Module 0: Virtual Machine

Working with Pathogen Genomes

What is an Operating System?

- Software that supports the computer's basic functions
- Manages computer hardware (screen, mouse, keyboard)
- Provides tools for managing files, running software
- Provides a way via software applications to interact with the computer

Examples include:
- **Windows**
- OS X
- **Linux**

What is a virtual machine?

A virtual machine (VM) is a software computer that, like a physical computer, runs an operating system and a set of software applications. It allows you to run one operating system (e.g. Linux) within another operating system (e.g. Windows).

The VM produced for this course already includes the data and software you'll need for the exercises.

Why use a VM?

The virtual machines can be built once and then run in a range of different environments without problems. This makes it a lot easier for you to reproduce what you've learnt on this course after you've left as well as making it easier for us to jump straight into teaching you new things without lots of setup.

A lot of bioinformatics software is built to run on Linux, some of this runs on OSX and a bit runs on Windows. This is because many high performance clusters run variants of Linux. We therefore want to teach in a similar environment.

Adding the virtual machine to Oracle VirtualBox

On this course we will be running a VM based on BioLinux which is based on a distribution of Linux called Ubuntu. We periodically provide updates for the VM on our website but you should use the supplied copy for now.

We will be running the VM on a Windows machine using the VirtualBox software. Other software is available to run the VM but this is a good free alternative. The following instructions walk you through how to setup the VM.

IMPORTANT NOTE: There are small differences between the images below, the instructions and what you'll see on the computer. If there's any doubt, follow the instructions in the text rather than the images.

Insert the USB stick into your machine. Our sticks will use USB 3 and run faster if you **plug the stick into a blue port.** Then open **Oracle VirtualBox** on your machine and select **'New'**. On these machines you'll find VirtualBox under the Windows Start Menu.

Enter a name for your VM, **'Vietnam_2017'**. Select **'Linux'** as the type of operating system that will run on your VM. Select the version as **'Ubuntu (64bit)'** and click **Continue**.

Select the amount of memory (RAM) to allocate to this VM, the values available to you will depend on the amount of memory (RAM) available on the host machine. On both our machines and your machine at home move the slider to the top of the green section.
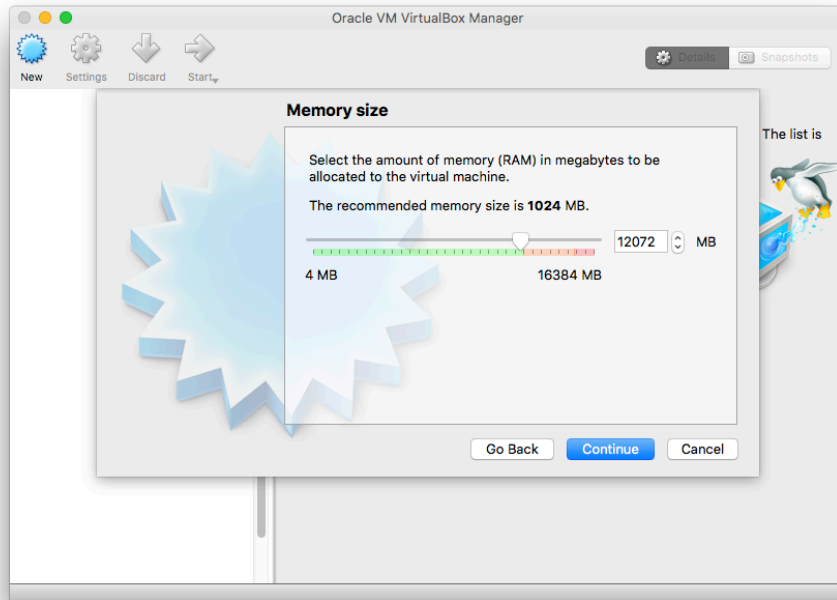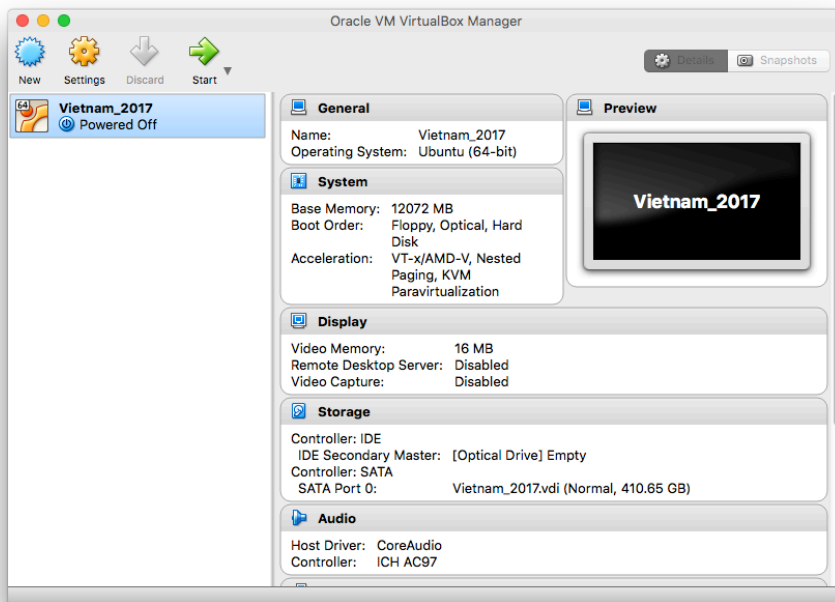

