UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

APPLICATION CONTAINERIZATION AND ORCHESTRATION LAB

COURSE: B.Tech CSE (Devops)

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Lab Experiment 3: Docker Volume

In this lab experiment, you will learn how to work with Docker volumes, which are used to persist data across containers. Volumes enable data to be stored outside the container filesystem and are crucial for managing data consistency and sharing data between containers.

Prerequisites:

Docker installed and running on your machine.

Objective:

Create a Docker volume, use it with a container, and observe how data persists across container instances.

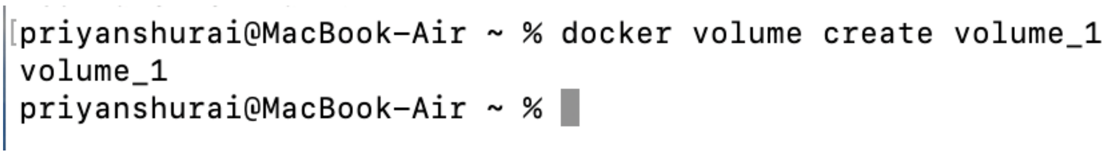
Steps:

Step 1: Create a Docker Volume

Open a terminal on your machine.

Run the following command to create a Docker volume named "my_volume":

```
docker volume create my_volume
```

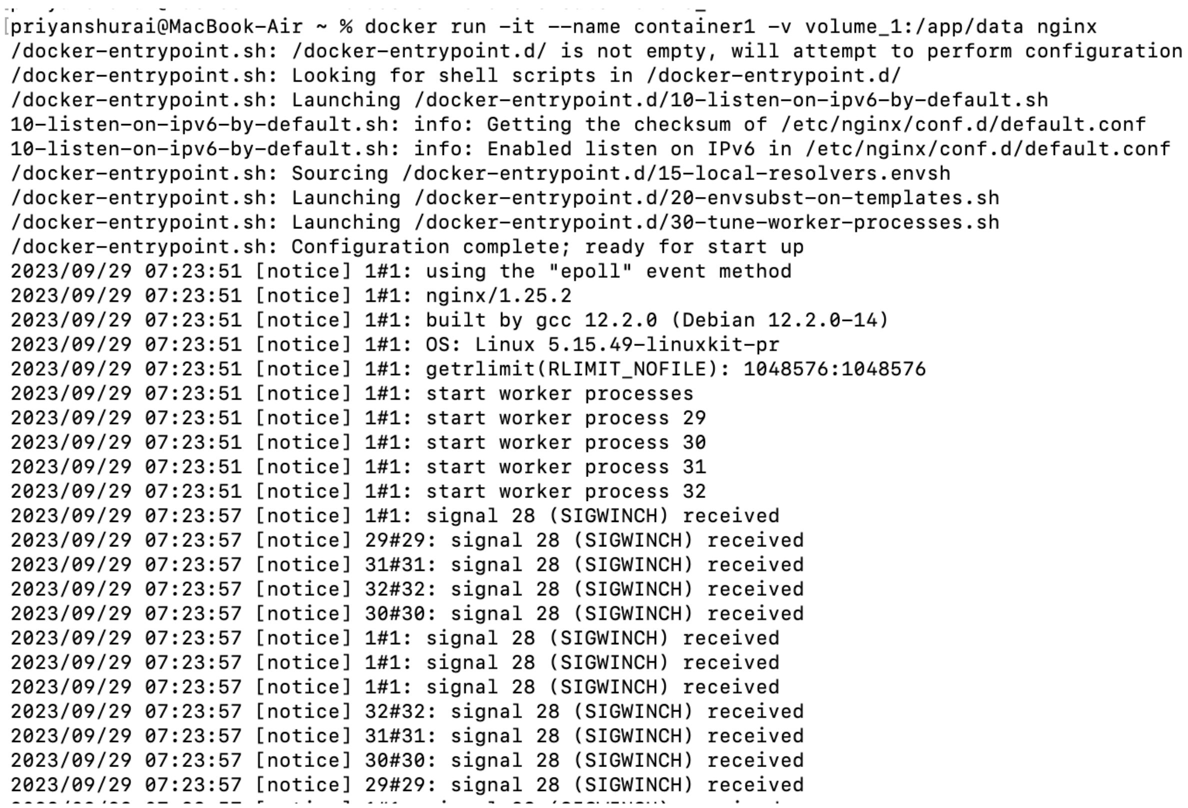


```
[priyanshurai@MacBook-Air ~ % docker volume create volume_1
volume_1
priyanshurai@MacBook-Air ~ % 
```

