Anvil: HCC's Cloud

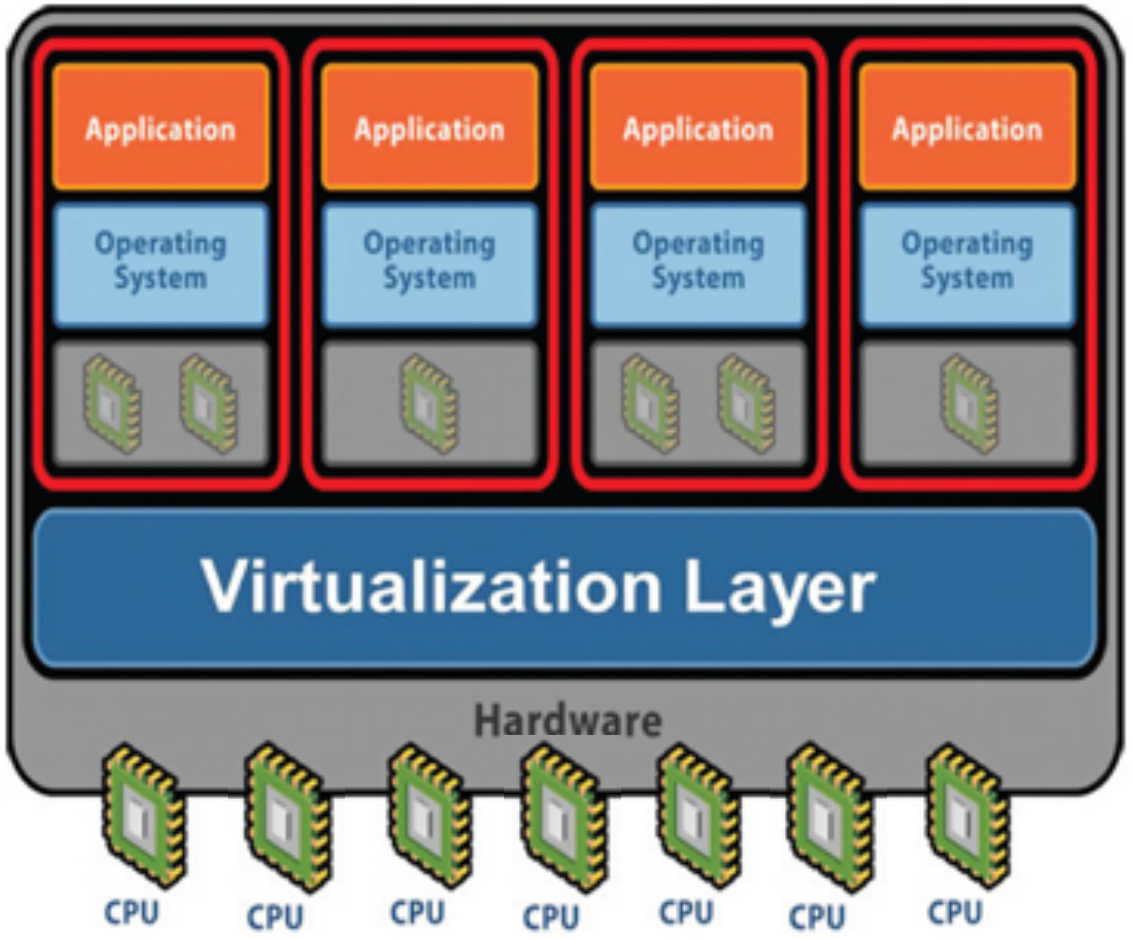
HCC Fall Kickstart 2018

Anvil: HCC's Cloud

- OpenStack Cloud Resource offering customizable virtual machines
- For projects **not well served by a traditional Linux environment**:
  - Software with graphical interfaces
  - Alternate Operating Systems (such as Windows)
  - projects that require root access or dedicated resources
    - test cluster environments
    - webserver
    - databases

What is a Virtual Machine?

- "computer within a computer"
- Shared hardware that is partitioned and isolated to act as a stand alone system
- Can run different types of operating systems and software.



Terminology

- **Project:** HCC group = project
  - basic unit of ownership
- **Image:** "Software"
  - Everything needed to create a virtual machine for a specific OS
- **Flavor:** "Hardware"
  - The resources allotted to the virtual machine
- **Instance:** Image + Flavor = Instance
  - The virtual machine itself
- **Volume:** "External Hard Drive"
  - Persistent storage that can exist even after an instance is destroyed
- **Snapshot:** "Backup"
  - A saved copy of an instance at a specific point of time

Setting up a New Computer

Imagine you just bought a new PC from your local box store...

Before you can start using it, you need to...

- Set up the machine
- Setup a new user/login
- Add files and software

After setting it up, you only need to...

- Check that the computer is on
- Login to the computer
- Begin working

Setting up a New Instance

Using Anvil is similar to buying a new computer:

Before you can start using it, you need to...

- ~~Set up the machine~~ Create an instance
- ~~Setup a new user/login~~ Create SSH Keys
- Add files and software

After setting it up, you only need to...

- ~~Check that the computer is on~~ Ensure the instance is running
- ~~Login to the computer~~ Connect to your instance
- Begin working

Creating a VM: Overview

- Connect to Anvil VPN *
- Create SSH Keys
- Create Instance
- Connect to Instance *

* Only these steps are needed to connect to an instance once it is created

Creating a VM: Connect to the Anvil VPN

- The Anvil web portal is accessible from the Internet in general
- For security reasons, **the Anvil instances are not**
- In order to access the Anvil instance from on and off-campus, you will need to first **connect to the Anvil VPN**

Creating a VM: Connect to the Anvil VPN

- If you've already connected to the campus VPN service before, you'll already have the **Cisco AnyConnect client** installed and can use it to connect to Anvil VPN
- If you do not have the Cisco AnyConnect client installed, connect to your home institution's VPN and follow the onscreen prompts to install.

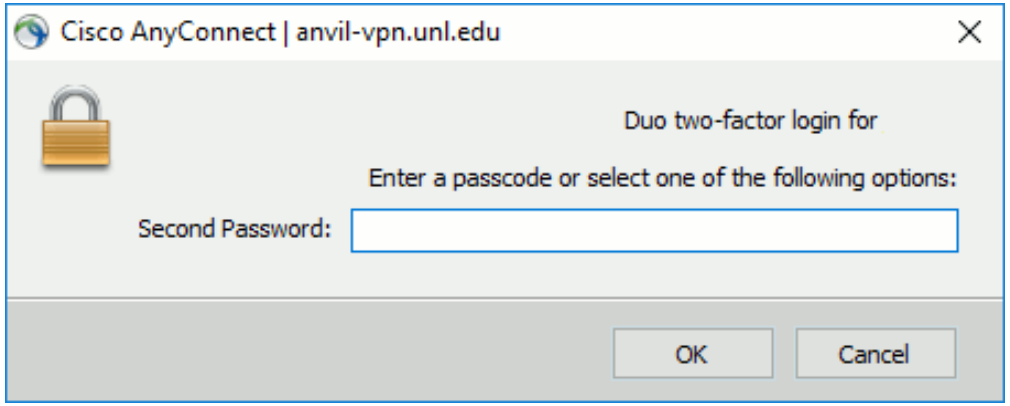
http://vpn.unl.edu

http://vpn.unomaha.edu

http://vpn.unk.edu

Creating a VM: Connect to the Anvil VPN

- Once installed, connect to **anvil-vpn.unl.edu** with your HCC credentials.
- The third prompt is for two-factor authentication



Type...	To...
push	Push a login request to your phone
phone	Authenticate via phone callback
sms	Get a new batch of SMS passcodes
A passcode	Login using a passcode, such as those generated by Duo Mobile, a Yubikey or sent to you in an SMS

Creating a VM: Create SSH Keys

- OpenStack uses SSH key pairs to identify users and control access to the VMs themselves - instead of username/password
- Key pairs consist of two files, a **public key** and a **private key**

Anvil Instance

Public Key

Private Key

Treat the private key file the same as you would a password
Keep your private key in a secure location and do not share it with anyone

Creating a VM: Connect to the Anvil Dashboard

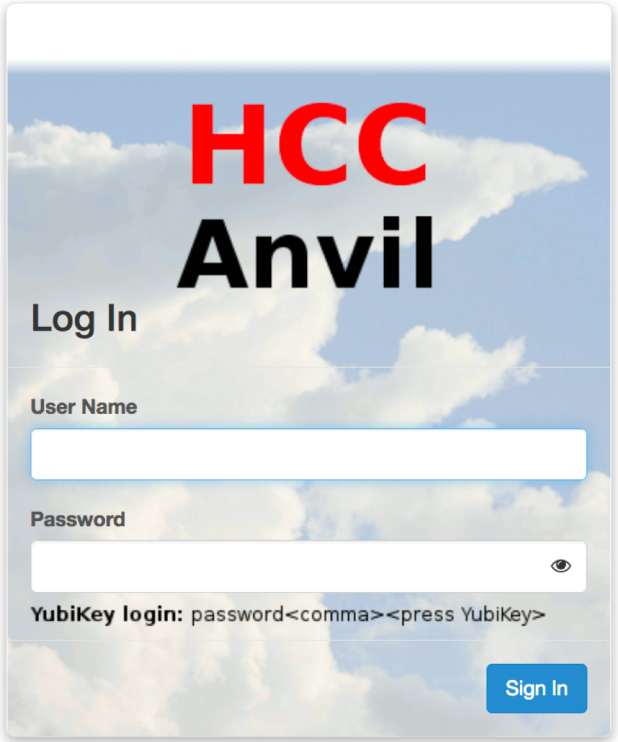
- Anvil instances are administered through the dashboard

  http://anvil.unl.edu

- Login using your HCC credentials
- A Duo Push Notification will automatically be sent to your phone
- To login using a passcode or Yubikey, enter:

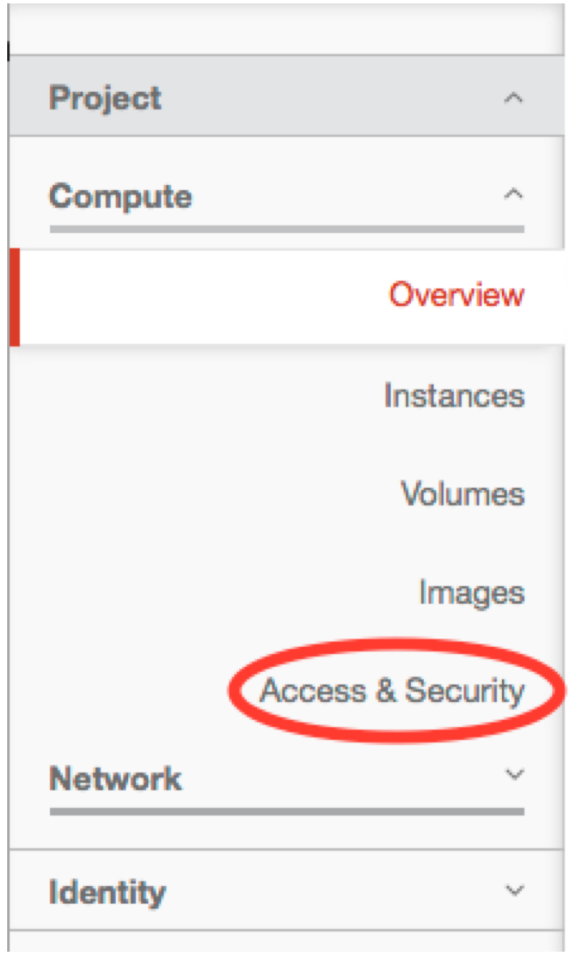
  `password,passcode`

  in the password field



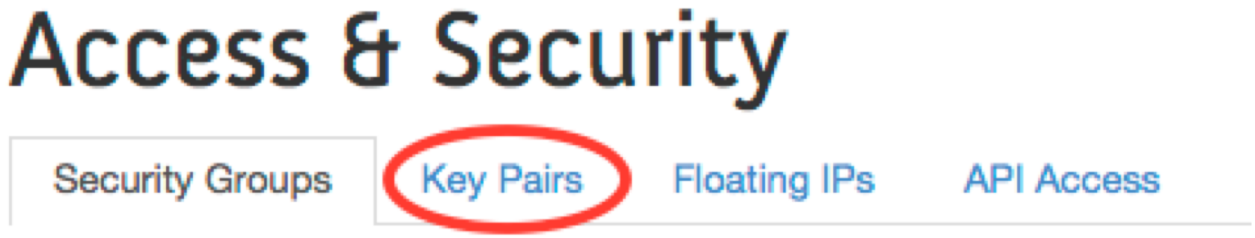
Creating a VM: Create SSH keys

- SSH Keypairs can be created using the Anvil Dashboard.
- On the left-hand side navigation menu, click **Access & Security**

