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1 SpiderNet Virtual Machines

SpiderNet environment consist of both physical devices (routers, switches, other network devices) and virtual machines (end user workstations and servers). This is a guide on how to use the virtual machines provided on SpiderNet vCenter (scenter.labranet.jamk.fi, *SCenter*).

The SCenter environment can be used with a browser supporting Adobe Flash (Firefox ESR is recommended). The environment can be accessed from home using LabraNet VPN, see VPN guides on <https://student.labranet.jamk.fi>.

One can also use the vSphere Client, a separate software installed on the classroom workstations. The software can be downloaded from the SCenter web portal, see Picture 1.

This manual currently only covers the use of the web ui, as the use of vSphere Client will be deprecated in the future. If unsure what method to use, ask your teacher/instructor how your course will be using the SCenter environment.

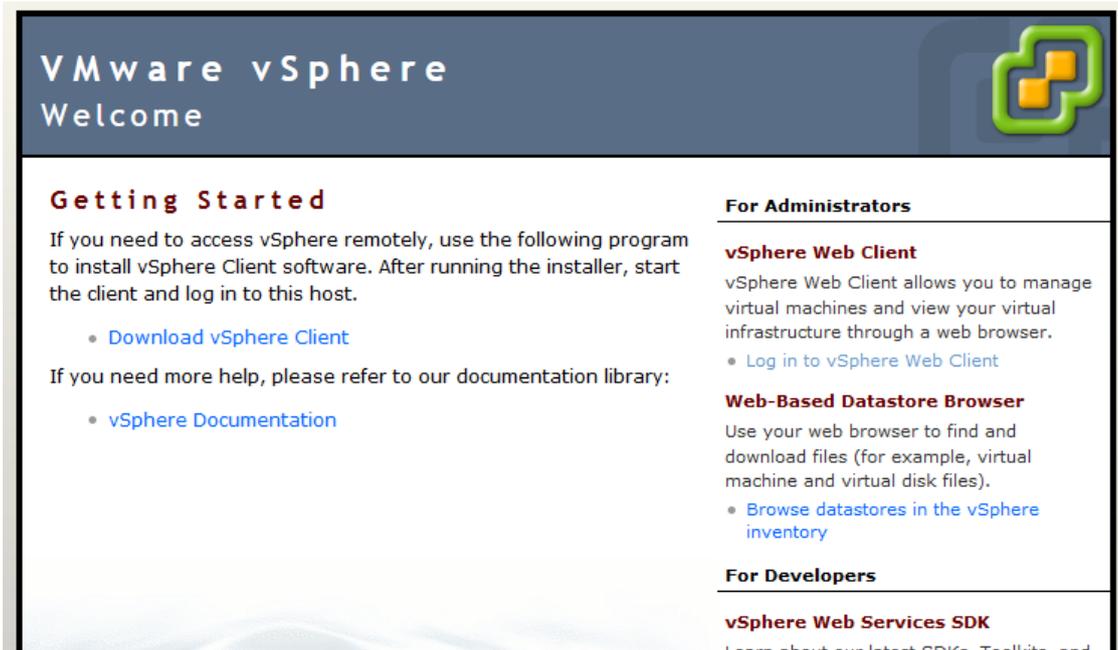
In this guide, Chapter 2 covers how to use existing virtual machines. It will also show how to change the network of the virtual machine in case your course requires that. Chapter 3 will give more information on how to create new virtual machines and modify them. Chapter 4 has some general tips and troubleshooting help for common problems. The guide will be updated when new issues are found or new features are added.

2 Basic usage

2.1 Logging in

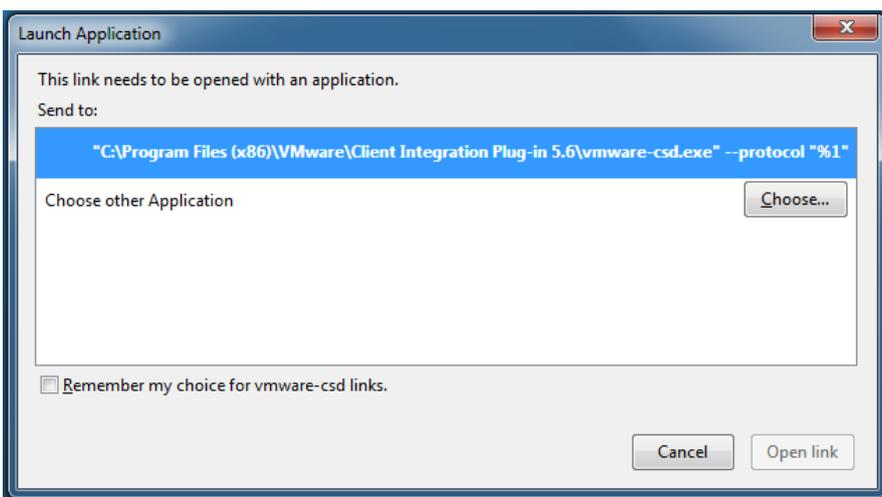
To log in (or to download the vSphere Client), browse to the address

<https://scenter.labranet.jamk.fi/> and click **Log in to vSphere Web Client** (Picture 1).



Picture 1: Scenter Portal

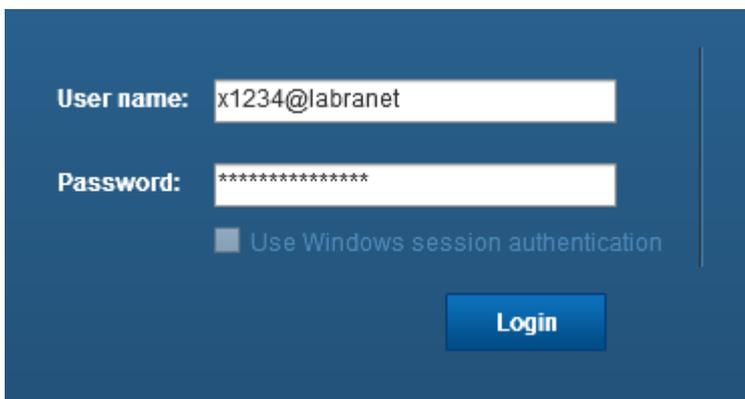
You will be asked to enable Flash. You may also receive the following kind of popup (Picture 2).