Step 2: Launch Containers with the Volume

Run a container using the volume you created:

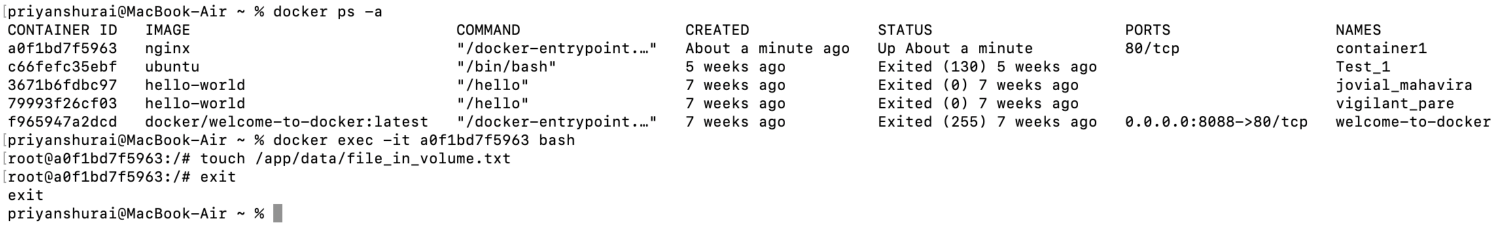
```
docker run -it --name container1 -v my_volume:/app/data nginx
```



```
[priyanshurai@MacBook-Air ~ % docker run -it --name container1 -v volume_1:/app/data nginx
/docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to perform configuration
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.sh
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/default.conf
10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/default.conf
/docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2023/09/29 07:23:51 [notice] 1#1: using the "epoll" event method
2023/09/29 07:23:51 [notice] 1#1: nginx/1.25.2
2023/09/29 07:23:51 [notice] 1#1: built by gcc 12.2.0 (Debian 12.2.0-14)
2023/09/29 07:23:51 [notice] 1#1: OS: Linux 5.15.49-linuxkit-pr
2023/09/29 07:23:51 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2023/09/29 07:23:51 [notice] 1#1: start worker processes
2023/09/29 07:23:51 [notice] 1#1: start worker process 29
2023/09/29 07:23:51 [notice] 1#1: start worker process 30
2023/09/29 07:23:51 [notice] 1#1: start worker process 31
2023/09/29 07:23:51 [notice] 1#1: start worker process 32
2023/09/29 07:23:57 [notice] 1#1: signal 28 (SIGWINCH) received
2023/09/29 07:23:57 [notice] 29#29: signal 28 (SIGWINCH) received
2023/09/29 07:23:57 [notice] 31#31: signal 28 (SIGWINCH) received
2023/09/29 07:23:57 [notice] 32#32: signal 28 (SIGWINCH) received
2023/09/29 07:23:57 [notice] 30#30: signal 28 (SIGWINCH) received
2023/09/29 07:23:57 [notice] 1#1: signal 28 (SIGWINCH) received
2023/09/29 07:23:57 [notice] 1#1: signal 28 (SIGWINCH) received
2023/09/29 07:23:57 [notice] 1#1: signal 28 (SIGWINCH) received
2023/09/29 07:23:57 [notice] 32#32: signal 28 (SIGWINCH) received
2023/09/29 07:23:57 [notice] 31#31: signal 28 (SIGWINCH) received
2023/09/29 07:23:57 [notice] 30#30: signal 28 (SIGWINCH) received
2023/09/29 07:23:57 [notice] 29#29: signal 28 (SIGWINCH) received
```