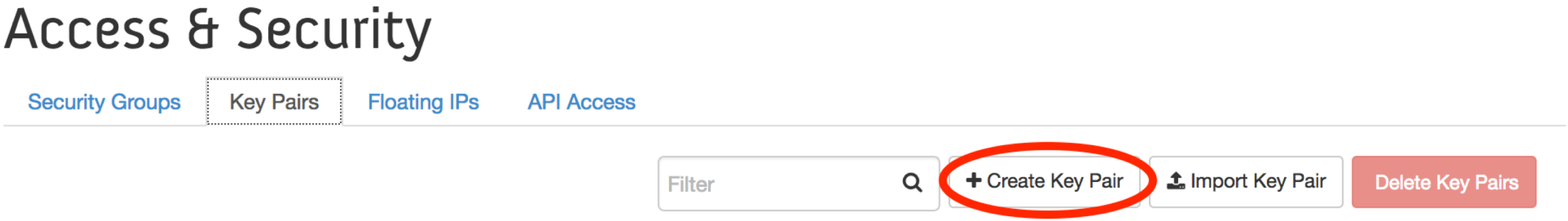


Creating a VM: Create SSH keys

- Choose the **Key Pairs tab** in the main window section:

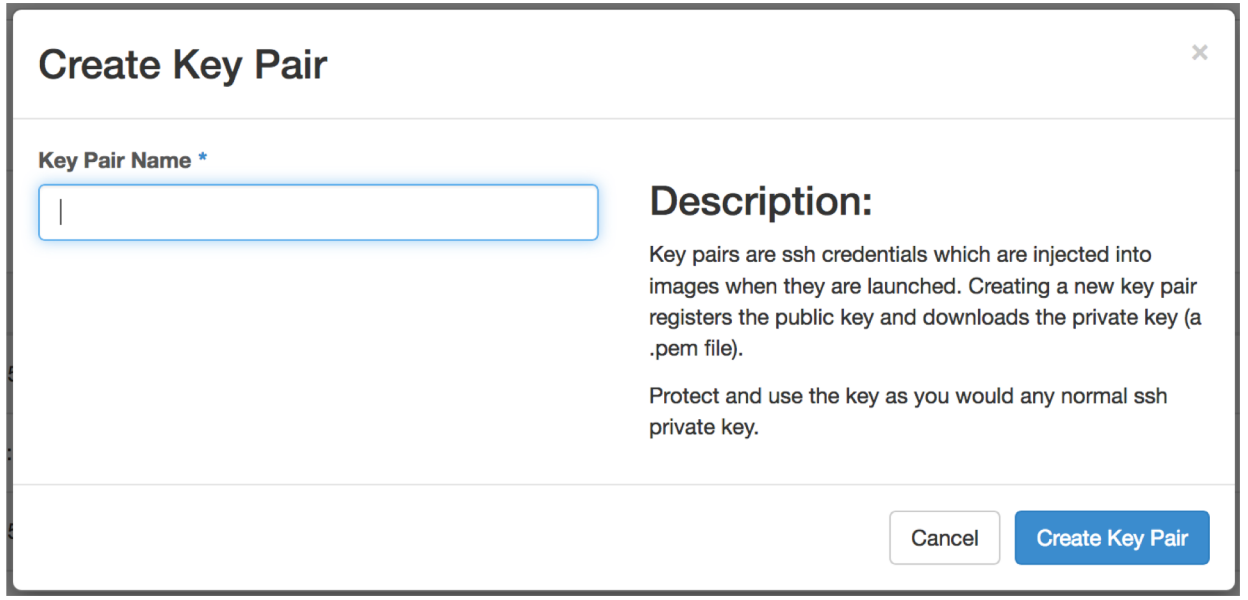


- On the right-hand side, click the **Create Key Pair** button:



Creating a VM: Create SSH keys

- In the pop-up window, fill in the **Key Pair Name** field with a convenient name (e.g. *my_key_pair*)
- Click the **Create Key Pair** button to close the pop-up and save the key

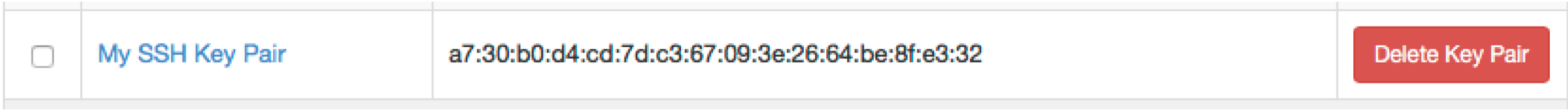


- The private key file should begin downloading. Put this file someplace safe.

Do not navigate away from this page until you have successfully downloaded the private key file or you will need to create a new one

Creating a VM: Create SSH keys

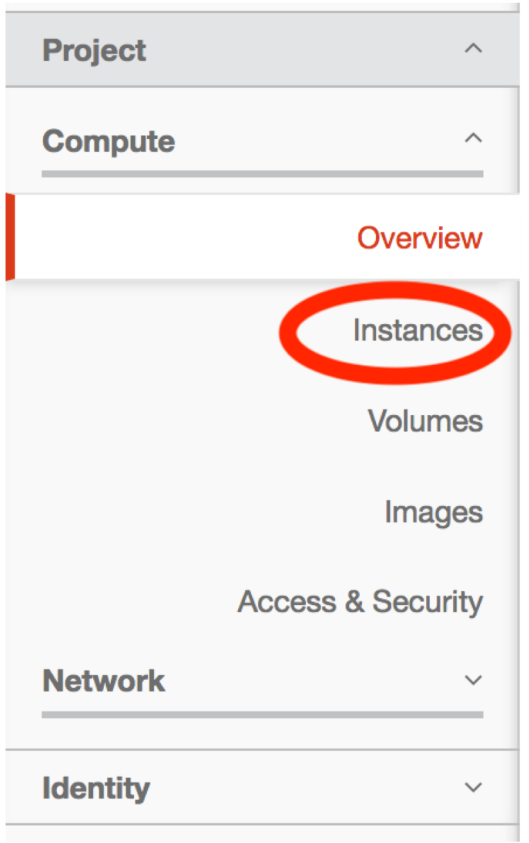
- You should then see an entry with the saved key (the fingerprint value will be different than the example below)



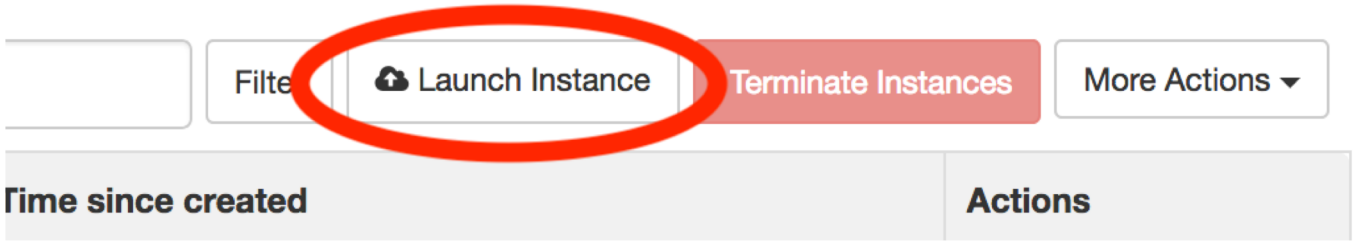
- The key pair can now be associated with any newly created instances
  - You can use the same key pair with multiple instances

Creating a VM: Create Instance (Windows)

- On the left-hand side navigation menu, click **Instances**

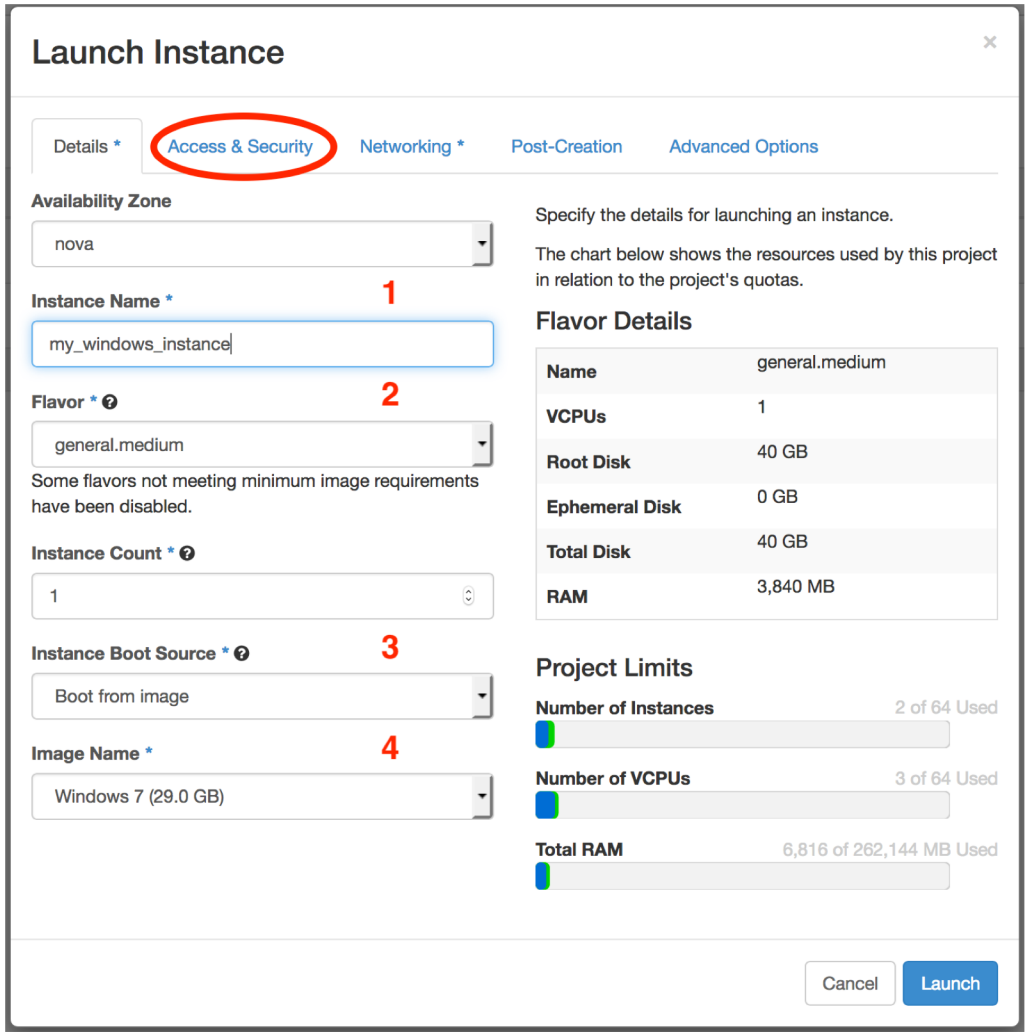


- Click the **Launch Instances** button on the top right-hand corner



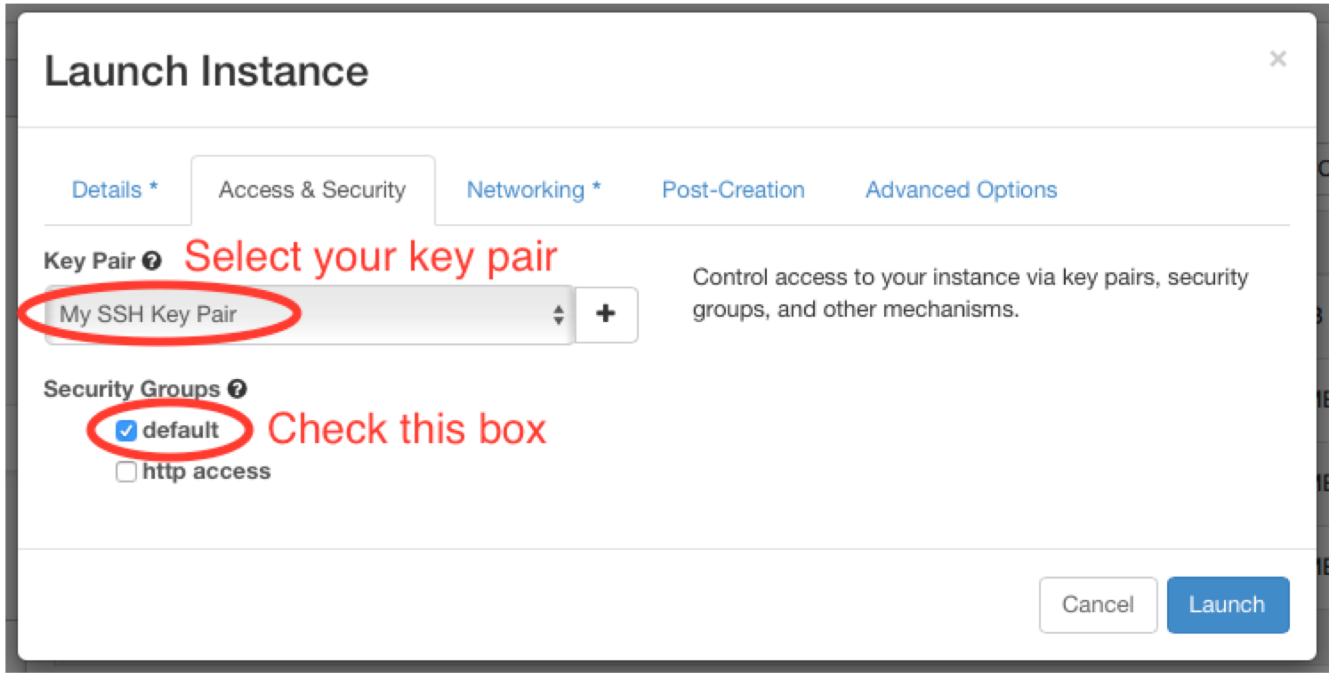
Creating a VM: Create Instance (Windows)

