Docker Swarm

Docker Swarm is a clustering and scheduling tool for **Docker** containers. With **Swarm**, IT administrators and developers can establish and manage a cluster of **Docker** nodes as a single virtual system

Docker Swarm Manager

A **swarm** is a group of machines that are running **Docker** and joined into a cluster. After that has happened, you continue to run the **Docker** commands you're used to, but now they are executed on a cluster by a **swarm manager**.

Using a Raft implementation, the managers maintain a consistent internal state of the entire swarm and all the services running on it. For testing purposes it is OK to run a swarm with a single manager. If the manager in a single-manager swarm fails, your services continue to run, but you need to create a new cluster to recover.

To take advantage of swarm mode's fault-tolerance features, Docker recommends you implement an odd number of nodes according to your organization's high-availability requirements. When you have multiple managers you can recover from the failure of a manager node without downtime.

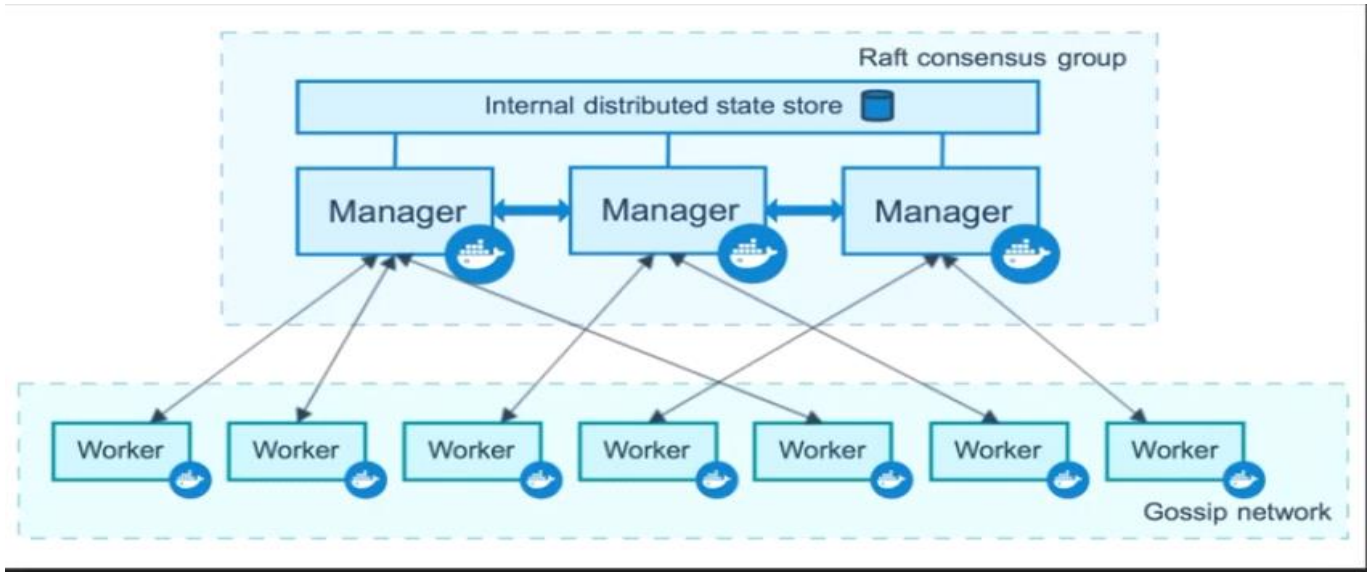
- A three-manager swarm tolerates a maximum loss of one manager.
- A five-manager swarm tolerates a maximum simultaneous loss of two manager nodes.
- An N manager cluster tolerates the loss of at most (N-1)/2 managers.

- Docker recommends a maximum of seven manager nodes for a swarm.

Docker Swarm Worker Node

Worker nodes are also instances of Docker Engine whose sole purpose is to execute containers. Worker nodes don't participate in the Raft distributed state, make scheduling decisions, or serve the swarm mode HTTP API.

You can create a swarm of one manager node, but you cannot have a worker node without at least one manager node. By default, all managers are also workers. In a single manager node cluster, you can run commands like docker service create and the scheduler places all tasks on the local Engine.



