Lab 0 (prelab)

Due: no submission

Objectives:

1. Connecting to UNIX server and setting up the VNC desktop
    a. Non-VNC based methods are provided for those who have issues using VNC.
2. Setting up the working environment for Cadence Virtuoso

Phase 1:

You need to use the Viterbi server (UNIX operating system) where the Cadence Virtuoso is already installed. You will use Cadence Virtuoso throughout the semester for custom chip design and almost all Computer Aided Design (CAD) tools are based on UNIX. Therefore, being familiar with UNIX system and its commands is necessary. If you are not familiar with UNIX, this course would be a good starting point for you.

In this lab you will learn how to connect to the Viterbi server from your own computer and forward the port to your own computer from the server. In the next phase, you will learn to set up an environment for running Cadence Virtuoso remotely. The node names for the server are:

viterbi-scf1.usc.edu

viterbi-scf2.usc.edu

Step 0: If you are in the domain of USC network, i.e., USC Secure Wireless, you can skip this step

Download and set up the USC VPN to make sure you are in the USC network. You can only connect to the server through the USC network. (Only the USC DNS server that is located in USC network can interpret the host name “viterbi-scf2.usc.edu”)

Step 1: Download the software

For Windows users, download VNC viewer.

For Mac users, download VNC viewer only.

The above step gets you ready for connection to the server through SSH protocol and brings up a VNC desktop that visualizes Cadence Virtuoso.

For both, download one of the popular Sftp clients such as FileZilla and refer to the instructions for file transfer or see the steps at the end of this guide. There are other alternatives you could use such as WinSCP, Xftp, MobaXterm, etc. They are used in almost same way.

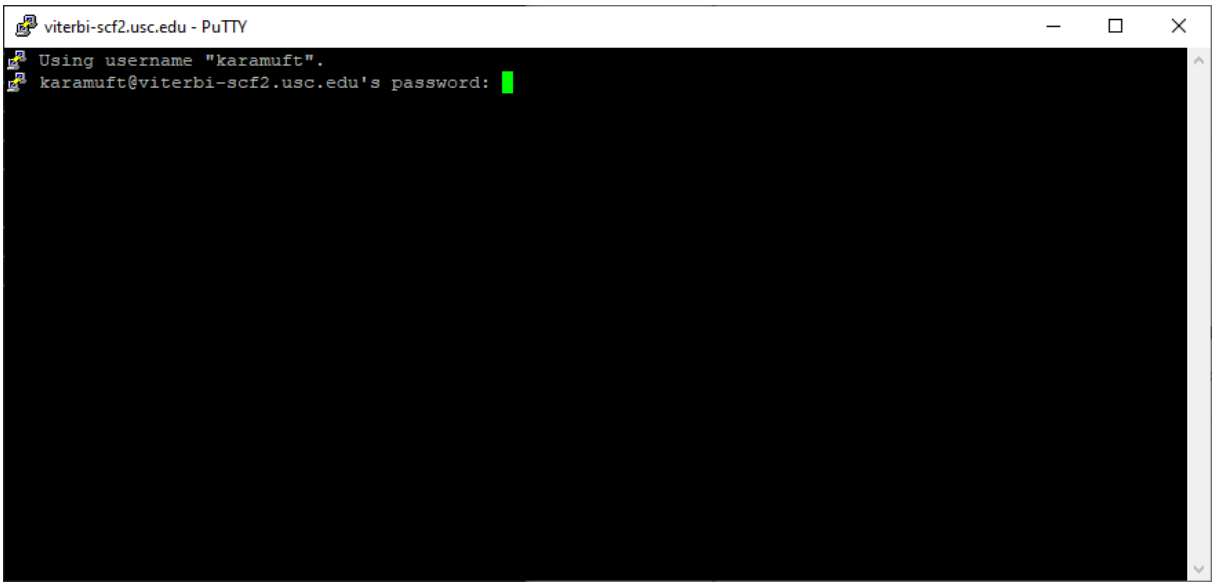
Step 2: Connect to the Viterbi server

For Windows/Mac users, use the built-in terminal and execute:

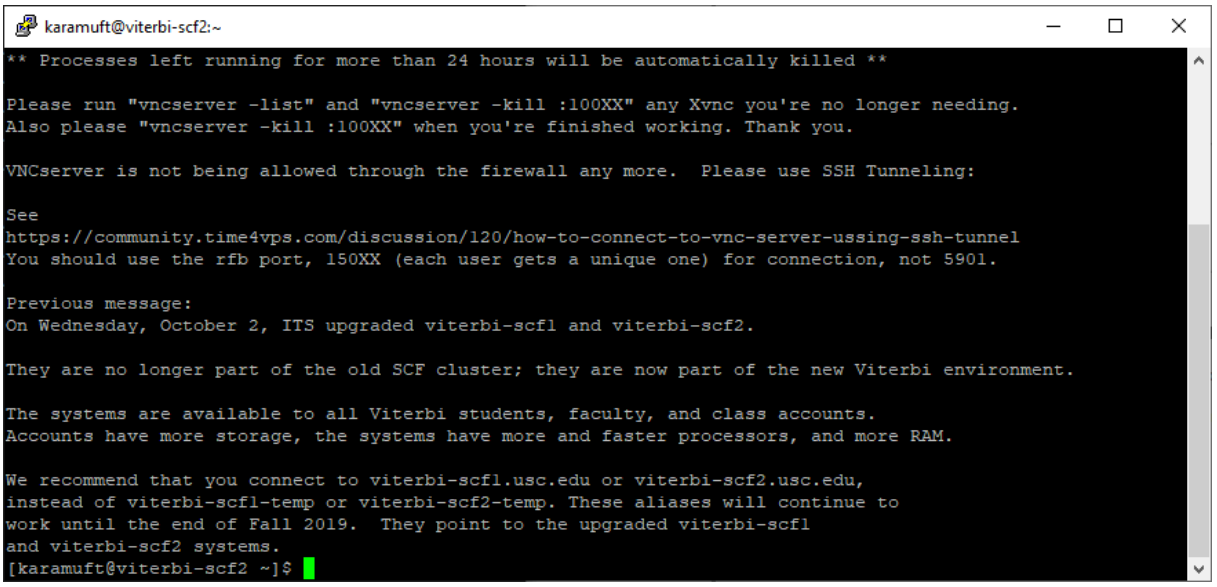
```
ssh your_usc_net_id@viterbi-scf2.usc.edu
```

command to connect to the Viterbi server.

For both Windows and Mac users, after established the connection, you should be able to see the command line prompt. Login using the same password as your myUSC portal, press enter to login (Note: password typing invisible in UNIX-like system by default). If you cannot see the prompt or there's no content displayed, make sure you are under the USC network and try again.



After entering the password, you will see messages in the terminal.



Step 3: Configuring the VNC server (for the first time)

After entering your session, type:

`vncserver`

and press enter to start configuring your VNC desktop. It will ask you to set a password to initiate the vncserver.

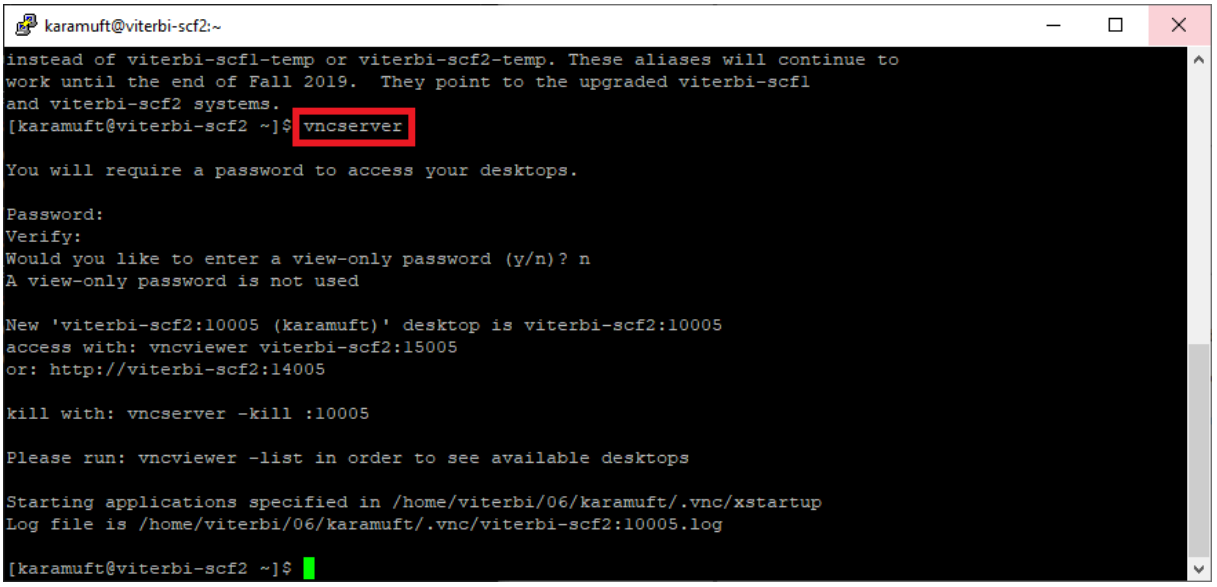
If forget your password, use:

`rm ~/.vnc/passwd`

command to delete the password you have set and relaunch the VNC server by rerunning:

`vncserver`

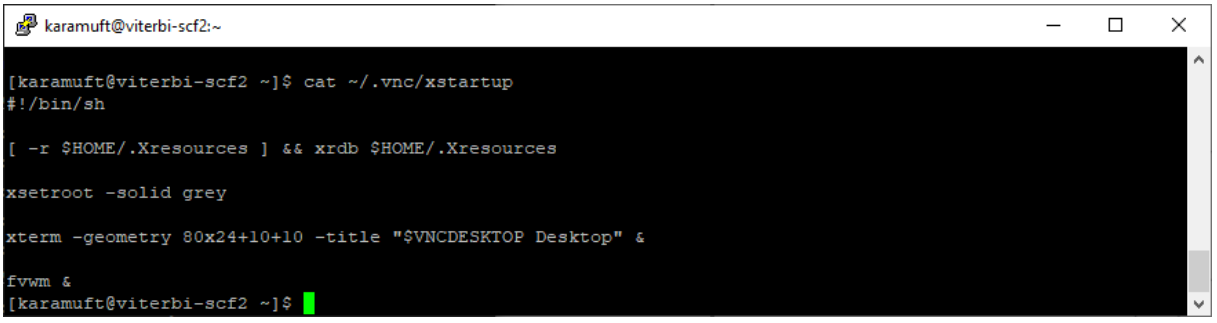
command. It will ask you to set a new password.



