



BOTO3 AND JUPYTER INSTALLATION GUIDE

Install Boto3 and Jupyter on the EC2 instance with **Amazon Linux** as the OS.

BOTO3

1. The first step is to log into the EC2 instance. You can use the following AWS CLI command to check the available instances in your account.

```
aws ec2 describe-instances --output table
```

```
C:\Users\sanskar.agrawal>aws ec2 describe-instances --output table
```

DescribeInstances	
Reservations	
OwnerId	688716701626
ReservationId	r-09a806cf680979232
Instances	
AmiLaunchIndex	0
Architecture	x86_64
ClientToken	
EbsOptimized	False
EnaSupport	True
Hypervisor	xen
ImageId	ami-062f7200baf2fa504
InstanceId	i-0972d2698b920051e
InstanceType	t2.micro
KeyName	csd_pair1
LaunchTime	2020-01-23T08:41:09.000Z
PrivateDnsName	ip-172-31-93-141.ec2.internal
PrivateIpAddress	172.31.93.141
PublicDnsName	ec2-54-210-233-152.compute-1.amazonaws.com
PublicIpAddress	54.210.233.152
RootDeviceName	/dev/xvda
RootDeviceType	ebs
SourceDestCheck	True
StateTransitionReason	
SubnetId	subnet-ef1e33c1
VirtualizationType	hvm

Note: If you don't have an existing EC2 instance, you are first expected to create it.

2. The instance must be in the running state for you to connect to it. In case it is not in that state, you can run the following command to start the instance,;

```
aws ec2 start-instances --instance-ids your_instance_id
```

3. Once the instance is in running state, you can extract the Public DNS link using the following command:

```
aws ec2 describe-instances --output table
```

```
C:\Users\sanskar.agrawal>aws ec2 describe-instances --output table
```

DescribeInstances	
Reservations	
OwnerId	688716701626
ReservationId	r-09a806cf680979232
Instances	
AmiLaunchIndex	0
Architecture	x86_64
ClientToken	
EbsOptimized	False
EnaSupport	True
Hypervisor	xen
ImageId	ami-062f7200baf2fa504
InstanceId	i-0972d2698b920051e
InstanceType	t2.micro
KeyName	csd_pair1
LaunchTime	2020-01-23T08:41:09.000Z
PrivateDnsName	ip-172-31-93-141.ec2.internal
PrivateIpAddress	172.31.93.141
PublicDnsName	ec2-54-210-233-152.compute-1.amazonaws.com
PublicIpAddress	54.210.233.152
RootDeviceName	/dev/xvda
RootDeviceType	ebs
SourceDestCheck	True
StateTransitionReason	
SubnetId	subnet-ef1e33c1
VirtualizationType	hvm

You can now connect to the EC2 instance using the Key pair file that you must have saved when the instance was created. This step has been covered in the previous lectures. You can refer to the documentation provided.

- a. Linux/macOS: You can directly SSH into the instance using the local terminal.
- b. Windows: You must use the PuTTY software to log into the instance. Make sure that you have the same public IP address as before. In case, the address has changed, you must add a new rule in the Security Group.

4. Once you have logged into the EC2 instance, the first step is to check for the prerequisites. You will require the pip3 package to install the Boto3 package. You can run the following commands:

```
python3 --version  
pip3 --version
```

Output:

```
ec2-user@ip-172-31-22-81:~  
login as: ec2-user  
Authenticating with public key "imported-openssh-key"  
  
  _ | _ | _ )  
  _ | ( _ /   Amazon Linux 2 AMI  
  _ | \ _ | _ |  
  
https://aws.amazon.com/amazon-linux-2/  
2 package(s) needed for security, out of 5 available  
Run "sudo yum update" to apply all updates.  
[ec2-user@ip-172-31-22-81 ~]$ python3 --version  
-bash: python3: command not found  
[ec2-user@ip-172-31-22-81 ~]$ pip3 --version  
-bash: pip3: command not found  
[ec2-user@ip-172-31-22-81 ~]$
```

If the packages are installed, you can skip the 5th and the 6th step.

5. As you can see in the image above, you must first install the Python3 and pip3 package. To install Python, you must run the following commands:

```
sudo yum -y update
```

This command will help you to update the Linux repository.

Output:

```
Verifying : tzdata-2020a-1.amzn2.noarch
Verifying : pll-kit-trust-0.23.21-2.amzn2.0.1.x86_64
Verifying : pll-kit-0.23.21-2.amzn2.0.1.x86_64
Verifying : chrony-3.2-1.amzn2.0.5.x86_64
Verifying : cloud-init-19.3-3.amzn2.noarch

Dependency Installed:
  nettle.x86_64 0:2.7.1-8.amzn2.0.2

Updated:
  chrony.x86_64 0:3.5.1-1.amzn2.0.1      cloud-init.noarch 0:19
  tzdata.noarch 0:2020d-2.amzn2

Complete!
```

```
sudo yum install python36
```

This command will install the Python 3.6 on your instance

Output:

```
[ec2-user@ip-172-31-22-81 ~]$ sudo yum install python36
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
No package python36 available.
Error: Nothing to do
[ec2-user@ip-172-31-22-81 ~]$
```