1. Give your instance a recognizable name, such as *yourname_windows_instance*
2. Select **general.medium** for the flavor
3. Select **Boot from image** for Instance Boot Source
4. Choose **Windows 7 (29.0 GB)** for the boot image



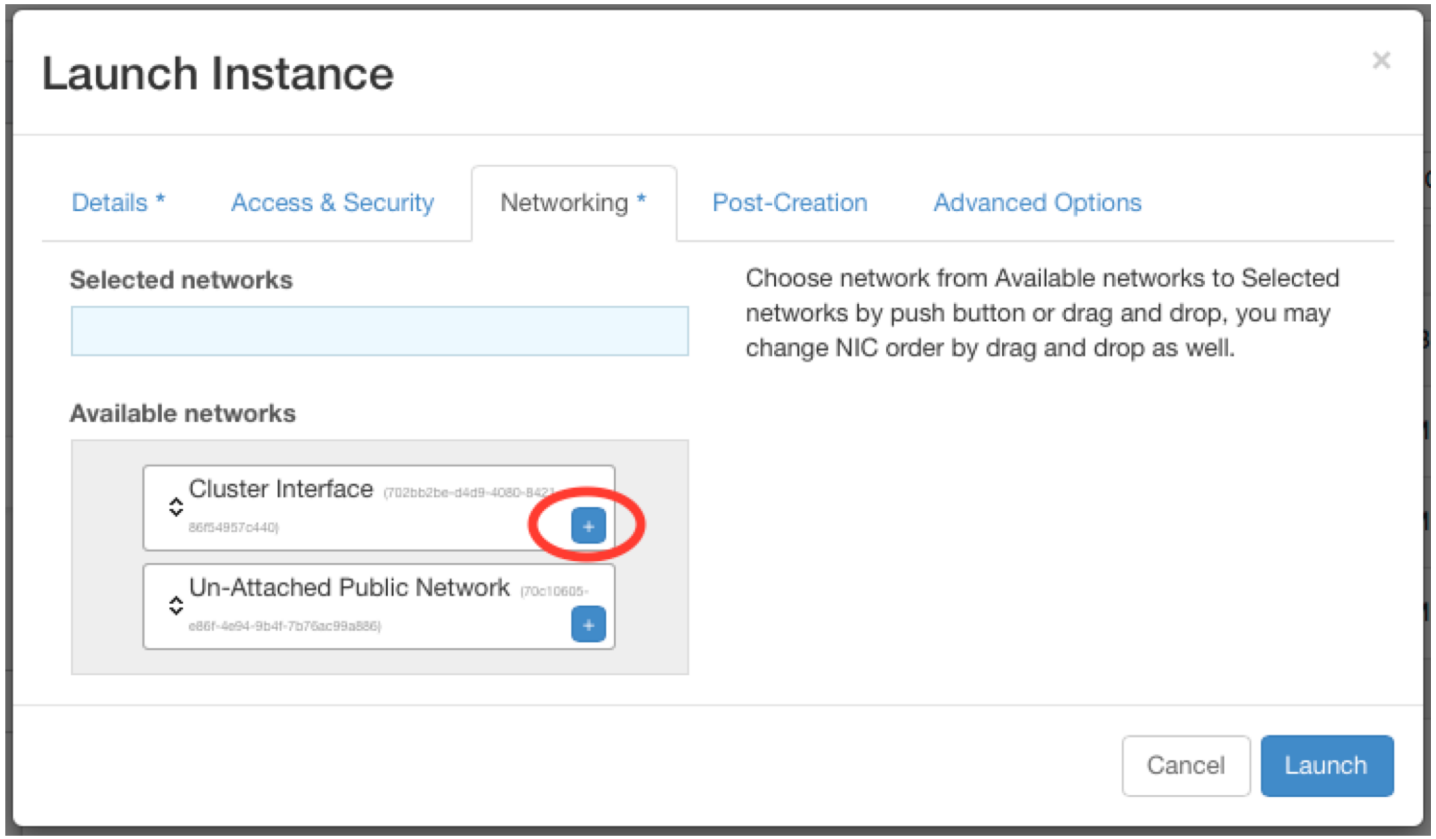
Creating a VM: Create Instance (Windows)

- Click the **Access & Security** tab
- Under **Key Pair**, select your SSH key pair from the drop-down menu
- Under **Security Groups**, check the default box



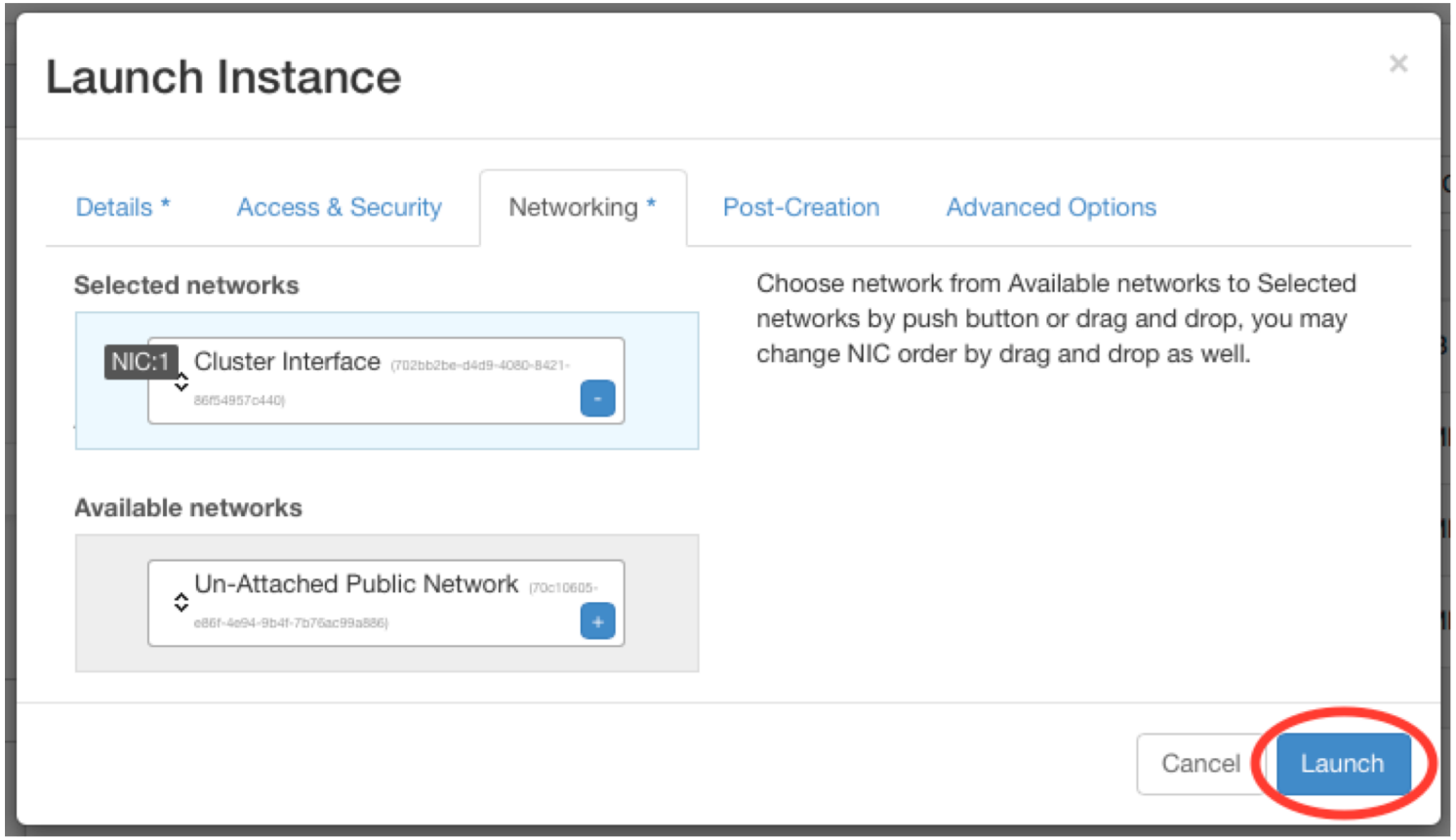
Creating a VM: Create Instance (Windows)

- Click the **Networking** tab
- Under **Available networks**, click the small *blue '+' icon* in the *Cluster Interface* box
- This will add *Cluster Interface* to the **Selected networks**



Creating a VM: Create Instance (Windows)

- Click the **Launch** button to start the instance
- It may take several minutes for the instance to complete



Creating a VM: Exercise

- While you are waiting for your Windows instance to finish setting up, create a second VM.
- Use the same steps as before, but this time use:
    - image: **CentOS 7.4 (8.0GB)**
    - flavor: **general.small**

Once you have finished, put up your green sticky note.

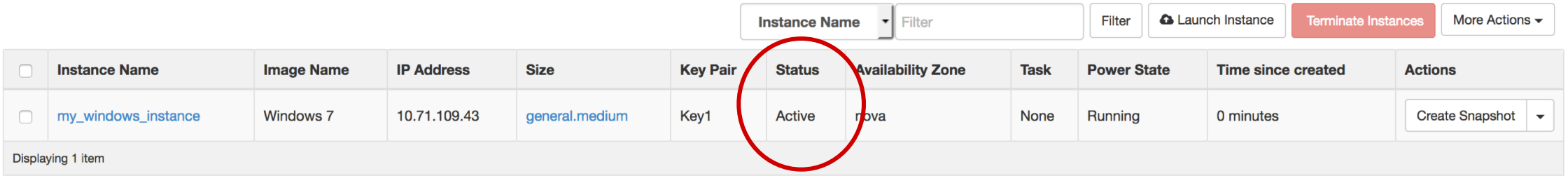
If you have issues, put up your red sticky note and one of the helpers will be around to assist.

Creating a VM: Connect to the Instance (Windows)

- After an instance has been created, you can connect (login) and begin using it
- Connecting is done via **SSH or X2Go for Linux instances** and via **Remote Desktop (RDP) for Windows instances**
- When the Windows instance is created, the password is set randomly using your SSH Key Pair
- This password can be retrieved via the Dashboard web interface, and then is used to login via Remote Desktop

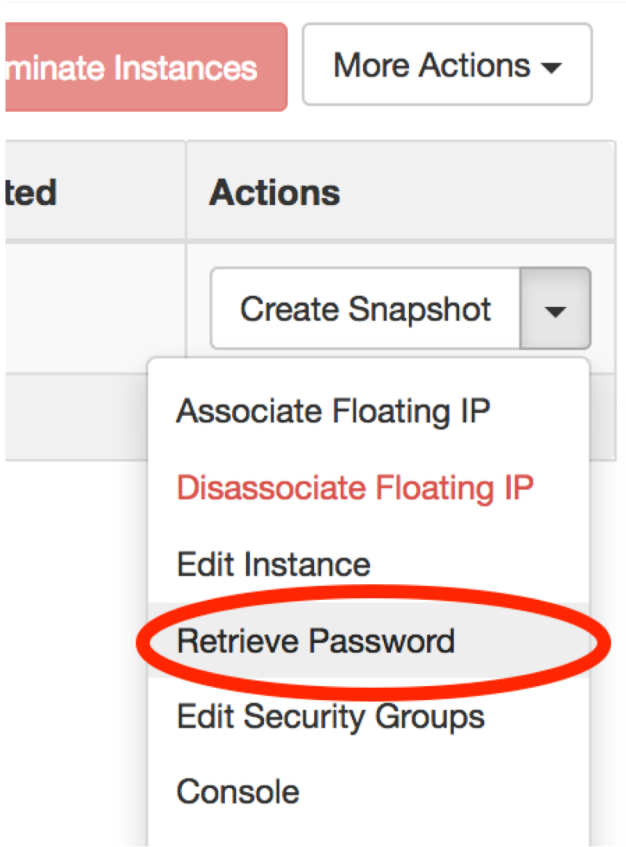
Creating a VM: Connect to the Instance (Windows)

- On the left-hand side navigation menu, click **Instances**



- **It may take several minutes for a Windows instance to complete setup and be accessible.**
- **It is recommended to wait 10 minutes after the *Status* field shows *Active* before trying to connect**

