, and turn off the "Network Level Authentication" requirement below that option. This will remove a barrier that makes this server unavailable for remote desktop logins from other Windows and Linux endpoints in your team's lab infrastructure:



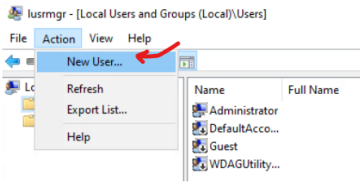
From the Windows Start menu, select Settings. *(Challenge: see if you can learn keyboard shortcuts for this!)*



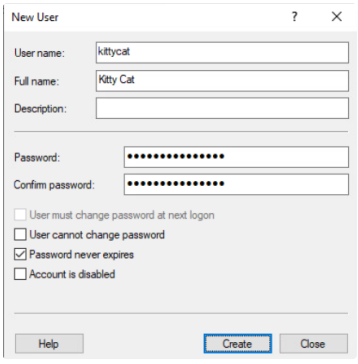
The settings that should be tweaked are in System, Personalization, Network, and Accounts:



Select **Accounts**, then Other Users, then “Add someone else to this PC.” This will launch a utility named “lusrmgr [Local Users and Groups].” From the Action menu choose “New User…:”

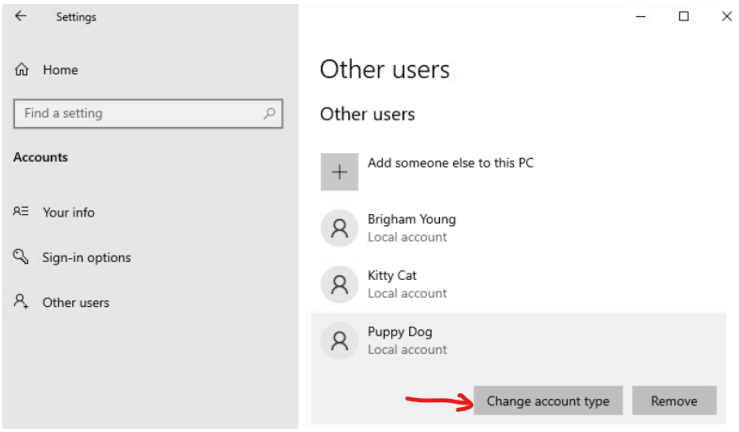


Fill out the dialog form to set up your user account, and then select “Create.” Here’s how Kitty in our example would set up her account:

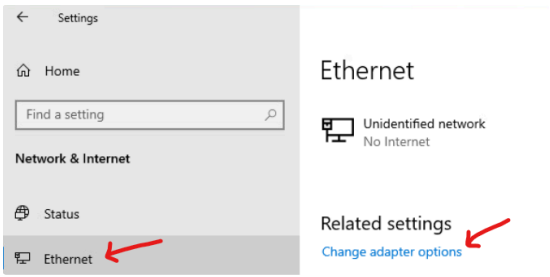


Fill out the form again for your teammate’s account and hit “Create,” and yet again for your instructor’s account and hit “Create,” then tap [Close] and exit the “lusrmgr” utility.

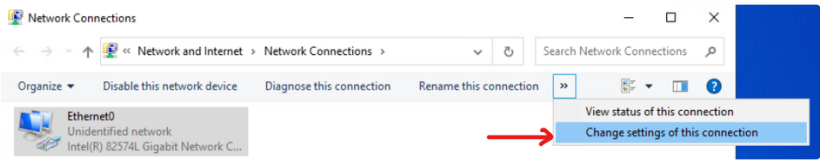
Back in Settings > Accounts > Other Users, select each of the new accounts one by one, choose “Change account type” with each one, and change each account from Standard to Administrator, so that each becomes a privileged local administrator:



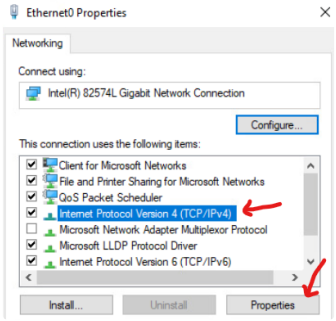
Back at Settings home, select **Network & Internet**, then Ethernet, then “Change Adapter Options:”



