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APPLICATION
CONTAINERIZATION

Name: Rakshit Kapoor

Course: B. TECH CSE DevOps (2018-22)

Roll no.: R171218082

Sapid: 500067642

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>vagrant --version
'vagrant' 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19 # 'vagrant box outdated'.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
21
```

Step-4: Run vagrant up command

C:\> Select Command Prompt

Couldn't open file C:/Users/RAKSHIT/vm1/base

```
C:\Users\RAKSHIT\vm1>vagrant up
Bringing machine 'default' up with 'virtualbox' provider...
==> default: Box 'ubuntu/xenial64' could not be found. Attempting to find and install...
default: Box Provider: virtualbox
default: Box Version: >= 0
==> default: Loading metadata for box 'ubuntu/xenial64'
default: URL: https://vagrantcloud.com/ubuntu/xenial64
==> default: Adding box 'ubuntu/xenial64' (v20201102.0.0) for provider: virtualbox
default: Downloading: https://vagrantcloud.com/ubuntu/boxes/xenial64/versions/20201102.0.0/providers/virtualbox.box
Download redirected to host: cloud-images.ubuntu.com
default:
==> default: Successfully added box 'ubuntu/xenial64' (v20201102.0.0) for 'virtualbox'!
==> default: Importing base box 'ubuntu/xenial64'...
==> default: Matching MAC address for NAT networking...
==> default: Checking if box 'ubuntu/xenial64' version '20201102.0.0' is up to date...
==> default: Setting the name of the VM: vm1_default_1604381661215_55248
Vagrant is currently configured to create VirtualBox synced folders with
the 'SharedFoldersEnableSymlinksCreate' option enabled. If the Vagrant
guest is not trusted, you may want to disable this option. For more
information on this option, please refer to the VirtualBox manual:

https://www.virtualbox.org/manual/ch04.html#sharedfolders

This option can be disabled globally with an environment variable:

VAGRANT_DISABLE_VBOXSYMLINKCREATE=1

or on a per folder basis within the Vagrantfile:

config.vm.synced_folder '/host/path', '/guest/path', SharedFoldersEnableSymlinksCreate: false
==> default: Clearing any previously set network interfaces...
==> default: Preparing network interfaces based on configuration...
default: Adapter 1: nat
==> default: Forwarding ports...
default: 22 (guest) => 2222 (host) (adapter 1)
==> default: Running 'pre-boot' VM customizations...
==> default: Booting VM...
==> default: Waiting for machine to boot. This may take a few minutes...
default: SSH address: 127.0.0.1:2222
default: SSH username: vagrant
default: SSH auth method: private key

default:
default: Vagrant insecure key detected. Vagrant will automatically replace
default: this with a newly generated keypair for better security.
default:
default: Inserting generated public key within guest...
default: Removing insecure key from the guest if it's present...
default: Key inserted! Disconnecting and reconnecting using new SSH key...
==> default: Machine booted and ready!
==> default: Checking for guest additions in VM...
default: The guest additions on this VM do not match the installed version of
default: VirtualBox! In most cases this is fine, but in rare cases it can
default: prevent things such as shared folders from working properly. If you see
default: shared folder errors, please make sure the guest additions within the
default: virtual machine match the version of VirtualBox you have installed on
default: your host and reload your VM.
default:
default: Guest Additions Version: 5.1.38
default: VirtualBox Version: 5.2
==> default: Mounting shared folders...
default: /vagrant => C:/Users/RAKSHIT/vm1
```

C:\Users\RAKSHIT\vm1>

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:~$
```

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

[illegible]

- 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:ffff16eea1a8ae92867721d90c59a75652ea66d29c05294e6e2f898704bdb8cf1
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#
```