Note: In case you receive an error as shown below, you can run the following:

```
sudo yum -y install python37
```

Output:

```
Installed:
  python3.x86_64 0:3.7.9-1.amzn2.0.1

Dependency Installed:
  python3-libs.x86_64 0:3.7.9-1.amzn2.0.1      python3-pip.noarch 0:9.0.3-1.amzn2.0.2      python3-setuptools.noarch 0:38.4.0-3.amzn2.0.6

Complete!
[ec2-user@ip-172-31-22-81 ~]$
```



6. Once you have installed Python, the next step is to install the pip package corresponding to Python3.

```
curl -O https://bootstrap.pypa.io/get-pip.py
```

Output:

```
[ec2-user@ip-172-31-93-141 ~]$ curl -O https://bootstrap.pypa.io/get-pip.py
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           Dload  Upload   Total             Spent    Left     Speed
100 1734k  100 1734k    0     0  27.7M           0 --:--:-- --:--:-- --:--:-- 27.7M
[ec2-user@ip-172-31-93-141 ~]$
```

```
sudo python3 get-pip.py
```

This command will install the pip corresponding to Python3 on your instance.

Output:

```
[ec2-user@ip-172-31-22-81 ~]$ sudo python3 get-pip.py
Collecting pip
  Downloading pip-20.3.3-py2.py3-none-any.whl (1.5 MB)
    | 1.5 MB 17.2 MB/s
Collecting wheel
  Downloading wheel-0.36.2-py2.py3-none-any.whl (35 kB)
Installing collected packages: pip, wheel
Attempting uninstall: pip
  Found existing installation: pip 9.0.3
  Uninstalling pip-9.0.3:
    Successfully uninstalled pip-9.0.3
  WARNING: The scripts pip, pip3 and pip3.7 are installed in '/usr/local/bin' which is not on PATH.
  Consider adding this directory to PATH or, if you prefer to suppress this warning, use --no-warn-script-location.
  WARNING: The script wheel is installed in '/usr/local/bin' which is not on PATH.
  Consider adding this directory to PATH or, if you prefer to suppress this warning, use --no-warn-script-location.
Successfully installed pip-20.3.3 wheel-0.36.2
[ec2-user@ip-172-31-22-81 ~]$
```

7. Now, you have the required packages installed. However, there is one check required at this step. You must be able to call the functions associated with pip directly. You must not specify the complete path of the package to run the commands.

To check this, run the following command:

pip3 --version

Output:

```
[ec2-user@ip-172-31-22-81 ~]$ python3 --version
Python 3.7.9
[ec2-user@ip-172-31-22-81 ~]$ pip3 --version
pip 20.3.3 from /usr/local/lib/python3.7/site-packages/pip (python 3.7)
[ec2-user@ip-172-31-22-81 ~]$
```

You must follow the steps discussed ahead to make sure that you don't receive an error in future:

- Run this command to open the bash file.

vi .bashrc

To edit the file, press the 'i' key.

- You are expected to add the following command at the end of the file.

export PATH="/usr/local/bin/:\$PATH"

```
# .bashrc

# Source global definitions
if [ -f /etc/bashrc ]; then
    . /etc/bashrc
fi

# Uncomment the following line if you don't like systemctl's auto-paging feature:
# export SYSTEMD_PAGER=

# User specific aliases and functions
export PATH="/usr/local/bin/:$PATH"
```

- Do not make any other changes in the file. Once you have added this, press **Esc** and type **:wq!** And press enter to exit the bash file.



- You must finally execute the file to load the changes.
source .bashrc
- Now verify:
pip3 -V

```
[ec2-user@ip-172-31-22-81 ~]$ pip3 -V
pip 20.3.3 from /usr/local/lib/python3.7/site-packages/pip (python 3.7)
[ec2-user@ip-172-31-22-81 ~]$
```

You are now ready with all the prerequisites to install the Boto3 package.



8. To install the Boto3 package, you must run the following command in the instance:

```
pip3 install boto3
```

Output:

```
[ec2-user@ip-172-31-93-141 ~]$ pip3 install boto3
Defaulting to user installation because normal site-packages is not writeable
Collecting boto3
  Downloading boto3-1.11.7-py2.py3-none-any.whl (128 kB)
    | 128 kB 34.7 MB/s
Collecting s3transfer<0.4.0,>=0.3.0
  Downloading s3transfer-0.3.1-py2.py3-none-any.whl (69 kB)
    | 69 kB 14.8 MB/s
Collecting jmespath<1.0.0,>=0.7.1
  Downloading jmespath-0.9.4-py2.py3-none-any.whl (24 kB)
Collecting botocore<1.15.0,>=1.14.7
  Downloading botocore-1.14.7-py2.py3-none-any.whl (5.9 MB)
    | 5.9 MB 35.8 MB/s
Collecting docutils<0.16,>=0.10
  Downloading docutils-0.15.2-py3-none-any.whl (547 kB)
    | 547 kB 33.4 MB/s
Collecting python-dateutil<3.0.0,>=2.1
  Downloading python-dateutil-2.8.1-py2.py3-none-any.whl (227 kB)
    | 227 kB 43.0 MB/s
Collecting urllib3<1.26,>=1.20
  Downloading urllib3-1.25.8-py2.py3-none-any.whl (125 kB)
    | 125 kB 46.6 MB/s
Collecting six>=1.5
  Downloading six-1.14.0-py2.py3-none-any.whl (10 kB)
Installing collected packages: docutils, jmespath, six, python-dateutil, urllib3
Successfully installed boto3-1.11.7 botocore-1.14.7 docutils-0.15.2 jmespath-0.9.4
[ec2-user@ip-172-31-93-141 ~]$
```

