UNIVERSITY OF PETROLEUM & ENERGY STUDIES

Dehradun

APPLICATION CONTAINERIZATION

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Experiment-1

Create VM using Vagrant

Step-1: Download and Install Virtual Box(5.2.44) as well as Vagrant(2.2.10)

- **Virtual box**
  https://www.virtualbox.org/wiki/Download_Old_Builds_5_2
- **Vagrant**
  https://www.vagrantup.com/

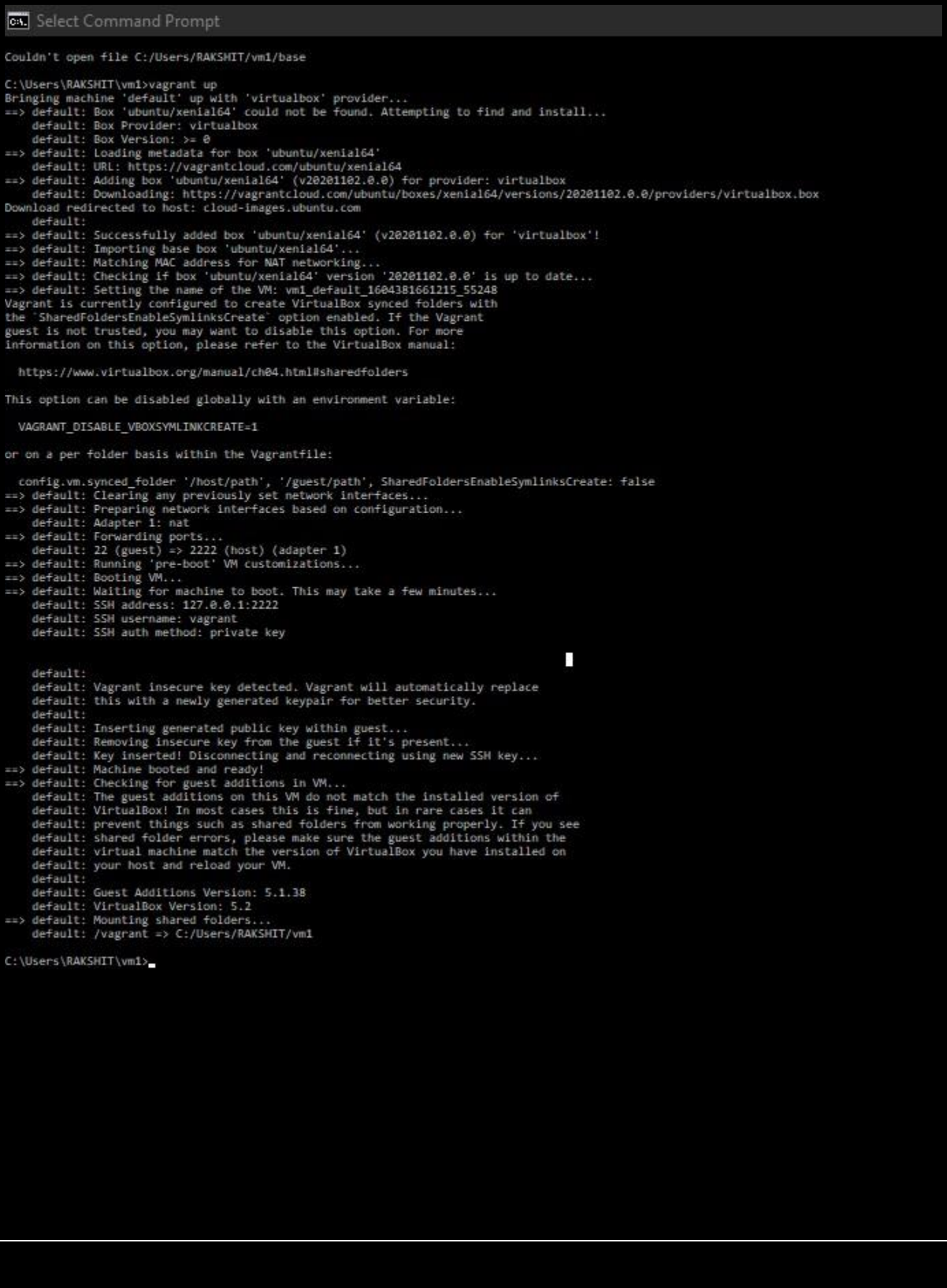
Step-2: After installing vagrant check the version and make a folder to initialize vagrantfile.

```
Microsoft Windows [Version 10.0.19041.572]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\RAKSHIT>vargrant --version
'vargrant' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\RAKSHIT>vagrant --version
Vagrant 2.2.10

C:\Users\RAKSHIT>mkdir vm1

C:\Users\RAKSHIT>cd vm1

C:\Users\RAKSHIT\vm1>vagrant init
A `Vagrantfile` has been placed in this directory. You are now
ready to `vagrant up` your first virtual environment! Please read
the comments in the Vagrantfile as well as documentation on
`vagrantup.com` for more information on using Vagrant.
```