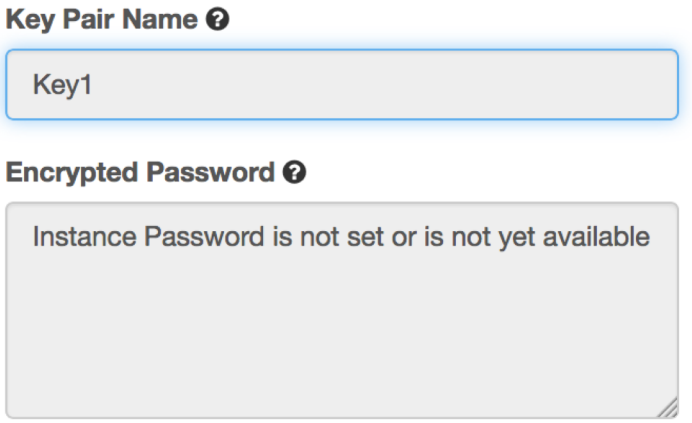
Creating a VM: Connect to the Instance (Windows)



To retrieve the password for your instance:

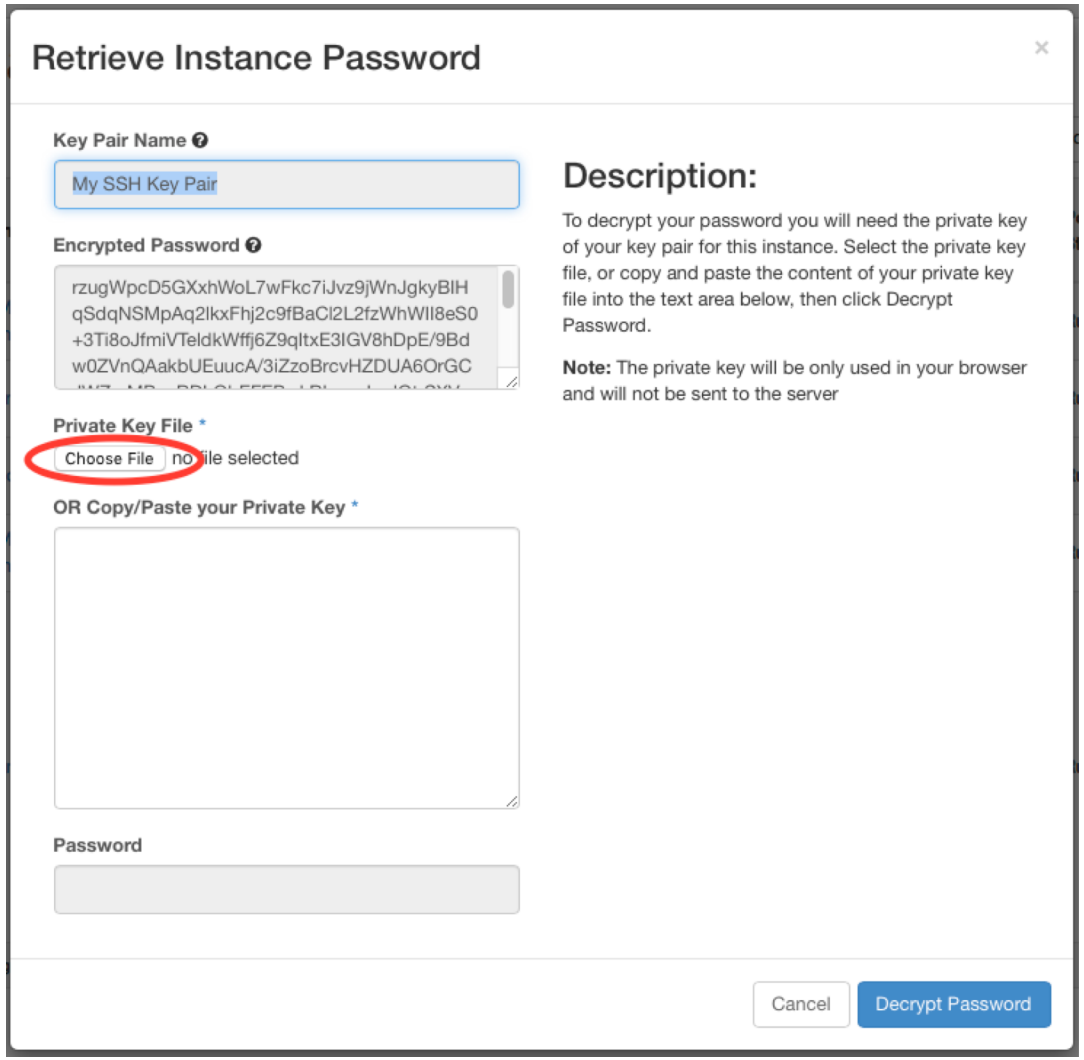
- Click the down arrow next to the **Create Snapshot** button to the right of your instance listing.
- Click **Retrieve Password**

If you get the message "Instance Password is not set or is not yet available" wait a bit and try again.



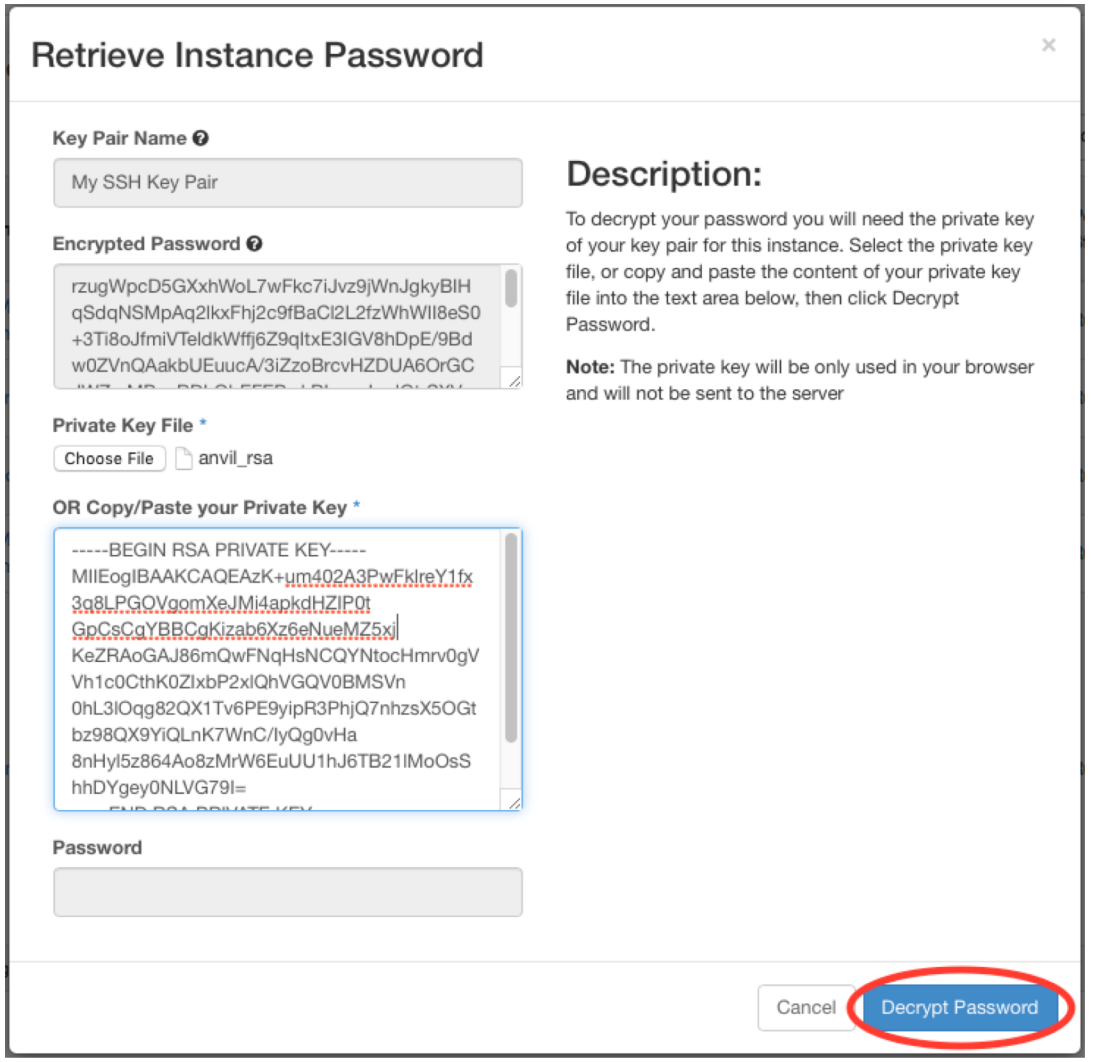
Creating a VM: Connect to the Instance (Windows)

- In the new pop-up window you will need to select your *private SSH key file*
- Click the **Choose File** button to open a File Explorer window
- Navigate to your private key file and choose to open the file



Creating a VM: Connect to the Instance (Windows)

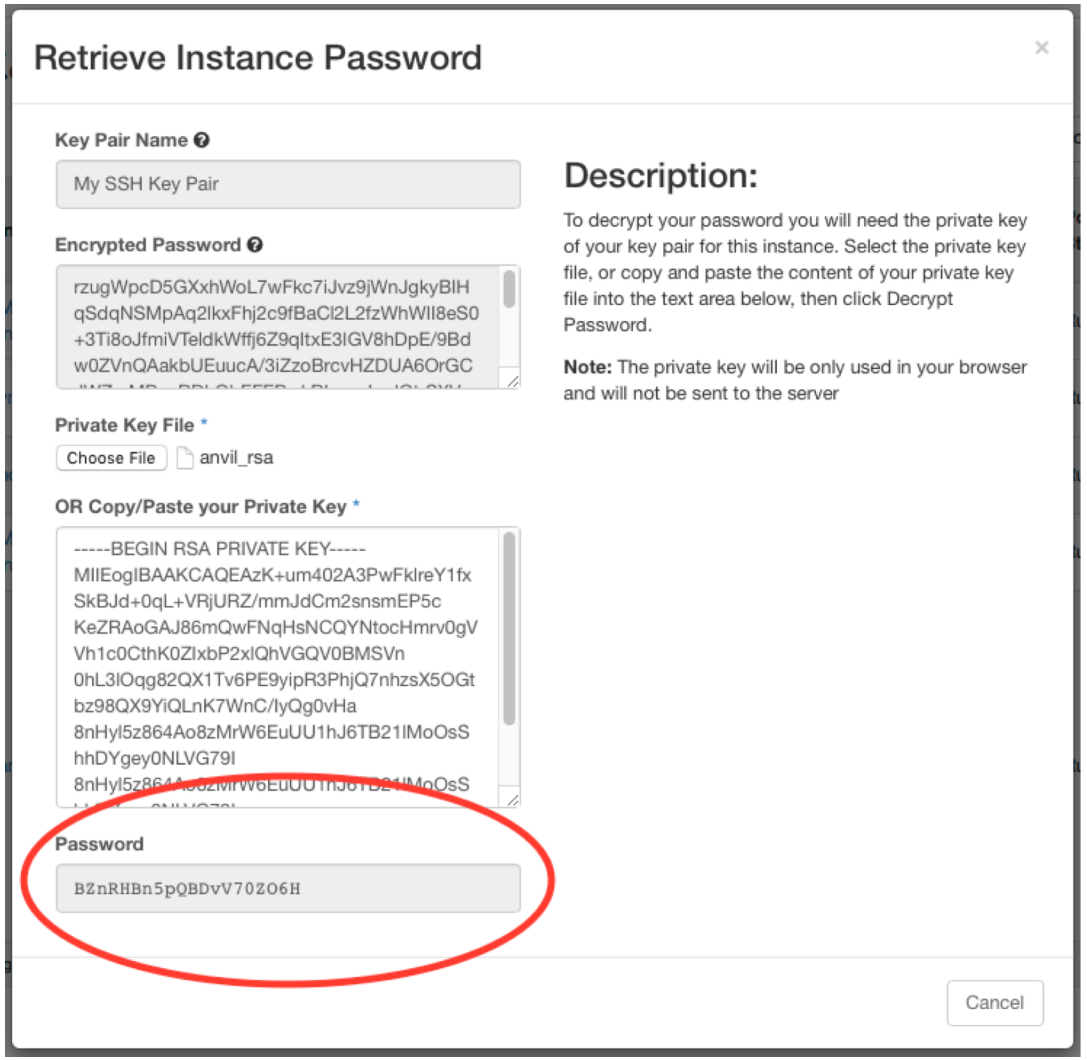
- The contents of your private key file should now be inside the text box
- Click the **Decrypt Password** button



Creating a VM: Connect to the Instance (Windows)

- The randomly generated password should appear in the **Password** field
- Copy and paste this password into a convenient text editor so it is readily accessible

Do not save this password in a text file. If you need it in the future, you can retrieve it again using the same process.