The Boto3 package is now installed. You can check this using the command below:

```
pip3 list
```

Output:

```
[ec2-user@ip-172-31-93-141 ~]$ pip3 list
Package           Version
-----
boto3              1.11.7
botocore           1.14.7
docutils           0.15.2
jmespath           0.9.4
pip                20.0.1
python-dateutil    2.8.1
s3transfer         0.3.1
setuptools         38.4.0
six                1.14.0
urllib3            1.25.8
wheel              0.33.6
[ec2-user@ip-172-31-93-141 ~]$
```

As you can see, the Boto3 package is present in the list. The package has been successfully installed in the instance.

INSTALLING JUPYTER ON EC2 INSTANCE

1. You can run the following command on the EC2 terminal to install the jupyter server.

```
pip3 install jupyter --user
```

```
Successfully installed MarkupSafe-1.1.1 Send2Trash-1.5.0 argon2-cffi-20.1.0 async-generator-1.10 attrs-20.3.0 backcall-0.2.0 bleach-3.2.0 fusedxml-0.6.0 entrypoints-0.3 importlib-metadata-3.4.0 ipykernel-5.4.3 ipython-7.19.0 ipython-genutils-0.2.0 ipywidgets-7.6.3 jedi-0.17.0 jupyter-1.0.0 jupyter-client-6.1.1 jupyter-console-6.2.0 jupyter-core-4.7.0 jupyterlab-pygments-0.1.2 jupyterlab-widgets-1.0.0 mistune-0.7 nbformat-5.1.2 nest-asyncio-1.4.3 notebook-6.2.0 packaging-20.8 pandocfilters-1.4.3 parso-0.8.1 pexpect-4.8.0 pickleshare-0.7.5 pycparser-2.20 pygments-2.7.4 pyparsing-2.4.7 pyrsistent-0.17.3 pyzmq-21.0.1 qtconsole-5.0.1 qtpy-1.9.0 traitlets-5.0.5 typing-extensions-3.7.4.3 wcwidth-0.2.5 webencodings-0.5.1 widgetsnbextension-3.5.1 zipp-3.4.0
[ec2-user@ip-172-31-22-81 ~]$
```

2. Verify jupyter server status using below command.

```
jupyter notebook list
```

```
[ec2-user@ip-172-31-22-81 ~]$ jupyter notebook list
Currently running servers:
[ec2-user@ip-172-31-22-81 ~]$
```

Currently jupyter server is not running.

3. You can start the Jupyter Notebook server using the command provided below:

```
jupyter notebook
```

```
[ec2-user@ip-172-31-22-81 ~]$ jupyter notebook
[I 06:33:26.140 NotebookApp] Serving notebooks from local directory: /home/ec2-user
[I 06:33:26.140 NotebookApp] Jupyter Notebook 6.2.0 is running at:
[I 06:33:26.140 NotebookApp] http://localhost:8888/?token=297879d6ab64b1498601afe773244a055e20db1ledf8bd59
[I 06:33:26.140 NotebookApp] or http://127.0.0.1:8888/?token=297879d6ab64b1498601afe773244a055e20db1ledf8bd59
[I 06:33:26.140 NotebookApp] Use Control-C to stop this server and shut down all kernels (t
[W 06:33:26.144 NotebookApp] No web browser found: could not locate runnable browser.
[C 06:33:26.145 NotebookApp]

To access the notebook, open this file in a browser:
file:///home/ec2-user/.local/share/jupyter/runtime/nbserver-32684-open.html
Or copy and paste one of these URLs:
http://localhost:8888/?token=297879d6ab64b1498601afe773244a055e20db1ledf8bd59
or http://127.0.0.1:8888/?token=297879d6ab64b1498601afe773244a055e20db1ledf8bd59
```

Now, the Jupyter Notebook is running on the EC2 instance. However, you need to access it through a browser using SSH tunneling. This step differs for Windows and Linux/Mac users.