As we have already created the virtual hard disk for you, select **'Use an existing virtual hard disk file'** and click on the **folder with a green arrow** on the right hand side.

Navigate to the USB drive and select the file *'Vietnam_2017.vdi'* and click *'Create'*.
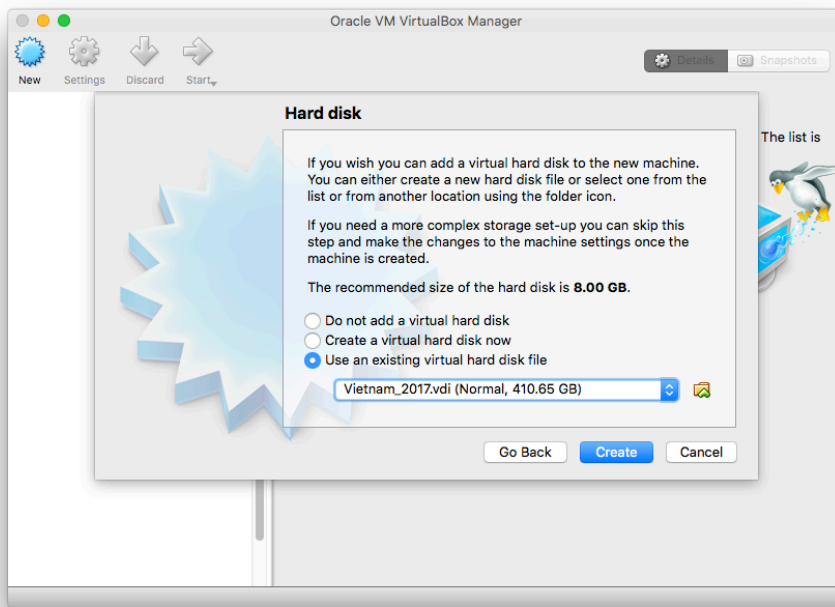
You should then see the screen below containing your VM *'Vietnam_2017'* in the Powered Off state.