Enter the container to observe the volume and create a file inside it:

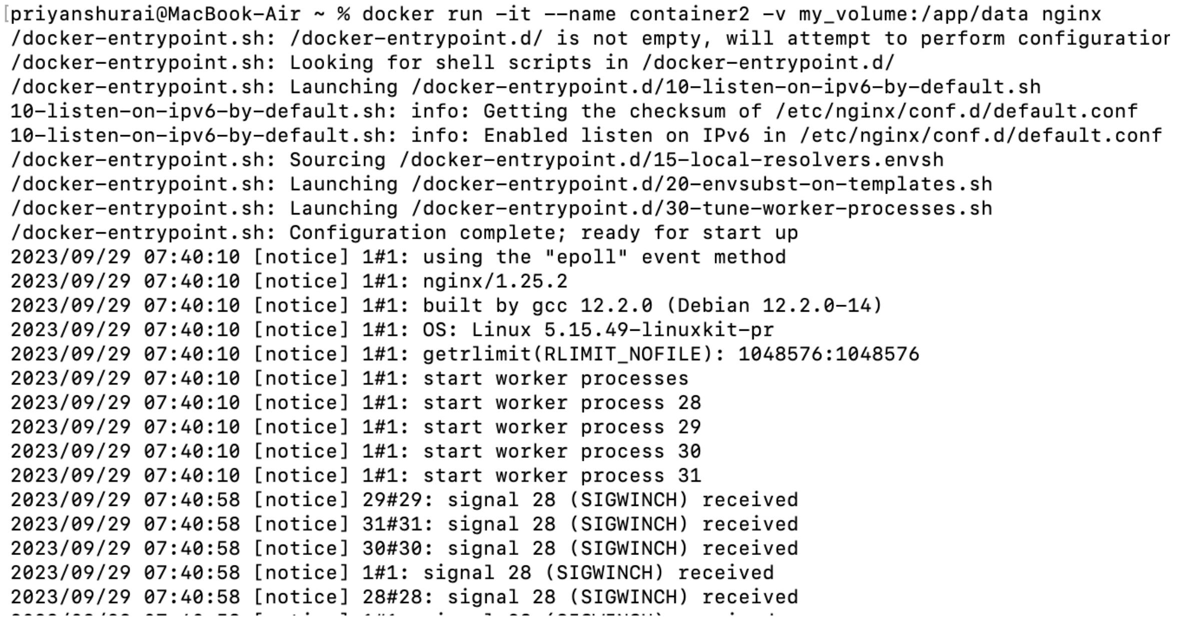
```
touch /app/data/file_in_volume.txt

exit
```



```
[priyanshurai@MacBook-Air ~ % docker ps -a
CONTAINER ID   IMAGE                             COMMAND                  CREATED              STATUS                       PORTS                  NAMES
a0f1bd7f5963   nginx                             "/docker-entrypoint.…"   About a minute ago   Up About a minute            80/tcp                 container1
c66fefc35ebf   ubuntu                            "/bin/bash"              5 weeks ago          Exited (130) 5 weeks ago                            Test_1
3671b6fdbc97   hello-world                       "/hello"                 7 weeks ago          Exited (0) 7 weeks ago                              jovial_mahavira
79993f26cf03   hello-world                       "/hello"                 7 weeks ago          Exited (0) 7 weeks ago                              vigilant_pare
f965947a2dcd   docker/welcome-to-docker:latest   "/docker-entrypoint.…"   7 weeks ago          Exited (255) 7 weeks ago     0.0.0.0:8088->80/tcp   welcome-to-docker
[priyanshurai@MacBook-Air ~ % docker exec -it a0f1bd7f5963 bash
[root@a0f1bd7f5963:/# touch /app/data/file_in_volume.txt
[root@a0f1bd7f5963:/# exit
exit
priyanshurai@MacBook-Air ~ %
```

