Launch the VirtualBox application on your (host) machine. If you just finished installing VirtualBox for the first time, then you will see no machine images are available to run on the left hand side of the GUI.

Tools	Preferences Import Export New Add	
	Welcome to VirtualBox! The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new VMs using corresponding toolbar buttons. You can popup a tools of currently selected element using corresponding element button. You can press the %? key to get instant help, or visit www.virtualbox.org for more information and latest news.	

Select "Preferences" from the VirtualBox application pull down menu.

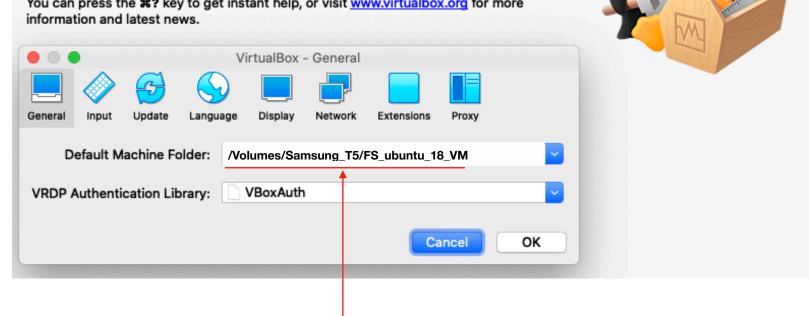
About VirtualBox			Oracle VM VirtualBox Manager
Check for Updates Network Operations Ma Reset All Warnings	nager	∦ ≣	Preferences Import Export New Add
Preferences	Ж,		Welcome to VirtualBox!
Services	•		The left part of application window contains global tools and lists all virtual machines and
Hide VirtualBox	жн		virtual machine groups on your computer. You can import, add and create new VMs using corresponding toolbar buttons. You can popup a tools of currently selected element using
Hide Others	∠#H		corresponding element button.
Show All			You can press the #? key to get instant help, or visit www.virtualbox.org for more
Quit VirtualBox	жQ		information and latest news.

Create a DEFAULT MACHINE FOLDER PATH on an (external or internal) drive where you have at least 30G of free disk space for VirtualBox to store the virtual machine. In the example below, the path under /Volumes/... was manually created on a different drive than the boot drive in order to enhance performance. External drives w/o a USB 3.0 or faster connection are not recommended.

Welcome to VirtualBox!

The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new VMs using corresponding toolbar buttons. You can popup a tools of currently selected element using corresponding element button.

You can press the #? key to get instant help, or visit www.virtualbox.org for more



Your path will differ.

An appliance file will be used to create an Ubuntu linux image to run. From the "File" pull down menu select "import appliance".



See the web page containing this document for the URL to download the virtual appliance file using your web browser. Most browsers are set to download files into your "Downloads" folder. Use the "Choose" icon to navigate to the downloaded file,

	Name	∧ Date Modified	
	💗 FS_Ubuntu_18_04_06.ova	Dec 31, 2021 at 11:16 PM	
Appliance to	o import		
	ose the source to import appliance from. This can be a local o import cloud VM from.	file system to import OVF archive or one of known cloud se	ervice
Source:	Local File System		
	ose a file to import the virtual appliance from. VirtualBox cur n Format (OVF). To continue, select the file to import below		
File:			
			Choose

Once the path/filename of the appliance file is listed in the "File" field, then select "continue".

Source:	Local File System	
	pose a file to import the virtual appliance from. VirtualBox currently supports importing appliances save ion Format (OVF). To continue, select the file to import below.	ed in the Open
File:	/Users/developer/Downloads/FS_ubuntu_18_04_06.ova	
	Your path will differ	

You will be presented with a window showing the current settings for the virtual appliance. Change the entry for "MAC address policy" to be "Generate new MAC addresses for all network adapters".