Creating a VM: Connect to the Instance (Windows)

Access to Windows instances is provided via Remote Desktop (RDP)

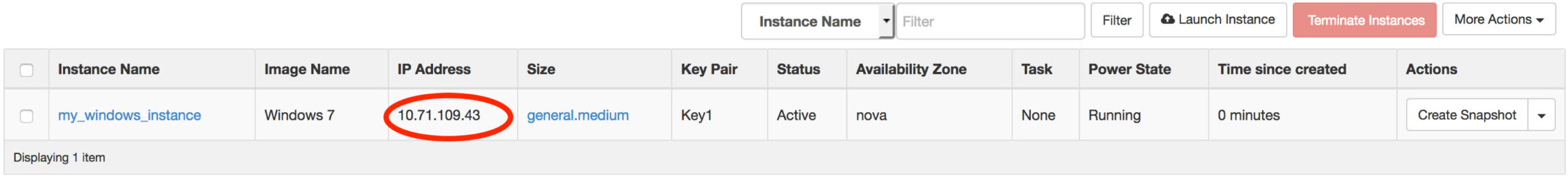
- **Windows:**
  - The Remote Desktop Connection Client is already installed on Windows

- **Mac:**
  - Install the free Microsoft Remote Desktop from the app store, http://go.unl.edu/RemoteDesktopMacOS

Be sure to use an up-to-date client program when connecting to Windows 10 instances (older RDP clients may have problems connecting to Windows 10 instances due to changes in security protocols)

Creating a VM: Connect to the Instance (Windows)

- Determine the **IP address** of your instance

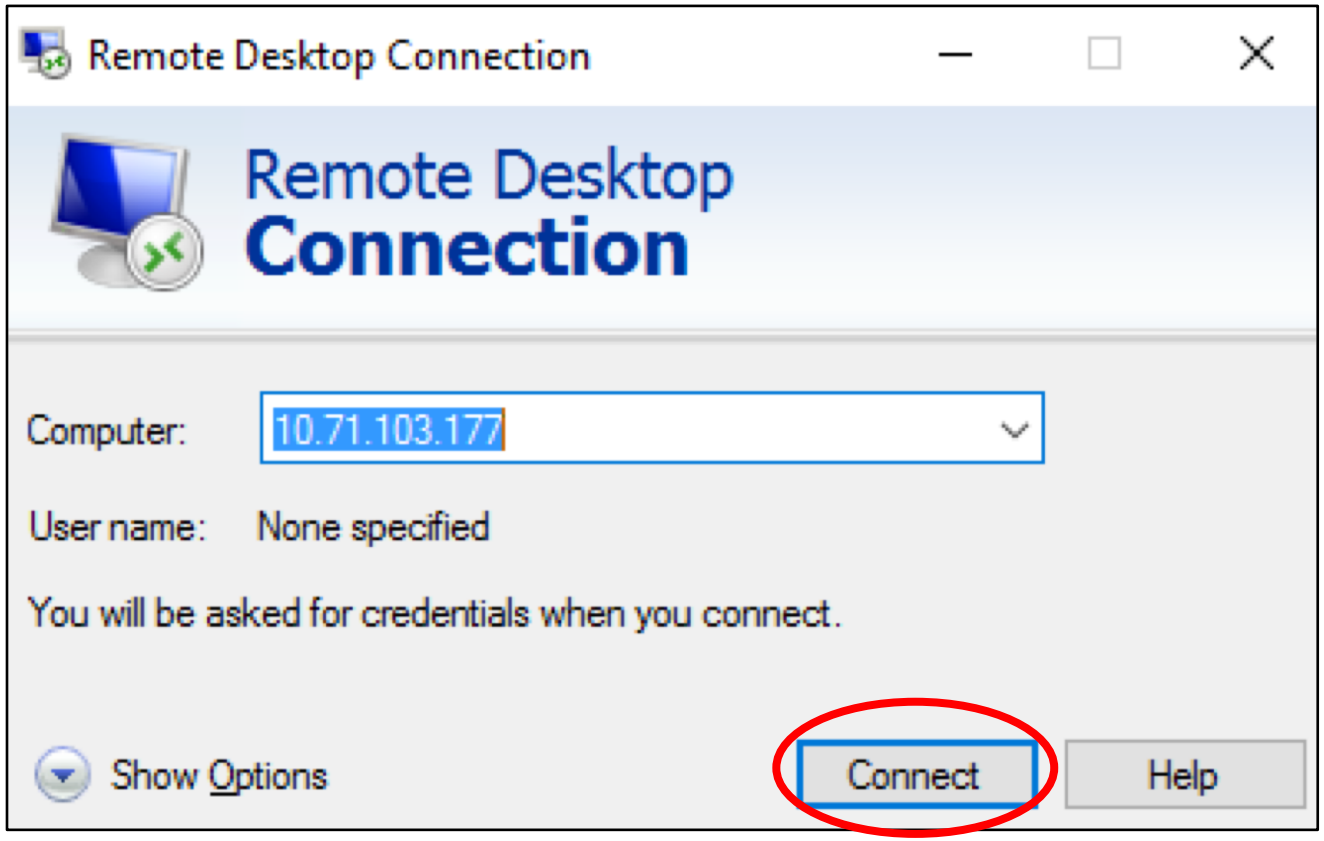


- The **username** used to connect is always:
  - **cloud-user**
- The **password** was retrieved earlier

Creating a VM: Connect to the Instance (Windows)

From Windows:

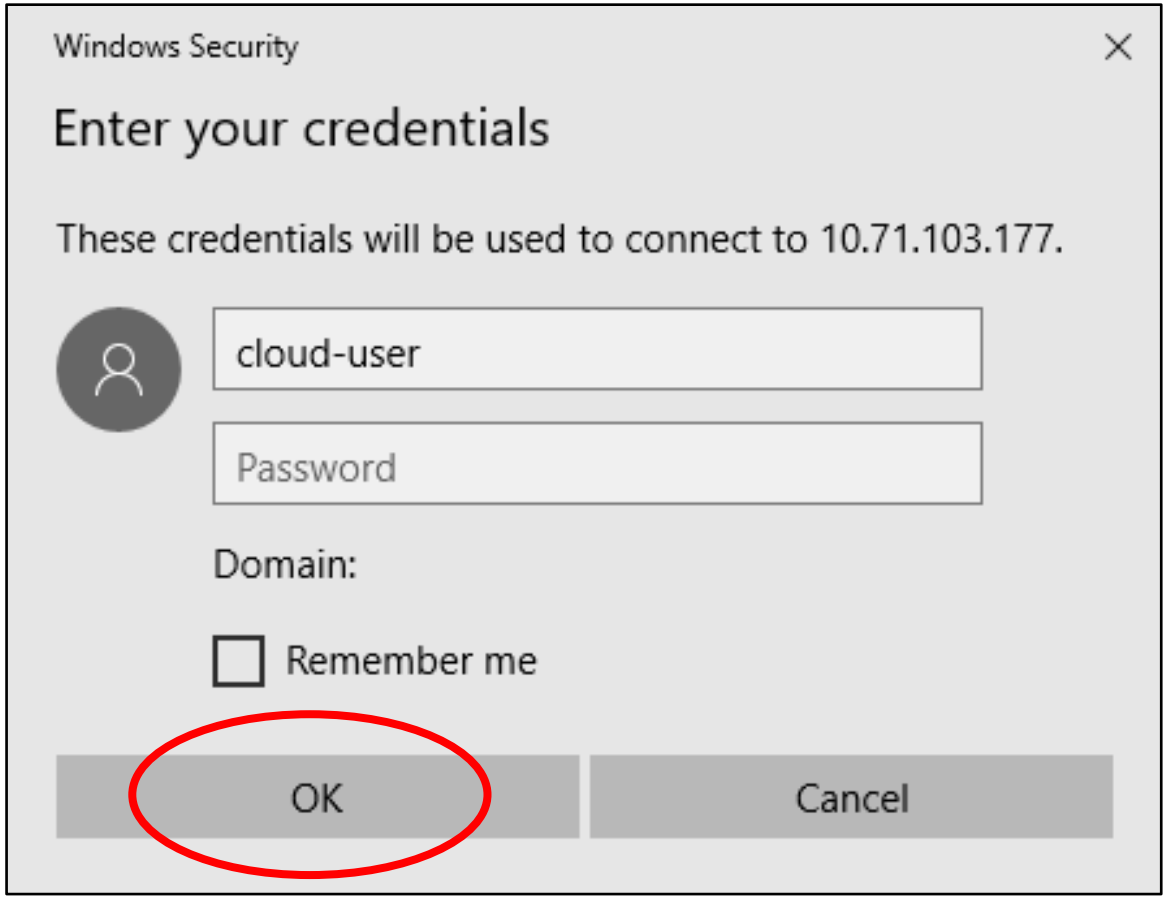
- Start your Remote Desktop client
- Enter the IP address in the **Computer** field
- Click **Connect**



Creating a VM: Connect to the Instance (Windows)

From Windows (cont.):

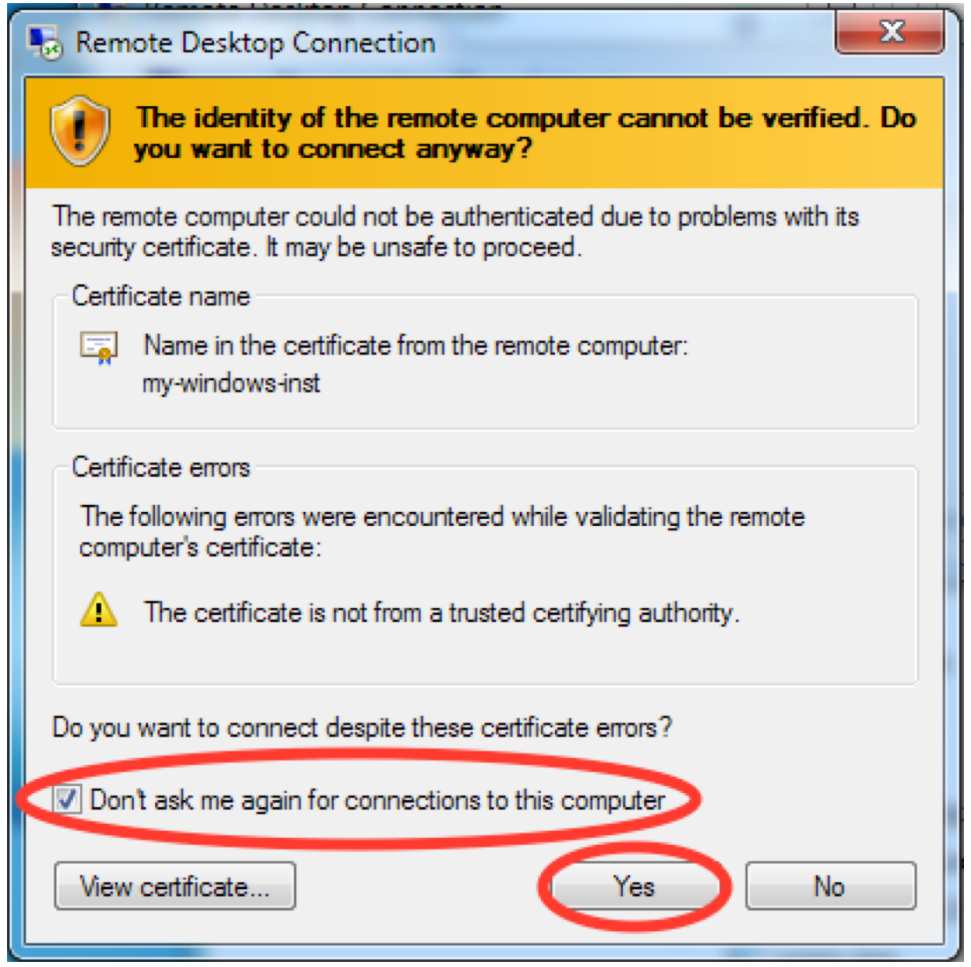
- Enter the **username**:
  - **cloud-user** (for *Windows 7*)
- Enter the **password** you retrieved



Creating a VM: Connect to the Instance (Windows)

From Windows (cont.):

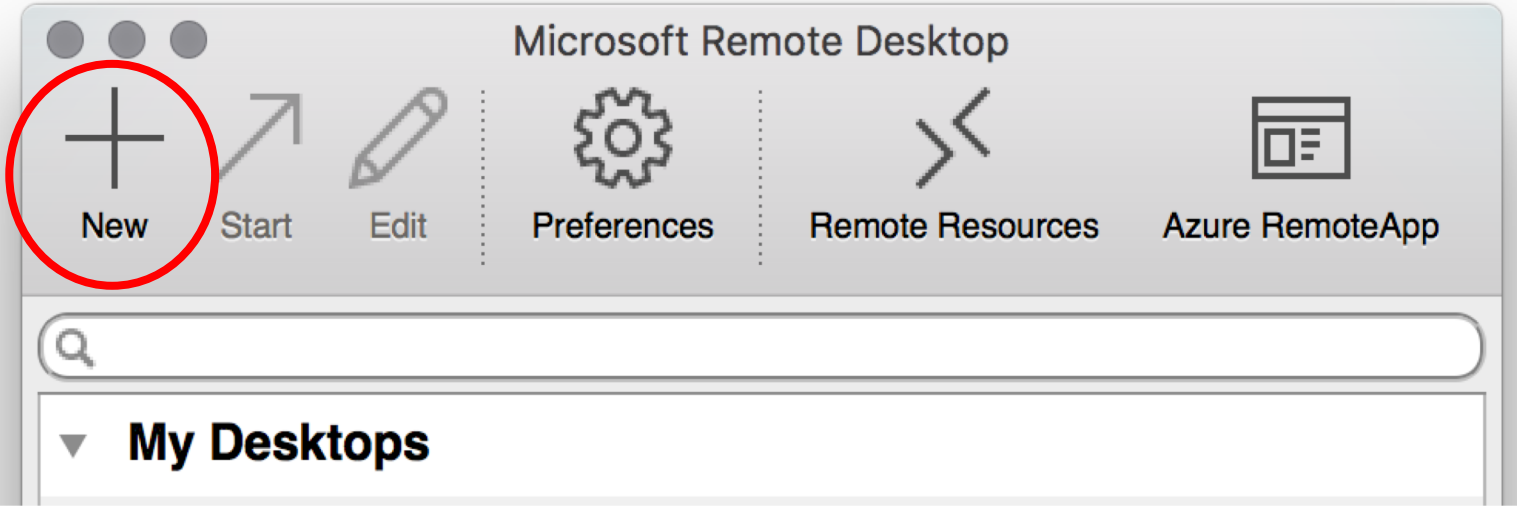
- You may see a warning box about the certificate of the remote computer
- To avoid this warning in the future, check the box that says "*Don't ask me again for connections to this computer*“
- Click **Yes**



Creating a VM: Connect to the Instance (Windows)

From MacOS:

- Start your Remote Desktop client
- Click the **New** button



Creating a VM: Connect to the Instance (Windows)

From MacOS:

Connection name

- Name for your connection. This can be anything you want.