Picture 2: Client Integration Plugin installer

This installer provides the VMware Client Integration Plugin and is not strictly needed so this popup can be closed with Cancel.

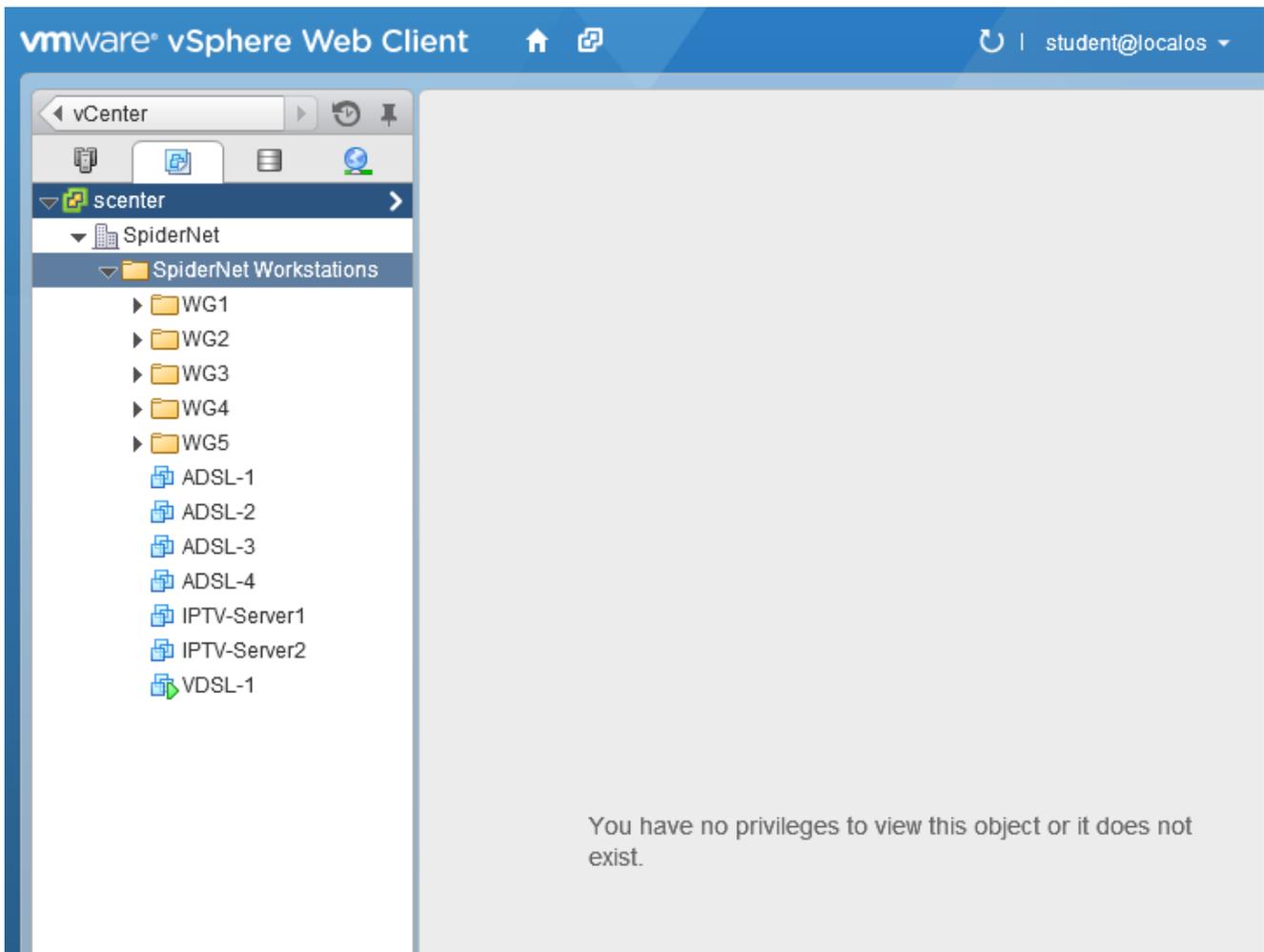
After these initial steps, you can log in to the Web Client. Some courses provide different credentials for you to access different virtual machines. For example, to use basic SpiderNet workgroup virtual machines use the credentials **student / spidernet**. You can also log in with your LabraNet account in the format **student-id@labranet** (Picture 3). If you are working in a LabraNet classroom you can check the **Use Windows session authentication** checkbox to log in automatically with your LabraNet account.

A screenshot of a login interface with a dark blue background. It features two white input fields: the first is labeled 'User name:' and contains the text 'x1234@labranet'; the second is labeled 'Password:' and contains a series of asterisks. Below the password field is a checkbox labeled 'Use Windows session authentication'. At the bottom center, there is a blue button with the text 'Login' in white.