	ppliance settings		
Image: Name FS_Ubuntu_18_04_06 Image: Guest OS Type Image: Ubuntu (64-bit) Image: CPU 1 Image: RAM 4096 MB Image: DVD Image: CPU Image: VI USB Controller Image: CPU Image:			u can
Guest OS Type ↓ Ubuntu (64-bit) CPU 1 RAM 4096 MB DVD ✓ USB Controller ✓ USB Controller ✓ LCH AC97 Network Adapter ✓ Inclel PRO/1000 MT Desktop (82540EM) ✓ Your network adapter will differ ✓ Storage Controller (IDE) PIIX4 ✓ Storage Controller (IDE) PIIX4 ✓ Storage Controller (SATA) AHCI ✓ Virtual Disk Image FS_Ubuntu_18_04_06-disk001.vmdk Base Folder Nolumes/Samsung_T5/FS_ubuntu_18_VM ✓ Primary Group / Your path will differ Machine Base Folder: Nolumes/Samsung_T5/FS_ubuntu_18_VM Center Addresses Centrale network adapter MAC addresses Additional Options Center MAC addresses for all network adapters Center	Virtual System 1		
CPU 1 RAM 4096 MB DVD VD VD VI LSB Controller ICH AC97 Network Adapter Intel PRO/1000 MT Desktop (82540EM) Your network adapter will differ Vour network adapter will differ Vour network adapter will differ Virtual Disk Image FS_Ubuntu_18_04_06-disk001.vmdk Base Folder Nolumes/Samsung_T5/FS_ubuntu_18_VM Your path will differ Machine Base Folder: Nolumes/Samsung_T5/FS_ubuntu_18_VM Court path will differ	😽 Name	FS_Ubuntu_18_04_06	
RAM 4096 MB DVD USB Controller USB Controller ICH AC97 Network Adapter Intel PRO/1000 MT Desktop (82540EM) Your network adapter will differ Storage Controller (IDE) PIIX4 Storage Controller (IDE) PIIX4 Storage Controller (SATA) AHCI Virtual Disk Image FS_Ubuntu_18_04_06-disk001.vmdk Virtual Disk Image FS_Ubuntu_18_04_06-disk001.vmdk Primary Group / Your path will differ Machine Base Folder: //olumes/Samsung_T5/FS_ubuntu_18_VM Support / Support //	🚼 Guest OS Type	🛃 Ubuntu (64-bit)	
Image: Second Secon	CPU	1	
	RAM	4096 MB	
 Sound Card IcH AC97 Network Adapter Intel PRO/1000 MT Desktop (82540EM) Your network adapter will differ Storage Controller (IDE) PIIX4 Storage Controller (IDE) PIIX4 Storage Controller (SATA) AHCI Virtual Disk Image FS_Ubuntu_18_04_06-disk001.vmdk Base Folder //olumes/Samsung_T5/FS_ubuntu_18_VM Primary Group / Your path will differ Machine Base Folder: //olumes/Samsung_T5/FS_ubuntu_18_VM Include all network adapter MAC addresses Additional Options: Generate new MAC addresses for all network adapters 	 DVD 	\sim	
 Network Adapter Intel PRO/1000 MT Desktop (82540EM) Your network adapter will differ Storage Controller (IDE) PIIX4 Storage Controller (SATA) AHCI Virtual Disk Image FS_Ubuntu_18_04_06-disk001.vmdk Base Folder Nolumes/Samsung_T5/FS_ubuntu_18_VM Primary Group Vour path will differ Machine Base Folder: Nolumes/Samsung_T5/FS_ubuntu_18_VM Include all network adapter MAC addresses Additional Options: 	USB Controller	\checkmark	