PC Name

- Your Instance IP address as retrieved from the dashboard

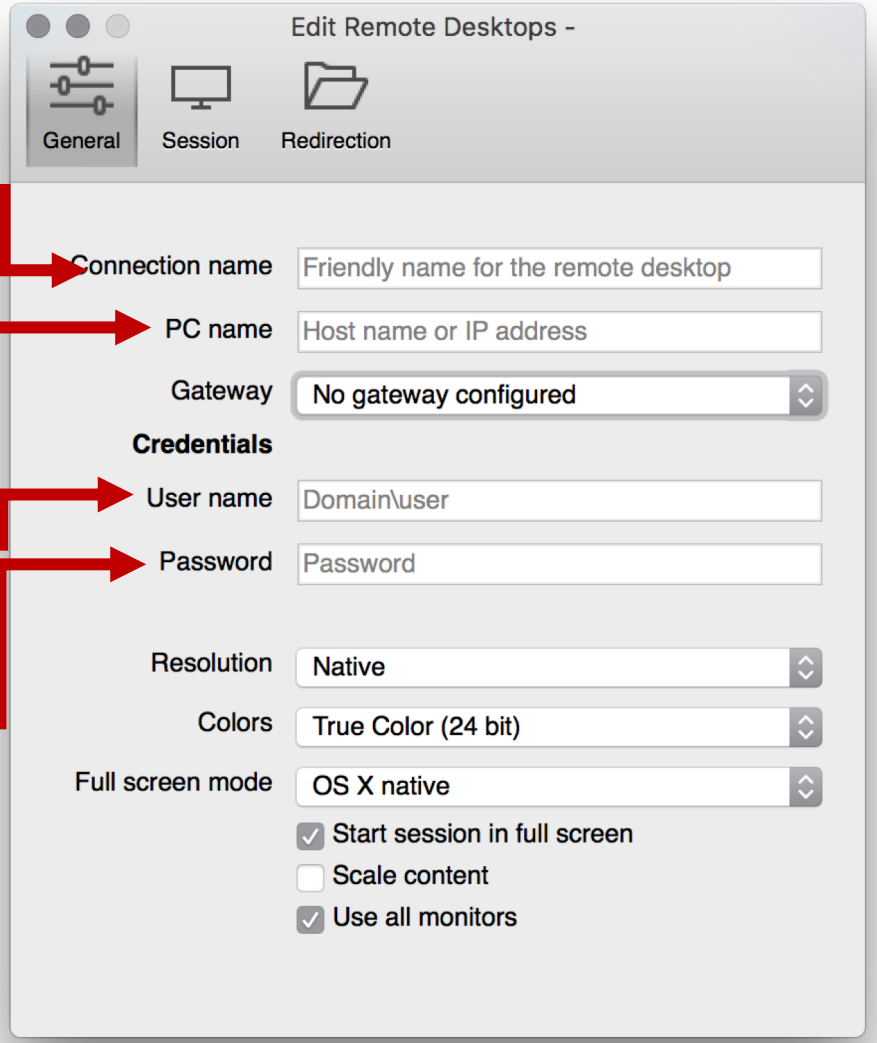
User name

- This is always **cloud-user** for Windows 7 instances

Password

- The password you decrypted using your private key file

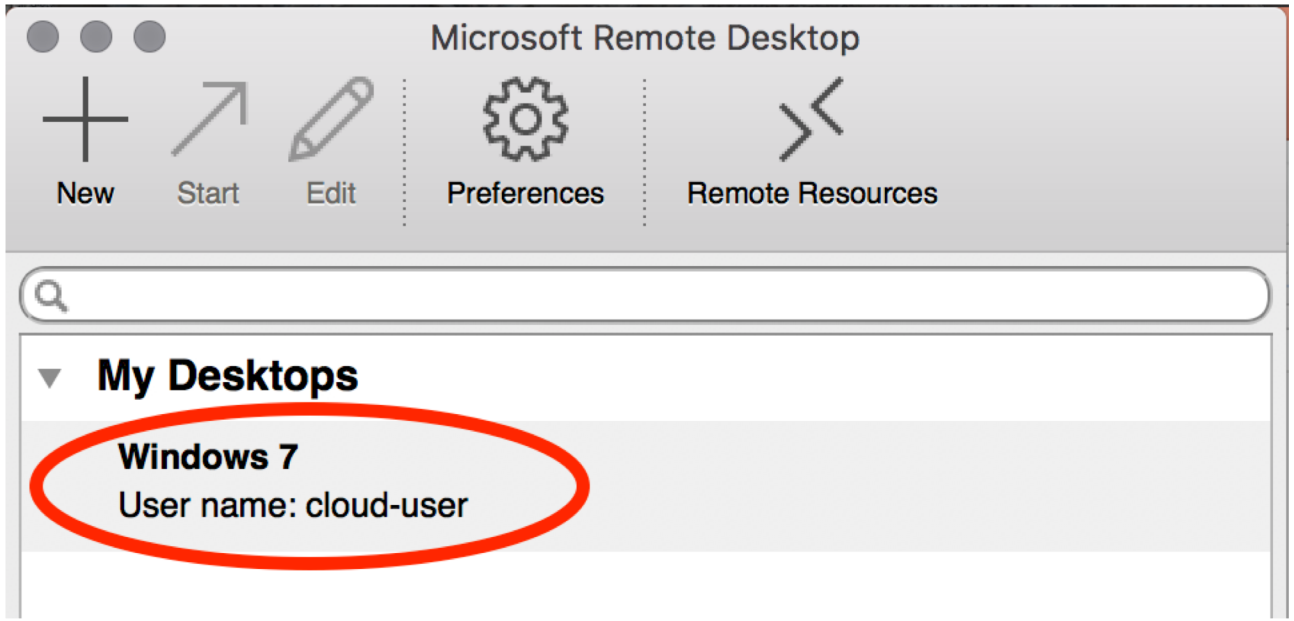
Close the window to save changes



Creating a VM: Connect to the Instance (Windows)

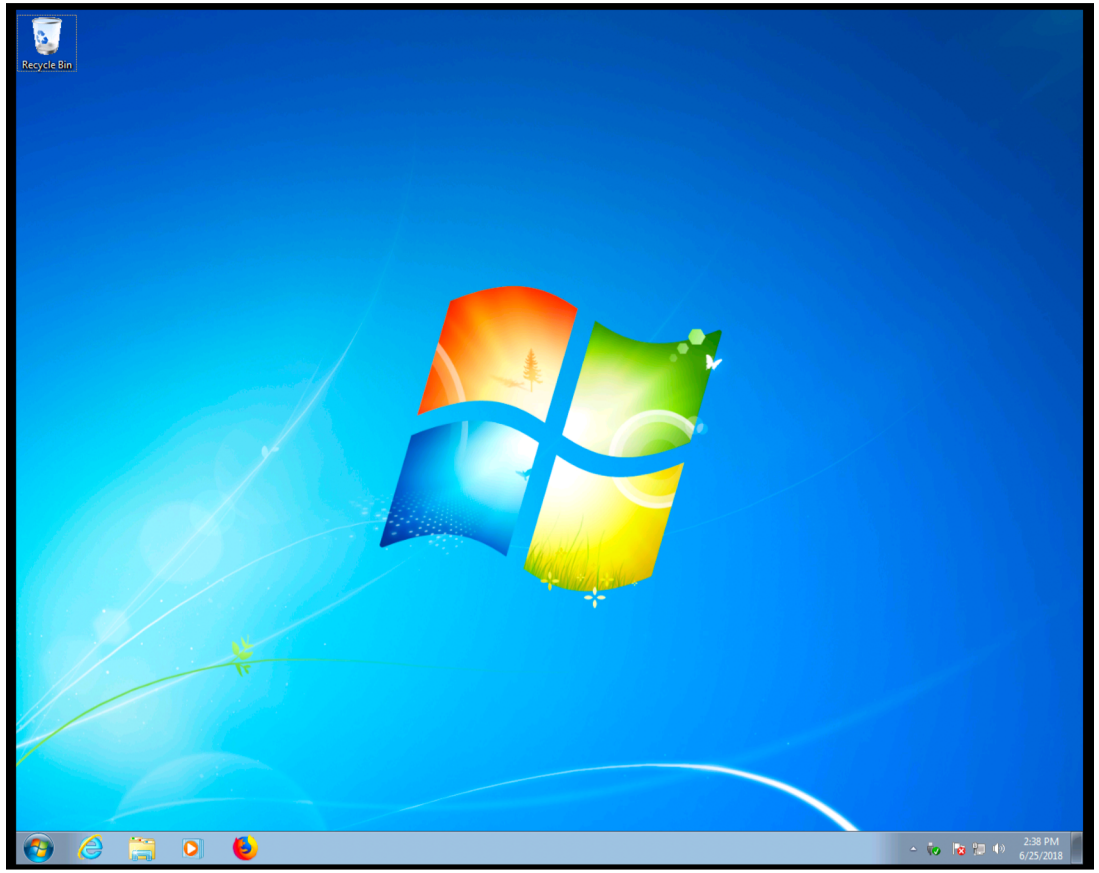
From MacOS:

- Double click on the new connection listed to connect.



Creating a VM: Connect to the Instance (Windows)

- Your virtual machine is ready for installation of additional software or custom configuration!
- **To transfer files in and out of your VM, add a cloud-based storage application such as Google Drive or Box.**
- Or you can setup a personal endpoint for Globus.



Creating a VM: Exercise

- Exit the Remote Desktop and Cisco AnyConnect clients
- Following the steps we just did, reconnect to your instance
- Remember, to connect we need to follow these basic steps:
  - Connect to the Anvil VPN using Cisco AnyConnect
  - Connect to your instance using Remote Desktop
- Note: You shouldn't need to use the Anvil dashboard at all!

Once you have finished, put up your green sticky note.

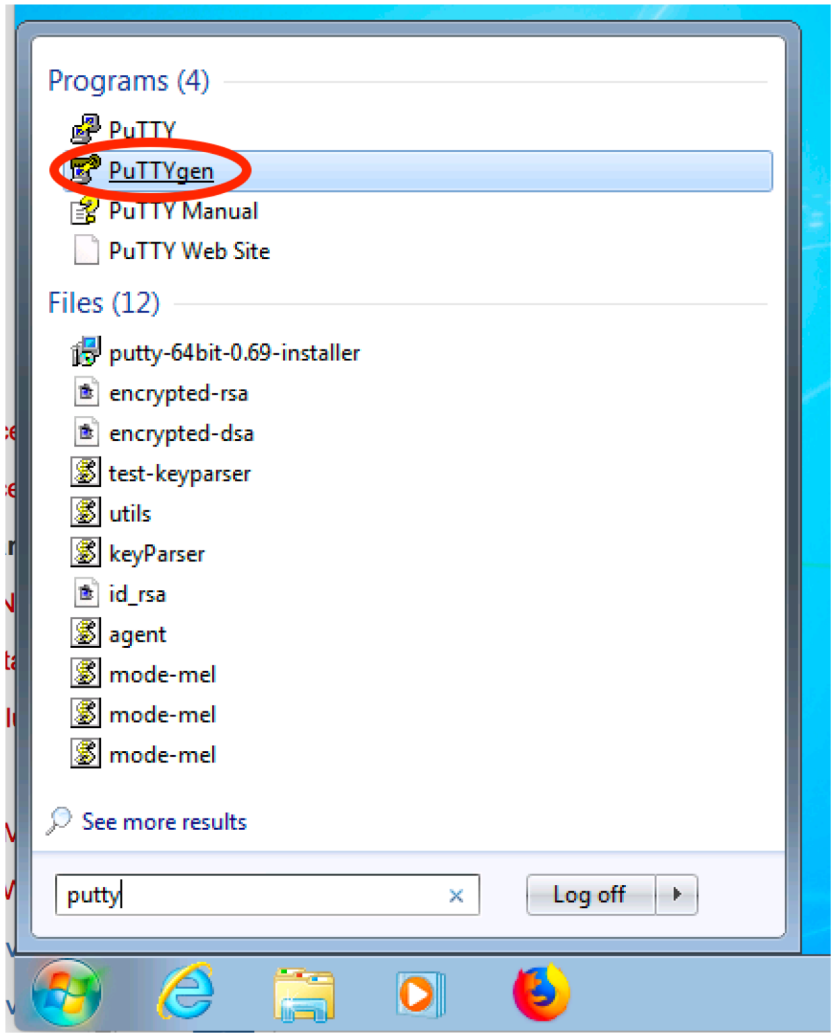
If you have issues, put up your red sticky note and one of the helpers will be around to assist.