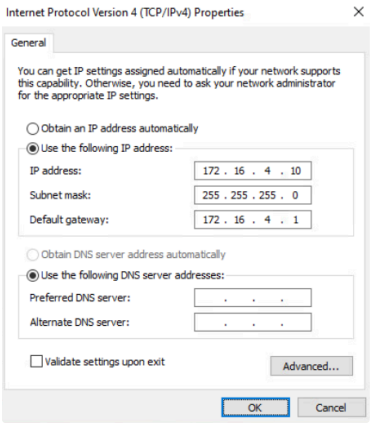
This will launch the “Network Connections” utility. Select the “Ethernet0” virtual network adapter, then expand the remaining menu items and select “Change settings of this connection:”



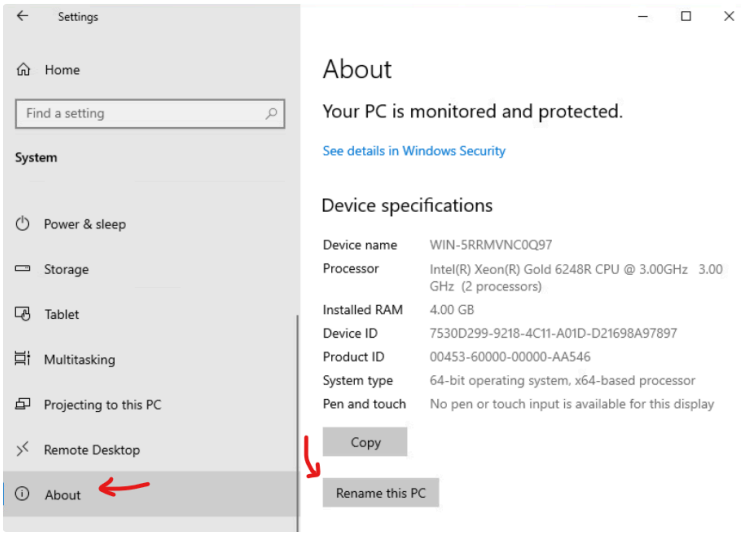
Select “IPv4” and tap “Properties:”



Fill out this server’s IP address, subnet mask, and gateway address, then tap [OK]. (For now, don’t worry about DNS settings; those will be updated later.)

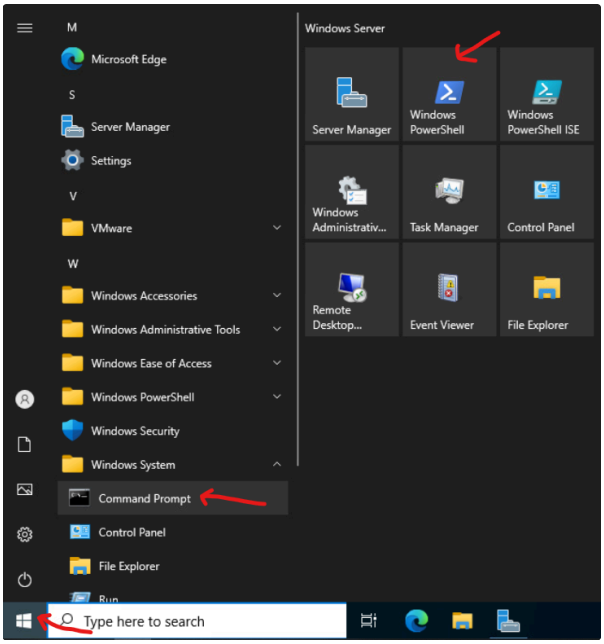


Back at Settings home, select **System** and find “About” at the very bottom of the left menu. Then tap “Rename this PC” and make the hostname match the name you chose for the VM:

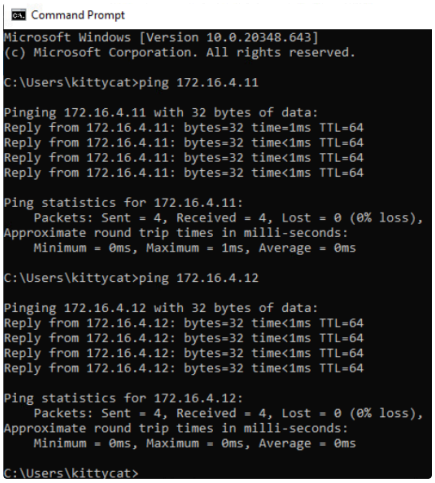


You will be prompted to reboot the server. After it restarts, log in again, but this time with your own user account instead of Administrator.

If you have already deployed another endpoint in this zone, such as an AlmaLinux OS or Ubuntu server, you may use the following procedure to test your Windows Server’s network connectivity. Launch a command-line interface; either *PowerShell* or *Command Prompt* will do nicely:

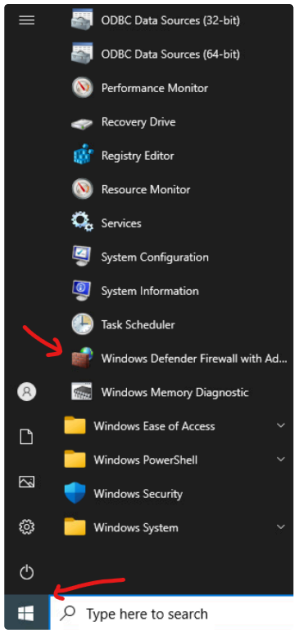


At the shell prompt, use the “ping” command-line utility to test connectivity to your Linux servers. Example:

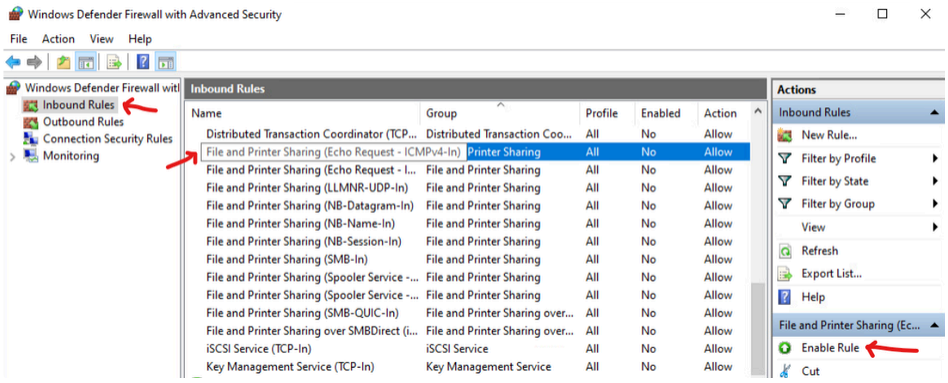


Conversely, if you try to “ping” the Windows server *from* a Linux server, it won’t work yet, because the default configuration of *Windows Defender Firewall* ignores all incoming “ping” attempts. Adjust this host-based software firewall on your Windows Server as follows:

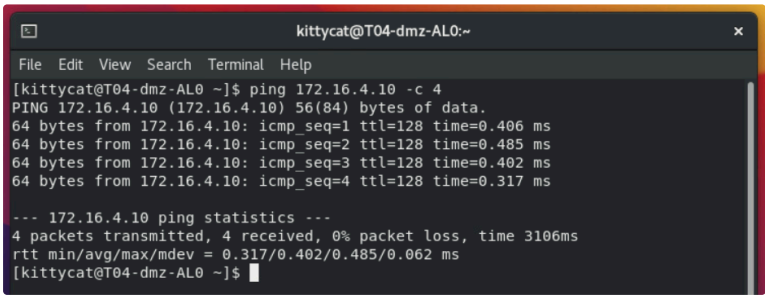
From the Start menu, select Windows Administrative Tools, then find and launch “Windows Defender Firewall with Advanced Security.” *(Optional challenge: can you figure out how to do this using the keyboard only, no mouse?)*