Update Settings

Left click on *'Vietnam_2017'*, then click on Settings at the top of the window. Click General >> Advanced and then change "Shared Clipboard" to Bidirectional. This will make it possible to copy and paste things from the Windows "host" into and out of the Linux "guest".
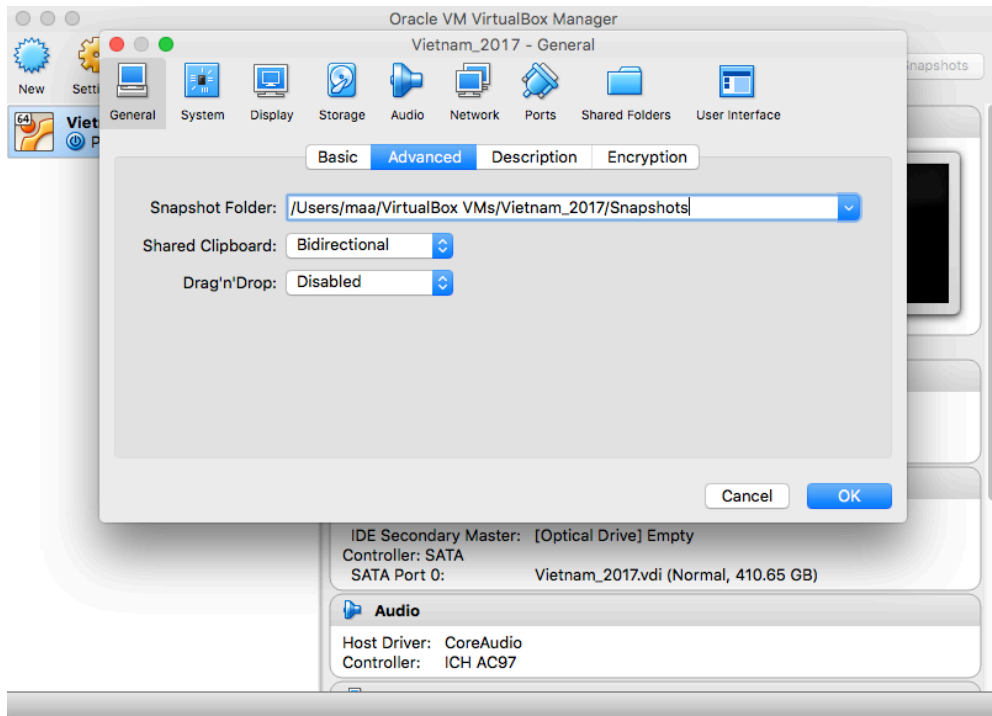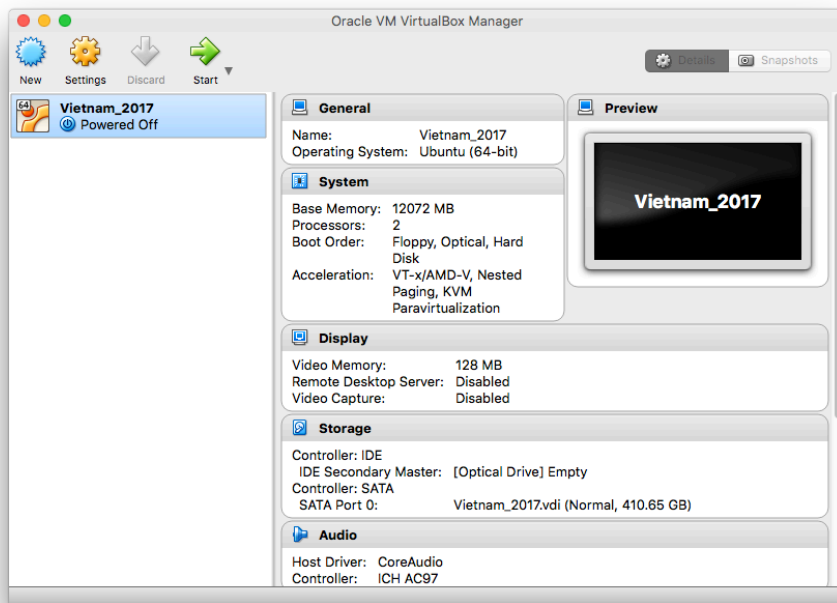