Then, you need to check the content of the directory ~/.vnc/xstartup

You can do so by executing:

cat ~/.vnc/xstartup



The output of the previous command should look the same as mine below:

#!/bin/sh

[-r $HOME/.Xresources] && xrdb $HOME/.Xresources

xsetroot -solid grey

xterm -geometry 80x24+10+10 -title "$VNCDESKTOP Desktop" &

fvwm &

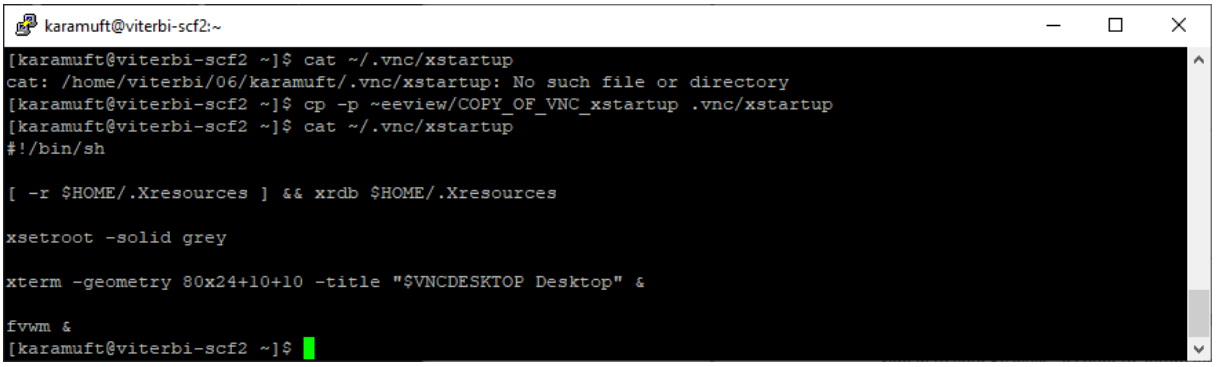
If yours are different, or the file doesn't even exist, there are two solutions:

Method 1 (Simple, one step, recommended):

We have the working file backup already on the server. Just copy it to your home directory by executing:

`cp -p ~eeview/COPY_OF_VNC_xstartup .vnc/xstartup`

Make sure you are in your home directory while you execute this command. If the file exists, this command will overwrite your original file, which is what we want. If the file does not exist, this command will create it for you with correct content.



Method 2:

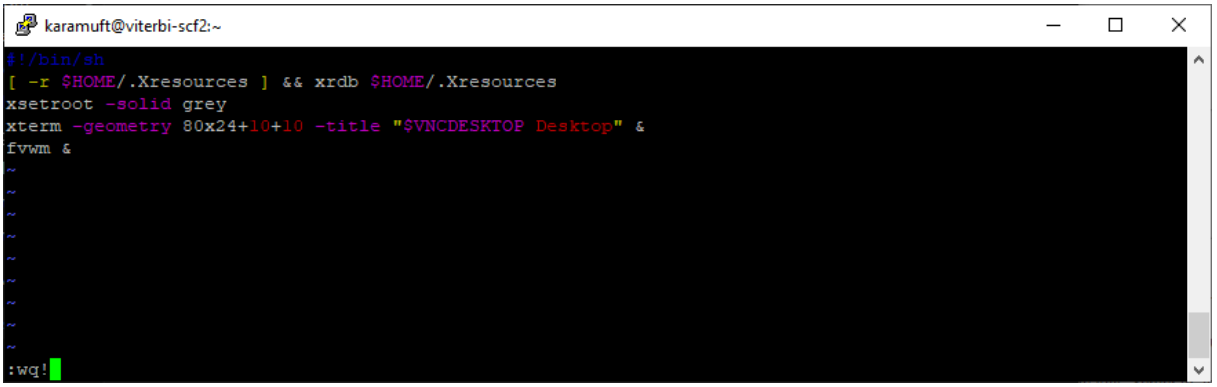
Use the text editor Vim to modify the target file, execute the command:

`vi .vnc/startups`

to open the file with Vim. Press `i` on your keyboard to enter insert mode, do your editing. After editing, press `ESC` to exit the insert mode. To save the content, type:

`:wq!`

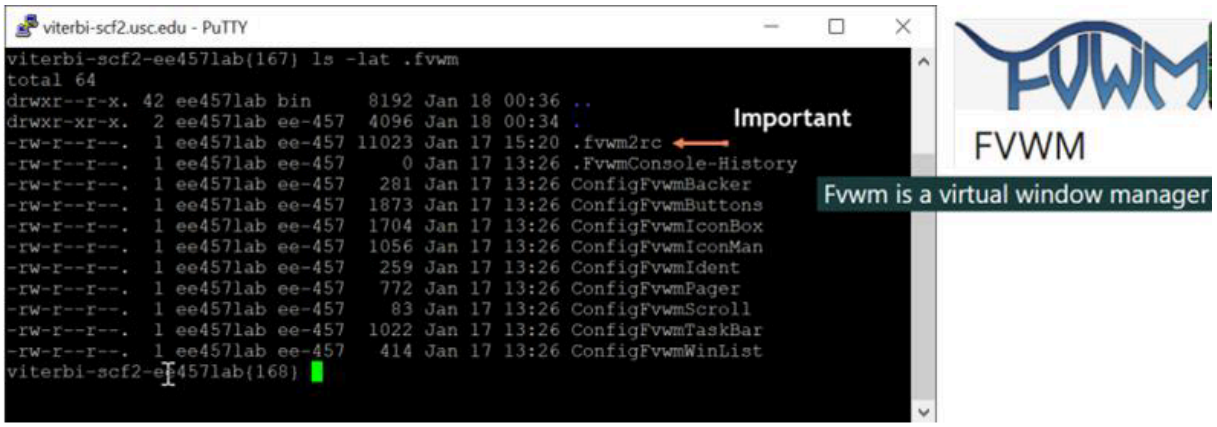
then press `ENTER` to save and leave.



Step 4: fvwm

Check to see if you have a .fvwm (F Virtual Window Manager) subdirectory with the following files.

ls -lat .fvwm



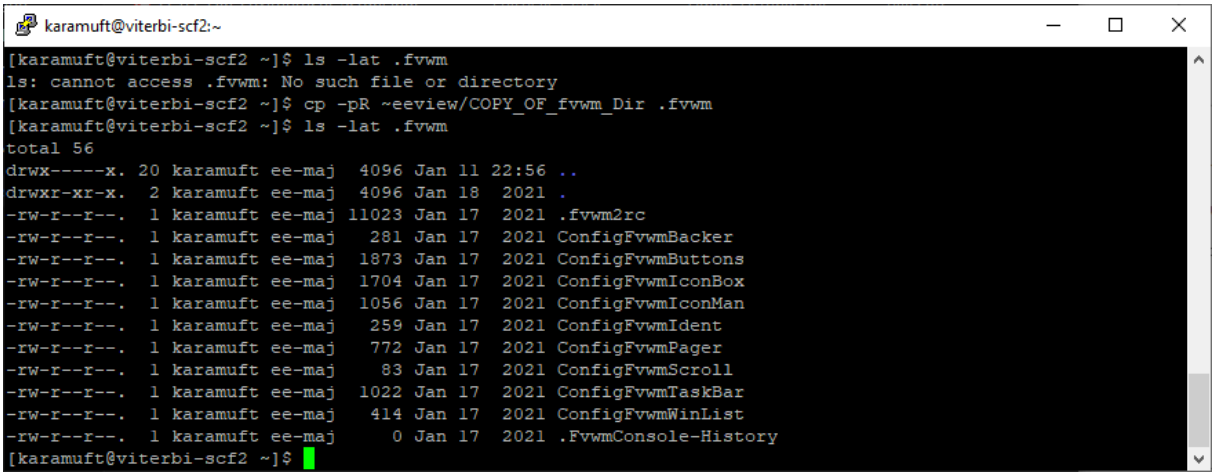
If you are new to VNC, I recommend that you go for fvwm. Most likely you may not have the directory itself. Or you may have an empty directory. If you have an empty .fvwm directory, use the following command to get the files from Professor Puvvada's eeview account:

cp -p ~eeview/COPY_OF_fvwm_Dir/* .fvwm/

If you do not even have an empty .fvwm directory, then use the following command:

cp -pR ~eeview/COPY_OF_fvwm_Dir .fvwm (Recommended)

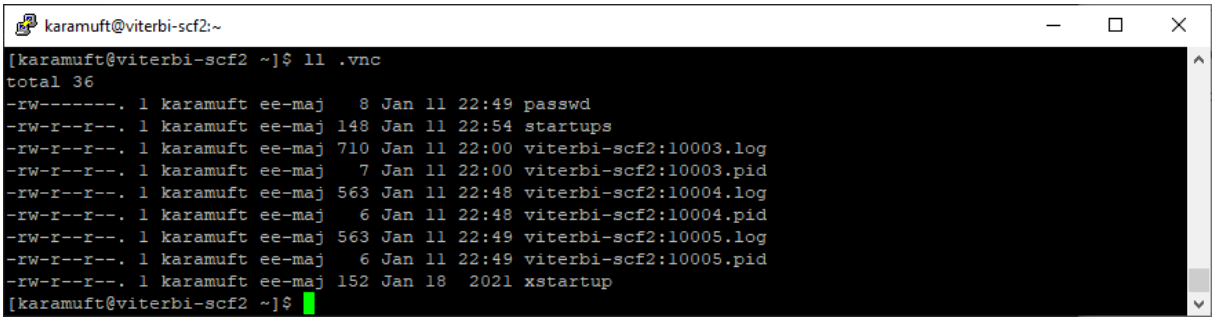
The following illustrates copying the entire directory and its contents recursively into Professor Gandhi Puvvada's ee201 account from his eeview account.