Picture 3: Log in with LabraNet credentials

2.2 Navigating

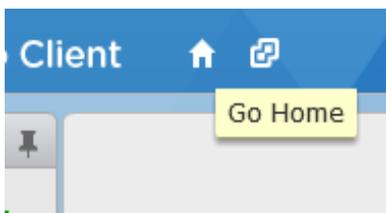
After logging in, you will see an overview of the SCenter resources. Many of the resources and panes can safely be ignored as you will not have relevant permissions to use them. To find and use the virtual machines, navigate from the left pane to **vCenter - VMs and Templates** -view. This will be the main page you will be using. From the left pane you can expand the hierarchy of SpiderNet to see what virtual machines you can use with the credentials you provided. (Picture 4)



Picture 4: VMs and Templates -view

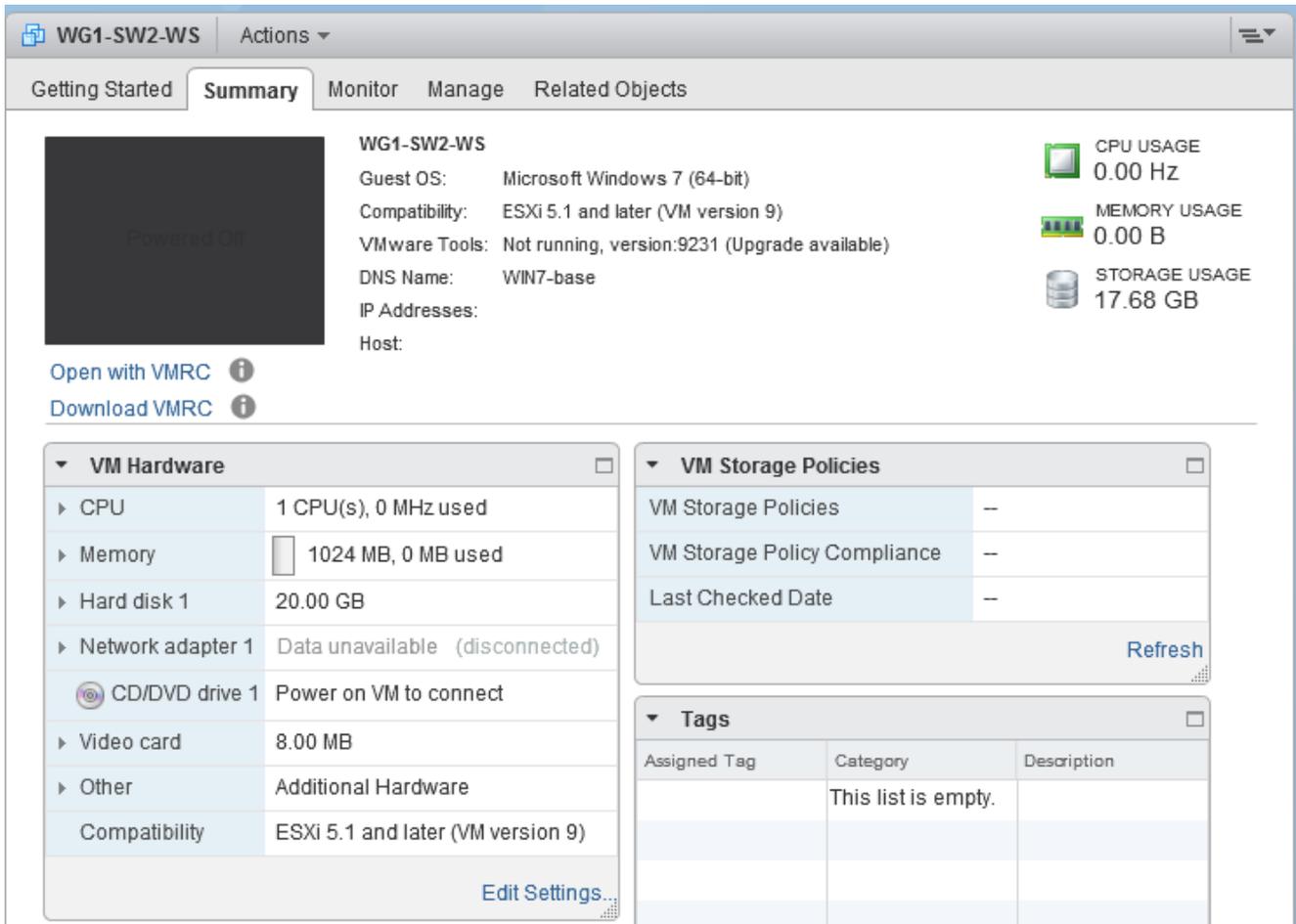
Note: If you cannot expand the SpiderNet -view, you might not have enough permissions to use any virtual machines. Contact your teacher/instructor for further information.

If you get lost in the UI, you can always get to the Home view by clicking the house-looking button on the top of the page (Picture 5).



Picture 5: Go Home -button

From the hierarchy you will need to find the corresponding virtual machine for your lab/group. After this you will be presented the controls of this virtual machine on the middle pane as tabs. The default view is a **Getting Started** -tab that can be closed from the top right corner. Mostly you will be using the Summary tab, which provides information and controls for the virtual machine (Picture 6).



Picture 6: Virtual Machine summary

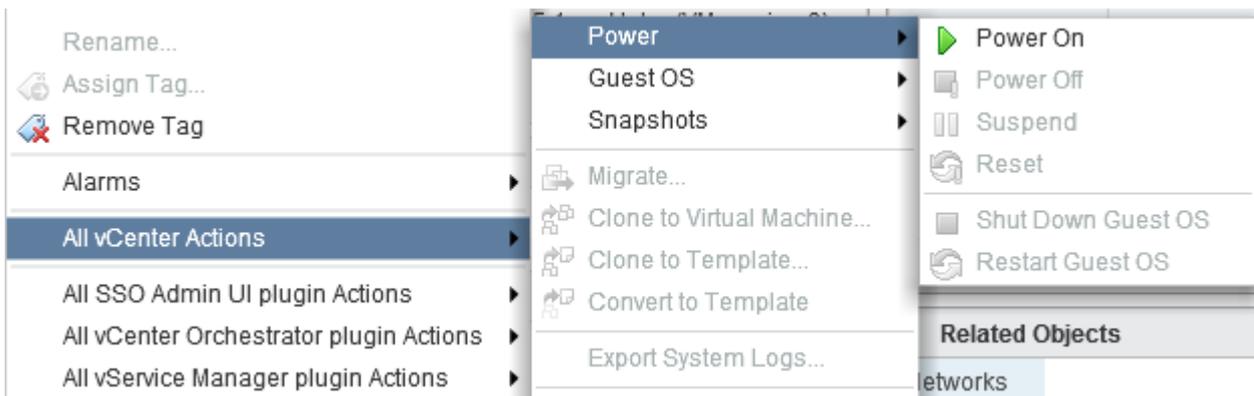
2.3 Controlling virtual machines

Basic controls for the virtual machines (Power on, off, reset, etc) can be found by right-clicking the virtual machine and using the Actions menu (Picture 7).