Creating a VM: Connect to the Instance (Linux)

- To connect to your VM, we will use an SSH connection using the same approach as connecting to HCC clusters
- **Once your instance is created, note the IP address as before**
- **With Linux images, you will not need to retrieve the password**
  - **We will use our keypair file to authorize our connection**

Creating a VM: Connect to the Instance (Linux)

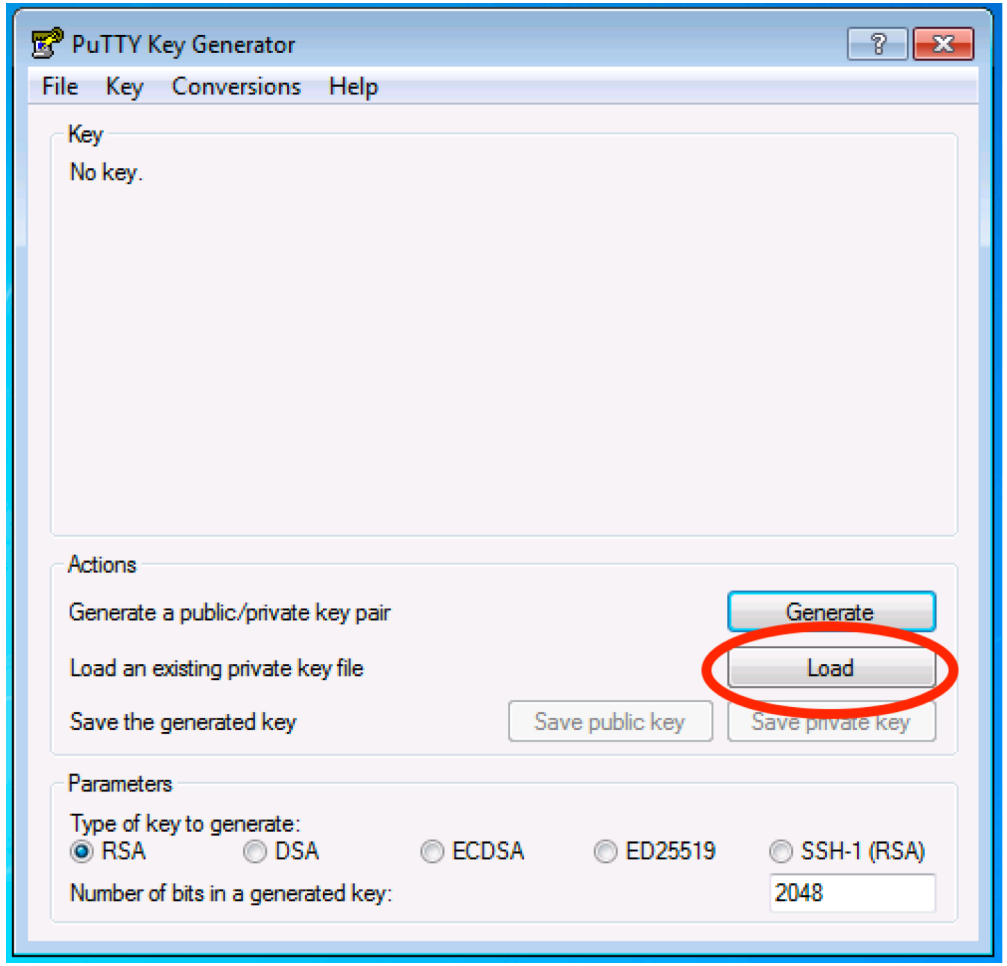
- **From Windows:**
  - We will be connecting using PuTTY, just as before
  - **PuTTY uses a proprietary format for their keys, so we will need to convert the keyfile you downloaded**
  - **Run the PuTTYgen application**



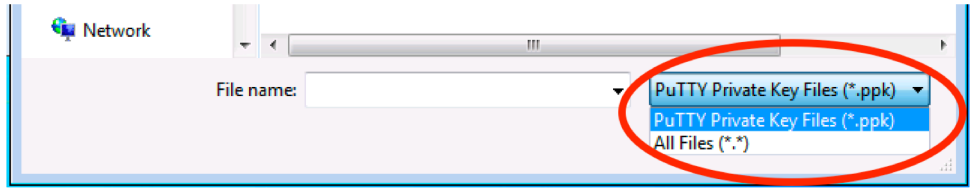
Creating a VM: Connect to the Instance (Linux)

From Windows (cont.):

- Click the "Load" button and select the private key file you downloaded previously



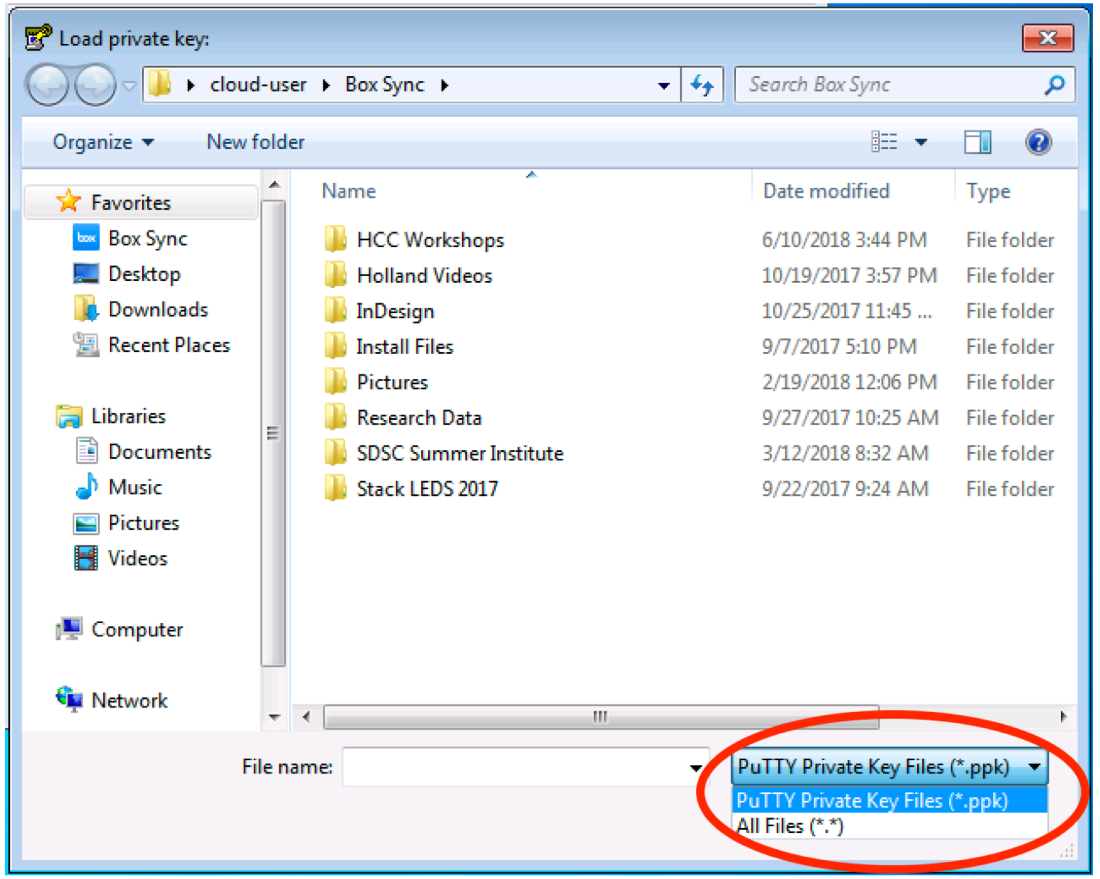
If you cannot see your private key file, change the file type to All files (*.*) in the dropdown box next to File name.



Creating a VM: Connect to the Instance (Linux)

From Windows (cont.):

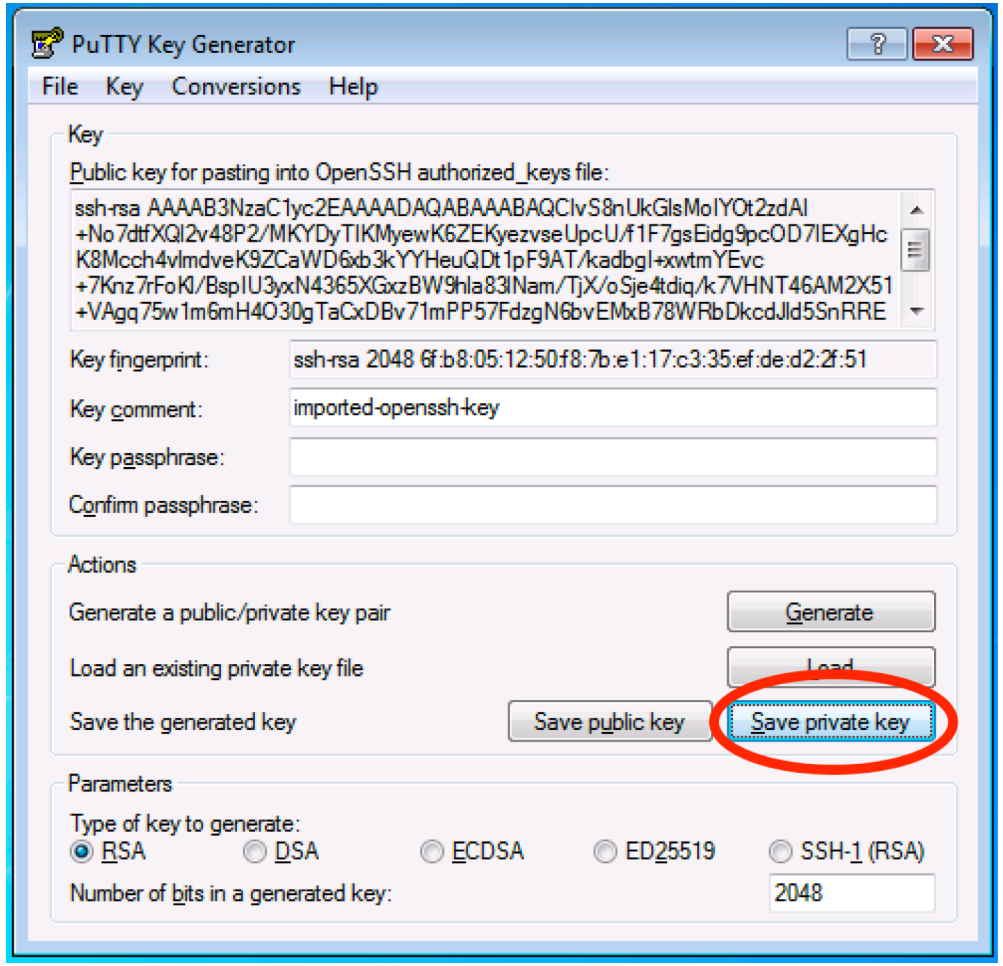
- You will need to change the files shown to include All Files by clicking the drop down box next to "File name:"



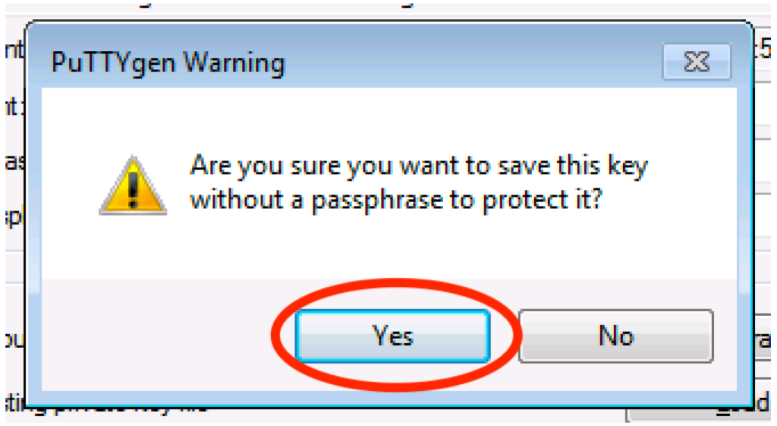
Creating a VM: Connect to the Instance (Linux)