Step 5: Executable startup

We want to make .vnc/xstartup file executable. Before the conversion, run the following command:

ll .vnc

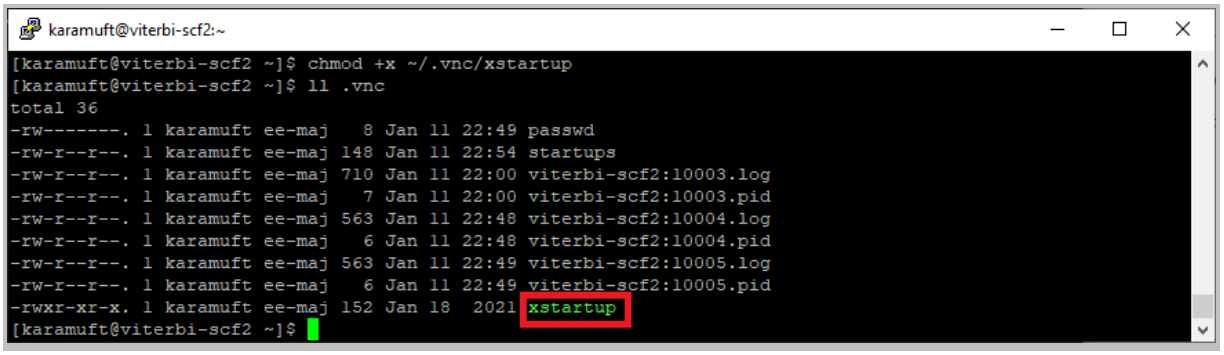


Run the following command to make it executable:

chmod +x ~/.vnc/xstartup

After execution:

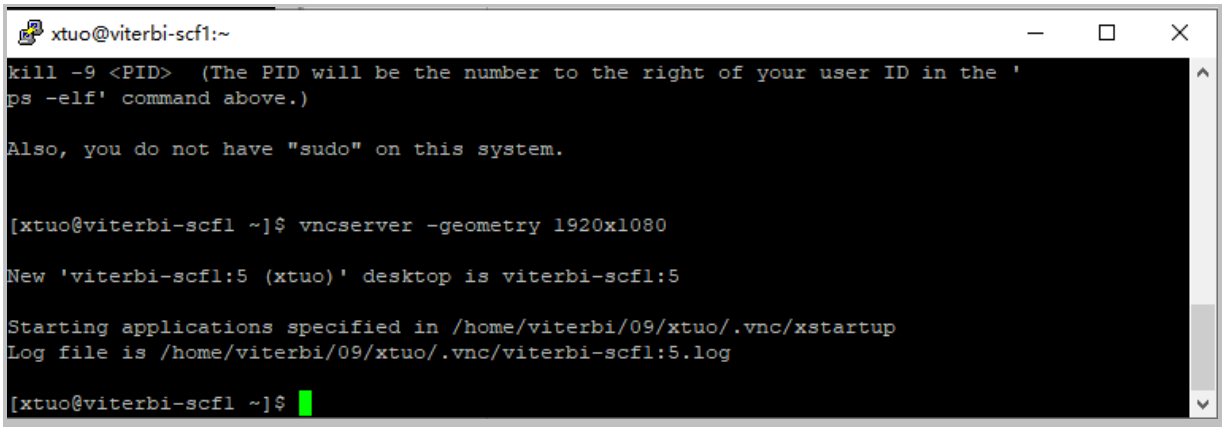
ll .vnc



Step 6: Create a VNC desktop with resolution that suits your screen

You can create a VNC desktop with resolution you want by executing the following:

vncserver -geometry 1920x1080



To check all the running desktop instances you created, execute the following:

vncserver -list

To manually terminate the desktop 5, run the following (don't forget the space and the colon following by)

vncserver -kill :5

You don't lose any files or configurations by killing a desktop. But terminating the redundant desktops will free up system resources for both you and others, so please remember to check it after you finish your work. That will be very helpful.

Step 7: Forward the remote desktop you created at step 6 to your local computer via VNC viewer

Only for Mac users:

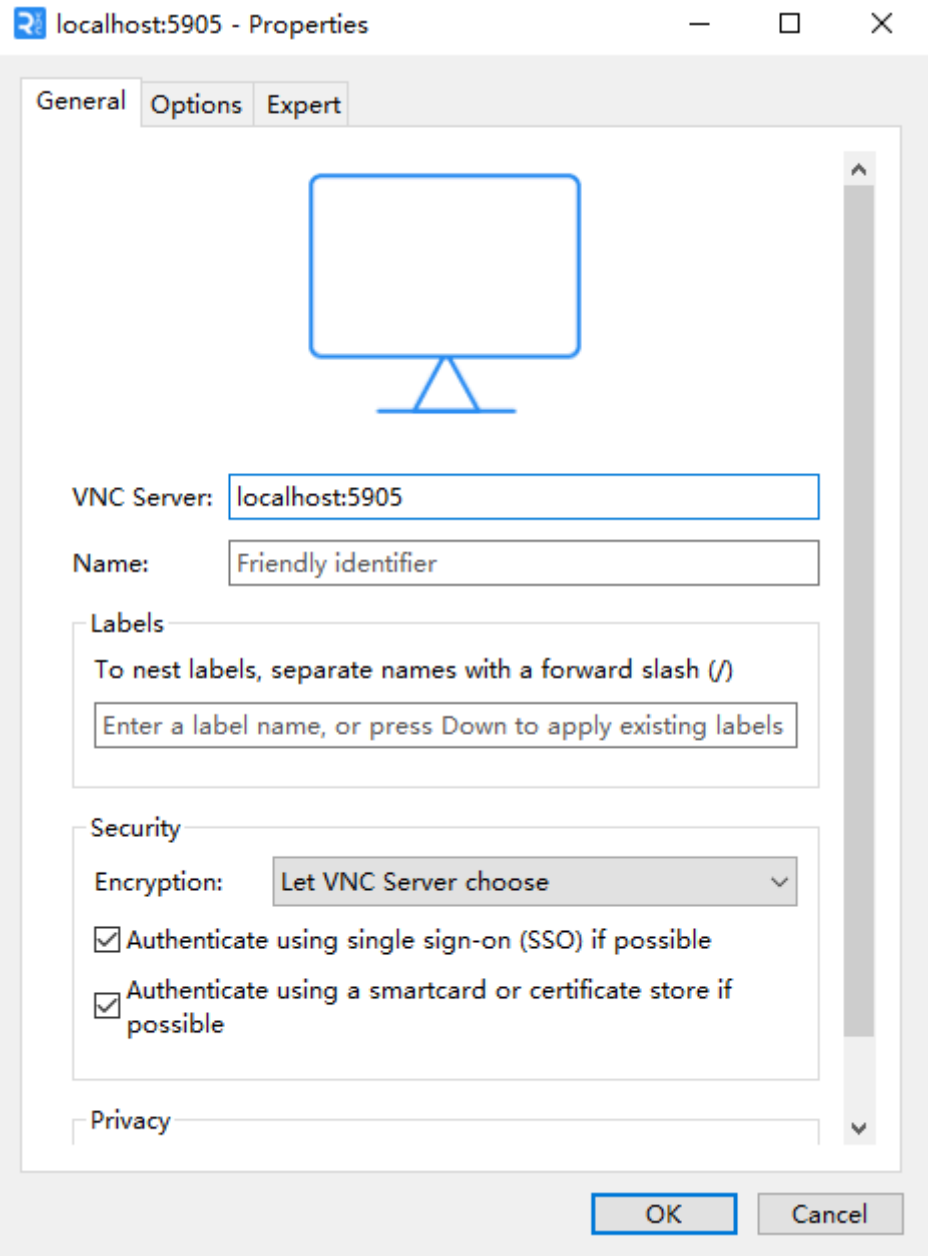
Before starting VNC Viewer, you need to forward the server port to a local port. Enter the following command:

ssh -L 59XX:localhost:59XX <username>@viterbi-scf2.usc.edu

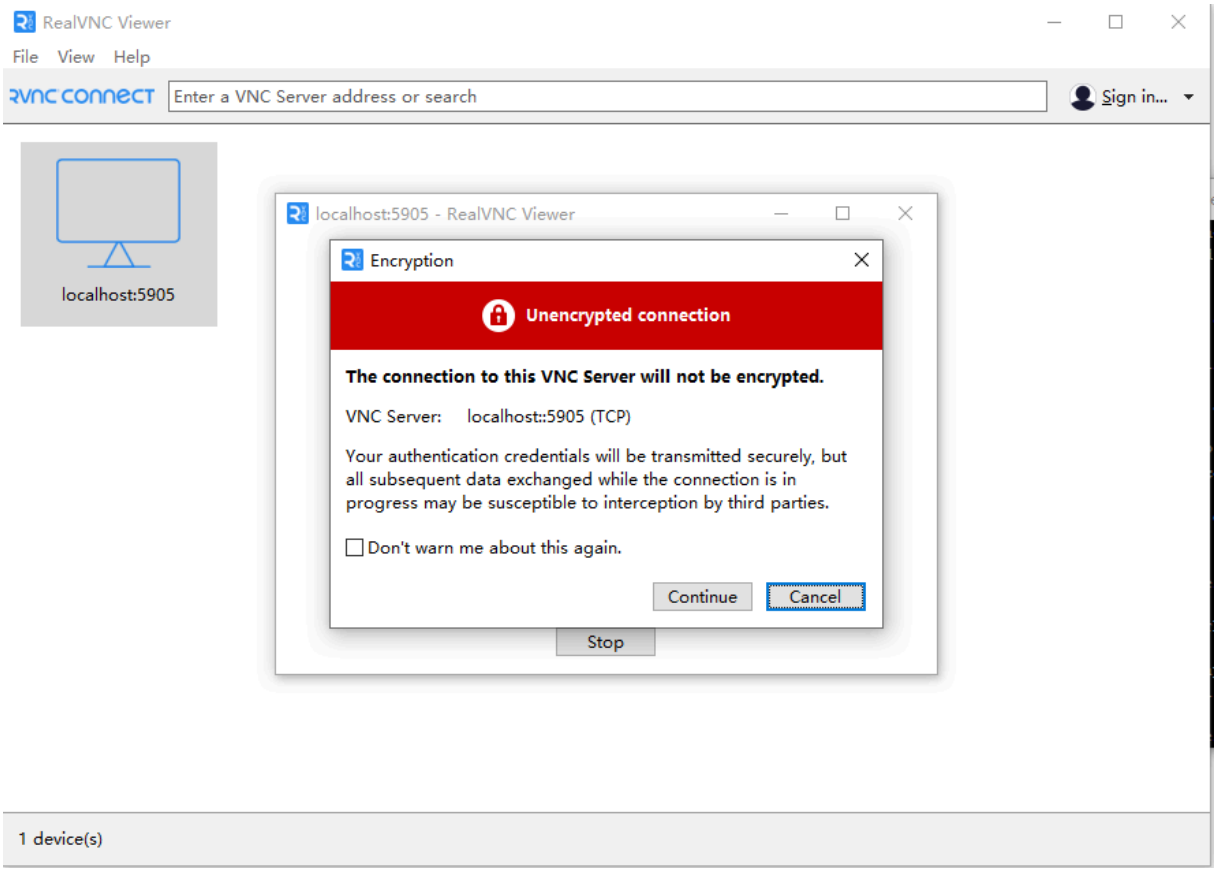
Launch "VNC viewer" on your laptop. Click File->New connection. Then, in 'VNC Server', type in:

localhost:59XX

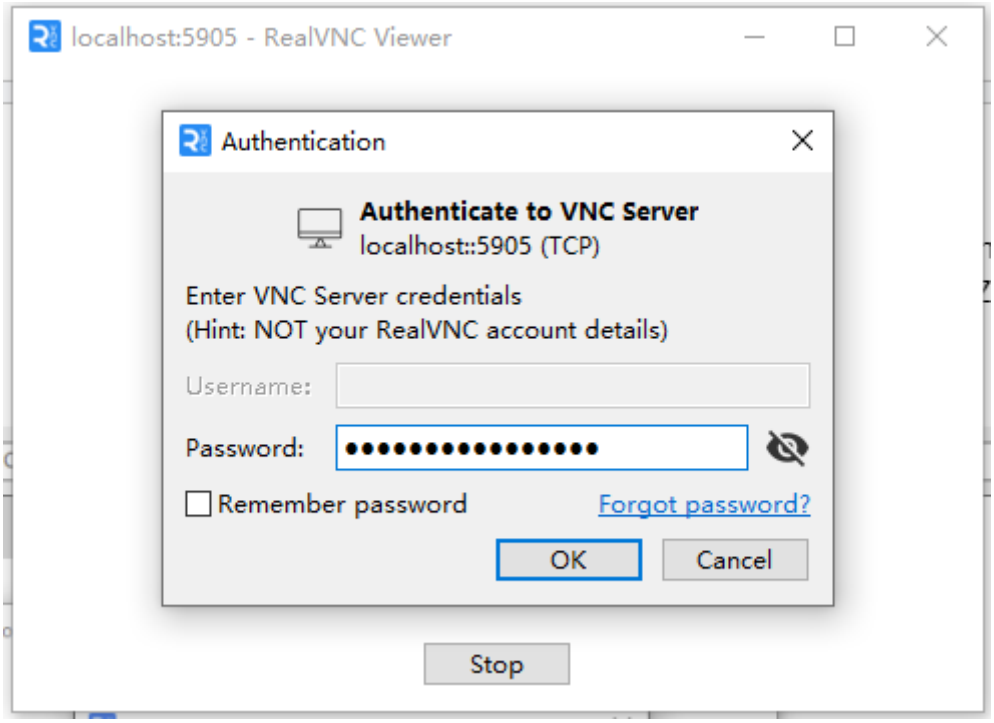
where xx should be replaced with the number you got from step 6, hit 'OK' to save the setting.



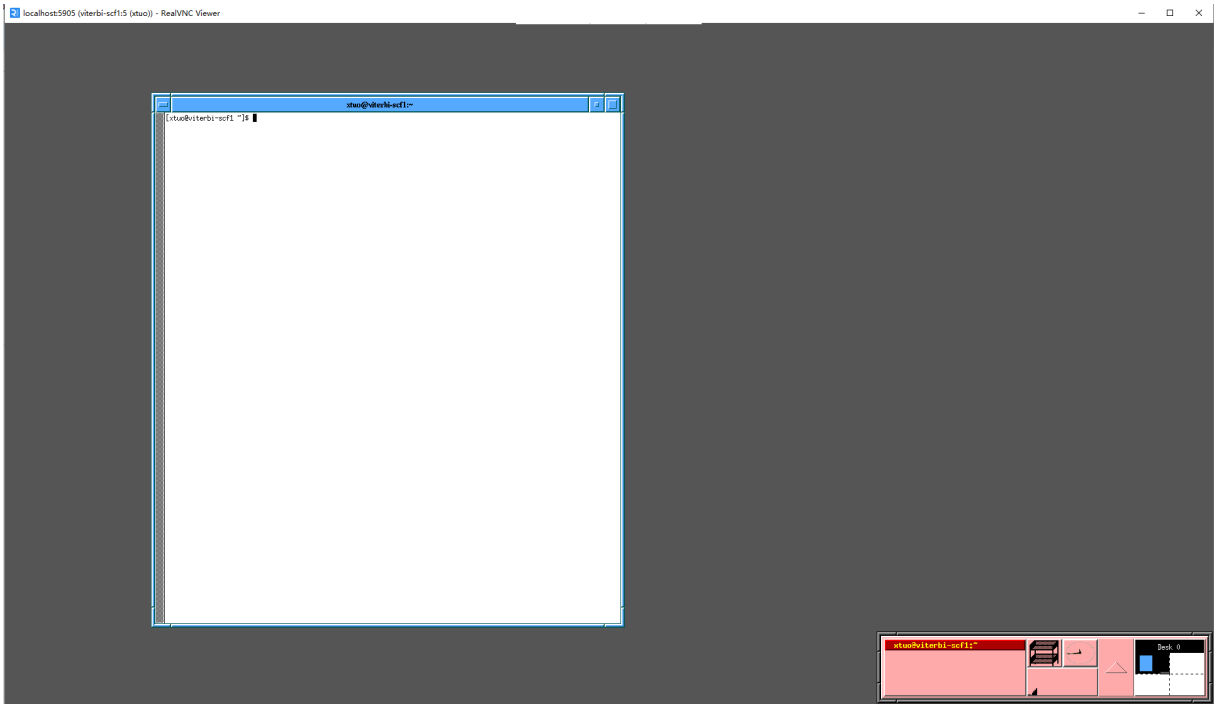
Click the desktop icon it just created, you will be asked to trust the connection, hit ‘Continue’.



After this, it will ask you to enter password. This password is the one you set in step 3.



Now you should be able to see the desktop, which would look like this:



Alternative 1 (only for Windows users):

Besides the PuTTY + VNC Viewer approach, **MobaXterm**, another software, allows users to access graphical applications of a remote server from a local computer. One of the major differences is that it does not send the image of a desktop to the users. Instead, it allows the users to launch a graphical application from the built-in local terminal. Another is that it is easy to run a long simulation without closing the graphical application using the first method. On the other hand, to run such a long simulation (which might take days to finish) in a graphical user interface through MobaXterm, one has to keep it on and maintain the internet connection.

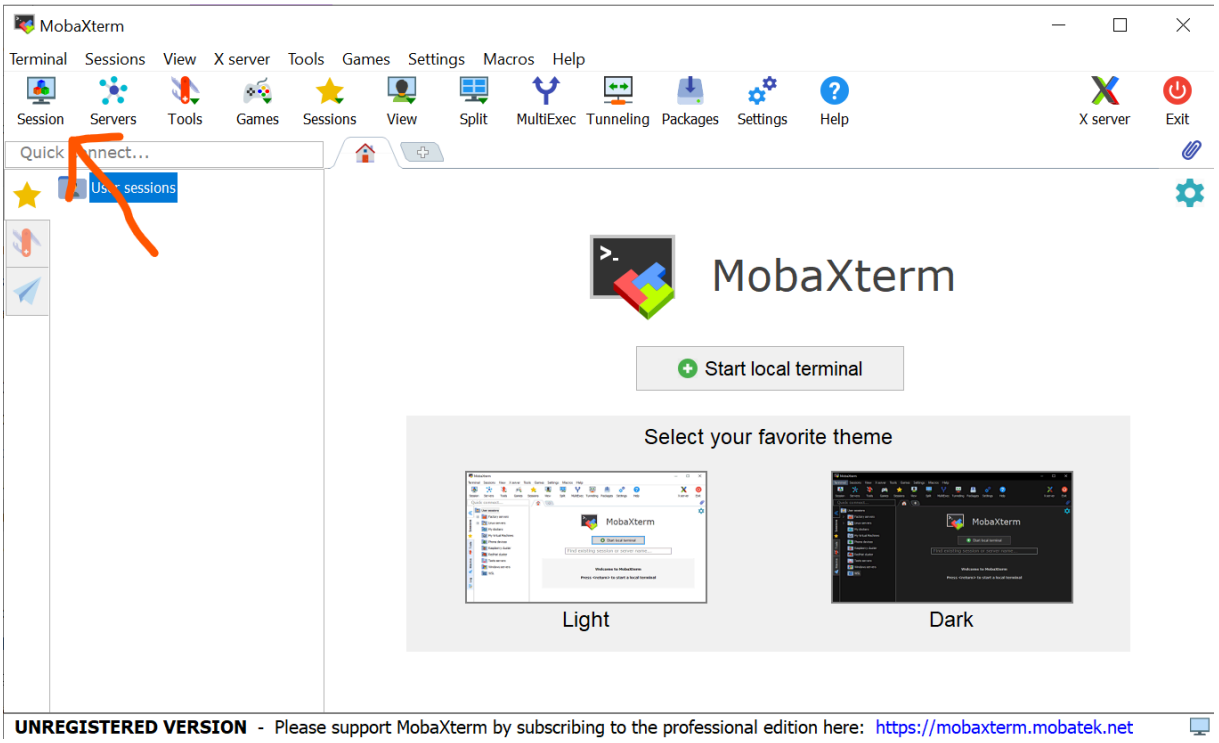
It is **not required** to use this approach. It is provided in case some of you might not be able to access the Viterbi servers through the first method.