Picture 7: Actions-menu

Note: Some of the actions, such as hard reset and Poweroff are hidden in the Actions-menu under All vCenter Actions (Picture 8).



Picture 8: All vCenter Actions

Control differences explained:

- Power On: Starts the vm
- Power Off: Turns the vm off instantly, like pulling the plug on a computer
- Suspend: Pauses the vm
- Reset: Hard reset, like pressing the reset button on a computer
- Shut Down Guest OS: Tells the vm to shut down cleanly
- Restart Guest OS: Tells the vm to restart operating system cleanly

Normally you would use the **Shut Down** and **Restart Guest OS** as these are a clean way of controlling the operating system running in the virtual machine. If however the operating system is unresponsive, you may need to use the **Power Off/Reset** actions instead. Please avoid using **Suspend** as suspended virtual machines still continue to reserve resources for themselves.

2.4 Using the console

There are two consoles for a virtual machine. You can click on the picture of the vms console view under Summary-tab or select **Open Console** from the Actions-menu. This will open the Web Console for the vm. However, avoid using this console as it is very minimal and the keyboard layout will be wrong.

Instead, under the picture of the vm console, click **Open with VMRC**. This will open the vm console in a separate **VMware Remote Console** -program, which is much better to use (Picture 9). If you do not have the VMRC software installed (classrooms should have), you can download it by clicking **Download VMRC** in the same place.



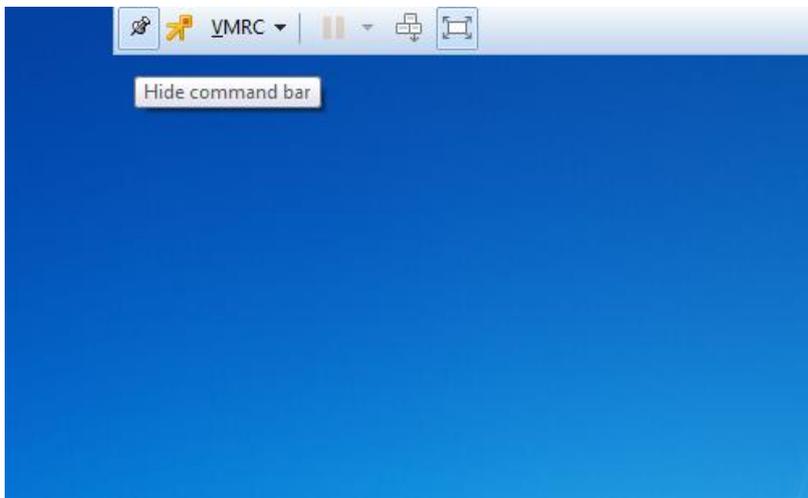
Picture 9: VMware Remote Console

You can also find basic controls, such as Power On, Shutdown, etc. for the virtual machine under the VMRC-menu on top left of the window.

To use the operating system installed in the virtual machine, click anywhere in the console window and the console should snap your keyboard and mouse inside the window. To get out of the console, press **Left Control + Alt**. Some operating systems will automatically snap in and out of the window.

Few additional keyboard shortcuts are good to know:

- **Left Control + Alt + Insert**: This will send Ctrl+Alt+Del to the virtual machine, for example to log in to Windows guests. Normal Ctrl+Alt+Del will not work as your workstation will get it.
- **Left Control + Alt + Enter**: This will enter/exit full screen mode. In full screen you will get a control bar on top of the VM, which you can hide/unhide using the pin button on the left side (Picture 10).

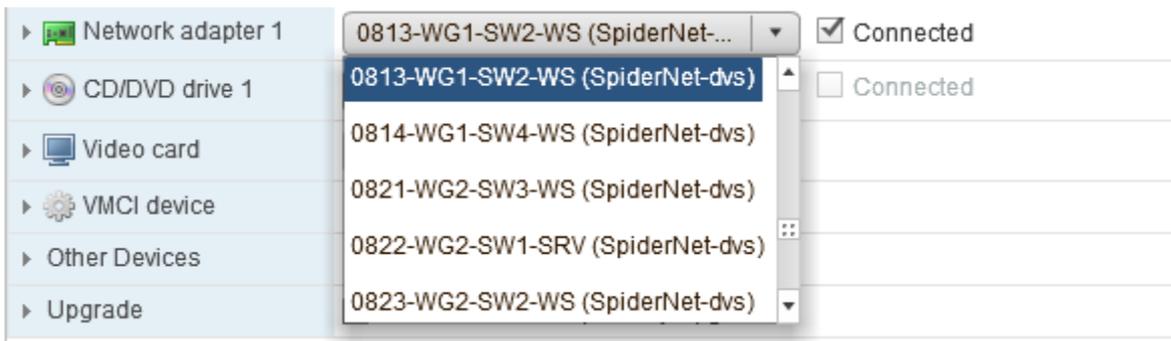


Picture 10: Command bar on full screen

Note: Some operating systems, such as Linux, will by default blank the console window. If the virtual machine is running and the console is just black, click in it and press some keys to unblank the view.

