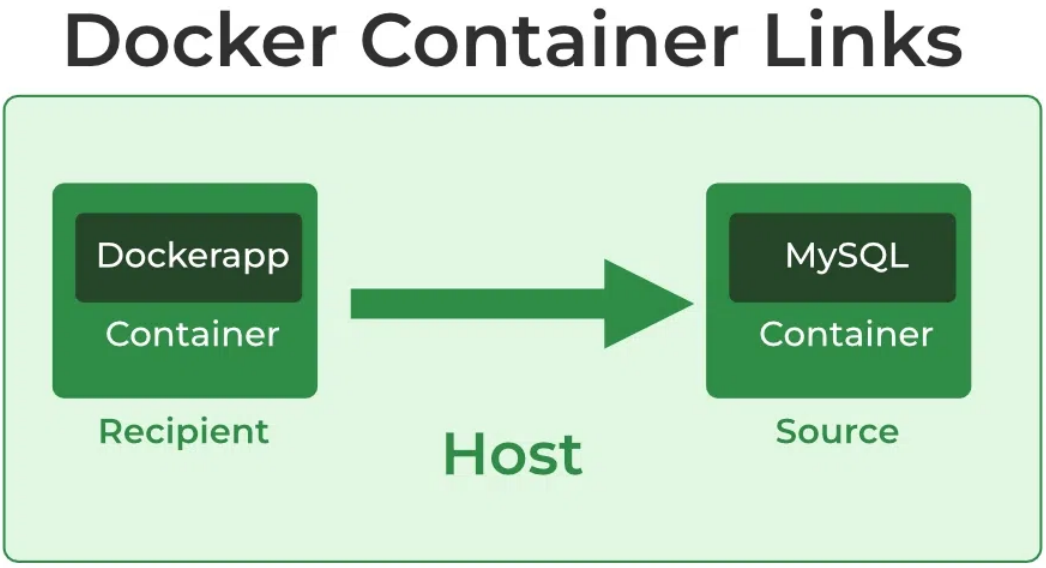
Docker – Container Linking

Last Updated : 27 Apr, 2023

Docker is a set of platforms as a service (PaaS) products that use the Operating system level visualization to deliver software in packages called containers.There are times during the development of our application when we need two containers to be able to communicate with each other. It might be possible that the services of both containers are dependent on each other. This can be done with the help of **Container Linking.**

Previously the containers were used by using the "–link" flag but that has now become deprecated and is considered a legacy command.



Connect with the Linking System

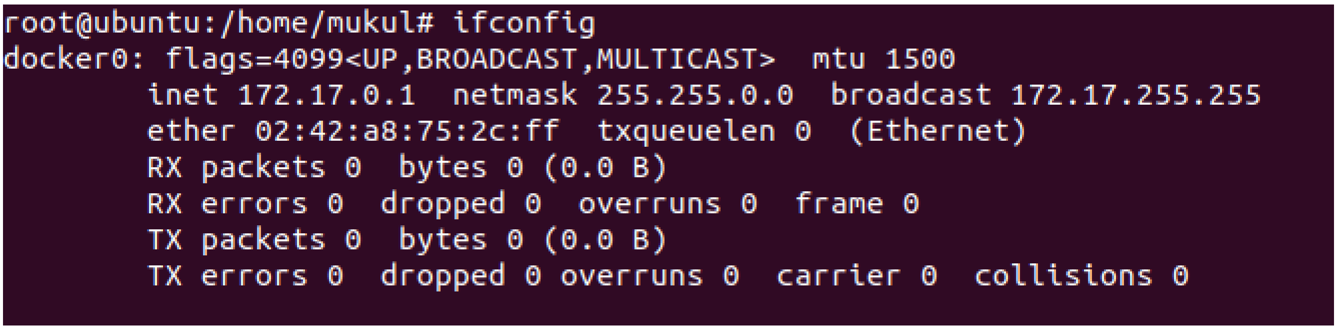
There are two ways of linking the containers

- The default way
- User-defined way

To understand the formation of a custom network between two containers we need to understand how docker assigns the network automatically.