Step 1: Download and install MobaXterm Home Edition

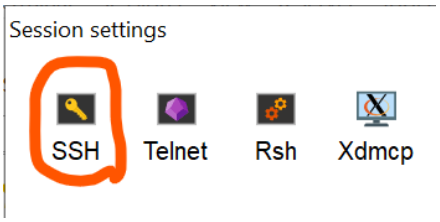
Link: https://mobaxterm.mobatek.net/download-home-edition.html

Step 2: Create a remote session

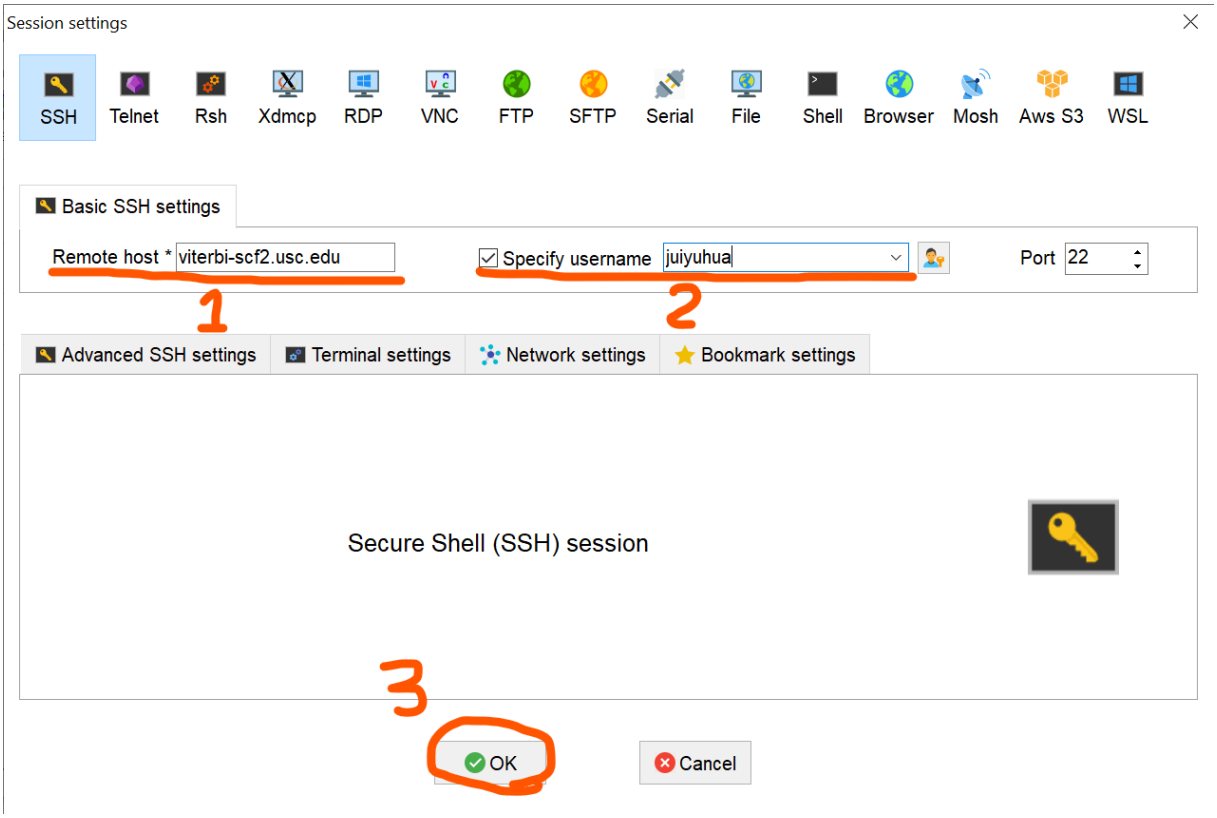
Click on the *session* icon to start a new remote session.



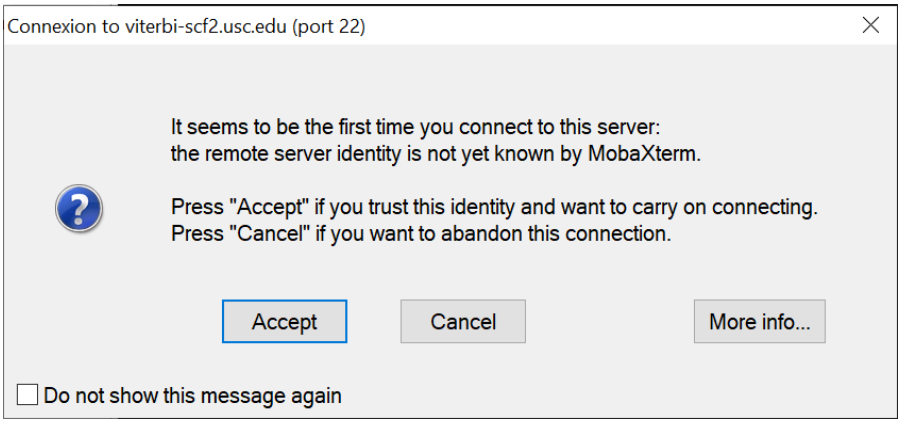
Then click on the *SSH* icon.



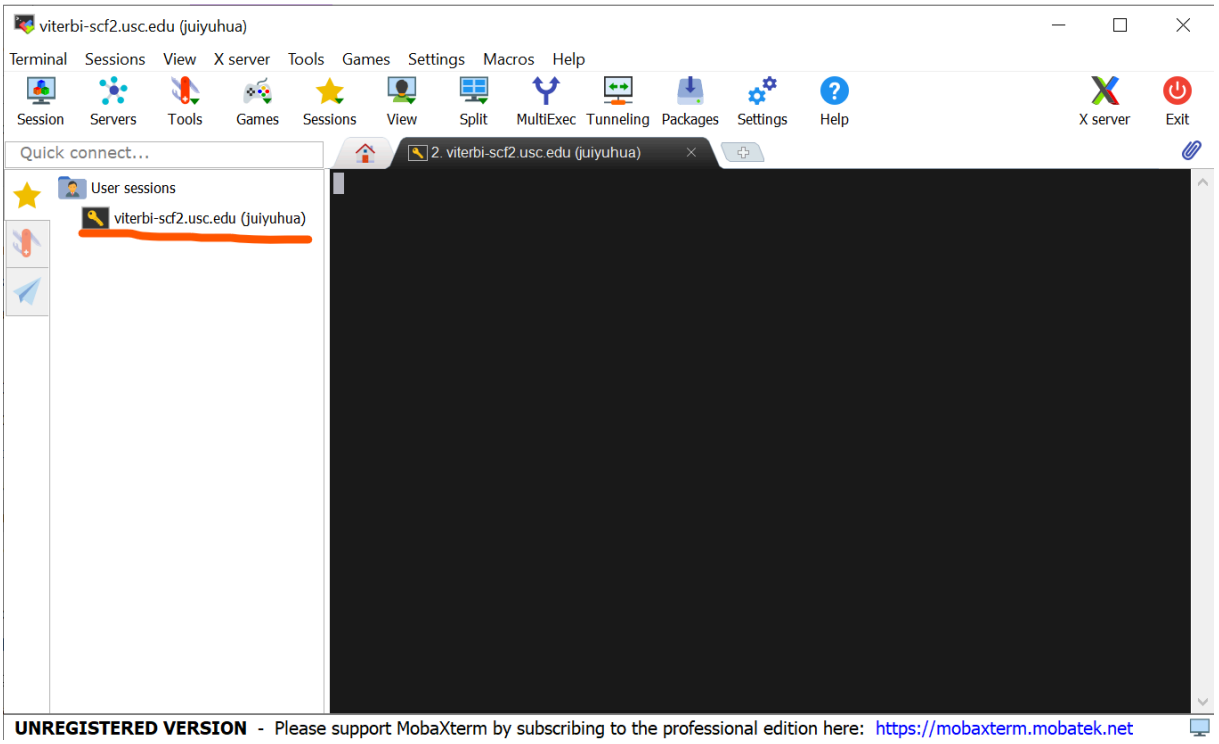
In the basic SSH settings, enter *viterbi-scf2.usc.edu* to specify the remote host. Next, specify the username by entering your *USC NetID* (username). Keep the port to be 22, the default value.



If it is your first time connecting to this server, MobaXterm asks if you trust this server. Click on *Accept*.