2.5 Changing the network

Some work may require you to change the network of the virtual machine. Use the **Edit Settings** - action to modify virtual machine. You can then select which VLAN the network adapters are connected to (Picture 11). You can also connect or disconnect the adapter using the **Connected** - checkbox.

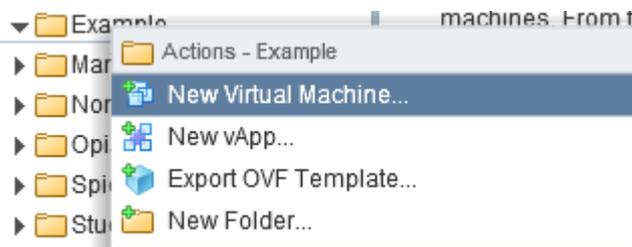


Picture 11: Selecting VLAN for Network adapter

3 Managing virtual machines

3.1 Creating a new virtual machine

To create a new virtual machine, right-click on the folder where you want to create the VM, and select **Create Virtual Machine** from the Actions-menu. This will open the wizard for new virtual machine (Picture 12). If you have no permissions to create virtual machines, this option will be greyed out.



Picture 12: Create Virtual Machine

In the wizard, select **Create a new virtual machine** and follow the steps. Here are the most important steps to consider:

- **Select a computer resource: SpiderNet-Cluster**
- **Select storage:** Usually you only have one option of storage, but if unsure, check your teacher/instructor.
- **Select compatibility: ESXi 5.5 and later**
- **Select a guest OS:** Select whichever option is the closest to the operating system that will be installed in the virtual machine

NOTE! The last step is Customize hardware. There is one vitally important step here, enable it before doing anything else. Expand the **New Hard disk** and select **Disk Provisioning: Thin provision** (Picture 13). This makes sure space is not pre-allocated, but used only when required.

New Hard disk	40	GB
Maximum Size	N/A  Maximum virtual disk size will not be validated if datastore cluster is selected as storage.	
VM storage policy	None 	
Location	Store with the virtual machine	
Disk Provisioning	<input type="radio"/> Thick provision lazy zeroed <input type="radio"/> Thick provision eager zeroed <input checked="" type="radio"/> Thin provision	
Shares	Normal	1000

Picture 13: Thin provision

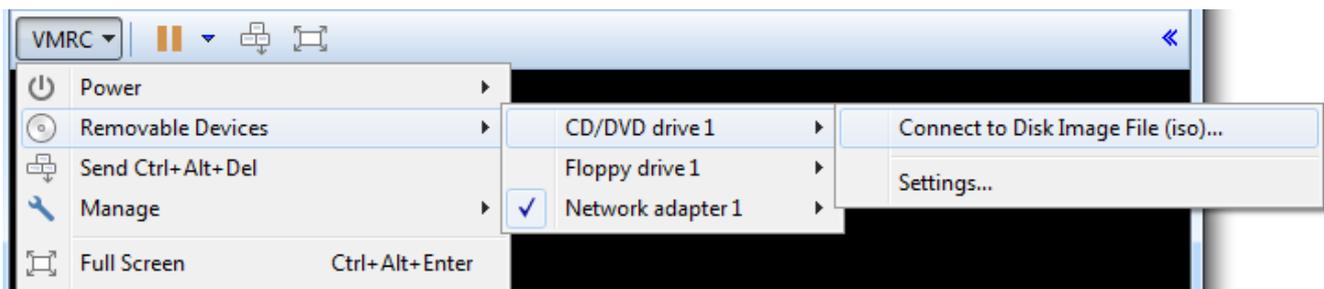
Other settings to consider when creating the new virtual machine:

- **CPU:** If more than 1 core is required, expand the CPU and select **Cores per Socket**. Do NOT select multiple CPUs as this might affect performance.
- **Memory:** Try to be frugal and don't overuse memory. You can easily add CPU cores and memory later if needed.
- **New Hard disk:** When using the **Thin Provision**, only the amount of space is used that is necessary, so the hard disk size is not so critical. Set the value you will be using at most. For Windows machines, 40GB should be enough. For basic Linux machines, 8-16G is enough depending on whether you are using command line or GUI. ALWAYS REMEMBER TO SET THIN PROVISION!
- **New SCSI controller:** Select **VMware Paravirtual**. This will give you the best performance. If the operating system does not support this, you can change it later to **LSI Logic SAS** or **LSI Logic Parallel**.
- **New Network:** Always select **VMXNET 3** in the Adapter Type. For the VLAN, consult your course topology. If you need Internet access, use **0722-Student-VMs**.
- **New CD/DVD Drive:** Do not add CD here, you can do it later in the VMRC when installing the operating system

When you are done, always review the settings before clicking **Finish**.

3.2 Installing Guest Operating System

To install the operating system to a new virtual machine. Open the VMRC and Power On the vm. During boot you have a very limited time to hit Esc key to select the boot media, but a new vm should boot from CD anyway, as the virtual hard disk is empty. Connect the installation media from the VMRC menu by selecting Removable Devices - CD/DVD driver - Connect to Disk Image File (iso) (Picture 14).



Picture 14: Connecting disk media

*NOTE: You cannot connect the CD before powering the vm on. Also, Power Off and Reset will disconnect the media, which is annoying. To reboot from the CD, send Ctrl+Alt+Del by pressing **Left Control+Alt+Insert**.*

3.3 Installing VMware Tools

Always after you have installed the operating system, make sure to install **VMware Tools** also. These tools provide information from the guest OS to SCenter, make the using of the VM easier and help to achieve better performance. For Windows, select **Manage - Install VMware Tools** from the VMRC menu (Picture 15).