Run a second container, using the same volume, to verify data persistence:

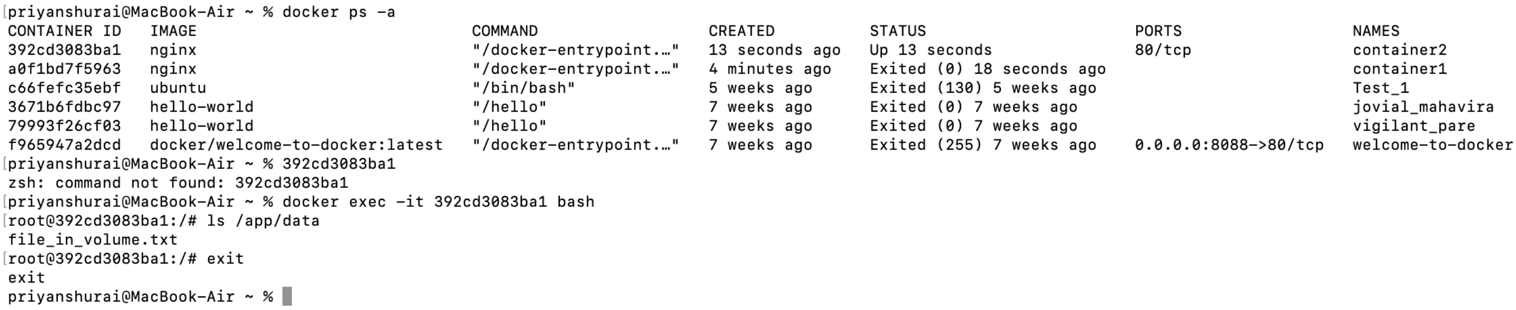
```
docker run -it --name container2 -v my_volume:/app/data nginx
```



```
[priyanshurai@MacBook-Air ~ % docker run -it --name container2 -v my_volume:/app/data nginx
/docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to perform configuratior
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.sh
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/default.conf
10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/default.conf
/docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2023/09/29 07:40:10 [notice] 1#1: using the "epoll" event method
2023/09/29 07:40:10 [notice] 1#1: nginx/1.25.2
2023/09/29 07:40:10 [notice] 1#1: built by gcc 12.2.0 (Debian 12.2.0-14)
2023/09/29 07:40:10 [notice] 1#1: OS: Linux 5.15.49-linuxkit-pr
2023/09/29 07:40:10 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2023/09/29 07:40:10 [notice] 1#1: start worker processes
2023/09/29 07:40:10 [notice] 1#1: start worker process 28
2023/09/29 07:40:10 [notice] 1#1: start worker process 29
2023/09/29 07:40:10 [notice] 1#1: start worker process 30
2023/09/29 07:40:10 [notice] 1#1: start worker process 31
2023/09/29 07:40:58 [notice] 29#29: signal 28 (SIGWINCH) received
2023/09/29 07:40:58 [notice] 31#31: signal 28 (SIGWINCH) received
2023/09/29 07:40:58 [notice] 30#30: signal 28 (SIGWINCH) received
2023/09/29 07:40:58 [notice] 1#1: signal 28 (SIGWINCH) received
2023/09/29 07:40:58 [notice] 28#28: signal 28 (SIGWINCH) received
```

Enter the second container and check if the file exists:

```
ls /app/data

exit
```