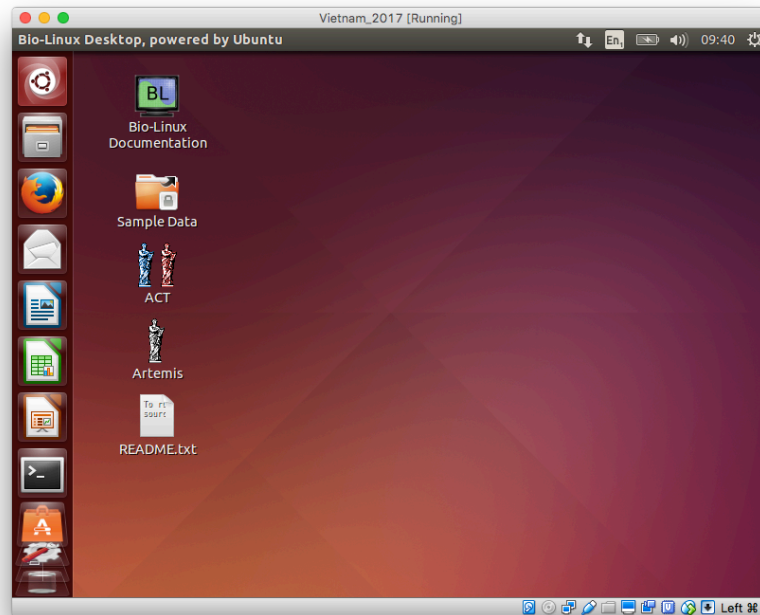Now click **System >> Processor** and slide the slider to the top of the green section (i.e. use half the CPUs).
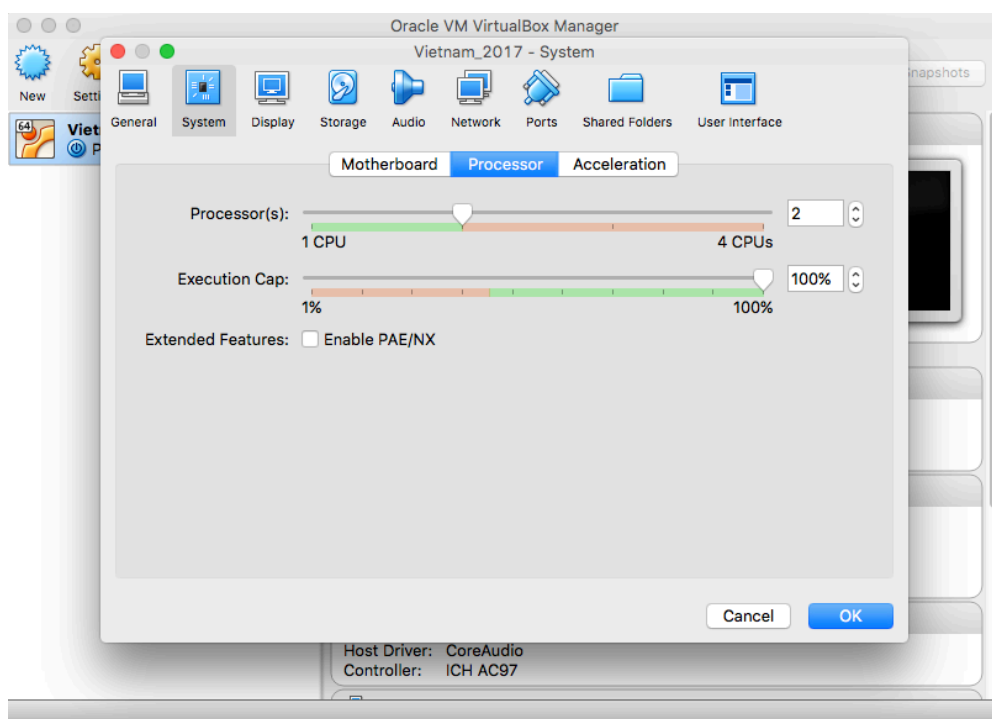
Click **Display >> Screen** and change Video Memory to the maximum amount.
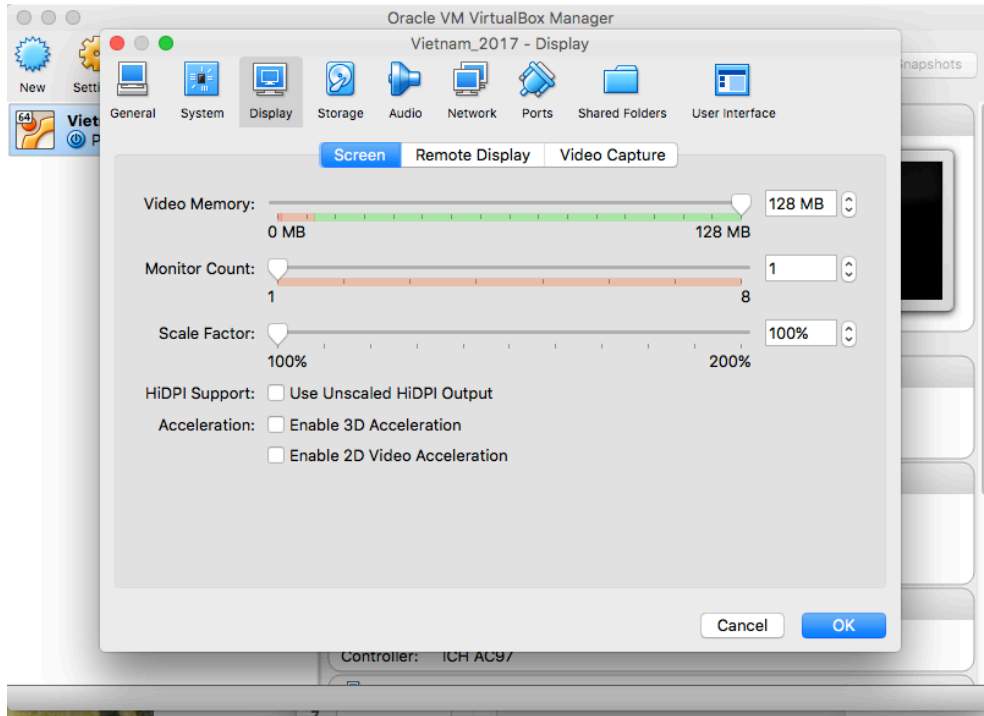
Click OK to save these changes. You should now be able to start the VM: **click on Vietnam_2017** and then **press the Start button**.