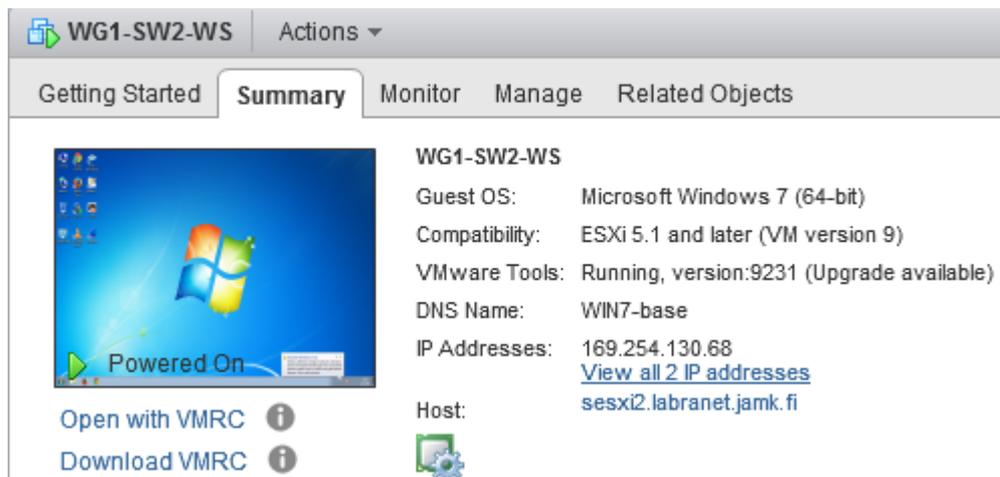


Picture 15: Installing VMware Tools

For Linux/BSD, install the tools as a system package from the Internet (GUI versions in parenthesis):

- RHEL/Centos/Fedora package managers: **yum install open-vm-tools** (open-vm-tools-desktop)
- Ubuntu/Debian: **apt install open-vm-tools** (open-vm-tools-desktop)
- Other distributions (such as PfSense): Search for open-vm-tools with your package manager

Reboot after installation in any case. After the VMware Tools are correctly installed and running, you will see their status and other information from the guest operating system in the Summary tab in Web Client (Picture 16) .



Picture 16: VMware Tools Information

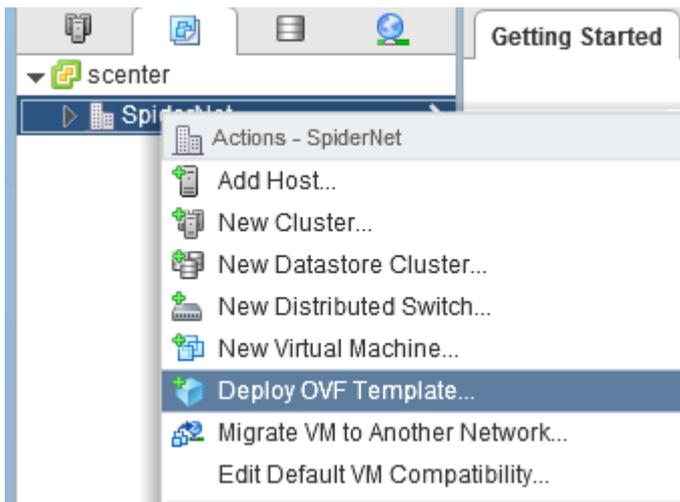
Note. Shut Down and Restart Guest OS -actions requires that VMware Tools are correctly running in the operating system, so this is one more reason to install them.

3.4 Deploying OVF files

If you already have a virtual machine in OVF format you wish to use, it can be deployed directly.

Right-click **SpiderNet**-datacenter from the left pane (Not the target folder like when creating a new virtual machine) and select **Deploy OVF Template** (Picture 17). Then follow the wizard just like when creating a new virtual machine.

You can also export the virtual machine as an OVF file to be used elsewhere by selecting **All vCenter Actions - Export OVF Template**. The virtual machine to be exported needs to be powered off.



Picture 17: Deploy OVF Template

NOTE: These features require you to use a browser that is compatible with the VMware Client Integration Plug-in. Currently only supported browser is Firefox ESR 52, which can be found in classrooms. Another way is to use either vSphere Client or OVFTool -software to deploy the OVF.

NOTE 2: The OVF to be deployed must be compatible with VMware, eg. it must have been created with a VMware product (Another vSphere environment or VMware Workstation/Player, etc.). OVF files created with VirtualBox need to be modified before they can be deployed. You can find guides for this kind of conversion in the Internet.