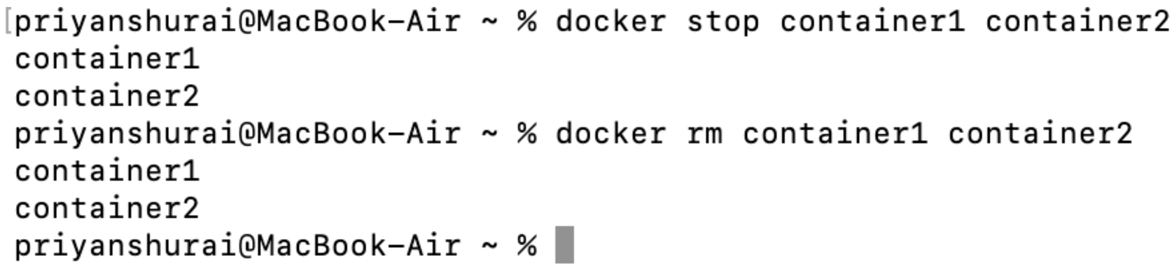


```
[priyanshurai@MacBook-Air ~ % docker ps -a
CONTAINER ID   IMAGE                              COMMAND                  CREATED          STATUS                        PORTS                   NAMES
392cd3083ba1   nginx                              "/docker-entrypoint.…"   13 seconds ago   Up 13 seconds                 80/tcp                  container2
a0f1bd7f5963   nginx                              "/docker-entrypoint.…"   4 minutes ago    Exited (0) 18 seconds ago                             container1
c66fefc35ebf   ubuntu                             "/bin/bash"              5 weeks ago      Exited (130) 5 weeks ago                              Test_1
3671b6fdbc97   hello-world                        "/hello"                 7 weeks ago      Exited (0) 7 weeks ago                                jovial_mahavira
79993f26cf03   hello-world                        "/hello"                 7 weeks ago      Exited (0) 7 weeks ago                                vigilant_pare
f965947a2dcd   docker/welcome-to-docker:latest    "/docker-entrypoint.…"   7 weeks ago      Exited (255) 7 weeks ago      0.0.0.0:8088->80/tcp    welcome-to-docker
[priyanshurai@MacBook-Air ~ % 392cd3083ba1
zsh: command not found: 392cd3083ba1
[priyanshurai@MacBook-Air ~ % docker exec -it 392cd3083ba1 bash
[root@392cd3083ba1:/# ls /app/data
file_in_volume.txt
[root@392cd3083ba1:/# exit
exit
priyanshurai@MacBook-Air ~ %
```

Step 3: Cleanup

Stop and remove the containers:

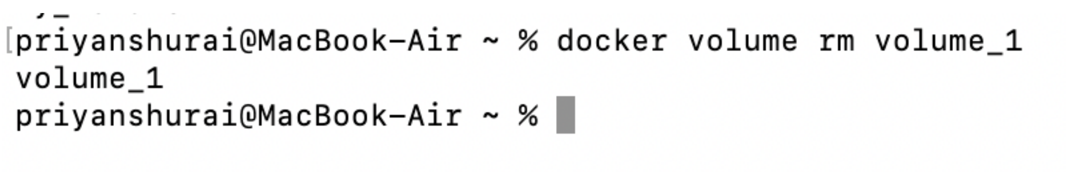
```
docker stop container1 container2

docker rm container1 container2
```



```
[priyanshurai@MacBook-Air ~ % docker stop container1 container2
container1
container2
priyanshurai@MacBook-Air ~ % docker rm container1 container2
container1
container2
priyanshurai@MacBook-Air ~ %
```

Remove the volume:

```
docker volume rm my_volume
```



```
[priyanshurai@MacBook-Air ~ % docker volume rm volume_1
 volume_1
 priyanshurai@MacBook-Air ~ %
```

Conclusion:

In this experiment, you learned how to create a Docker volume, associate it with containers, and observed how data persisted between different container instances. Docker volumes are essential for maintaining data integrity, sharing data between containers, and ensuring data persistence even when containers are removed or replaced. This skill is crucial for managing stateful applications and databases within a Dockerized environment.