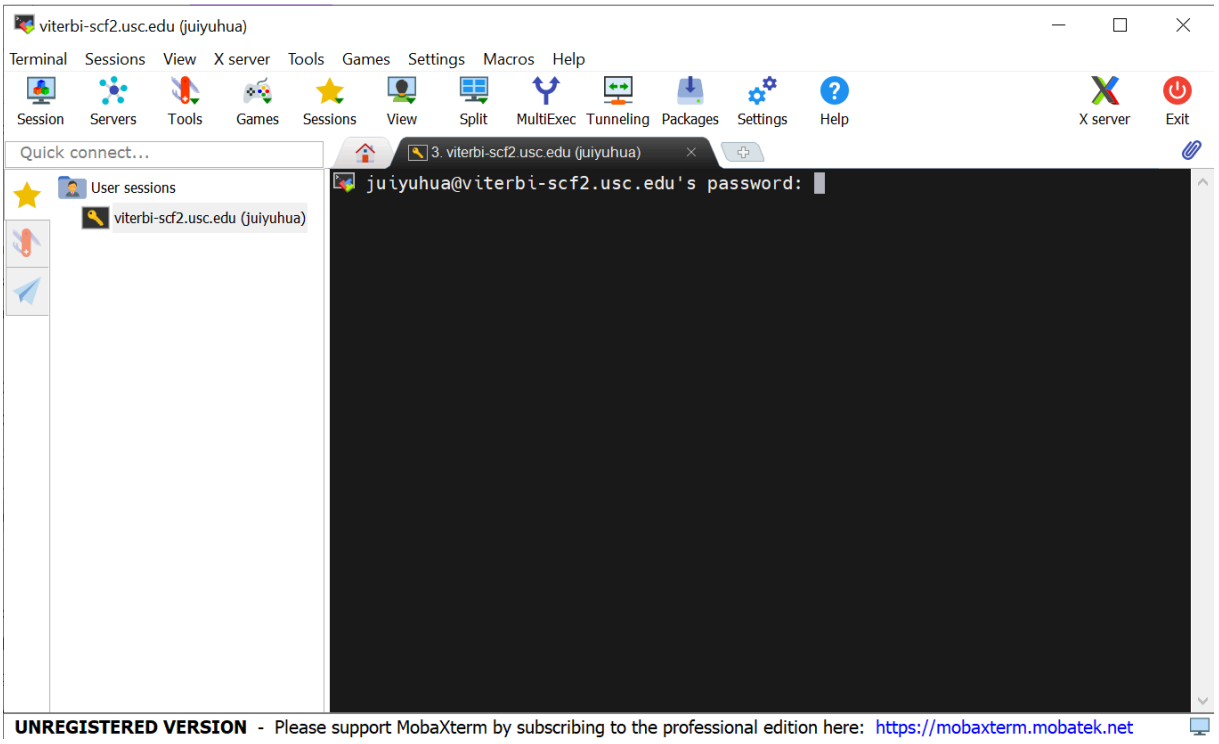


Now, the newly created session is listed under User sessions. You can see the server's IP address next to a key icon, and the username is in parentheses to the right of the server's IP address. Note that you can access the server efficiently using this profile.



Step 3: Start a remote session

Now, double click the created shortcut to start a new session.



Alternative 2 (only for MacOS users):

Similar to MobaXterm, **XQuartz** allows users to access graphical applications of a remote server from a local computer.

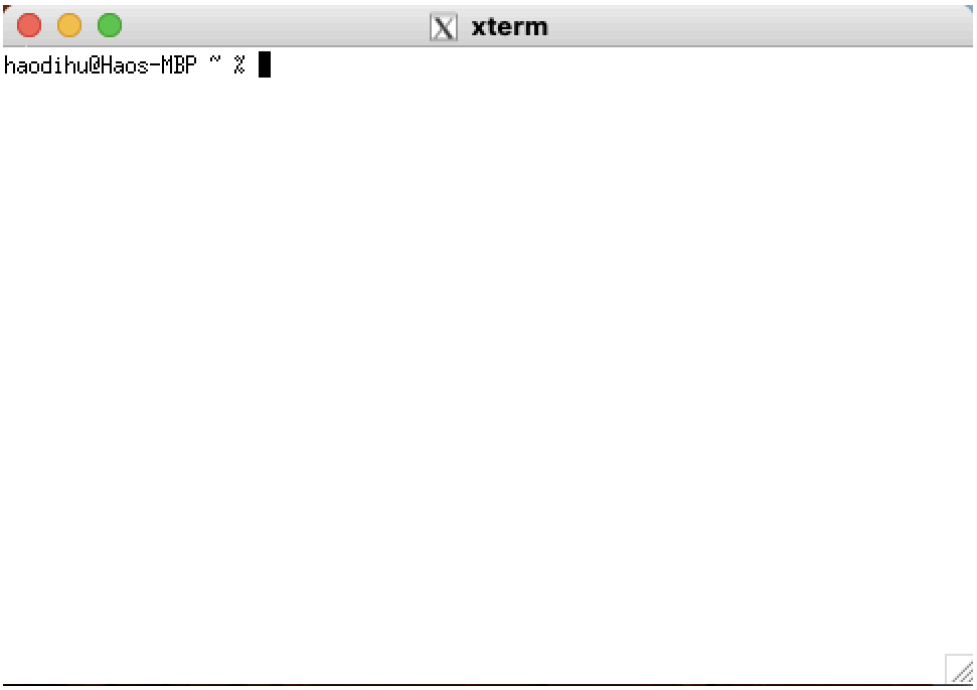
It is **not required** to use this approach. It is provided in case some of you might not be able to access the Viterbi servers through the first method.

Step 1: Download and install XQuartz (XQuartz-2.8.5.pkg)

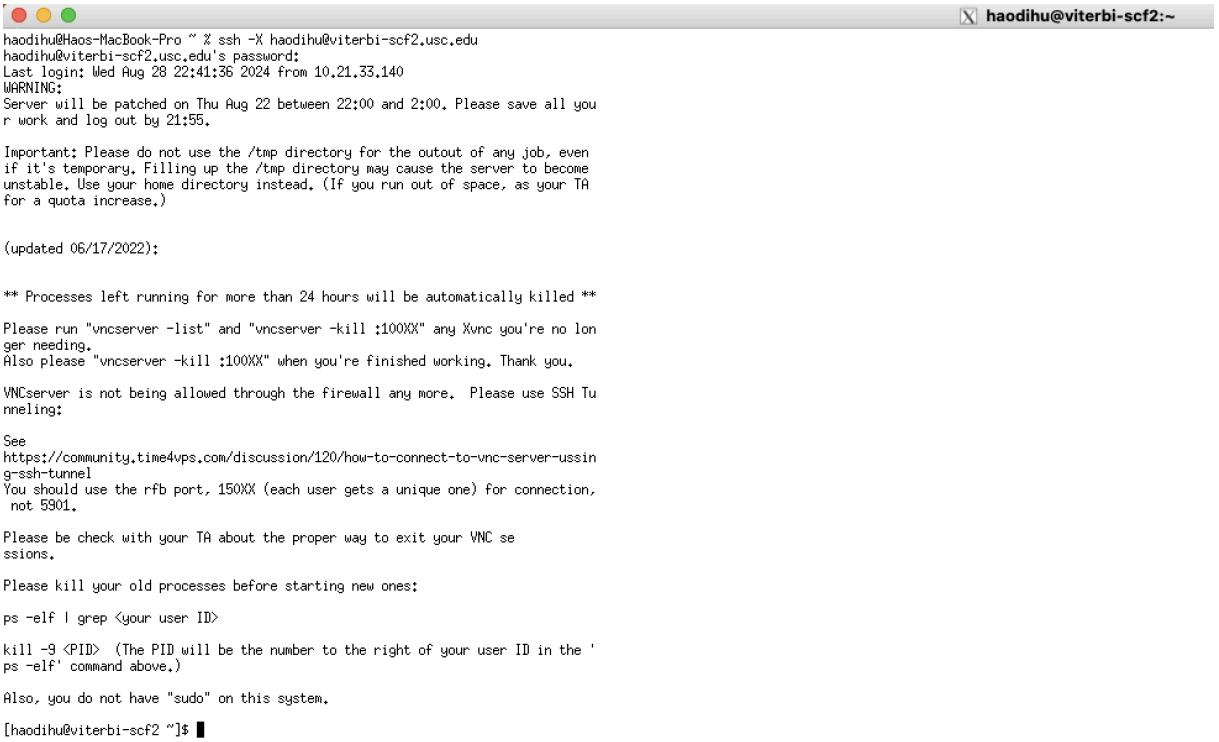
Link: https://www.xquartz.org/

Step 2: Start a remote session

- Open a terminal in XQuartz, which looks like the following:



- Type command “ssh -x <yourUSCNetID>@viterbi-scf2.usc.edu” and it will ask you to enter your password for your USCNetID(The same as how you log into MyUSC). Once you log in, it looks like the following:


haodihu@viterbi-scf2:~
haodihu@Haos-MacBook-Pro ~ % ssh -X haodihu@viterbi-scf2.usc.edu
haodihu@viterbi-scf2.usc.edu's password:
Last login: Wed Aug 28 22:41:36 2024 from 10.21.33.140
WARNING:
Server will be patched on Thu Aug 22 between 22:00 and 2:00. Please save all you
r work and log out by 21:55.
Important: Please do not use the /tmp directory for the outout of any job, even
if it's temporary. Filling up the /tmp directory may cause the server to become
unstable. Use your home directory instead. (If you run out of space, as your TA
for a quota increase.)
(updated 06/17/2022):
** Processes left running for more than 24 hours will be automatically killed **
Please run "vncserver -list" and "vncserver -kill :100XX" any Xvnc you're no lon
ger needing.
Also please "vncserver -kill :100XX" when you're finished working. Thank you.
VNCserver is not being allowed through the firewall any more. Please use SSH Tu
nneling:
See
https://community.time4vps.com/discussion/120/how-to-connect-to-vnc-server-ussin
g-ssh-tunnel
You should use the rfb port, 150XX (each user gets a unique one) for connection,
not 5901.
Please be check with your TA about the proper way to exit your VNC se
ssions.
Please kill your old processes before starting new ones:
ps -elf | grep <your user ID>
kill -9 <PID> (The PID will be the number to the right of your user ID in the '
ps -elf' command above.)
Also, you do not have "sudo" on this system.
[haodihu@viterbi-scf2 ~]$

Phase 2:

Now that we have set up the VNC desktop, it's time to work with Cadence Virtuoso. In this part, we only set up the environment for Virtuoso and we will learn the basics about Virtuoso in the next lab assignment.