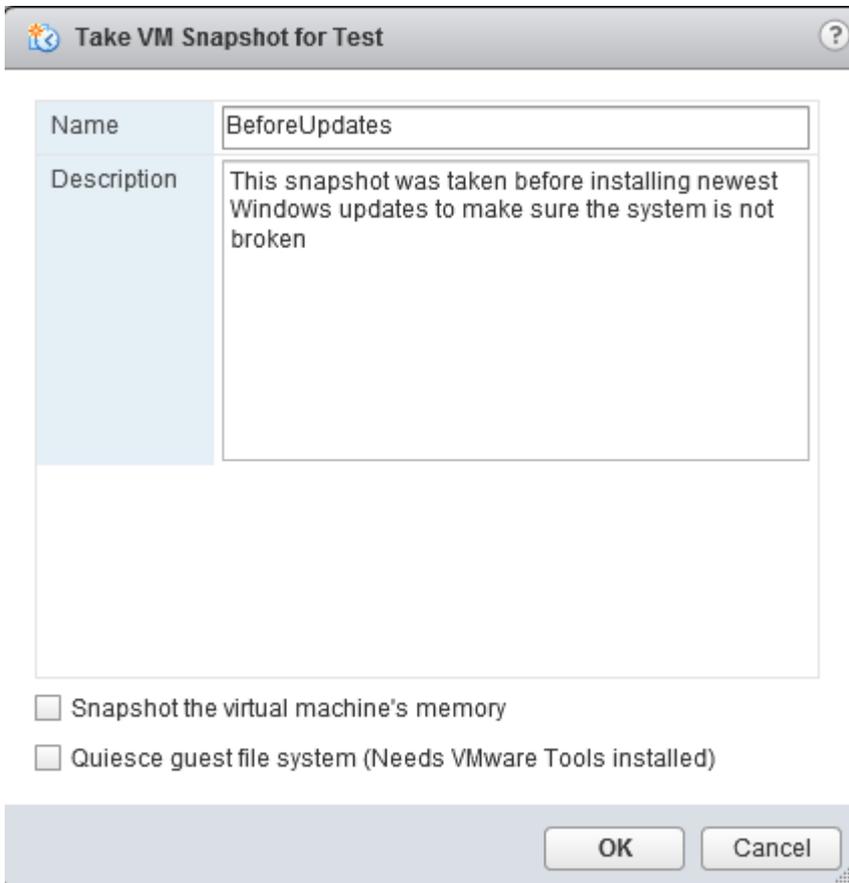
3.5 Modifying virtual machines

To modify already existing virtual machines, use the **Edit Settings** -Action. Some settings such as CPU/Memory limits can only be change when the virtual machine is powered off. Some settings such as disk provisioning method and network adapter type cannot be changed at all. To change disk provisioning from Thick to Thin, contact LabraNet administration or your Teacher/Instructor. To change Network adapter type, you need to remove it and create a new network adapter. To add more devices, use the **New device** option in the bottom of Edit Settings -dialog.

3.6 Using snapshots

If you are doing potentially dangerous tasks in the virtual machine or for some other reason want to return to this point later, you can take a snapshot of the virtual machine. Snapshots work by storing

the current data in the virtual machine hard disk as a point in time. You can later return to this point and restore whatever work was lost or changed completely. To take a snapshot, select **Take Snapshot** from the Actions-menu. (Picture 18)

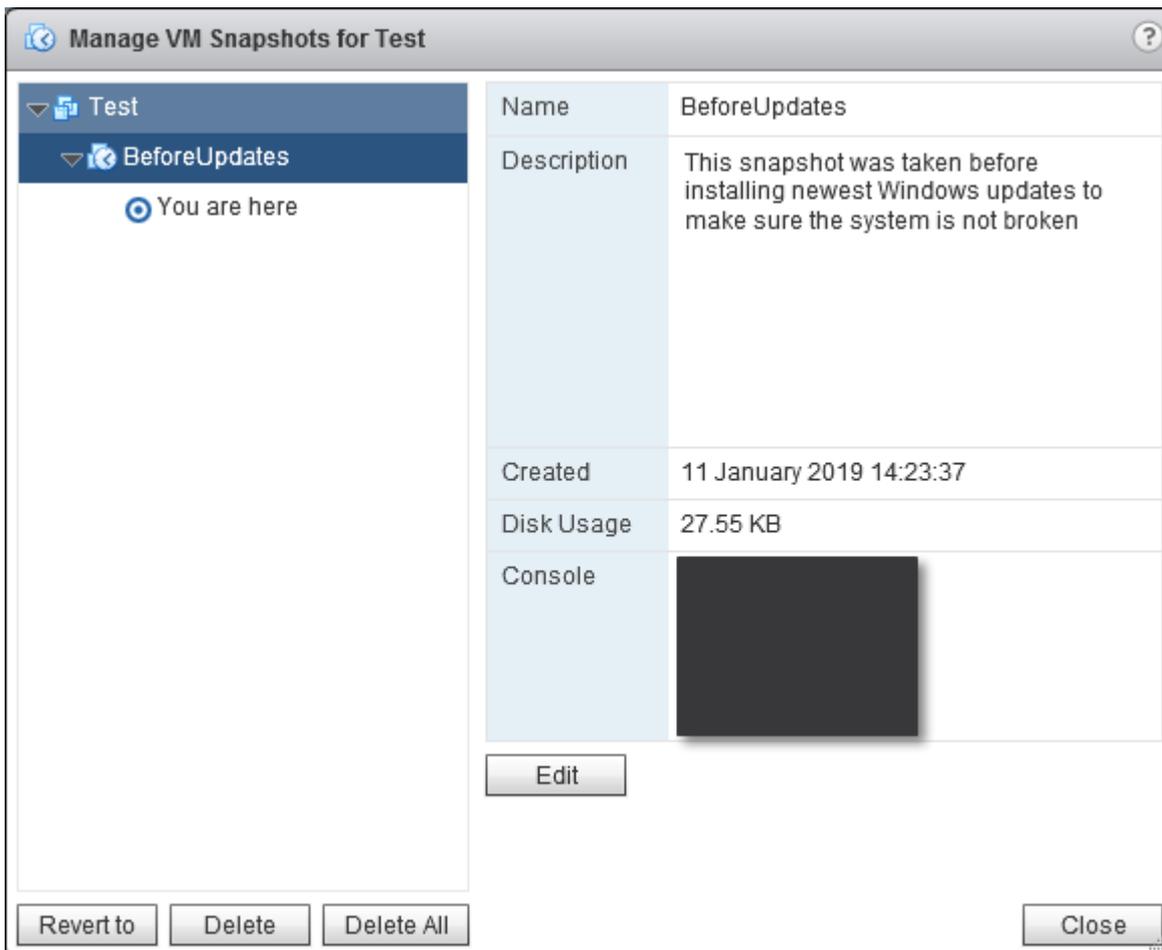


Picture 18: Taking a virtual machine snapshot

There are two options when taking a snapshot of a virtual machine:

- **Snapshot the virtual machine's memory:** This will create a so-called Live Snapshot, which includes a memory dump. When restoring a Live Snapshot, you will get back to exactly where you left the virtual machine, powered on and all programs running
- **Quiesce guest file system:** This will tell the virtual machine to close all file handles currently open and makes sure that all changes are written to disk so nothing is lost. Useful when taking snapshots of SQL servers and servers that are under heavy load.

