

Title :- Implementation of Virtualization in Cloud Computing to Learn Virtualization Basics, Benefits of Virtualization in Cloud using Open Source Operating System. (Docker).

Objective :- From this experiment, the students will be able to,

- Understand the concepts of building, deploying and managing applications on Docker.
- Understand Docker interface, its commands and implement on playwithdocker.com

Problem Statement :- To understand the basic commands, its platform how it works, configuration of its instances by creating and deploying applications on both ubuntu terminal as well as playwithdocker.com.

Outcomes :-

- Students will be able to easily build, debug and deploy apps on docker terminal.
- By using dockerHub, one gets to know the container movement from and to the instance.
- One will get to know the various types of commands used in docker for various uses.

Software and Hardware Requirements :- (DOCKER)

- Software:- Windows/Linux Operating System, DockerHub Account
- Hardware:- Nil

Theory:-

Docker is a tool designed to make it easier to create, deploy, and run applications by using containers. Containers allow a developer to package up an application with all of the parts it needs, such as libraries and other dependencies, and deploy it as one package. By doing so, thanks to the container, the developer can rest assured that the application will run on any other Linux machine regardless of any customized settings that machine might have that could differ from the machine used for writing and testing the code.

In a way, Docker is a bit like a virtual machine. But unlike a virtual machine, rather than creating a whole virtual operating system, Docker allows applications to use the same Linux kernel as the system that they're running on and only requires applications be shipped with things not already running on the host computer. This gives a significant performance boost and reduces the size of the application.

And importantly, Docker is open source. This means that anyone can contribute to Docker and extend it to meet their own needs if they need additional features that aren't available out of the box.

Docker is a tool that is designed to benefit both developers and system administrators, making it a part of many DevOps (developers + operations) toolchains. For developers, it means that they can focus on writing code without worrying about the system that it will ultimately be running on. It also allows them to get a head start by using one of thousands of programs already designed to run in a Docker container as a part of their application. For operations staff, Docker gives flexibility and potentially reduces the number of systems needed because of its small footprint and lower overhead.

Program Codes with Output Screenshots:- <DOCKER COMMANDS IMPLEMENTED ON

Screenshots:-

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Dmitry: ~$ cat /dev/null
root@bash01:~# docker run hello-world
Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
1. The Docker client contacted the Docker daemon.
2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
   (unless you already had it on your machine)
3. The Docker daemon created a new container from that image which runs the
   executable that produces the output you are currently reading.
4. The Docker daemon streamed that output to the Docker client, which sent it
   to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
$ docker run -it ubuntu bash

Share images, automate workflows, and more with a new Docker Hub:
https://hub.docker.com/