Cadence Environment Setup Guide for gpdk045 PDK:

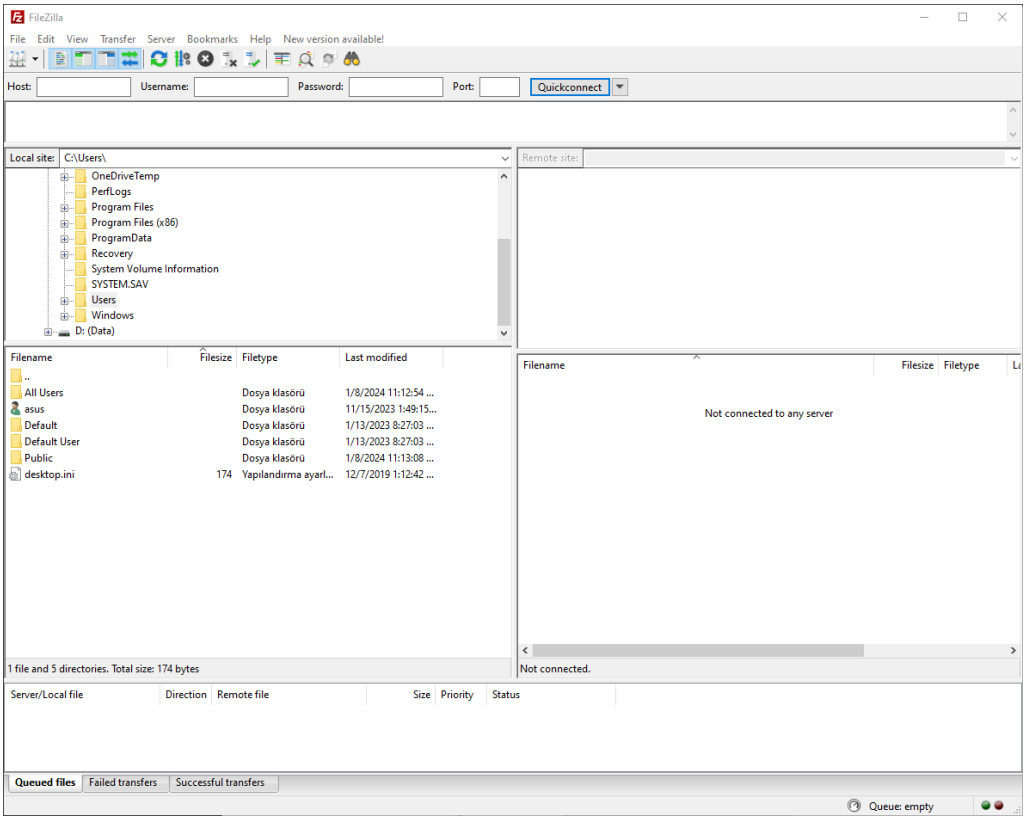
Step 1: Downloading the files

Download the Setup Files folder from the DEN or Brightspace, extract the folder and then upload the following two files into your home directory using FileZilla or WinSCP. You can follow the steps that I provided, or you can refer this for FileZilla tutorial.

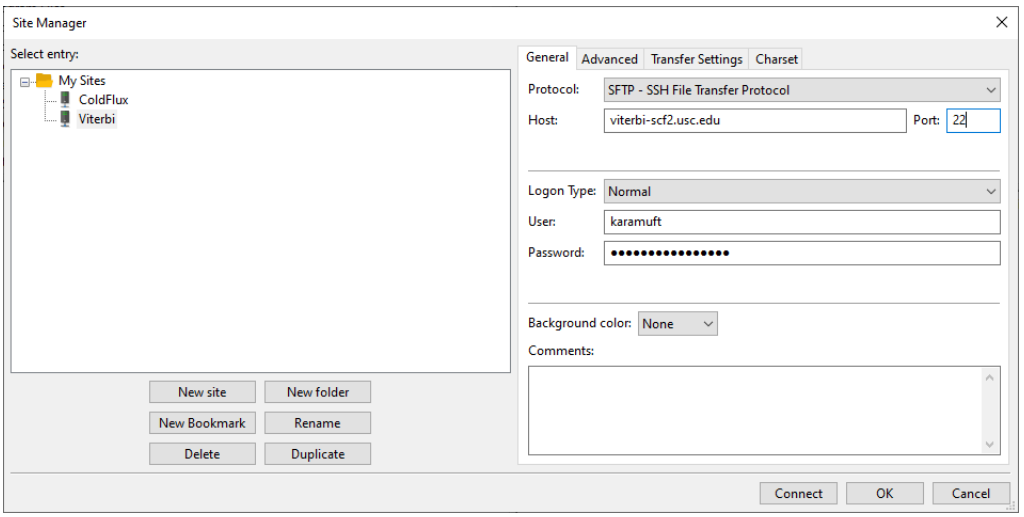
- setup_cds_gpdk045.sh
- setup_ee477_ee577a_v2101b.csh

Step 1.1: Uploading the files

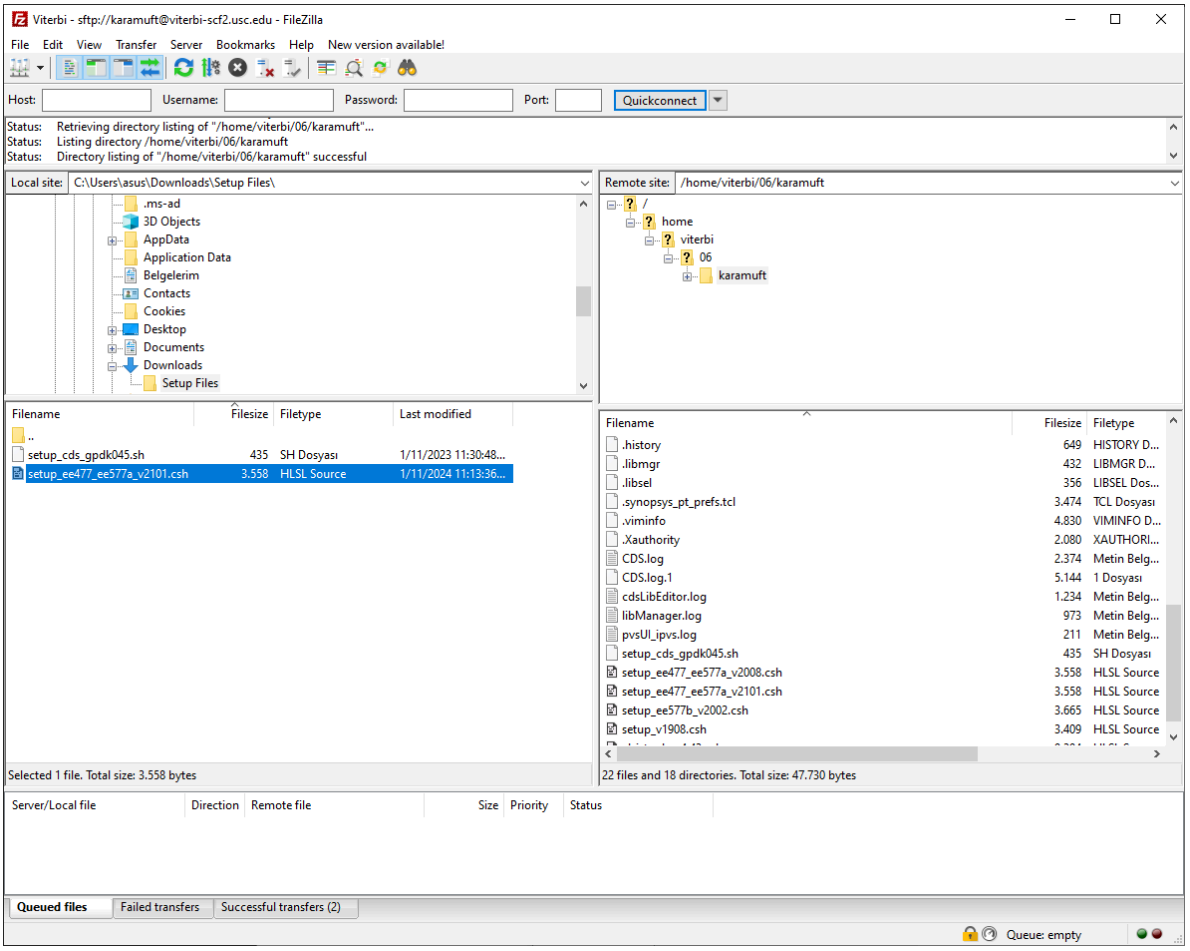
After installing the FileZilla, the interface will be similar to the one below.



Go to File->Site Manager and add a new site. Similar to the instruction that we did in step 2 for PuTTY, enter your credentials. I named the entry as Viterbi.



After that, click “Connect”. On the interface, you will see the directories. On the left-hand side, it will be your local directory and on the right-hand side, you will access the server site. By going to the directory of the setup files, you can upload them to the home directory on the server site.