Step-3: Add **config.vm.box = "ubuntu/xenial64" to** vagrantfile

```
13  # Every Vagrant development environment requires a box. You can search for
14  # boxes at https://vagrantcloud.com/search.
15  config.vm.box = "ubuntu/xenial64"
16
17  # Disable automatic box update checking. If you disable this, then
18  # boxes will only be checked for updates when the user runs
19  # `vagrant box outdated`. This is not recommended.
20  # config.vm.box_check_update = false
```

Step-4: Run **vagrant up** command



Step-5: Run **vagrant ssh** command to enter the virtual machine.

```
==> default: Mounting shared folders...
    default: /vagrant => C:/Users/RAKSHIT/vm1

C:\Users\RAKSHIT\vm1>vagrant ssh
Welcome to Ubuntu 16.04.7 LTS (GNU/Linux 4.4.0-193-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

0 packages can be updated.
0 updates are security updates.

New release '18.04.5 LTS' available.
Run 'do-release-upgrade' to upgrade to it.


vagrant@ubuntu-xenial:~$
```

Step-6: Install the docker using following steps

- First, in order to ensure the downloads are valid, add the GPG key for the official Docker repository to your system:

  ```
  $ curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
  ```

  ```
  vagrant@ubuntu-xenial:~$ curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add
  OK
  ```

- Add the Docker repository to APT sources:

  ```
  $ sudo add-apt-repository "deb [arch=amd64] https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable"
  ```

- Next, update the package database with the Docker packages from the newly added repo:

  ```
  $ sudo apt-get update
  ```

```
vagrant@ubuntu-xenial:~$ sudo add-apt-repository "deb [arch=amd64] https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable"
vagrant@ubuntu-xenial:~$ sudo apt-get update
Get:1 https://download.docker.com/linux/ubuntu xenial InRelease [66.2 kB]
Get:2 http://security.ubuntu.com/ubuntu xenial-security InRelease [109 kB]
Get:3 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages [15.0 kB]
Hit:4 http://archive.ubuntu.com/ubuntu xenial InRelease
Get:5 http://archive.ubuntu.com/ubuntu xenial-updates InRelease [109 kB]
Get:6 http://security.ubuntu.com/ubuntu xenial-security/universe amd64 Packages [772 kB]
Get:7 http://archive.ubuntu.com/ubuntu xenial-backports InRelease [107 kB]
Get:8 http://archive.ubuntu.com/ubuntu xenial/universe amd64 Packages [7,532 kB]
Get:9 http://security.ubuntu.com/ubuntu xenial-security/universe Translation-en [218 kB]
Get:10 http://security.ubuntu.com/ubuntu xenial-security/multiverse amd64 Packages [8,236 B]
Get:11 http://security.ubuntu.com/ubuntu xenial-security/multiverse Translation-en [2,888 B]
Get:12 http://archive.ubuntu.com/ubuntu xenial/universe Translation-en [4,354 kB]
Get:13 http://archive.ubuntu.com/ubuntu xenial/multiverse amd64 Packages [144 kB]
Get:14 http://archive.ubuntu.com/ubuntu xenial/multiverse Translation-en [106 kB]
Get:15 http://archive.ubuntu.com/ubuntu xenial-updates/universe amd64 Packages [1,194 kB]
Get:16 http://archive.ubuntu.com/ubuntu xenial-updates/universe Translation-en [348 kB]
Get:17 http://archive.ubuntu.com/ubuntu xenial-updates/multiverse amd64 Packages [23.0 kB]
Get:18 http://archive.ubuntu.com/ubuntu xenial-updates/multiverse Translation-en [8,632 B]
Get:19 http://archive.ubuntu.com/ubuntu xenial-backports/main amd64 Packages [9,812 B]
Get:20 http://archive.ubuntu.com/ubuntu xenial-backports/main Translation-en [4,456 B]
Get:21 http://archive.ubuntu.com/ubuntu xenial-backports/universe amd64 Packages [11.3 kB]
Get:22 http://archive.ubuntu.com/ubuntu xenial-backports/universe Translation-en [4,476 B]
Fetched 15.1 MB in 39s (388 kB/s)
Reading package lists... Done
vagrant@ubuntu-xenial:~$
```

