Lab Exercise 4- Working with Docker Networking

Step 1: Understanding Docker Default Networks

Docker provides three default networks:

- bridge: The default network when a container starts.
- host: Bypasses Docker's network isolation and attaches the container directly to the host network.
- none: No networking is available for the container.

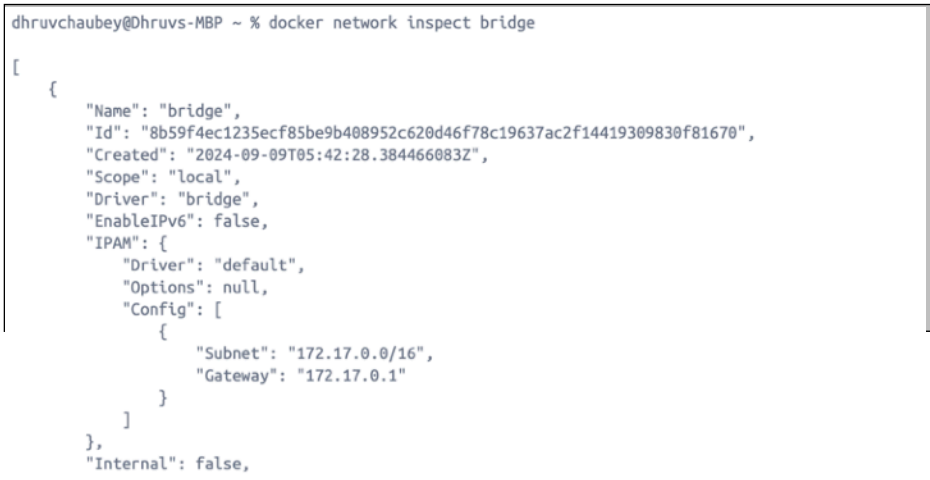
1.1. Inspect Default Networks

Check Docker's default networks using:

docker network ls

1.2. Inspect the Bridge Network

docker network inspect bridge

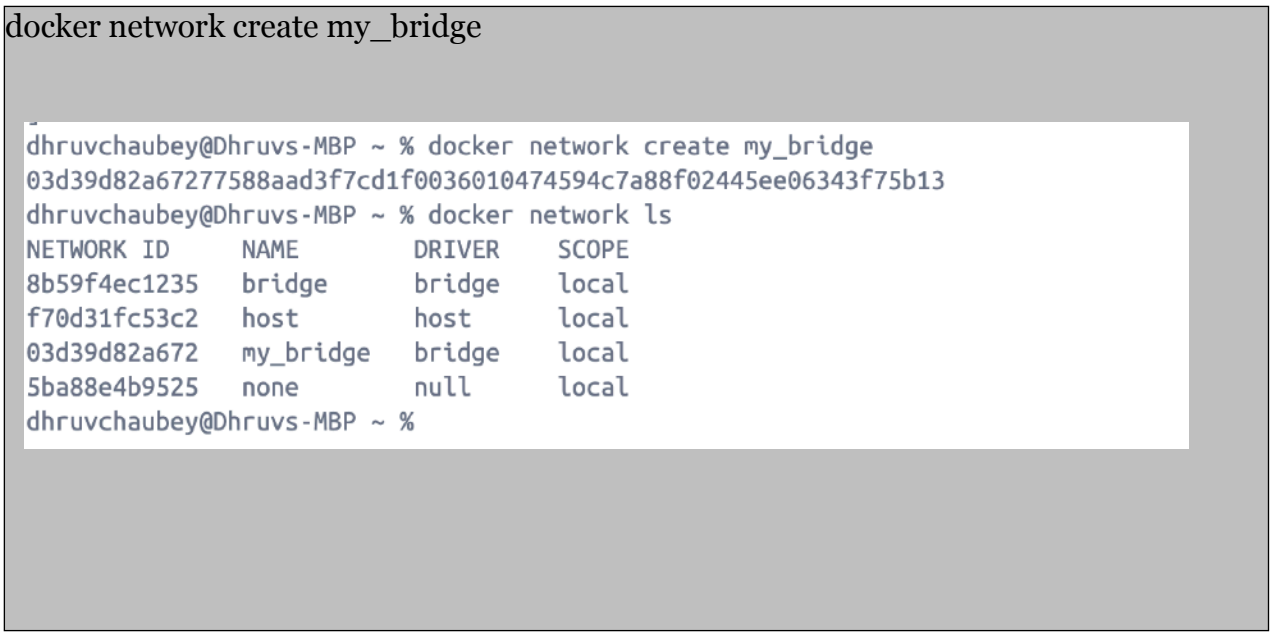


This command will show detailed information about the bridge network, including the connected containers and IP address ranges.

Step 2: Create and Use a Bridge Network

2.1. Create a User-Defined Bridge Network

A user-defined bridge network allows containers to communicate by name instead of IP.