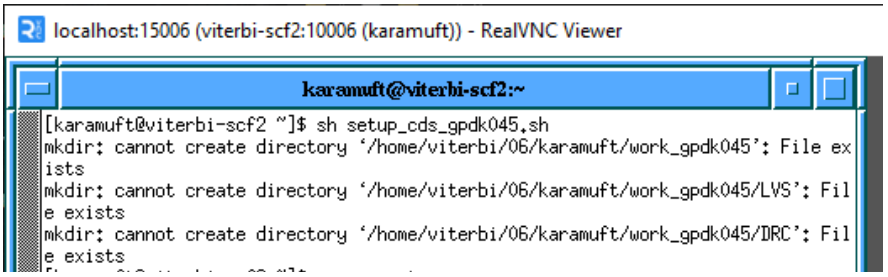


Step 2: Running the script

Run the script setup_cds_gpdk045.sh on your home directory. By running the following:

```
sh setup_cds_gpdk045.sh
```

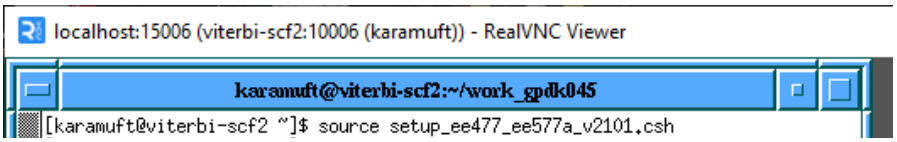
Once it is done, you will find a new folder called “work_gpdk045” (This step only needs to be done once to setup the cadence generic PDK 45nm environment). Since I already have the corresponding directory, I encounter the following feedback stating “File exists”.



Step 3: Source

To use the tool, you need to source the tool setup file every time you log in:

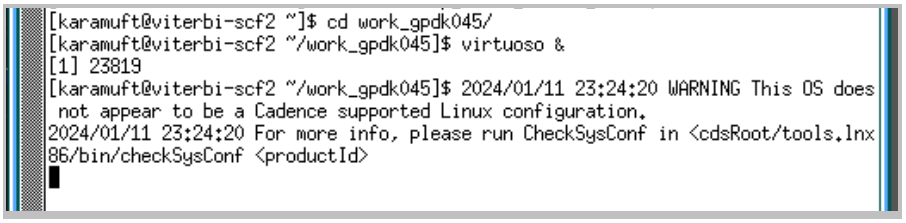
```
source setup_ee477_ee577a_v2101.csh
```



Step 4: Virtuoso

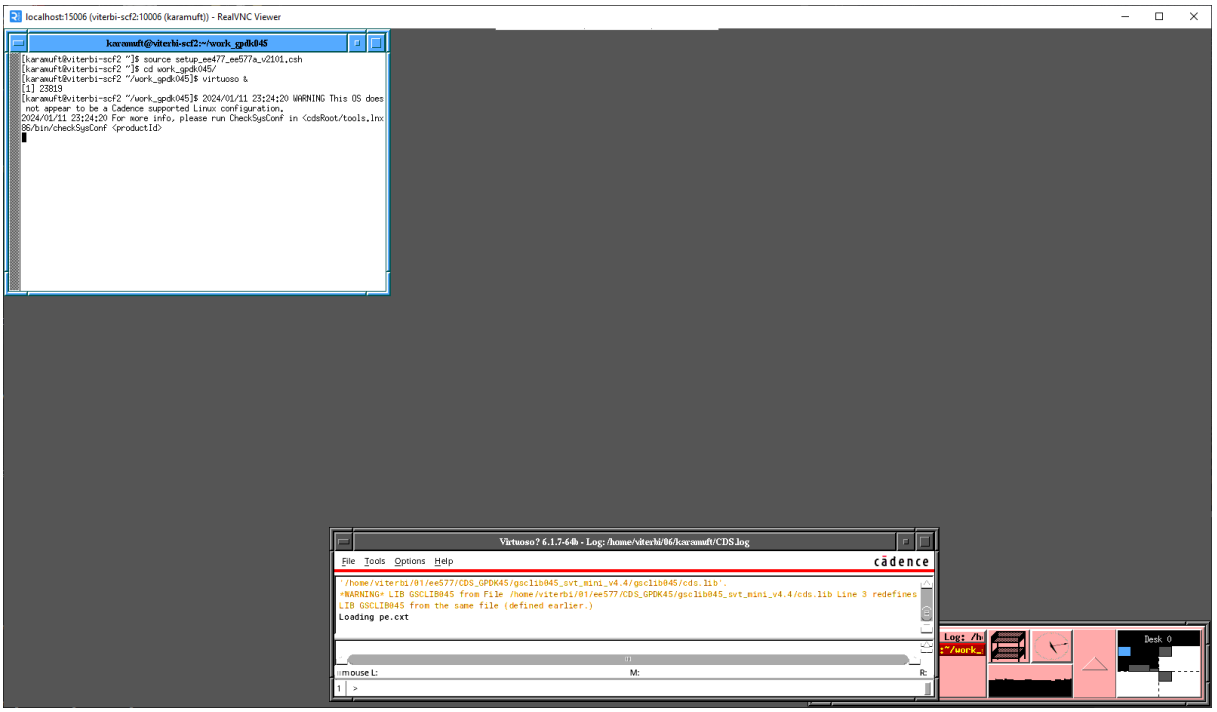
To launch Virtuoso, you need to go to the 'work_gpdk045' directory and execute the two commands below:

```
cd work_gpdk045
virtuoso &
```

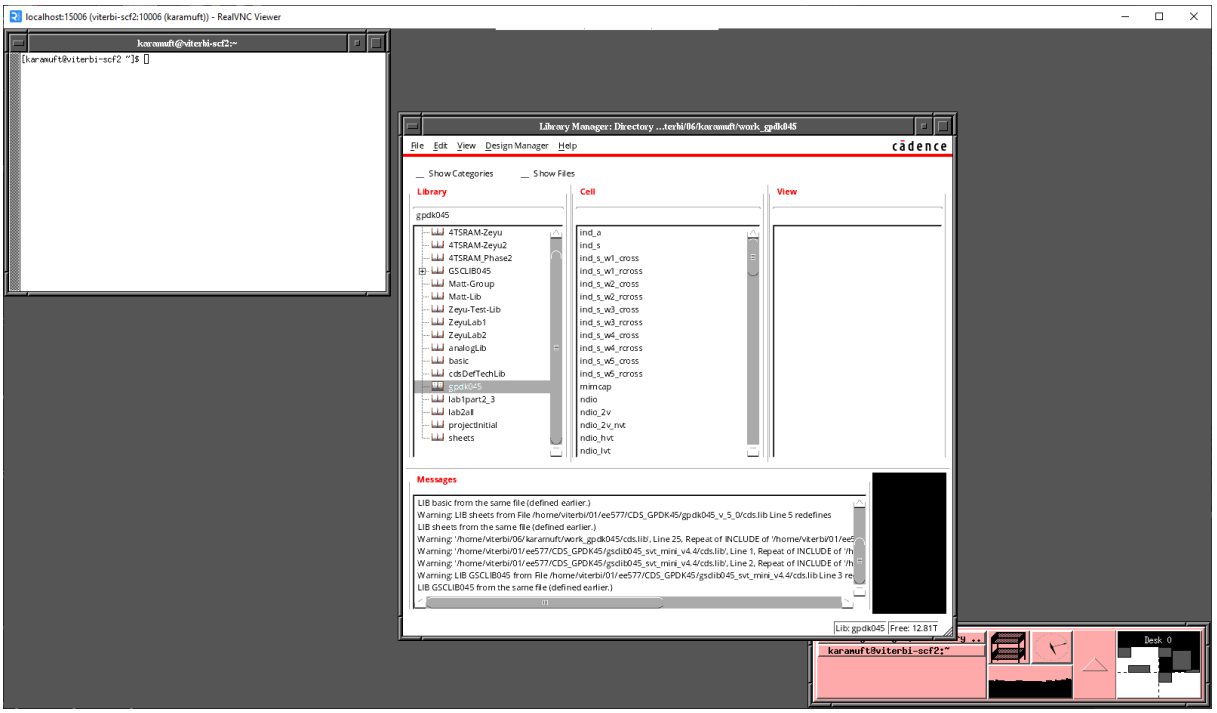


Step 5: Check library manager

In the window popped up, go to Tools->Library Manager.



You will be able to see the cell library gpdk045 listed on the left.

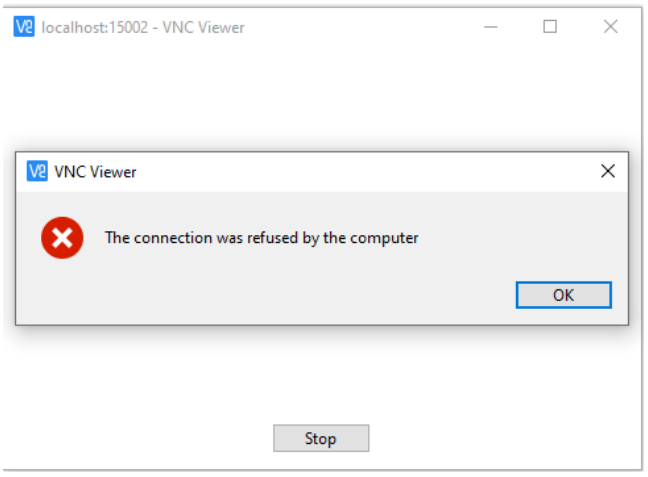


Step 6: Close Virtuoso

Save your work, close the VNC desktop and then close the terminal window you opened (PuTTY) in Phase 1.

Troubleshooting:

- Connection was refused if you have not used your VNC desktop for a while (typically days)



  - Solution: start a new VNC desktop and terminate the old one

- Password is not correct
  - Solution: start a new VNC desktop. If still not solved, try reset the password by removing the .vnc/passwd file.
- Cannot open Virtuoso
  - Solution: run source setup_ee477_ee577a_v2101.csh
- The command appears to be wrong and cannot run
  - Solution: write the command manually rather than copy-paste. Make sure that it matches the given command.
- VNC Black Screen Error: If you see a black screen only without any terminal after starting the VNC Viewer, then do the following steps. This problem happens due to the "xstartup" file. If you delete the .vnc folder , it will be reset to the default setting, when you will create a new VNC session again.
  - Solution: Type the following command in your home directory using the PuTTy terminal or your terminal in MAC.

```
rm -rf .vnc
```

  - Kill the existing vnc session and create a new vnc session.