It should then look a little like this:

You can make the VM use the entire screen by pressing the right hand 'Ctrl' key and 'f' at the same time. This should work on Windows and (probably) Linux hosts; on OSX you should press the right 'Cmd' key (the funny box with circles on the corners) and the 'f' key. You can escape by using the same key combination.

Username and password

If you need them, the username is "manager" and the password is also "manager".

Using the VM at home

You get to keep the USB stick after the course and can use it to continue working on the exercises.

● On Mac OSX you will probably need to copy the virtual machine onto your hard disk. Copy Vietnam_2017.vdi from the USB stick onto your hard drive and then follow these instructions again. Note, when selecting the "existing hard disk" in one of the steps, you need to point it at the copy on your hard disk.
● On Linux, you may or may not be able to run the VM from the USB stick.
● On Windows, you should be able to run the VM from the USB stick by following these instructions. You may see a slight performance benefit from moving it onto your hard disk though.

Removing the virtual machine from VirtualBox

DO NOT DO THIS UNTIL THE END OF THE COURSE OR UNLESS TOLD OTHERWISE

In the main *VirtualBox* window, *right click* on your virtual machine (seen in the left hand column). Select *'Remove'* from the menu.
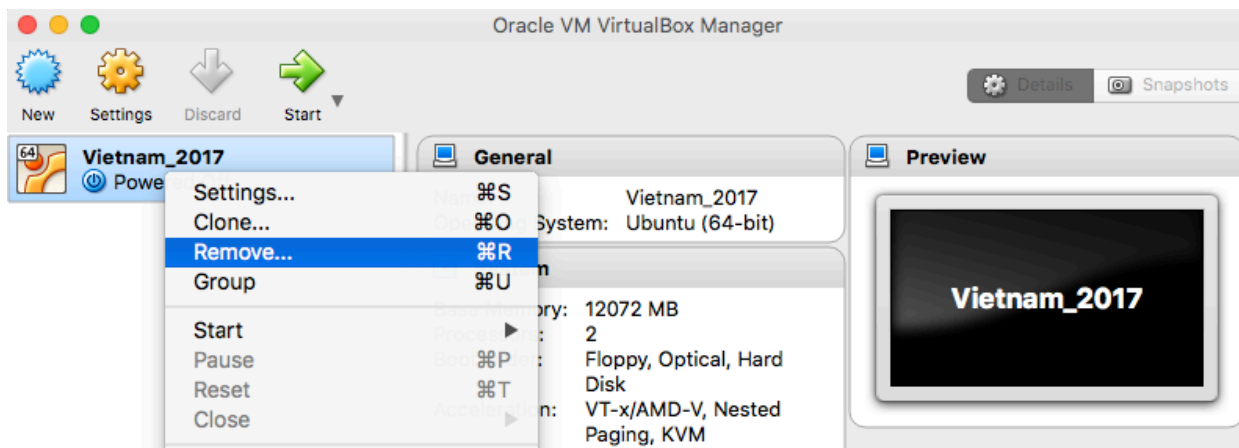
Then select *'Remove only'*, do not select the 'Delete all files' option as this will delete the the vdi file that contains the virtual machine.
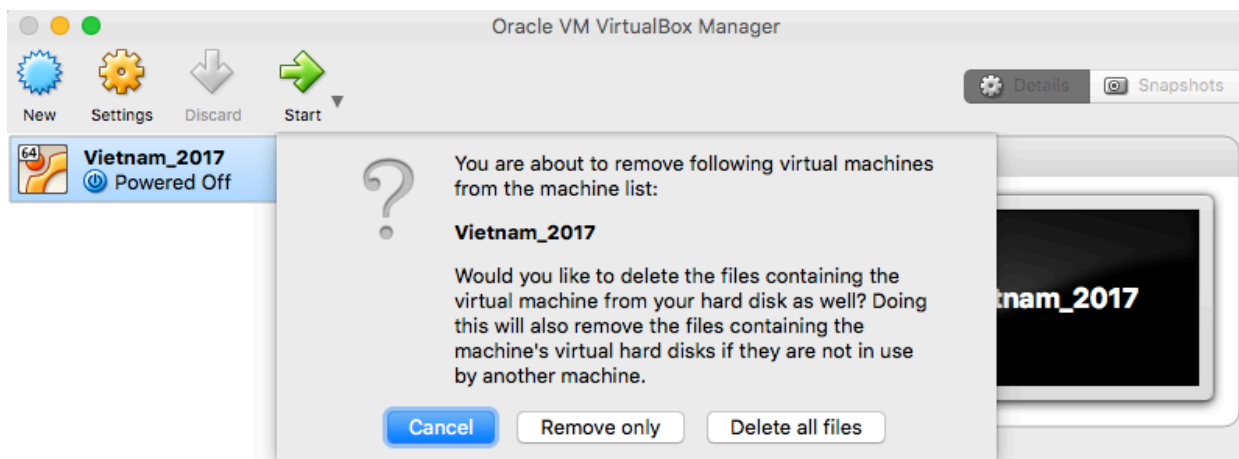