CONNECTING TO A JUPYTER NOTEBOOK - LINUX/MAC

1. After you have launched the Jupyter notebook server, you must open a new terminal window and run the following commands:

```
ssh -i "keypair1.pem" -N -f -L 8888:localhost:8888  
ec2-user@IPv4_address_of_EC2 instance
```

2. Next, you can select the url from the previous terminal window and paste to the local browser. You should not use **Ctrl + C** to copy as it raises the prompt to end the session. The text is automatically copied by selecting it in the window.

```
[ec2-user@ip-172-31-22-81 ~]$ jupyter notebook  
[I 06:33:26.140 NotebookApp] Serving notebooks from local directory: /home/ec2-user  
[I 06:33:26.140 NotebookApp] Jupyter Notebook 6.2.0 is running at:  
[I 06:33:26.140 NotebookApp] http://localhost:8888/?token=297879d6ab64b1498601afe773244a055e20db1ledf8bd59  
[I 06:33:26.140 NotebookApp] or http://127.0.0.1:8888/?token=297879d6ab64b1498601afe773244a055e20db1ledf8bd59  
[I 06:33:26.140 NotebookApp] Use Control-C to stop this server and shut down all kernels (t  
[W 06:33:26.144 NotebookApp] No web browser found: could not locate runnable browser.  
[C 06:33:26.145 NotebookApp]  
  
To access the notebook, open this file in a browser:  
file:///home/ec2-user/.local/share/jupyter/runtime/nbserver-32684-open.html  
Or copy and paste one of these URLs:  
http://localhost:8888/?token=297879d6ab64b1498601afe773244a055e20db1ledf8bd59  
or http://127.0.0.1:8888/?token=297879d6ab64b1498601afe773244a055e20db1ledf8bd59
```

The Jupyter notebook will be launched in the browser.

CONNECTING TO A JUPYTER NOTEBOOK - WINDOWS

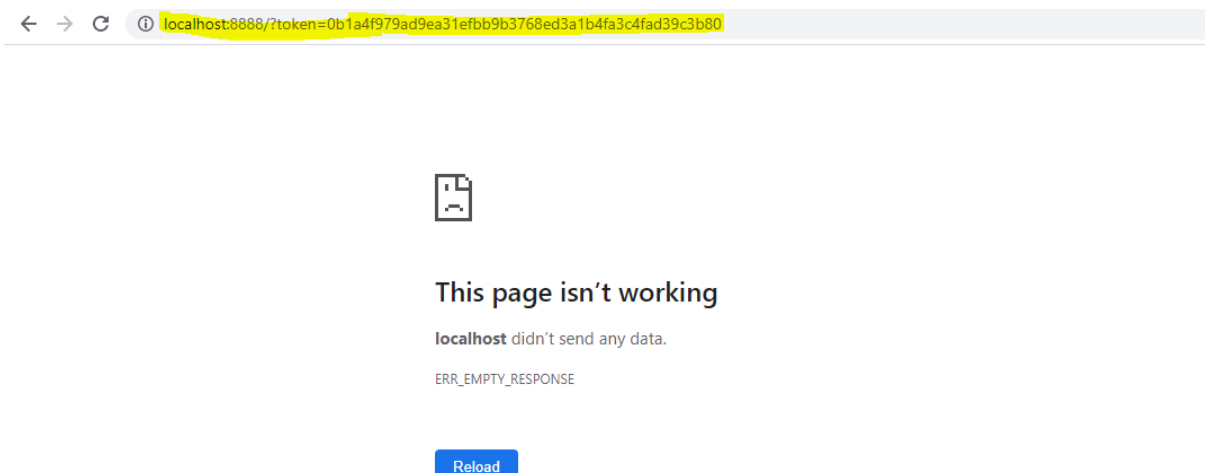
This is a step by step approach to connect to a Jupyter Notebook once it has been installed in the EC2 instance. For this task, you will require the PuTTY software when working with the Windows machine.

1. You can select the url from the PuTTY window and paste in the local browser. You should not use **Ctrl + C** to copy as it raises the prompt to end the session. The text is automatically copied by selecting it in the window.

```
[ec2-user@ip-172-31-22-81 ~]$ jupyter notebook
[I 06:33:26.140 NotebookApp] Serving notebooks from local directory: /home/ec2-user
[I 06:33:26.140 NotebookApp] Jupyter Notebook 6.2.0 is running at:
[I 06:33:26.140 NotebookApp] http://localhost:8888/?token=297879d6ab64b1498601afe773244a055e20db1ledf8bd59
[I 06:33:26.140 NotebookApp] or http://127.0.0.1:8888/?token=297879d6ab64b1498601afe773244a055e20db1ledf8bd59
[I 06:33:26.140 NotebookApp] Use Control-C to stop this server and shut down all kernels (t
[W 06:33:26.144 NotebookApp] No web browser found: could not locate runnable browser.
[C 06:33:26.145 NotebookApp]

To access the notebook, open this file in a browser:
file:///home/ec2-user/.local/share/jupyter/runtime/nbserver-32684-open.html
Or copy and paste one of these URLs:
http://localhost:8888/?token=297879d6ab64b1498601afe773244a055e20db1ledf8bd59
or http://127.0.0.1:8888/?token=297879d6ab64b1498601afe773244a055e20db1ledf8bd59
```

You will find that the Jupyter Notebook will not be launched.



The conclusion is that we can not access this url without the SSH tunneling. For this, we will again use the services offered by PuTTY.