- Make sure you are about to install from the Docker repo instead of the default Ubuntu 16.04 repo:

```
$ apt-cache policy docker-ce
```

```
vagrant@ubuntu-xenial:~$ apt-cache policy docker-ce
docker-ce:
  Installed: (none)
  Candidate: 5:19.03.13~3-0~ubuntu-xenial
  Version table:
     5:19.03.13~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:19.03.12~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:19.03.11~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:19.03.10~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:19.03.9~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:19.03.8~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:19.03.7~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:19.03.6~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:19.03.5~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:19.03.4~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:19.03.3~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:19.03.2~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:19.03.1~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:19.03.0~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:18.09.9~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:18.09.8~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:18.09.7~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:18.09.6~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:18.09.5~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:18.09.4~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:18.09.3~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:18.09.2~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:18.09.1~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     5:18.09.0~3-0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     18.06.3~ce~3-0~ubuntu 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     18.06.2~ce~3-0~ubuntu 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     18.06.1~ce~3-0~ubuntu 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     18.06.0~ce~3-0~ubuntu 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     18.03.1~ce~0~ubuntu 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     18.03.0~ce~0~ubuntu 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     17.12.1~ce~0~ubuntu 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     17.12.0~ce~0~ubuntu 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     17.09.1~ce~0~ubuntu 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     17.09.0~ce~0~ubuntu 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     17.06.2~ce~0~ubuntu 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     17.06.1~ce~0~ubuntu 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     17.06.0~ce~0~ubuntu 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     17.03.3~ce~0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     17.03.2~ce~0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     17.03.1~ce~0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
     17.03.0~ce~0~ubuntu-xenial 500
        500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages
```