The Default Way

Once we install docker and create a container a default bridged network is assigned to docker, by the name of Docker0. The IP is in the range of 172.17.0.0/16 (where 172.17.0.1 is assigned to the interface)



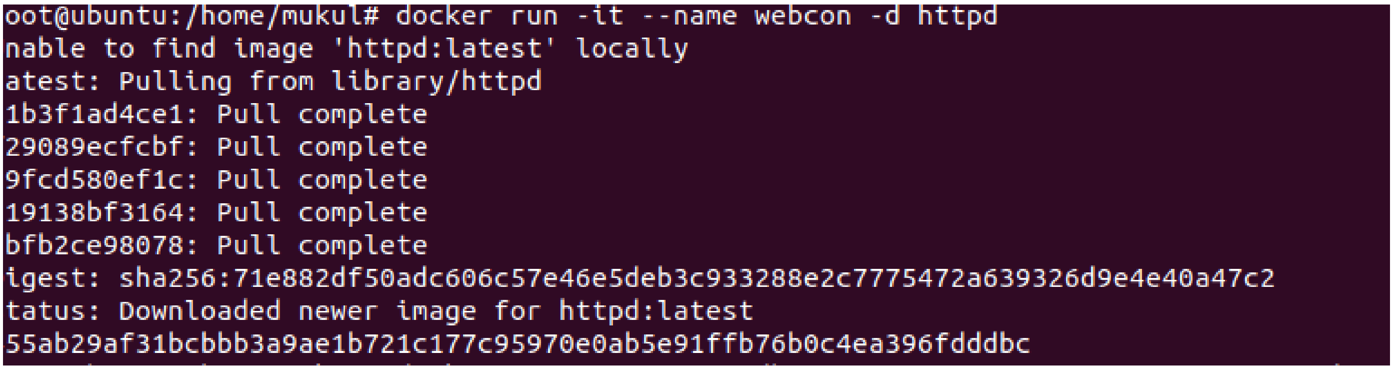
```
root@ubuntu:/home/mukul# ifconfig
docker0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        inet 172.17.0.1  netmask 255.255.0.0  broadcast 172.17.255.255
        ether 02:42:a8:75:2c:ff  txqueuelen 0  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

Now the containers that we will create will get their IPs in the range of 172.17.0.2/16.

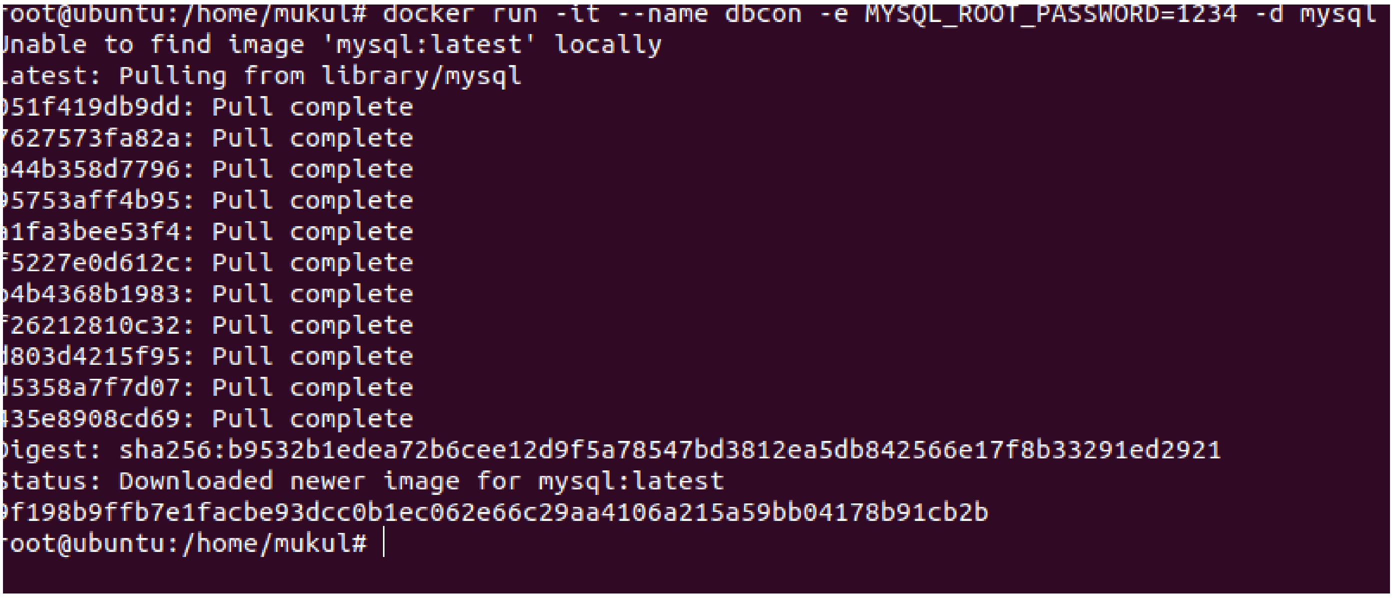
Step 1: Create two new containers, webcon, and dbcon