 Network Adapter Intel PRO/1000 MI Desktop (82540EM) adapter will differ Storage Controller (IDE) PIIX4 Storage Controller (SATA) AHCI Virtual Disk Image FS_Ubuntu_18_04_06-disk001.vmdk Base Folder Nolumes/Samsung_T5/FS_ubuntu_18_VM Primary Group Your path will differ 	🕩 Sound Card		
 Storage Controller (IDE) PIIX4 Storage Controller (IDE) PIIX4 Storage Controller (SATA) AHCI Virtual Disk Image FS_Ubuntu_18_04_06-disk001.vmdk Base Folder //olumes/Samsung_T5/FS_ubuntu_18_VM Primary Group / Your path will differ Machine Base Folder: //olumes/Samsung_T5/FS_ubuntu_18_VM Include all network adapter MAC addresses Include only NAT network adapter MAC addresses Generate new MAC addresses for all network adapters 	Network Adapter	V INTEL PRO/1000 M L DESKTOD (82540EM)	
 Storage Controller (SATA) AHCI Virtual Disk Image FS_Ubuntu_18_04_06-disk001.vmdk Base Folder //Volumes/Samsung_T5/FS_ubuntu_18_VM Primary Group / Your path will differ 	Storage Controller (IDE)	PIIX4	
 Virtual Disk Image FS_Ubuntu_18_04_06-disk001.vmdk Base Folder //olumes/Samsung_T5/FS_ubuntu_18_VM Primary Group / Your path will differ Machine Base Folder: //olumes/Samsung_T5/FS_ubuntu_18_VM Include all network adapter MAC addresses MAC Address Policy: / Include only NAT network adapter MAC addresses Generate new MAC addresses for all network adapters	Storage Controller (IDE)	PIIX4	
Base Folder /Volumes/Samsung_T5/FS_ubuntu_18_VM Primary Group / Your path will differ Machine Base Folder: /Volumes/Samsung_T5/FS_ubuntu_18_VM Include all network adapter MAC addresses MAC Address Policy: / Include only NAT network adapter MAC addresses Additional Options: Generate new MAC addresses for all network adapters	Storage Controller (SATA)	AHCI	
Image: Second	Virtual Disk Image	FS_Ubuntu_18_04_06-disk001.vmdk	
Machine Base Folder: Nolumes/Samsung_T5/FS_ubuntu_18_VM Include all network adapter MAC addresses MAC Address Policy: Include only NAT network adapter MAC addresses Additional Options: Generate new MAC addresses for all network adapters	🚞 Base Folder	/Volumes/Samsung_T5/FS_ubuntu_18_VM	
Machine Base Folder: Nolumes/Samsung_T5/FS_ubuntu_18_VM Include all network adapter MAC addresses MAC Address Policy: ✓ Include only NAT network adapter MAC addresses Additional Options: Generate new MAC addresses for all network adapters	🔞 Primary Group		
Additional Options:		Your path will differ	
Additional Options:			
MAC Address Policy: VInclude only NAT network adapter MAC addresses			
Additional Options: Generate new MAC addresses for all network adapters Generate		· · · · · · · · · · · · · · · · · · ·	0
Genera	Generate		
	Appliance is not signed		Generate