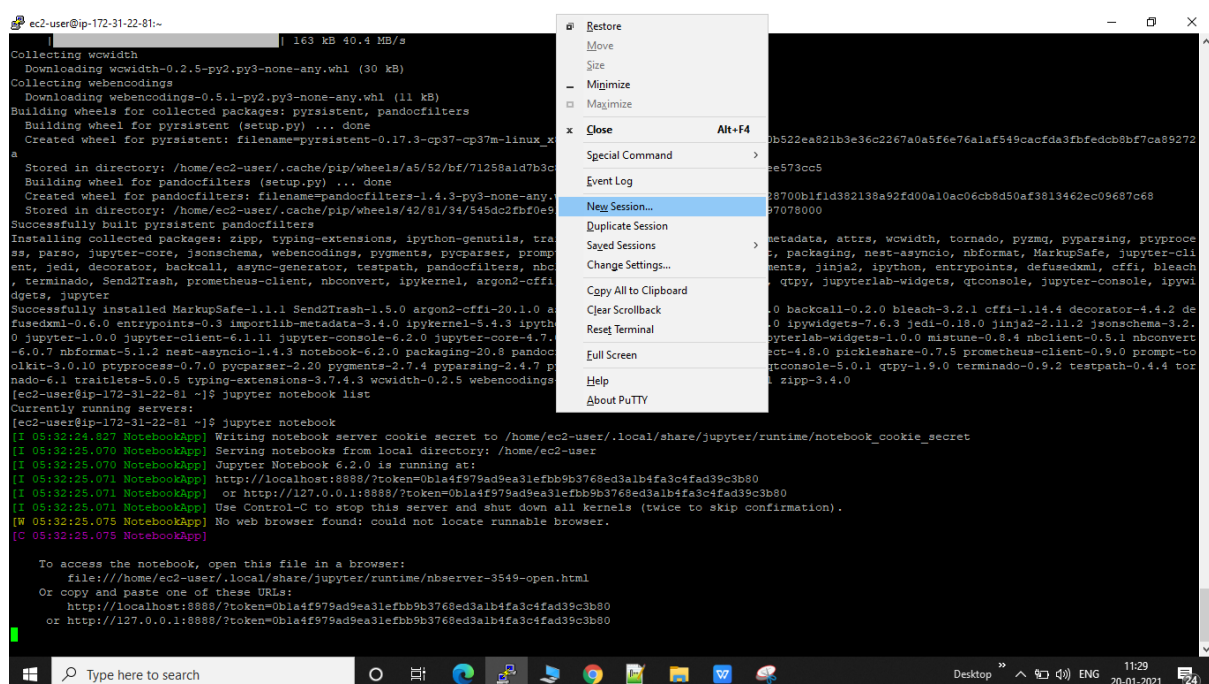
- You must first copy the public IP address of the EC2 instance from the AWS Console.

Jupyter i-0d4e8c7c45c5cab13 Running t2.micro 2/2 checks ... No alarm		
▼ Instance summary Info		
Instance ID i-0d4e8c7c45c5cab13 (Jupyter)	Public IPv4 address 34.229.163.7 open address	Private IPv4 addresses 172.31.22.81

You can fetch the same using the CLI as well. You can extract the Public DNS/IP link using the following command in AWS CLI:

```
aws ec2 describe-instances --output table
```

- Next, you must open a new PuTTY session by right clicking on the existing PuTTY window.