Shared folders

**This is an optional step which you can do at home. It is not needed as part of the course.**

By default, none of the files on the host machine are visible from inside the virtual machine; this describes how to share data between the host and the virtual machine. This might be

useful if you want to rerun some analysis with your own data or you want to share your results with a colleague.
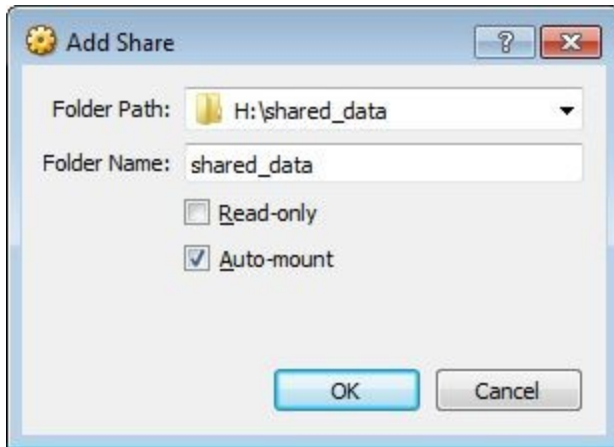
First, **shut down the virtual machine.** In the main **VirtualBox** window, **select your virtual machine** (on the left). Then go to **Settings >> Shared Folders**.
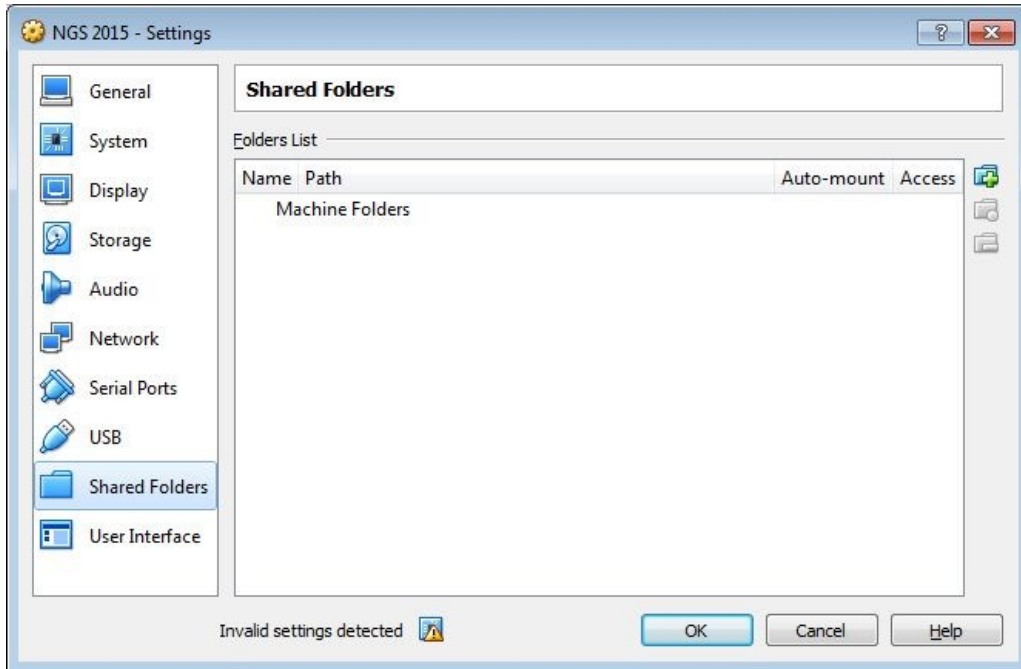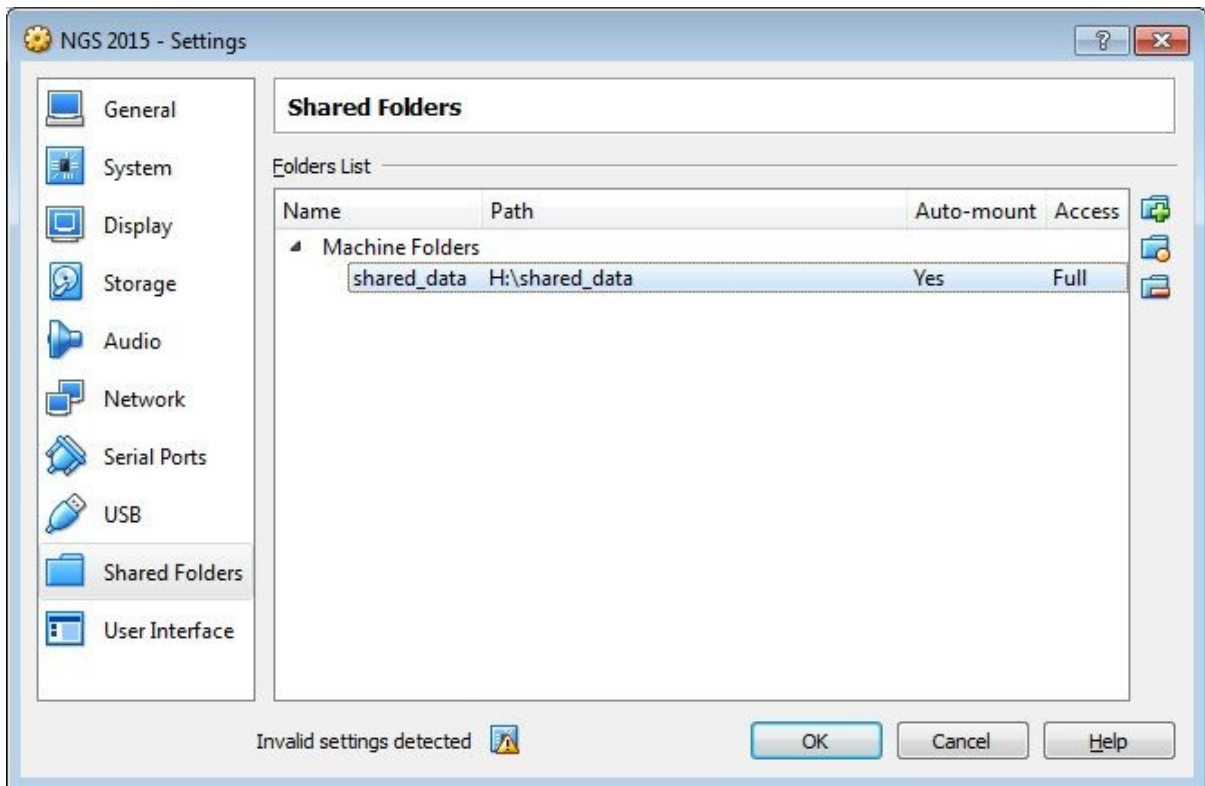