Select "Import" to create the virtual machine.

Settings		
Virtual System 1		
🍀 Name	FS_Ubuntu_18_04_06	
号 Guest OS Type	🚰 Ubuntu (64-bit)	
CPU	1	
RAM	4096 MB	
OVD	\checkmark	
🤌 USB Controller	\checkmark	
🕩 Sound Card	✓ ICH AC97	
📑 Network Adapter	✓ Intel PRO/1000 MT Desktop (82540EM)	
👌 Storage Controller (IDE) PIIX4	
👌 Storage Controller (IDE) PIIX4	
🔻 🧼 Storage Controller (SATA) AHCI	
Virtual Disk Imag	ge FS_Ubuntu_18_04_06-disk001.vmdk	
🖮 Base Folder	/Volumes/Samsung_T5/FS_ubuntu_18_VM	
🔂 Primary Group	1	
Machine Base Folder: /Vol	lumes/Samsung_T5/FS_ubuntu_18_VM	~
MAC Address Policy: Gen	erate new MAC addresses for all network adapters	\$
Additional Options: 🗹 Im	port hard drives as VDI	
	Guided Mode Restore Defaults Go Back Import	Cance

Wait for all steps in the import process to finish.

Virtua	l System 1	
3	Name FS_Ubuntu_18_04_06	
	Guest OS Type	🛃 Ubuntu (64-bit)
		virtual disk image 'FS_Ubuntu_18_04_06-disk001.vmdk' (2/3)
()	Sound Card	✓ ICH AC97
Ð	Network Adapter	Intel PRO/1000 MT Desktop (82540EM)
\diamond	Storage Controller (IDE)	PIIX4
\diamond	Storage Controller (IDE)	PIIX4

There should now be an entry for the virtual machine on the left hand side of the GUI with the current virtual machine configuration displayed on the opposite side.

•••	Oracle VM VirtualBox Manager
Tools	New Settings Discard Start
FS_Ubuntu_18_04_06	General Preview Name: FS_Ubuntu_18_04_06 Operating System: Ubuntu (64-bit) System System Base Memory: 4096 MB Boot Order: Floppy, Optical, Hard Disk Acceleration: VT-x/AMD-V, Nested Paging, KVM Paravirtualization
	Display Video Memory: 128 MB Graphics Controller: VMSVGA Acceleration: 3D Remote Desktop Server: Disabled Recording: Disabled
	Storage Controller: IDE IDE Secondary Device 0: [Optical Drive] Empty Controller: SATA SATA Port 0: FS_Ubuntu_18_04_06-disk001.vdi (Normal, 205.17 GB)
	Image: Weight of the second
	Network Adapter 1: Intel PRO/1000 MT Desktop (NAT)
	USB Controller: OHCI Device Filters: 0 (0 active)
	Shared folders
	None S Description
	None

Start the virtual machine by clicking on the "Start" icon in the VirtualBox application.

Tools	New Settings Discard Start	
FS_Ubuntu_18_04_06	General Name: FS_Ubuntu_18_04_06 Operating System: Ubuntu (64-bit)	Preview

The Ubuntu boot menu should appear with the 1st choice, "Ubuntu", highlighted. Hit return or wait for it to automatically boot.

ou have the Auto ca	apture keyboard option turned on. This will cause the Virtual Machine to automatically 🙁 GNU GRUB version 2.02	\$
∗Ubuntu		
Memory test	otions for Ubuntu : (memtest86+)	
Memory test	: (memtest86+, serial console 115200)	
Press en before b	↑ and ↓ keys to select which entry is highlighted. hter to boot the selected OS, `e' to edit the commands pooting or `c' for a command-line.	
The highlig	ghted entry will be executed automatically in 20s.	
	🖸 📀 🛄 🗗 🖉 🕐 🔳 🖬	eft

If the virtual machine fails to boot contact the freesurfer team and stop here. Otherwise, login as the user "developer" in the login menu. Get the password by sending an email request to the freesurfer help list.

Sun 21:54	0 - A 🕏 O -
developer	
Not listed?	
ubuntu®	
	📑 🤌 🗌 💻 🖶 🛐 🚫 🗭 Left 36

Enter the password.



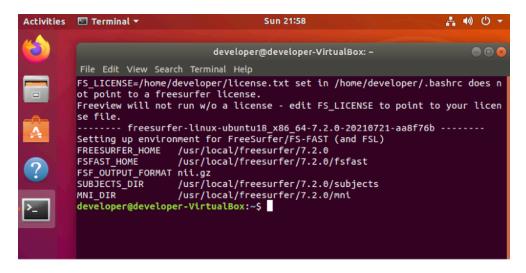
A blank desktop should appear after you login.



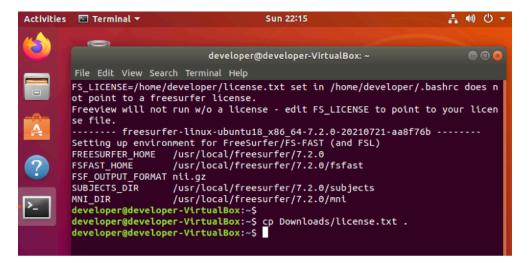
Right click with the mouse on the desktop and select "open Terminal".