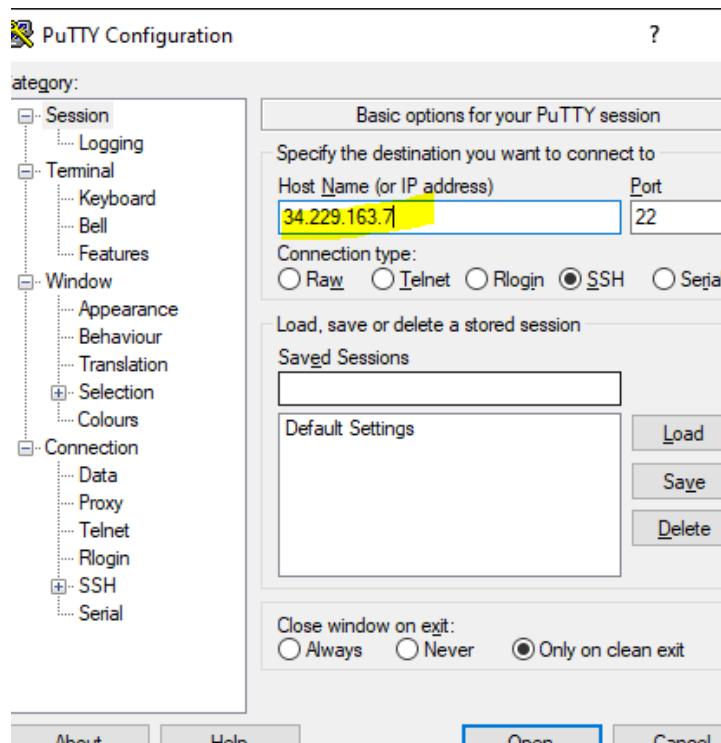


```

ec2-user@ip-172-31-22-81:~$
Collecting wcwidth
  Downloading wcwidth-0.2.5-py2.py3-none-any.whl (30 kB)
Collecting webencodings
  Downloading webencodings-0.5.1-py2.py3-none-any.whl (11 kB)
Building wheels for collected packages: pyrsistent, pandocfilters
  Building wheel for pyrsistent (setup.py) ... done
  Created wheel for pyrsistent: filename=pyrsistent-0.17.3-cp37-m-linux-x86_64.whl
Stored in directory: /home/ec2-user/.cache/pip/wheels/a5/52/bf/71258ald7b3d
Building wheel for pandocfilters (setup.py) ... done
  Created wheel for pandocfilters: filename=pandocfilters-1.4.3-py3-none-any.whl
Stored in directory: /home/ec2-user/.cache/pip/wheels/42/81/34/545dc2f0e9
Successfully built pyrsistent pandocfilters
Installing collected packages: zipp, typing-extensions, ipython-genutils, tra
as, parso, jupyter-core, jsonschema, webencodings, pygments, pyparsing, promp
ent, jedi, decorator, backcall, async-generator, testpath, pandocfilters, nbco
, terminado, Send2Trash, prometheus-client, nbconvert, ipykernel, argon2-cffi
dgets, jupyter
Successfully installed MarkupSafe-1.1.1 Send2Trash-1.5.0 argon2-cffi-20.1.0 a
fusedxml-0.6.0 entrypoints-0.3 importlib-metadata-3.4.0 ipykernel-5.4.3 ipyth
0 jupyter-1.0.0 jupyter-client-6.1.1 jupyter-console-6.2.0 jupyter-core-4.7.
-6.0.7 nbformat-5.1.2 nest-asyncio-1.4.3 notebook-6.2.0 packaging-20.9 pandoc
olkit-3.0.10 pyparsing-2.4.7 pygments-2.20 pyparsing-2.4.7 pyrsistent-0.17.3
nado-6.1 traitts-5.0.5 typing-extensions-3.7.4.3 wcwidth-0.2.5 webencodings
[ec2-user@ip-172-31-22-81 ~]$ jupyter notebook list
Currently running servers:
[ec2-user@ip-172-31-22-81 ~]$ jupyter notebook
[I 05:32:28.827 NotebookApp] Writing notebook server cookie secret to /home/ec2-user/.local/share/jupyter/runtime/notebook_cookie_secret
[I 05:32:28.827 NotebookApp] Serving notebooks from local directory: /home/ec2-user
[I 05:32:28.827 NotebookApp] 0 jupyter-1.0.0 jupyter-client-6.1.1 jupyter-console-6.2.0 jupyter-core-4.7.
-6.0.7 nbformat-5.1.2 nest-asyncio-1.4.3 notebook-6.2.0 packaging-20.9 pandoc
olkit-3.0.10 pyparsing-2.4.7 pygments-2.20 pyparsing-2.4.7 pyrsistent-0.17.3
nado-6.1 traitts-5.0.5 typing-extensions-3.7.4.3 wcwidth-0.2.5 webencodings
[I 05:32:28.827 NotebookApp] http://localhost:8888/?token=0b1a4f979ad9ea31efbb9b3768ed3a1b4fa3c4fad39c3b80
[I 05:32:28.827 NotebookApp] or http://127.0.0.1:8888/?token=0b1a4f979ad9ea31efbb9b3768ed3a1b4fa3c4fad39c3b80
[I 05:32:28.827 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
[W 05:32:28.827 NotebookApp] No web browser found: could not locate runnable browser.
[C 05:32:28.827 NotebookApp]

To access the notebook, open this file in a browser:
  file:///home/ec2-user/.local/share/jupyter/runtime/nbserver-3549-open.html
Or copy and paste one of these URLs:
  http://localhost:8888/?token=0b1a4f979ad9ea31efbb9b3768ed3a1b4fa3c4fad39c3b80
  or http://127.0.0.1:8888/?token=0b1a4f979ad9ea31efbb9b3768ed3a1b4fa3c4fad39c3b80
  
```

4. You must paste the copied Public IP address in the PuTTY window under the Host Name.



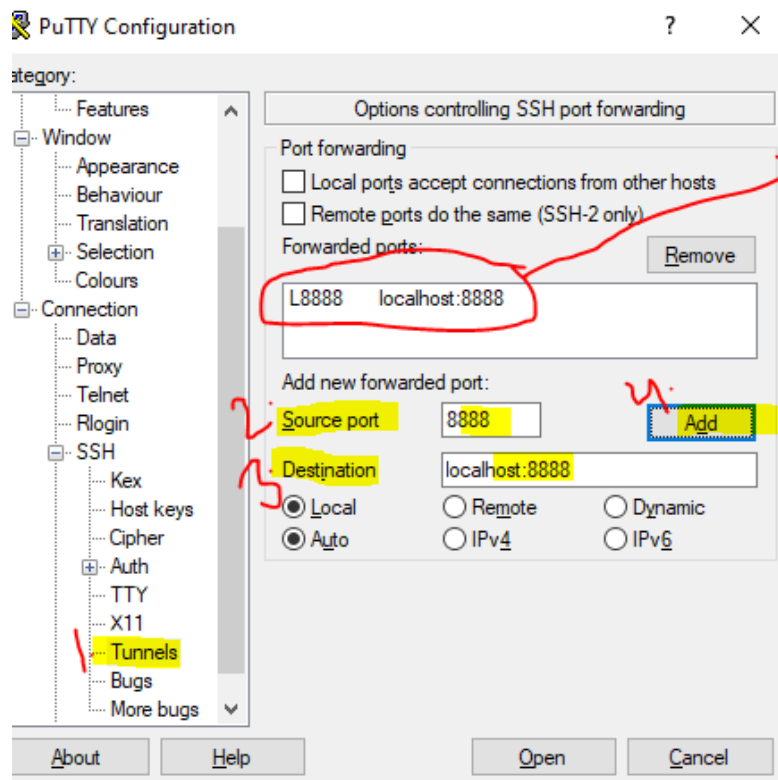
5. Next, you must establish a connection between the 8888 ports of both the machines. This port will be used in launching the Jupyter Notebook hosted on the EC2 instance on your local machine. For this, go to the 'Tunnels' section under 'SSH' to add the connection. Add the following elements as shown in the image:

SSH > Tunnels

Source port: **8888**

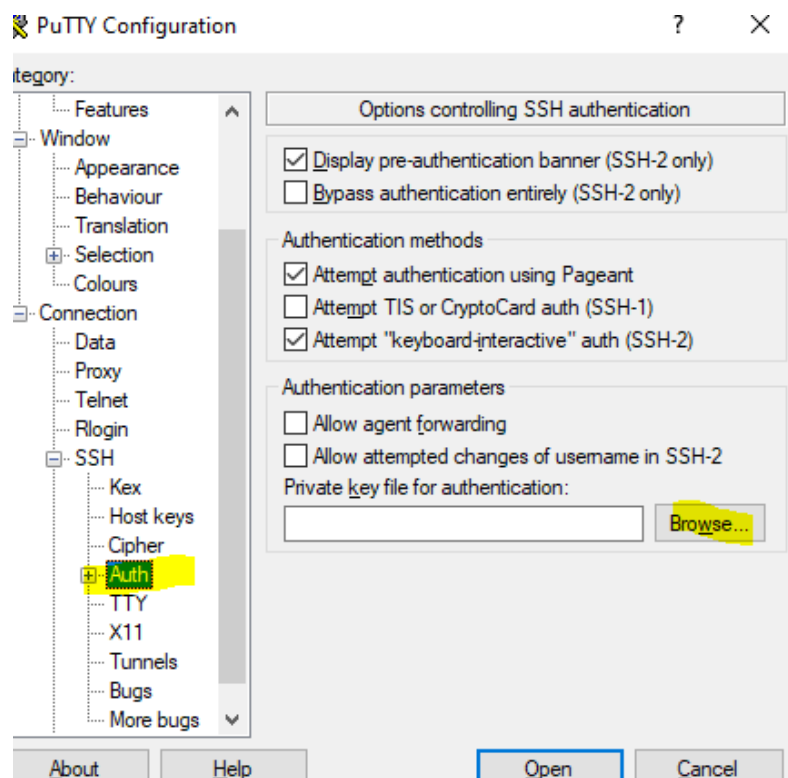
Destination: **localhost:8888**

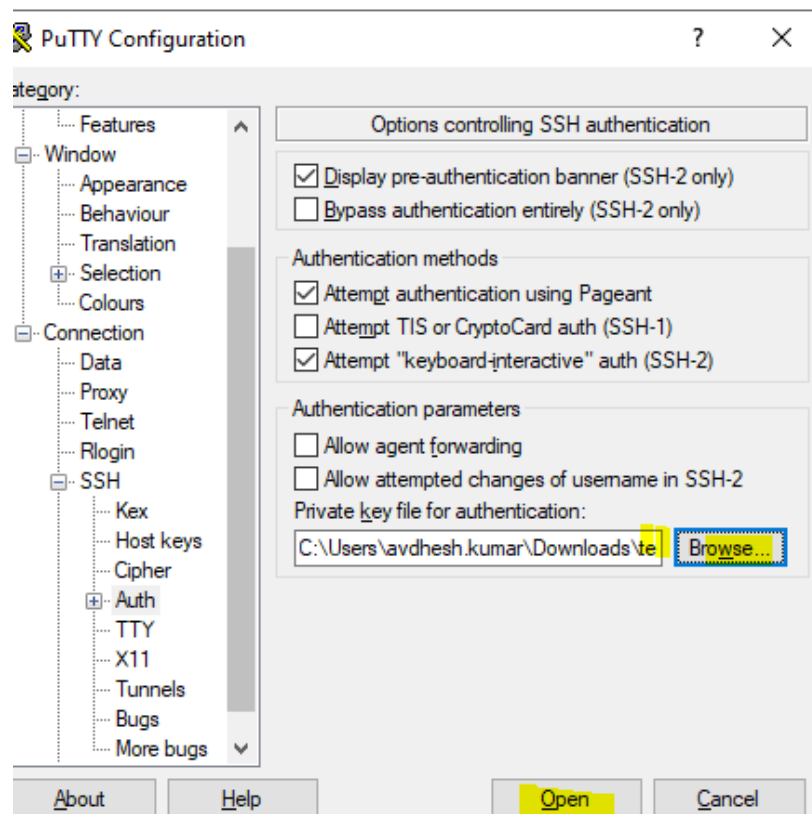
Once you have added the details, click on the 'Add' button.