In the menu on the left, select Inbound Rules. Then in the list of rules in the middle, find and select “File and Printer Sharing (Echo Request - ICMPv4-In).” Finally, in the menu at the lower right, tap “Enable Rule:”



Now your Windows Server will respond to “ping” attempts from other endpoints. Open a console on your Linux server, log in, get to a terminal shell prompt, and verify that you can “ping” your Windows Server:



Until this new server achieves Internet connectivity, that’s just about all that can be reasonably configured.

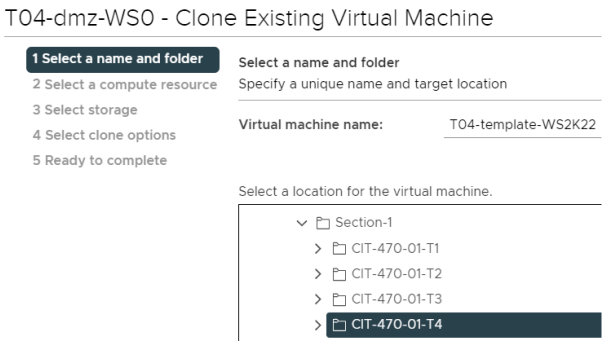
Note: Windows Server will periodically attempt to connect to Microsoft servers on the Internet, to check whether any security or feature updates are available for download. If it cannot successfully connect to the Internet after a certain amount of time, and is otherwise idle, it will shut itself down. So until you achieve Internet connectivity for a Windows Server VM, don’t be surprised that you will occasionally need to go to vSphere and restart it in order to operate it.

Optional: Clone the server VM

To deploy another Windows Server endpoint, you could simply repeat the instructions outlined above. But another option is to prepare a template based on your new Windows Server, and then deploy additional Windows Server VMs as clones of that template.

> Although you could just make a direct clone of your VM, and many features of a cloned Windows Server VM may work just fine, there are some features that *will not* work properly until the cloned server is reconfigured using a System Preparation Tool. We recommended that a Windows Server clone be deployed from a prepared **template**, not directly cloned from a VM.

First, shut down and power off your Windows Server VM. Then select your Windows Server VM, and in its **Actions** menu choose **Clone to Virtual Machine**. In the vSphere cloning wizard, choose a name for the clone that will identify it as your team's Windows Server "template." Example:



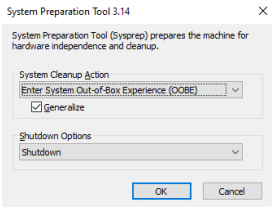
The cloning wizard in vSphere is very similar to the "new VM" wizards. You won't need to put an image in the virtual CD/DVD drive, because the OS is already installed. After finishing the wizard, change your clone's notes field to describe its purpose as a template.

Power on the clone, log in, launch a command-line utility, and enter these two command lines:

```
> cd \Windows\System32\Sysprep
```

```
> .\sysprep
```

These commands activate the System Preparation Tool. Turn on the "Generalize" option, and change the Shutdown Option from "Reboot" to "Shutdown." Then click [OK]:



After sysprep finishes working and the VM is shut down, go back to vSphere, select the (now powered-off) clone, and from the **Actions** menu select "Template," "Convert to Template."

To deploy another Windows VM, sect your new Template, and from the **Actions** menu choose **New VM from this Template**, and work through the wizard again. After you finish the wizard, select your new VM, power it on, and launch its web console. Most of the configuration of the original server, including user accounts and their passwords, are preserved and present on the new Windows Server VM, but there are other items you'll have to set up again:

- skip license activation;
- set the Administrator account password;
- configure the network adapter's static IP address, subnet mask, and gateway;
- rename the server to match the VM's name;
- (optional) change the desktop background wallpaper and lock screen background, to make it easier to distinguish among your other VMs.

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