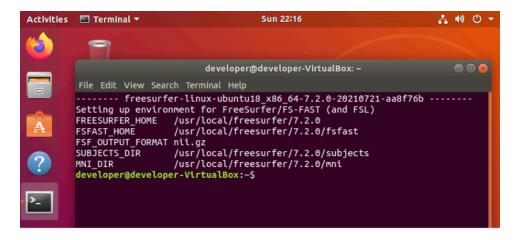
A new terminal windows should appear and notify you if a freesurfer license is missing. In the example below, no license was found. (**Obtain a free license file by filling out the form** at <u>http://mail.nmr.mgh.harvard.edu/mailman/listinfo/freesurfer</u>)



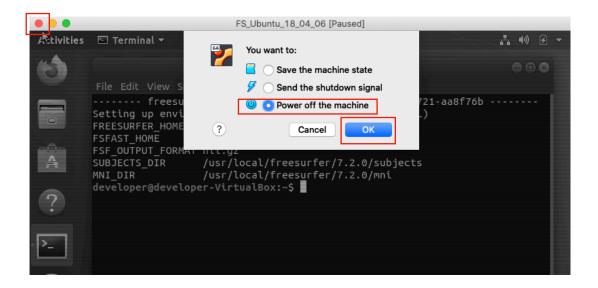
You can downloaded your license file, e.g., into your Downloads folder with a web browser. You can also try to cut and paste the text from license file or "drag and drop" the license file from the host machine into the VM (see end of this document). However you do it, add a valid "license.txt" file into the home directory for developer in the VM.



Close the current terminal window by clicking on the orange X in the upper right hand corner of the window. Repeat the step above where you right clicked on the empty desktop to bring up a new terminal window. The message about missing the license should be gone in the new terminal. **If your license file is still missing, review the steps above for the license file.**



Power off the virtual machine by closing the VirtualBox Ubuntu window. On Mac OS this is the red circle in upper left hand corner of the window. On Windows this is the X in the upper right hand corner of the window. Check the entry for "Power Off"



Now that you have verified the VM runs as is "out of the box", some changes should be made to the VM to better run freesurfer. With the VM still powered off, click on the "Settings" icon as the top of the VirtualBox window.

Tools	New	Settings	Discard	Start	
FS_Ubuntu_18_04_06		General			E Preview
Powered Off	Nam Ope			buntu_18_04_06 .tu (64-bit)	

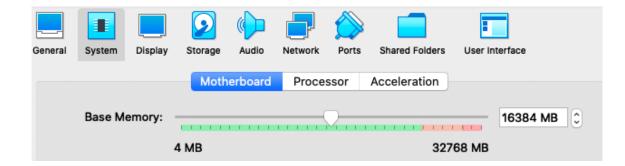
Click on the "System" icon to display the amount of RAM or "Base Memory" the VM can use from the host machine.

			Q		 	J	- -		
Take	Delete	Restore	Properties	Clone	Settings	Discar	d Start		
Name									
6	Current	State							
0	•			FS_Ubu	intu_18_04	4_06 - G	eneral		
General	System	Display	Storage	Audio	Network	Ports	Shared Folders	User Interface	

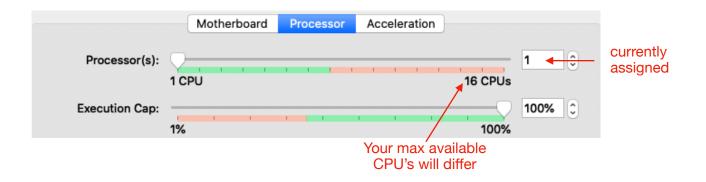
The VM has only ~4G of RAM "out of the box". To the right hand side of the slider under the red part of the bar, you see the maximum amount of RAM available to the VM. Often no more than 1/2 of available memory is given the VM since the host machine may be running other programs.