For more examples and ideas, visit:
https://docs.docker.com/get-started/

root@bash01:~# docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
hello-world         latest              3ce289b69969       13 months ago      1.04GB
root@bash01:~# docker pull ubuntu
Using default tag: latest
latest: pulling from library/ubuntu
5c9761a4d1b: Pull complete
a1170e4b7e: Pull complete
c0a1a0a0bf: Pull complete
a11e9426a0f: Pull complete
Digest: sha256:0c020d08c7f531ee9d0d55f7a1a00d0e2a4ee40e7200e0a8f1ac11b
1.4GB / 1.4GB [=====] 0s
root@bash01:~# docker run --rm --name test3 ubuntu /bin/bash -l -t
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test4 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test5 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test6 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test7 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test8 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test9 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test10 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test11 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test12 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test13 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test14 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test15 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test16 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test17 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test18 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test19 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test20 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test21 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test22 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test23 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test24 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test25 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test26 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test27 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test28 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test29 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test30 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test31 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test32 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test33 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test34 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test35 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test36 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test37 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test38 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test39 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test40 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test41 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test42 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test43 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test44 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test45 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test46 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test47 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test48 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~# docker run --rm --name test49 ubuntu /bin/bash
a1170e4b7e41a400b47a2ab4b3857b794179a67fa15c10e0f759be03d0
root@bash01:~
```

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Sun 12:08 AM
root@subbrantl-mp-Pavilion-Notebook-:~#

$PS C:\> Get-Childitem -Path .\

Object: subbrantl-mp-Pavilion-Notebook-
Status: Downloaded newer image for ubuntu:latest
root@subbrantl-mp-Pavilion-Notebook-# docker run -it -d ubuntu
a795fda2f43d480847a2a349e1857b7841f9b447fad153c74b4b7f510bed105
root@subbrantl-mp-Pavilion-Notebook-# docker images
REPOSITORY          TAG             IMAGE ID          CREATED           SIZE
ubuntu              latest         ccc6e670482b     4 weeks ago      64.2MB
hello-world         latest         fcd28e9e6bb6     13 months ago    1.64MB
root@subbrantl-mp-Pavilion-Notebook-# docker ps -a
CONTAINER ID        STATUS          PORTS          NAMES
a795fda2f43f        Up 10 seconds  /bin/bash     compute_test_cerf
2897c0d566         hello-world    /hello        About a minute ago    Exited (0) About a minute ago    revertant_carson
root@subbrantl-mp-Pavilion-Notebook-# docker exec -it a795fda2f43f bash
root@a795fda2f43f:/# echo hello xiti
hello xiti
root@a795fda2f43f:/# exit
bash: exit: command not found
root@a795fda2f43f:/# exit
exit
root@subbrantl-mp-Pavilion-Notebook-# docker stop a795fda2f43f
a795fda2f43f
root@subbrantl-mp-Pavilion-Notebook-# docker images
REPOSITORY          TAG             IMAGE ID          CREATED           SIZE
ubuntu              latest         ccc6e670482b     4 weeks ago      64.2MB
hello-world         latest         fcd28e9e6bb6     13 months ago    1.64MB
root@subbrantl-mp-Pavilion-Notebook-# docker ps -a
CONTAINER ID        STATUS          PORTS          NAMES
a795fda2f43f        Up 4 minutes    /bin/bash     compute_test_cerf
2897c0d566         hello-world    /hello        4 minutes ago    Exited (0) 4 minutes ago    revertant_carson
root@subbrantl-mp-Pavilion-Notebook-# docker commit a795fda2f43f subbrantl/ubuntuxiti
sha256:173311441a9f32d27a9ef3cbeccae8b1a3c7b4c7d0e0a0e1e0f4d
root@subbrantl-mp-Pavilion-Notebook-# docker images
REPOSITORY          TAG             IMAGE ID          CREATED           SIZE
subbrantl/ubuntuxiti latest         173311441a9f     22 seconds ago   64.2MB
ubuntu              latest         ccc6e670482b     4 weeks ago      64.2MB
hello-world         latest         fcd28e9e6bb6     13 months ago    1.64MB
root@subbrantl-mp-Pavilion-Notebook-# docker run -it -d subbrantl/ubuntuxiti
f9b2240f355f7a659f6e4e6e2c7e3e49a211f3e3a7f8b6c87c30000
root@subbrantl-mp-Pavilion-Notebook-# docker login
Login with your Docker ID to push and pull images from Docker Hub. If you don't have a Docker ID, head over to https://hub.docker.com to create one.
Username: subbrantl
Password:
Error response from daemon: Get https://registry-1.docker.io/v2/: unauthorized: incorrect username or password
root@subbrantl-mp-Pavilion-Notebook-# docker login
Login with your Docker ID to push and pull images from Docker Hub. If you don't have a Docker ID, head over to https://hub.docker.com to create one.
Username: subbrantl
Password:
Error response from daemon: Get https://registry-1.docker.io/v2/: unauthorized: incorrect username or password
root@subbrantl-mp-Pavilion-Notebook-#