```
$ docker run -it --name webcon -d httpd
$ docker run -it --name dbcon  -e MYSQL_ROOT_PASSWORD=1234 -d mysql
```

You can use any image, we'll be using **MySQL** and HTTPD images in our case.



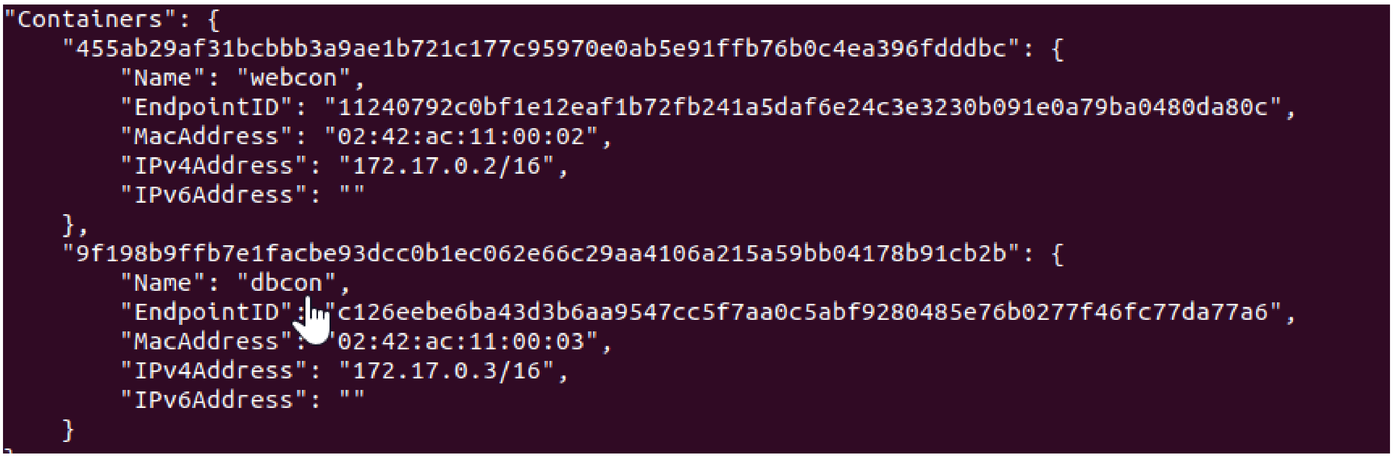
```
oot@ubuntu:/home/mukul# docker run -it --name webcon -d httpd
nable to find image 'httpd:latest' locally
atest: Pulling from library/httpd
1b3f1ad4ce1: Pull complete
29089ecfcbf: Pull complete
9fcd580ef1c: Pull complete
19138bf3164: Pull complete
bfb2ce98078: Pull complete
igest: sha256:71e882df50adc606c57e46e5deb3c933288e2c7775472a639326d9e4e40a47c2
tatus: Downloaded newer image for httpd:latest
55ab29af31bcbbb3a9ae1b721c177c95970e0ab5e91ffb76b0c4ea396fdddbc
```



```
oot@ubuntu:/home/mukul# docker run -it --name dbcon -e MYSQL_ROOT_PASSWORD=1234 -d mysql
nable to find image 'mysql:latest' locally
atest: Pulling from library/mysql
51f419db9dd: Pull complete
627573fa82a: Pull complete
44b358d7796: Pull complete
5753aff4b95: Pull complete
1fa3bee53f4: Pull complete
5227e0d612c: Pull complete
4b4368b1983: Pull complete
26212810c32: Pull complete
803d4215f95: Pull complete
5358a7f7d07: Pull complete
35e8908cd69: Pull complete
igest: sha256:b9532b1edea72b6cee12d9f5a78547bd3812ea5db842566e17f8b33291ed2921
tatus: Downloaded newer image for mysql:latest
f198b9ffb7e1facbe93dcc0b1ec062e66c29aa4106a215a59bb04178b91cb2b
oot@ubuntu:/home/mukul#
```

Step 2: Check the IPs of the new containers.