	Motherboard	Processor Acceleration	
Base Memory:	····		4096 MB
	4 MB	32768 MB	T T
Boot Order:	🗹 💾 Floppy	•	RAM
	🗹 🧿 Optical	Your maximum RAM	currently
	🗸 🚺 Hard Disk	available will differ	allocated to
	Network		VM

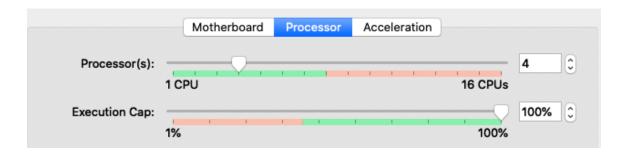
The recommendation for freesurfer is to allocate at least 12G of RAM and if possible 16G to the VM. If the total RAM available is 16G, then allocate 12G to the VM and try not to run other programs on the host machine when freesurfer is running. In the example below, 16G is assigned because it is 1/2 the total amount of RAM available on the host machine.



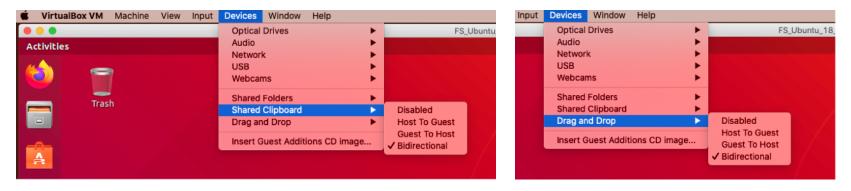
Performance can similarly also be improved by increasing the number of processors allocated to the VM. Click on the "Processor" tab next to the "Motherboard" tab. The VM has only 1 CPU "out of the box". To the right hand side of the slider under the red part of the bar, you see the maximum amount of CPU's available to the VM.



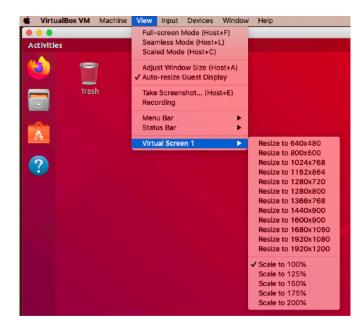
The recommendation for freesurfer is to allocate at least 2 CPU's and if possible 4 CPU's to the VM. If the total CPU's available are 2, then allocate 2 CPU's to the VM and try not to run other programs on the host machine when freesurfer is running. In the example below, 4 CPU's are allocated. (In the example below, there are 8 physical cores and 8 virtual cores via hyperthreading).



The guest extensions are installed in the VM. These allow for: (1) bi-directional cut and paste between the host machine and the Ubuntu linux window; (2) drag and drop files between the host machine and the Ubuntu linux window; (3) resize the Ubuntu linux window;. Change these settings while the VM is running.



Try **selecting a specific "Resize to** …" dimension available in the pull down menu. With **Auto-resize** set, it works on some hosts to manually resize the Ubuntu linux window by dragging on a corner to enlarge it. But this may not work with some host graphics hardware if the window is re-sized to non-standard dimensions. Re-sizing only takes effect after you login.

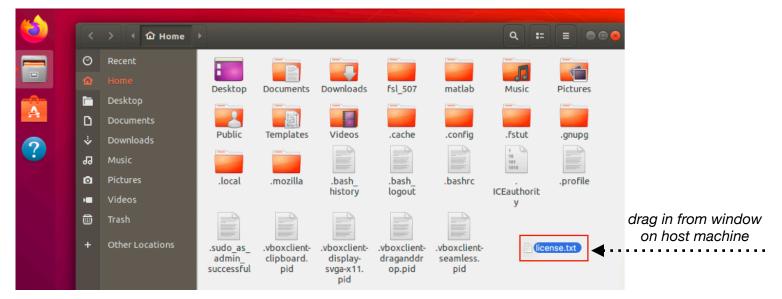


To **drag and drop files from the host machine into the VM**, first single click on the file cabinet icon on the left hand side of the desktop in the Ubuntu linux window. This will open the Ubuntu "Files" application which is the equivalent of the "Finder" (MacOS) or "Explorer" (Windows) in Linux. It will display the files in the home directory for userid developer.