From Windows (cont.):

- Click **Save private key** to save the key as a ppk file



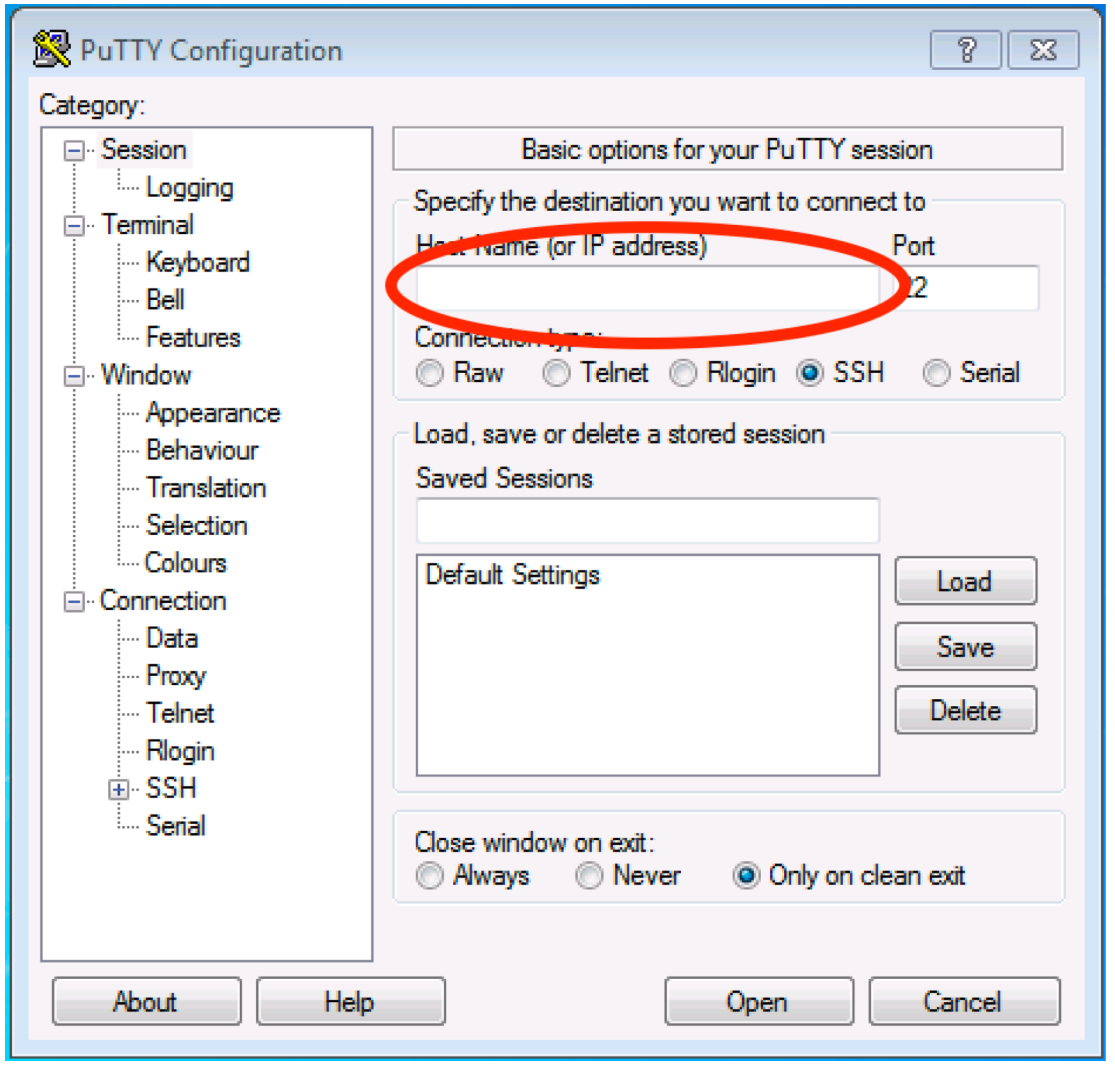
- When prompted, click **Yes**



Creating a VM: Connect to the Instance (Linux)

From Windows (cont.):

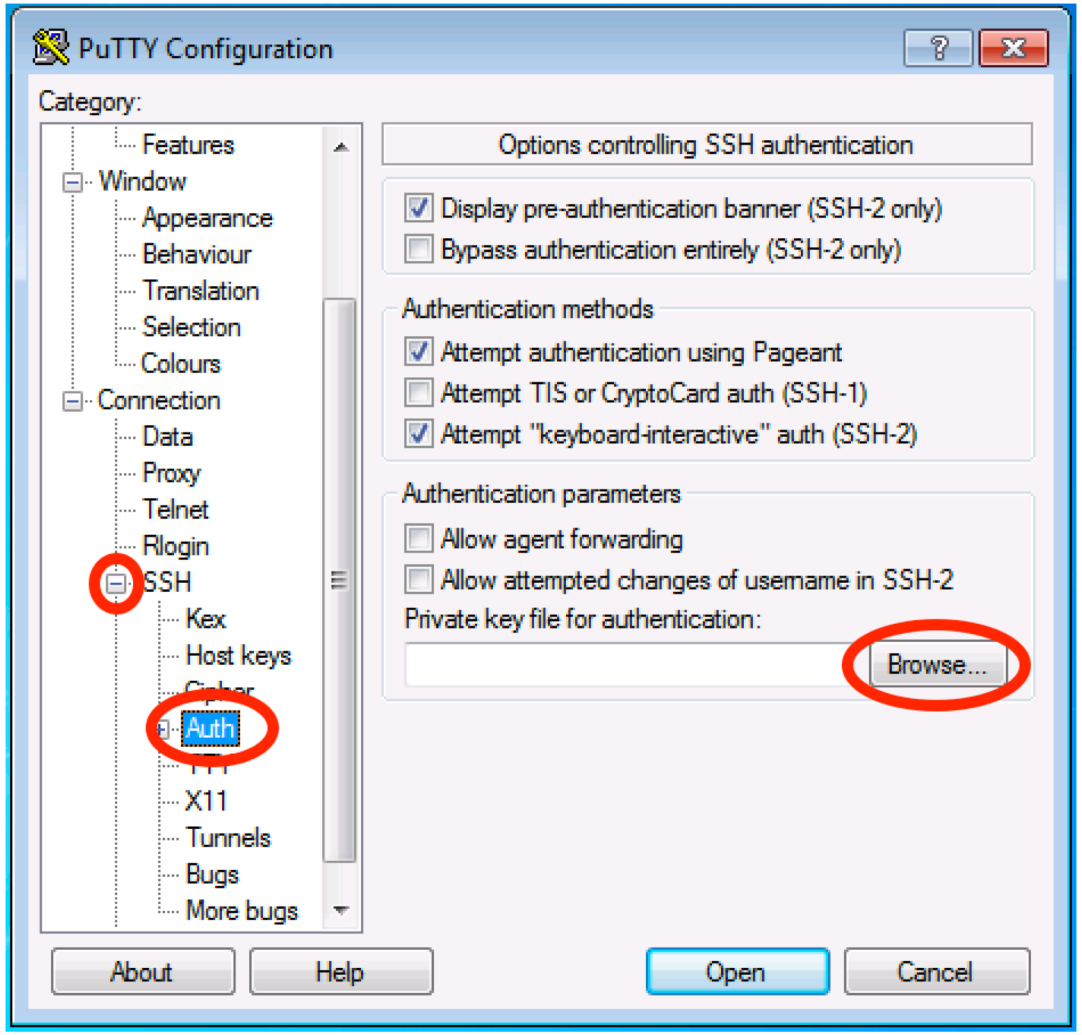
- Run PuTTY and enter the IP address of your instance into the **Host Name** box.



Creating a VM: Connect to the Instance (Linux)

From Windows (cont.):

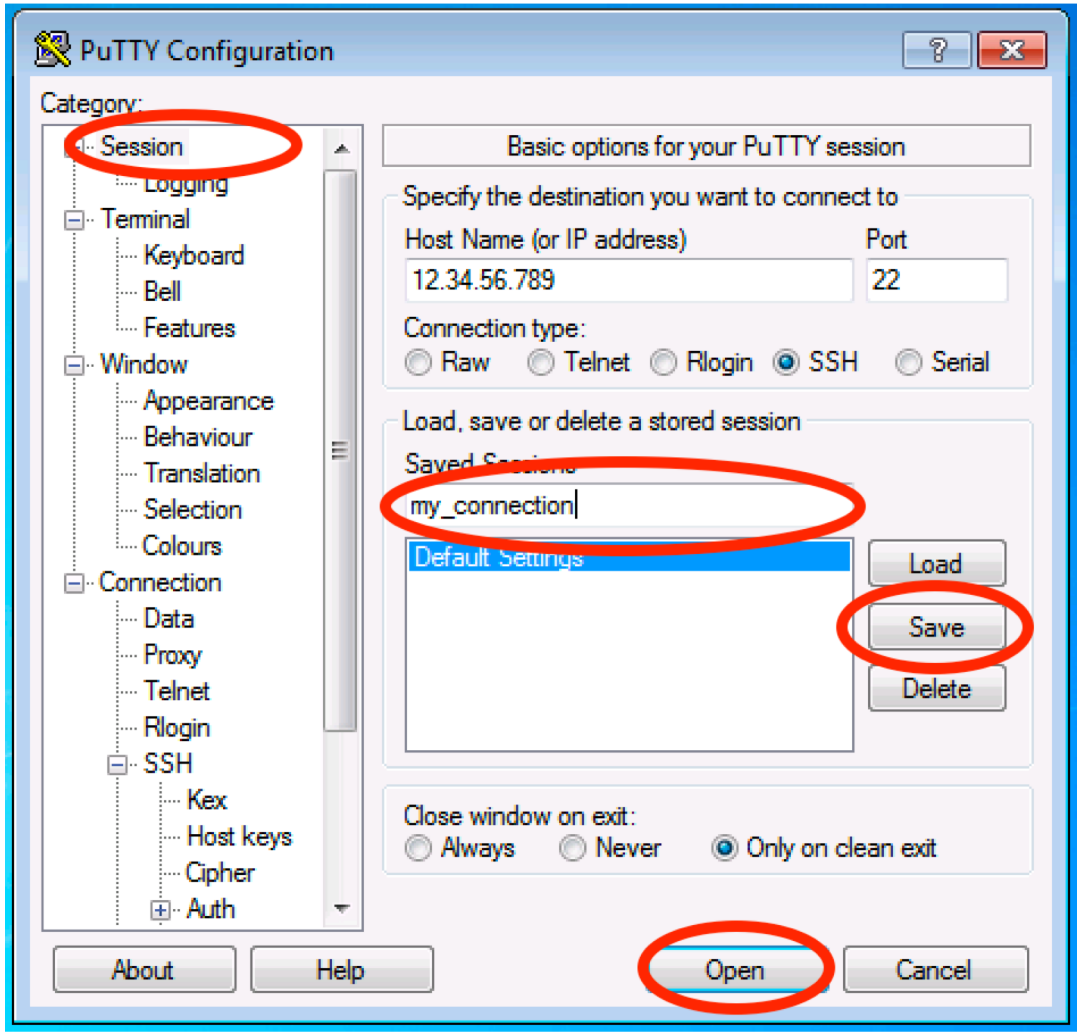
- In the left-hand category list, click **+** next to SSH and select **Auth**
- Click **Browse** and select the ppk version of your private key file.



Creating a VM: Connect to the Instance (Linux)

From Windows (cont.):

- To save this session for future use, scroll back up the left-hand list and select Session.
- Type a name for your session in the text box under **Saved Sessions** and click **Save**.
- To open the connection, click **Open**



Creating a VM: Connect to the Instance (Linux)

For Mac/Linux:

- Open your terminal and enter the command:

```
ssh -i key_file.pem centos@ip.of.your.vm
```

- -i allows us to use a key to connect
- The username depends on what Linux image you created your instance with
  - Since we are using CentOS, we use `centos` as the username
  - For an Ubuntu instance, the username would be `ubuntu`

- **If you get this error:**

```
Permissions 0644 for 'key_file.pem' are too open.
```

- **Enter the command `chmod 700 key_file.pem` and try to reconnect**

Connecting to Previously Created Instances

1. **Connect to the Anvil VPN**
   - Use Cisco AnyConnect Client to connect to anvil-vpn.unl.edu
2. ~~**Create SSH Keys**~~
3. ~~**Create Instance**~~
4. **Connect to Instance**
   - Use Remote Desktop to connect to Windows instances
   - Use SSH to connect to Linux instances

Using Anvil: Access and Overview

- Access to Anvil is by request only:
  - To request access visit: https://hcc.unl.edu/request-anvil-access
- Group Resource Limits:
  - Groups are initially allocated the following limits:

Number of Instances	Virtual Cores	RAM	Number of Volumes	Volume Storage
10	20	60GB	10	100 GB

  - Resource limits can be increased if necessary.
    - Email us at hcc-support@unl.edu to request an increase.

Contact Us

- **Email:** hcc-support@unl.edu
- **In Person:**

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