```
$ docker network inspect bridge
```

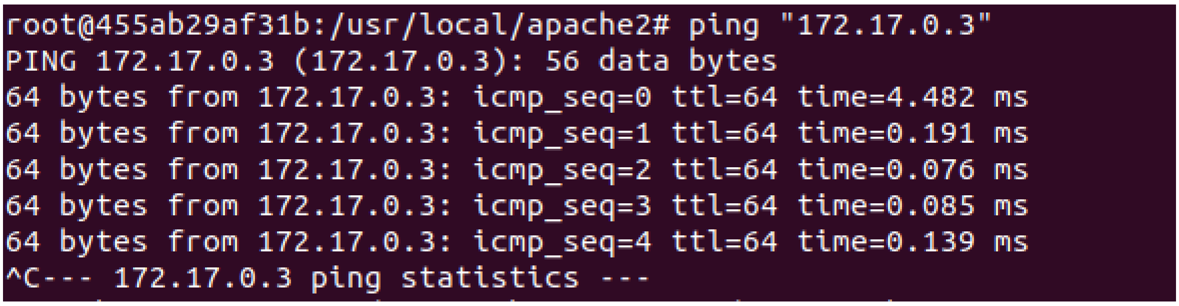


```
"Containers": {
    "455ab29af31bcbbb3a9ae1b721c177c95970e0ab5e91ffb76b0c4ea396fdddbc": {
        "Name": "webcon",
        "EndpointID": "11240792c0bf1e12eaf1b72fb241a5daf6e24c3e3230b091e0a79ba0480da80c",
        "MacAddress": "02:42:ac:11:00:02",
        "IPv4Address": "172.17.0.2/16",
        "IPv6Address": ""
    },
    "9f198b9ffb7e1facbe93dcc0b1ec062e66c29aa4106a215a59bb04178b91cb2b": {
        "Name": "dbcon",
        "EndpointID": "c126eebe6ba43d3b6aa9547cc5f7aa0c5abf9280485e76b0277f46fc77da77a6",
        "MacAddress": "02:42:ac:11:00:03",
        "IPv4Address": "172.17.0.3/16",
        "IPv6Address": ""
    }
```

With the help of these IPs, the docker host establishes a connection with the containers.

Step 3: Get inside the webcon container and try to ping the dbcon container, if you get a response back this means that the default connection is established.

```
$ docker container exec -it webcon /bin/bash
(to get into the webcon container)
$ ping "172.17.0.3"
(ping the dbcon container)
```



```
root@455ab29af31b:/usr/local/apache2# ping "172.17.0.3"
PING 172.17.0.3 (172.17.0.3): 56 data bytes
64 bytes from 172.17.0.3: icmp_seq=0 ttl=64 time=4.482 ms
64 bytes from 172.17.0.3: icmp_seq=1 ttl=64 time=0.191 ms
64 bytes from 172.17.0.3: icmp_seq=2 ttl=64 time=0.076 ms
64 bytes from 172.17.0.3: icmp_seq=3 ttl=64 time=0.085 ms
64 bytes from 172.17.0.3: icmp_seq=4 ttl=64 time=0.139 ms
^C--- 172.17.0.3 ping statistics ---
```

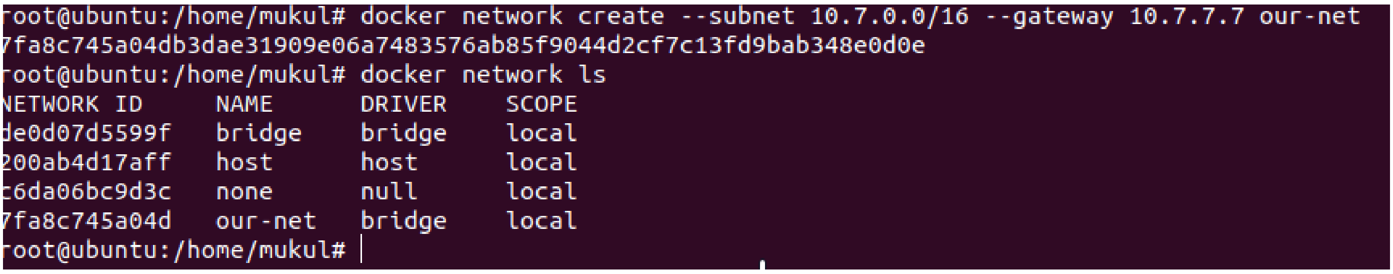
User-Defined Way

Step 1: Create a custom bridge network.