You can return to a snapshot with Manage Snapshots -action. (Picture 19)



Picture 19: Manage Snapshots

From Manage Snapshots you can **Revert To** the snapshot, which discards the current state of the virtual machine and returns to that point in time. You can **Delete** a single snapshot, or **Delete All** snapshots for this virtual machine. Note that these actions may take some time depending on the amount of changes.

There are some drawbacks to using snapshots:

- Avoid using Live Snapshots as they will use disk space to store the memory contents. Multiple memory dumps from Live Snapshots will quickly fill up the disk.
- Avoid taking snapshots from running machines anyways. When returning to a non-Live Snapshot of a running virtual machine, the operating system will act like it had crashed last time, as it was not shut down cleanly. You might lose some important data that was not saved.
- Avoid using multiple concurrent snapshots. They will quickly accumulate a lot of disk space usage, and disk IO will become slow when multiple virtual disk files need to be read.

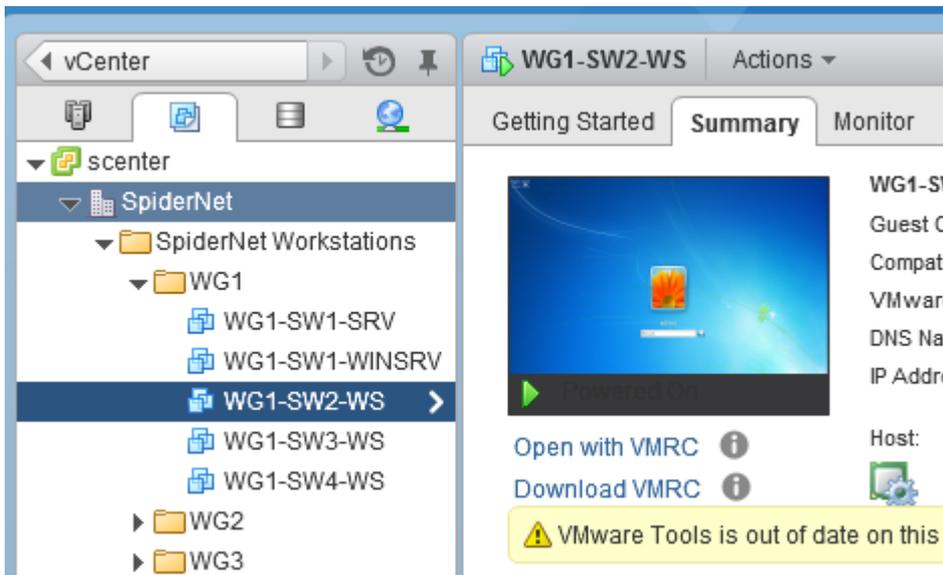
- Avoid keeping snapshots for a longer periods. All read/write operations on a virtual machine will be slower when the virtual machine has a snapshot open. Also all overwritten data will be retained, so disk space can be used multiple times.
- Snapshots are not backups! If the virtual machine is deleted, becomes corrupt or errors occur on the storage system, all data is lost. Keep backups of important data separate.

Best way to use snapshots is to take a snapshot, do whatever needs to be done in the virtual machine, verify that everything works and then delete the snapshot.

4 Troubleshooting and Tips

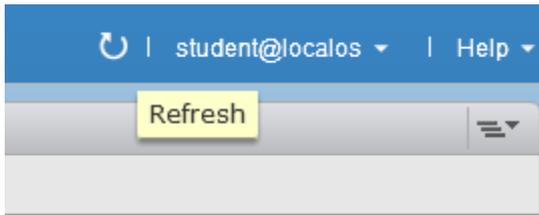
4.1 General problems with the Web UI

The vCenter Web Client can be a bit tricky some times. It is known to not refresh information of the virtual machines, such as running status or the vm console view correctly. For example, the vm can be seen as not running on the left pane when it actually is powered on correctly. (Picture 20)



Picture 20: Left pane incorrectly shows the status of the vm

In cases where a refresh of the view is required, do NOT refresh using the browsers refresh button or by pressing F5. This will reload the whole Web Client page which is slow. Instead, try clicking the Refresh button in the Web Client itself, located on the upper right side of the view, next to your user name (Picture 21).



Picture 21: Web Client refresh button

In more severe cases, the Web Client may become unresponsive or throw an error. In these cases it is necessary to refresh the whole page, or in worst case close and re-open the browser. If the problem persists, try to clear the browser's history/cache and log in again.

4.2 Copy&Paste

Copy & Paste does not work natively when using the virtual machine through a console. However, if you install VMware Tools, Copy&Paste should work in VMRC for graphical operating systems. This feature is somewhat limited and cannot move files across the virtual machine clipboard. Drag&drop copying is also not supported.

4.3 Nonpersistent virtual machines

The basic SpiderNet workgroup virtual machines (WGx-SWy-WS etc.) are configured as nonpersistent. This means these virtual machines will lose all changes when they are powered off. This way, any previous lab work does not affect new labs. You can see if the virtual machine is nonpersistent by checking the **Disk Mode** in **Edit Settings** (you can do this even if you have no permission to edit the machine). Nonpersistent virtual machines will have the Disk Mode as **Independent - Nonpersistent** (Picture 22).



Picture 22: Nonpersistent virtual machine

5 Technical information

This information is collected here if you need to check the environment against requirements of readily-available virtual machine templates or appliances. The current environment is a VMware vCenter with three vSphere hosts. These run vSphere 5.5 with latest updates. The hosts are HP Bladesystem G7/G6 servers having dual Xeon 6-core processors with HT and at least 140GB DDR3 RAM. CPUs are at least Westmere generation and support VT-x, VT-d and EPT virtualization extensions. If required, nested virtualization is possible.

Storage is provided with a dedicated storage system and it is based on 15k spinning disks. Capacity can be added if necessary. SSD storage is not currently available.