You can (single click and drag) a file from the host machine, e.g., from MacOS Finder, Windows Explorer) window, into the Files application in the Ubuntu desktop. You will see the name of the file while dragging as the mouse hovers over the Files window.



When you release the mouse the license.txt file icon appears in the Files window.

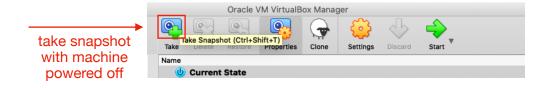


It is not necessary to use the "**snapshot**" functionality of VirtualBox in order to run freesurfer. However, taking periodic snapshots of the VM can be useful for backups and/or testing out changes as long as you **monitor available free disk space**.

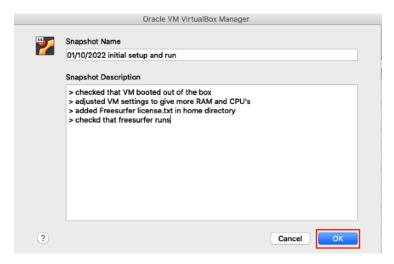
If you've taken no snapshots, then the "snapshot" view in the GUI will just show the "current state" of the machine. This means whatever you did between powering on and powering off the VM has been cumulatively saved into the current disk image of the virtual machine.

	FS_Ubuntu_18_04_00	6		E		Details	
					0	Snapshots	
					Ū	Logs	
😃 Curre	ent State						
		Attributes	Information				
Name:	Enter a name for the new snapshot						
Description:							
Description:							

Taking a snapshot saves the current state of the system as you left it when you powered off the machine and allows the disk image for the VM to be restored to that state. You can create a snapshot with the machine powered off using the "Take" button.



It's a good idea to take some notes about the system when you make a snapshot. Hit "OK" to save the snapshot.



Once saved, VirtualBox will show the "current state" of the machine to be subsequent to or after the snapshot. You can revert to a snapshot prior to the current state of the machine by selecting the snapshot and selecting the "Restore" icon. VirtualBox will ask you what it should do before the restore if it thinks you will lose the current state of the machine.

ame		Tak						
	022 initial setup and run							
⊍ Cur	ent State							
	Attribute	s Information						
Name:								
Name:	01/10/2022 initial setup and run							
Description:	> checked that VM booted out of the box							
	> adjusted VM settings to give more RAM and	d CPU's						
	> added Freesurfer license.txt in home direct	ory						
	> checkd that freesurfer runs							

You should **periodically check the folder where you told VirtualBox to create the VM** to ensure snapshots are not using up all the available disk space. Snapshots are delta files or the difference between the current state of the machine and the previous state of the machine. So while the first snapshot file saving the initial state of the system should be small, e.g., ~2MB, subsequent snapshot files could be large depending what files have been created in the Ubuntu VM.

Name	Date Modified	\sim	Date Created	Size	Kind
🐝 FS_Ubuntu_18_04_06.vbox	Today at 21:47		Today at 21:47	9 KB	Virtuafinition
FS_Ubuntu_18_04_06.vbox-prev	Today at 21:47		Today at 21:47	9 KB	Document
🔻 🚞 Snapshots	Today at 21:47		Dec 21, 2021 at 22:33	2.1 MB	Folder
¥ {a3e0ef19-7c30-4318-a040-70ad355ad043}.vdi	Today at 21:47		Today at 21:47	2.1 MB	VirtuaImage
¥ FS_Ubuntu_18_04_06.vdi	Jan 13, 2022 at 02:45		Dec 21, 2021 at 21:34	28.76 GB	VirtuaImage
🕨 🚞 Logs	Jan 13, 2022 at 02:00		Dec 21, 2021 at 21:36	741 KB	Folder
📥 SSD_1_VMs_1 > 🚞 FS_ubuntu_18_04_06 > 🚞 FS_Ubuntu_18_04_06					