```
$ docker network create <bridge_name>
(This will create a bridge with custom subnet and gateway)
```

We can also give our own subnet and gateway.

```
$ docker network create --subnet <your_subnet>
 --gateway <Your_gateway> bridgename
```



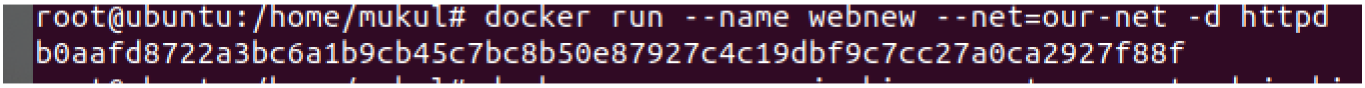
```
root@ubuntu:/home/mukul# docker network create --subnet 10.7.0.0/16 --gateway 10.7.7.7 our-net
7fa8c745a04db3dae31909e06a7483576ab85f9044d2cf7c13fd9bab348e0d0e
root@ubuntu:/home/mukul# docker network ls
NETWORK ID     NAME      DRIVER    SCOPE
de0d07d5599f   bridge    bridge    local
200ab4d17aff   host      host      local
c6da06bc9d3c   none      null      local
7fa8c745a04d   our-net   bridge    local
root@ubuntu:/home/mukul# 
```

Step 2: Verify if your network has been created or not.

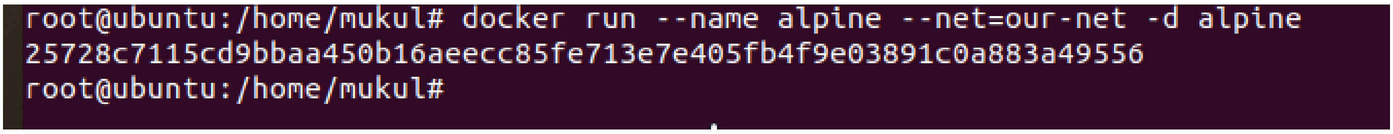
```
$ docker network ls
```

Step 3: Associate or link the two containers on the network that you just created by using the “–net” flag.

```
$ docker run --name <container_name>
 --net=<custom_net>
-d <image_name>
```



```
root@ubuntu:/home/mukul# docker run --name webnew --net=our-net -d httpd
b0aafd8722a3bc6a1b9cb45c7bc8b50e87927c4c19dbf9c7cc27a0ca2927f88f
```



```
root@ubuntu:/home/mukul# docker run --name alpine --net=our-net -d alpine
25728c7115cd9bbaa450b16aeecc85fe713e7e405fb4f9e03891c0a883a49556
root@ubuntu:/home/mukul#
```

We have used httpd and Alpine images for our containers.

Step 4: Get inside the webnew container(IP- 10.7.0.10) and ping the alpine container(IP- 10.7.0.2)

```
$ docker exec -it webnew /bin/bash
$ ping "10.7.0.2" (inside the webnew container)
```

If you start receiving the packets from the Alpine container then you have successfully established a connection between both containers using your own OUR-NET network. So this is how you can create your own custom bridged network which allows you to establish a connection between your container.

The Importance of Naming

Docker mainly depends upon the names of the containers we can see in the above example whenever you create a new container the name gets created automatically we can also name our container is will us in two different ways.

- By giving the container a name, we can keep track of the type of program that is executed inside of it, such as a web application or a database.
- If a web application wants to communicate with DB servers, for instance, it can act as a barrier between the two containers like a connection link.

We can name our container with the help of the command shown below

```
(--name) docker run -d -P --name <name/imagename/tag>
```

Environment Variables

If suppose the developer mentioned some –env (Environmental variables) in the source code by which we can connect to the database server, for example, Username and password then while creating the container we set the username and password as shown in the below command.

```
docker run -d --name <name>  -e USERNAME=<***> -e  PASSWORD=<***>  --
network <****>
```

We can set the above-mentioned env variables to the database container by using the following command.

```
docker run -d -p <port> --name <name>  -e HOSTNAME=<***> -e
USERNAME=<***> -e  PASSWORD=<***> --network <***>
```

Updating the /etc/hosts file

Docker adds a host entry for the source container to the /etc/hosts apart from the environmental variables we provide the command to link two containers is mentioned below.

```
docker run -t -i --rm --link <Mention Entries>
```

To check the list of entries that have been mentioned in the /etc/hosts file we can use the below command.

```
cat  /etc/hosts
```

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