- Finally, install Docker:

```
$ sudo apt-get install -y docker-ce
```

```
vagrant@ubuntu-xenial:~$ sudo apt-get install -y docker-ce
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  aufs-tools cgroupfs-mount containerd.io docker-ce-cli libltdl7 pigz
Suggested packages:
  mountall
The following NEW packages will be installed:
  aufs-tools cgroupfs-mount containerd.io docker-ce docker-ce-cli libltdl7 pigz
0 upgraded, 7 newly installed, 0 to remove and 0 not upgraded.
Need to get 91.2 MB of archives.
After this operation, 410 MB of additional disk space will be used.
Get:1 https://download.docker.com/linux/ubuntu xenial/stable amd64 containerd.io amd64 1.3.7-1 [24.3 MB]
Get:2 http://archive.ubuntu.com/ubuntu xenial/universe amd64 pigz amd64 2.3.1-2 [61.1 kB]
Get:3 http://archive.ubuntu.com/ubuntu xenial/universe amd64 aufs-tools amd64 1:3.2+20130722-1.1ubuntu1 [92.9 kB]
Get:4 http://archive.ubuntu.com/ubuntu xenial/universe amd64 cgroupfs-mount all 1.2 [4,970 B]
Get:5 http://archive.ubuntu.com/ubuntu xenial/main amd64 libltdl7 amd64 2.4.6-0.1 [38.3 kB]
Get:6 https://download.docker.com/linux/ubuntu xenial/stable amd64 docker-ce-cli amd64 5:19.03.13~3-0~ubuntu-xenial [44.2 MB]
Get:7 https://download.docker.com/linux/ubuntu xenial/stable amd64 docker-ce amd64 5:19.03.13~3-0~ubuntu-xenial [22.5 MB]
Fetched 91.2 MB in 5s (15.4 MB/s)
Selecting previously unselected package pigz.
(Reading database ... 54328 files and directories currently installed.)
Preparing to unpack .../pigz_2.3.1-2_amd64.deb ...
Unpacking pigz (2.3.1-2) ...
Selecting previously unselected package aufs-tools.
Preparing to unpack .../aufs-tools_1%3a3.2+20130722-1.1ubuntu1_amd64.deb ...
Unpacking aufs-tools (1:3.2+20130722-1.1ubuntu1) ...
Selecting previously unselected package cgroupfs-mount.
Preparing to unpack .../cgroupfs-mount_1.2_all.deb ...
Unpacking cgroupfs-mount (1.2) ...
Selecting previously unselected package containerd.io.
Preparing to unpack .../containerd.io_1.3.7-1_amd64.deb ...
Unpacking containerd.io (1.3.7-1) ...
Selecting previously unselected package docker-ce-cli.
Preparing to unpack .../docker-ce-cli_5%3a19.03.13~3-0~ubuntu-xenial_amd64.deb ...
Unpacking docker-ce-cli (5:19.03.13~3-0~ubuntu-xenial) ...
Selecting previously unselected package docker-ce.
Preparing to unpack .../docker-ce_5%3a19.03.13~3-0~ubuntu-xenial_amd64.deb ...
Unpacking docker-ce (5:19.03.13~3-0~ubuntu-xenial) ...
Selecting previously unselected package libltdl7:amd64.
Preparing to unpack .../libltdl7_2.4.6-0.1_amd64.deb ...
Unpacking libltdl7:amd64 (2.4.6-0.1) ...
Processing triggers for man-db (2.7.5-1) ...
Processing triggers for libc-bin (2.23-0ubuntu11.2) ...
Processing triggers for ureadahead (0.100.0-19.1) ...
Processing triggers for systemd (229-4ubuntu21.29) ...
Setting up pigz (2.3.1-2) ...
Setting up aufs-tools (1:3.2+20130722-1.1ubuntu1) ...
Setting up cgroupfs-mount (1.2) ...
Setting up containerd.io (1.3.7-1) ...
Setting up docker-ce-cli (5:19.03.13~3-0~ubuntu-xenial) ...
Setting up docker-ce (5:19.03.13~3-0~ubuntu-xenial) ...
Setting up libltdl7:amd64 (2.4.6-0.1) ...
Processing triggers for libc-bin (2.23-0ubuntu11.2) ...
Processing triggers for ureadahead (0.100.0-19.1) ...
Processing triggers for systemd (229-4ubuntu21.29) ...
vagrant@ubuntu-xenial:~$
```

Step-7: Executing the Docker Command Without Sudo

- If you want to avoid typing sudo whenever you run the docker command, add your username to the docker group:

```
$ sudo usermod -aG docker ${USER}
```

- To apply the new group membership, you can log out of the server and back in, or you can type the following:

```
$ su - ${USER}
```

  You will be prompted to enter your user's password to continue. Afterwards, you can confirm that your user is now added to the docker group by typing:

- If you need to add a user to the docker group that you're not logged in as, declare that username explicitly using:

```
$ sudo usermod -aG docker username
```

- Check the version of the docker

```
vagrant@ubuntu-xenial:~$ sudo usermod -aG docker ${USER}
vagrant@ubuntu-xenial:~$ su - ${USER}
Password:
vagrant@ubuntu-xenial:~$ sudo usermod -aG docker vagrant
vagrant@ubuntu-xenial:~$ ls
vagrant@ubuntu-xenial:~$ docker --version
Docker version 19.03.13, build 4484c46d9d
vagrant@ubuntu-xenial:~$
```

Step-8: Type **docker run -it ubuntu.** Create a new directory in ubuntu docker container and list the directory using command line**.**

```
vagrant@ubuntu-xenial:~$ docker run -it ubuntu
Unable to find image 'ubuntu:latest' locally
latest: Pulling from library/ubuntu
6a5697faee43: Pull complete
ba13d3bc422b: Pull complete
a254829d9e55: Pull complete
Digest: sha256:fff16eea1a8ae92867721d90c59a75652ea66d29c05294e6e2f898704bdb8cf1
Status: Downloaded newer image for ubuntu:latest
root@1514ed739ea3:/# mkdir vm1
root@1514ed739ea3:/# cd vm1
root@1514ed739ea3:/vm1# cd ..
root@1514ed739ea3:/# ls
bin  boot  dev  etc  home  lib  lib32  lib64  libx32  media  mnt  opt  proc  root  run  sbin  srv  sys  tmp  usr  var  vm1
root@1514ed739ea3:/# cd vm1
root@1514ed739ea3:/vm1# ls
root@1514ed739ea3:/vm1#
```