2.2. Run Containers on the User-Defined Network

Start two containers on the newly created my_bridge network:

```
docker run -dit --name container1 --network my_bridge busybox
```

```
dhruvchaubey@Dhruvs-MBP ~ % docker run -dit --name container1 --network my_bridge busybox

Unable to find image 'busybox:latest' locally
latest: Pulling from library/busybox
75e8ca8f509f: Pull complete
Digest: sha256:34b191d63fbc93e25e275bfccf1b5365664e5ac28f06d974e8d50090fbb49f41
Status: Downloaded newer image for busybox:latest
1e6fdf681bddef42e344827dda7d59e5e6ca042bd9f7526901e0ef3961275bb2
```

```
docker run -dit --name container2 --network my_bridge busybox
```

```
dhruvchaubey@Dhruvs-MBP ~ % docker run -dit --name container2 --network my_bridge busybox
e1d646f9c2676ce13063817087cae139870af9c19c1d62ba80ac0563fd86019f
dhruvchaubey@Dhruvs-MBP ~ %
```

2.3. Test Container Communication

Execute a ping command from container1 to container2 using container names:

```
docker exec -it container1 ping container2
```

```
dhruvchaubey@Dhruvs-MBP ~ % docker run -dit --name container2 --network my_bridge busybox
e1d646f9c2676ce13063817087cae139870af9c19c1d62ba80ac0563fd86019f
dhruvchaubey@Dhruvs-MBP ~ % docker exec -it container1 ping container2
PING container2 (172.18.0.3): 56 data bytes
64 bytes from 172.18.0.3: seq=0 ttl=64 time=0.077 ms
64 bytes from 172.18.0.3: seq=1 ttl=64 time=0.235 ms
64 bytes from 172.18.0.3: seq=2 ttl=64 time=0.233 ms
64 bytes from 172.18.0.3: seq=3 ttl=64 time=0.201 ms
64 bytes from 172.18.0.3: seq=4 ttl=64 time=0.201 ms
64 bytes from 172.18.0.3: seq=5 ttl=64 time=0.203 ms
64 bytes from 172.18.0.3: seq=6 ttl=64 time=0.194 ms
```

The containers should be able to communicate since they are on the same network.

Step 3: Create and Use a Host Network

3.1. Run a Container Using the Host Network

The host network allows the container to use the host machine's networking stack:

```
docker run -d --name host_network_container --network host nginx
```

```
/dev/fd/12:18: command not found: compdef
dhruvchaubey@Dhruvs-MBP ~ % docker run -d --name host_network_container --network host nginx
8fbc55010c70bae6fe67bebdafb137f12adc48ff062916416aa3981ad88a3827
dhruvchaubey@Dhruvs-MBP ~ %
```

Access the NGINX server via localhost:80 in your browser to verify the container is using the host network.

3.2. Check Network

```
docker network

inspect host
```

```
8fbc55010c70bae6fe67bebdafb137f12adc48ff062916416aa3981ad88a3827
dhruvchaubey@Dhruvs-MBP ~ % docker network inspect host

[
    {
        "Name": "host",
        "Id": "f70d31fc53c296c5bce7b080f51ea588c65327bdefeabf77bc69ccb05dc48f47",
        "Created": "2024-08-29T05:55:27.407696166Z",
        "Scope": "local",
        "Driver": "host",
        "EnableIPv6": false,
        "IPAM": {
            "Driver": "default",
            "Options": null,
            "Config": null
        },
        "Internal": false,
        "Attachable": false,
        "Ingress": false,
        "ConfigFrom": {
            "Network": ""
        },
        "Internal": false,
        "Attachable": false,
        "Ingress": false,
        "ConfigFrom": {
            "Network": ""
        },
        "ConfigOnly": false,
        "Containers": {
            "8fbc55010c70bae6fe67bebdafb137f12adc48ff062916416aa3981ad88a3827": {
                "Name": "host_network_container",
                "EndpointID": "c9002737e6fc0ad2414856977b3328d83e28ddcde1e2af209b2688a5d2b32476",
                "MacAddress": "",
                "IPv4Address": "",
                "IPv6Address": ""
            }
        },
        "Options": {},
        "Labels": {}
    }
]
```

Step 4: Disconnect and Remove Networks

4.1. Disconnect Containers from Networks

To disconnect container1 from my_bridge:

docker network disconnect my_bridge container1

```
dhruvchaubey@Dhruvs-MBP ~ % docker network disconnect my_bridge container1
```

To verify :

```
dhruvchaubey@Dhruvs-MBP ~ % docker network disconnect my_bridge container1

Error response from daemon: container 1e6fdf681bddef42e344827dda7d59e5e6ca042bd9f7526901e0ef3961275bb2 is not
 connected to network my_bridge
```

4.2. Remove Networks

To remove the user-defined network:

docker network rm my_bridge

First we disconnected container1 and container2 from my_bridge, only then we can remove the network.

```
dhruvchaubey@Dhruvs-MBP ~ % docker network rm my_bridge
my_bridge
dhruvchaubey@Dhruvs-MBP ~ %
```

Step 5: Clean Up

Stop and remove all containers created during this exercise:

docker rm -f container1 container2 host_network_container

```
dhruvchaubey@Dhruvs-MBP ~ % docker rm -f container1 container2 host_network_container
container1
container2
host_network_container
dhruvchaubey@Dhruvs-MBP ~ %
```