Click on the blue folder with a green plus on the right hand side. In the pop up box, **select "Other"** from the Folder Path option.
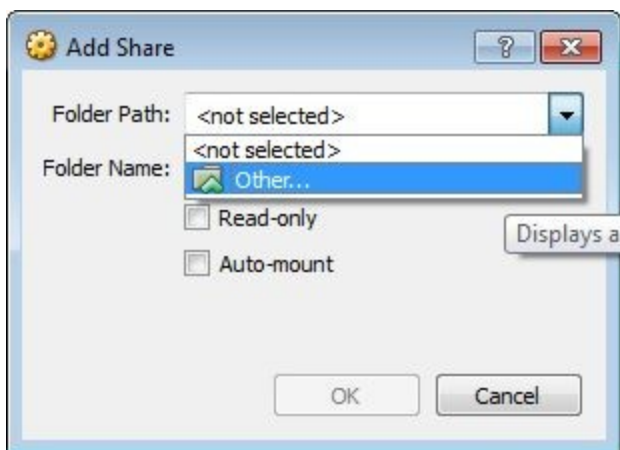
Find the folder that you would like to share with the Virtual Machine. It should now be visible in the Folder Path box. **Tick the Automount box**.

Now **click on OK**. The new shared folder should be in the Folders List:

Select OK and you will return to the main VirtualBox window. Now **start the virtual machine**.

Finding the shared folder in the virtual machine

Inside the virtual machine, the shared folder will be inside the directory "/media". It will have the same name as on the folder on the host machine, but with "sf_" added. For example, if the folder is called "shared_data" on the host, then it will be called "/media/sf_shared_data/" inside the virtual machine.