```

```
root@subhrantil-w-Pavilion-notebook:~# docker images
REPOSITORY    TAG                IMAGE ID           CREATED            SIZE
subhrantil/ubuntu    latest             373313461ab        8 minutes ago     64.2MB
ubuntu         latest             ccc6b76482b        4 weeks ago       64.2MB
hello-world     latest             fce289e99eb6       13 months ago     1.04MB

root@subhrantil-w-Pavilion-notebook:~# docker push subhrantil25/rep025:ubuntu
The push refers to repository [docker.io/subhrantil25/rep025]
An image does not exist locally with the tag: subhrantil25/rep025

root@subhrantil-w-Pavilion-notebook:~# docker tag ccc6b76482b subhrantil25 / ubuntu : tag123
'docker tag' requires exactly 3 arguments.
See 'docker tag --help'.

Usage:  docker tag SOURCE_IMAGE[:TAG] TARGET_IMAGE[:TAG]

Create a tag TARGET_IMAGE that refers to SOURCE_IMAGE.

root@subhrantil-w-Pavilion-notebook:~# docker tag ccc6b76482b subhrantil25/ubuntu:tag123
root@subhrantil-w-Pavilion-notebook:~# docker images
REPOSITORY    TAG                IMAGE ID           CREATED            SIZE
subhrantil/ubuntu    latest             373313461ab        18 minutes ago     64.2MB
subhrantil25/ubuntu    tag123             ccc6b76482b        4 weeks ago       64.2MB
ubuntu         latest             ccc6b76482b        4 weeks ago       64.2MB
hello-world     latest             fce289e99eb6       13 months ago     1.04MB

root@subhrantil-w-Pavilion-notebook:~# docker push subhrantil25/rep025:tag0000
The push refers to repository [docker.io/subhrantil25/rep025]
An image does not exist locally with the tag: subhrantil25/rep025

root@subhrantil-w-Pavilion-notebook:~# docker push subhrantil25/rep025:tag123
The push refers to repository [docker.io/subhrantil25/rep025]
An image does not exist locally with the tag: subhrantil25/rep025

root@subhrantil-w-Pavilion-notebook:~# docker push subhrantil25/ubuntu
The push refers to repository [docker.io/subhrantil25/ubuntu]
f55a8bdf0a8a: Mounted from library/ubuntu
3d6af239f9ac: Mounted from library/ubuntu
12de91b05328: Mounted from library/ubuntu
43a71722d1d1: Mounted from library/ubuntu
tag123: digest: sha256:b0c2186d3e8ec4487546471ac1b666c1cb0831bd7e324ab25c86693390 size: 1132

root@subhrantil-w-Pavilion-notebook:~# docker images
REPOSITORY    TAG                IMAGE ID           CREATED            SIZE
subhrantil/ubuntu    latest             373313461ab        17 minutes ago     64.2MB
ubuntu         latest             ccc6b76482b        4 weeks ago       64.2MB
subhrantil25/ubuntu    tag123             ccc6b76482b        4 weeks ago       64.2MB
hello-world     latest             fce289e99eb6       13 months ago     1.04MB

root@subhrantil-w-Pavilion-notebook:~# docker push subhrantil25/rep025/ubuntu
The push refers to repository [docker.io/subhrantil25/rep025]
An image does not exist locally with the tag: subhrantil25/rep025/ubuntu

root@subhrantil-w-Pavilion-notebook:~# docker push tag123/ubuntu
The push refers to repository [docker.io/tag123/ubuntu]
An image does not exist locally with the tag: tag123/ubuntu

root@subhrantil-w-Pavilion-notebook:~# docker push subhrantil25/rep025
The push refers to repository [docker.io/subhrantil25/rep025]
An image does not exist locally with the tag: subhrantil25/rep025

root@subhrantil-w-Pavilion-notebook:~#
```

Conclusion:- Students were able to get themselves hands-on experience on docker interface, understanding lots of commands and also gained knowledge about implementation of a cloud application.