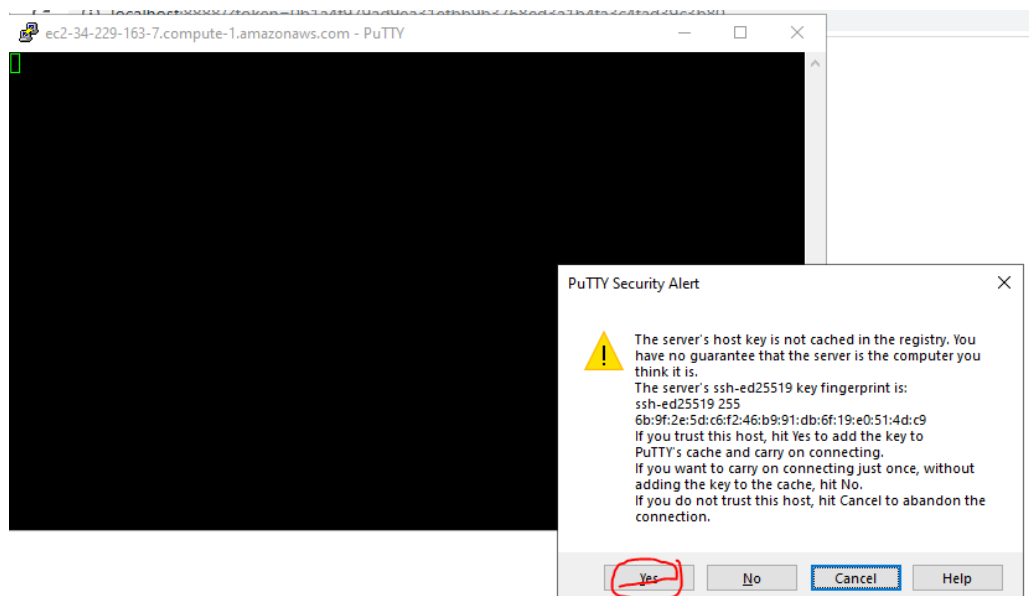
6. The next step is to provide the Key pair file that you must have saved when the instance was created. You must provide the key under the **Auth** tab of the SSH section.

SSH > Auth > Browse > ppk file path





7. After you have successfully selected the file, click on 'Open' to launch the EC2 instance. Click on 'Yes' in the dialogue box when prompted.

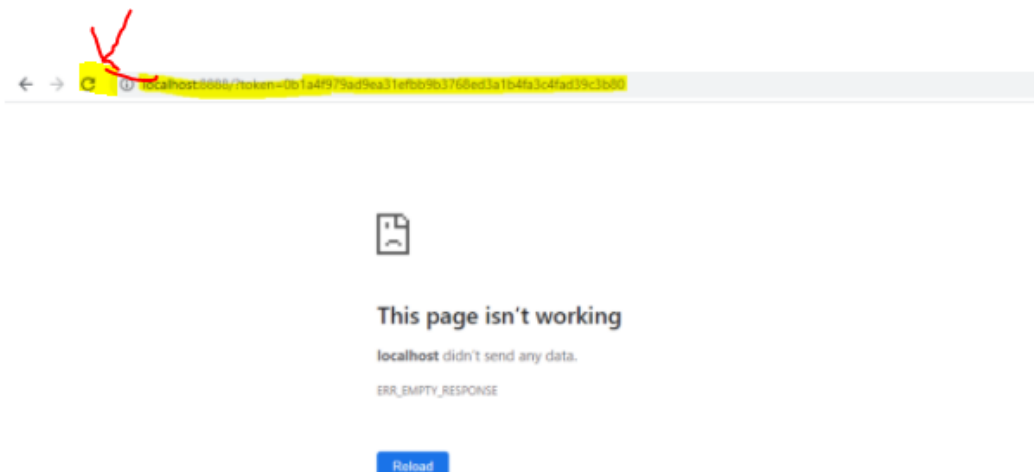


8. In the EC2 window, login with the username as 'ec2-user'. After logging in, run the following command to check the running servers:

jupyter notebook list

```
ec2-user@ip-172-31-22-81:~  
login as: ec2-user  
Authenticating with public key "imported-openssh-key"  
Last login: Wed Jan 20 06:13:06 2021 from 110.235.228.63  
  
  _ | _ | _ )  
  _ | ( _ | /  Amazon Linux 2 AMI  
  _ | \ _ | _ |  
  
https://aws.amazon.com/amazon-linux-2/  
[ec2-user@ip-172-31-22-81 ~]$ jupyter notebook list  
Currently running servers:  
http://localhost:8888/?token=0b1a4f979ad9ea31efbb9b3768ed3a1b4fa3c4fad39c3b80 ::  
/home/ec2-user  
[ec2-user@ip-172-31-22-81 ~]$
```

You can now select the link mentioned in the window to copy, and then paste it in the local browser to access the Jupyter notebook.





← → ↻

localhost:8888/tree

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jupyter

Quit Logout

Files

Running

Clusters

Select items to perform actions on them.

Upload

New

↻

<input type="checkbox"/>	0	▼	📁 /	Name ▼	Last Modified	File size
<input type="checkbox"/>			📄	get-pip.py	an hour ago	1.89 MB