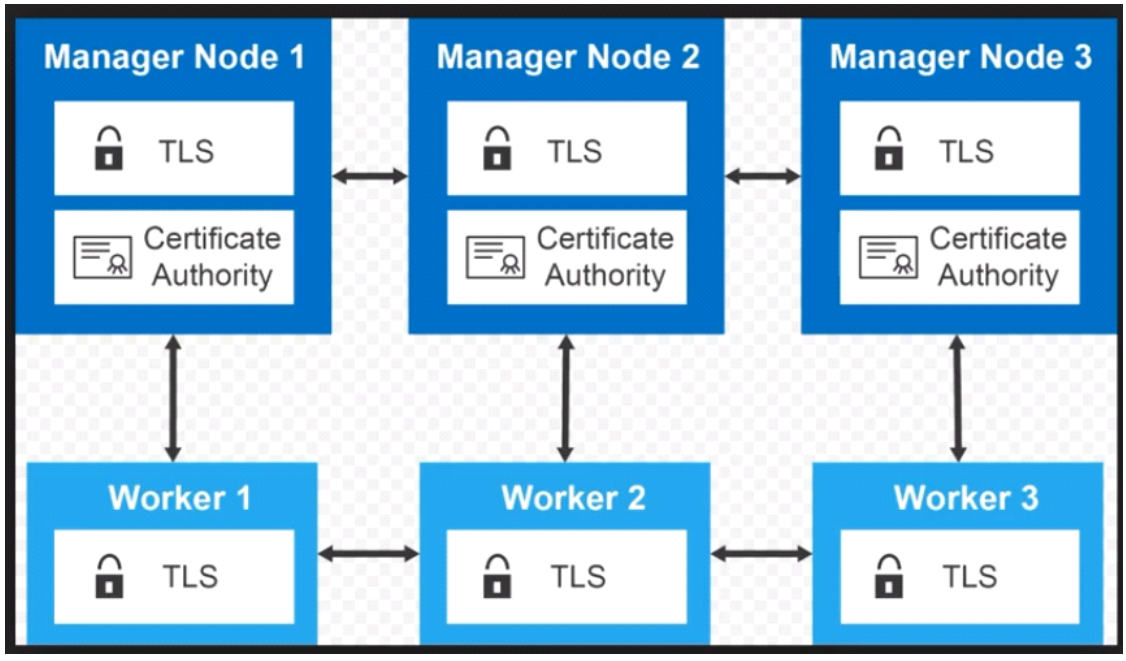
Manage swarm security with public key infrastructure (PKI)

The swarm mode public key infrastructure (PKI) system built into Docker makes it simple to securely deploy a container orchestration system. The nodes in a swarm use mutual Transport Layer Security (TLS) to authenticate, authorize, and encrypt the communications with other nodes in the swarm.

When you create a swarm by running docker swarm init, Docker designates itself as a manager node. By default, the manager node generates a new root Certificate Authority (CA) along with a key pair, which are used to secure communications with other nodes that join the swarm. If you prefer, you can specify your own externally-generated root CA, using the --external-ca flag of the docker swarm init command.

The manager node also generates two tokens to use when you join additional nodes to the swarm: one **worker token** and one **manager token**. Each token includes the digest of the root CA's certificate and a randomly generated secret. When a node joins the swarm, the joining node uses the digest to validate the root CA certificate from the remote manager. The remote manager uses the secret to ensure the joining node is an approved node.

Each time a new node joins the swarm, the manager issues a certificate to the node. The certificate contains a randomly generated node ID to identify the node under the certificate common name (CN) and the role under the organizational unit (OU). The node ID serves as the cryptographically secure node identity for the lifetime of the node in the current swarm.



Lab Session:

1. Create 3 Linux machines and install docker on it.
2. Name it as master ,worker01,worker02
3. On master machine run **docker swarm init** to make it as manager node
4. Above step will create master node and it will return a token for worker nodes
5.
```
root@master:/home/ubuntu# docker swarm init
Swarm initialized: current node (k1ui6jpvr0f1t679me9ewvrkg) is now a manager.

To add a worker to this swarm, run the following command:

    docker swarm join --token SWMTKN-1-0iabdwepndt8wipfhnppwvcgcjydwcnvp9ylqzhzxmmgs0vx6f-cvfj79c4rgil26omxvoc7ug1s 172.31.84.230:2377

To add a manager to this swarm, run 'docker swarm join-token manager' and follow the instructions.
```

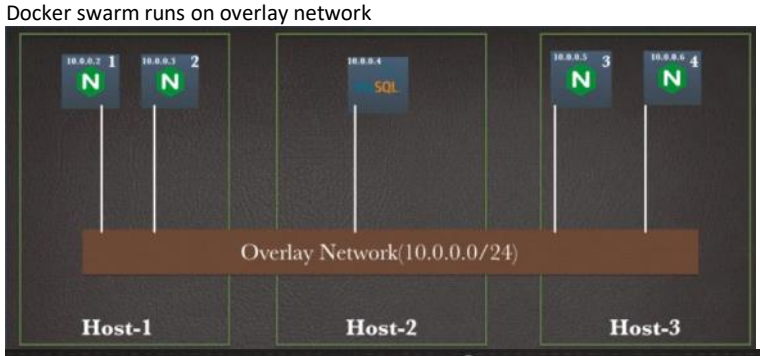
5.
```
root@master:/home/ubuntu# docker swarm init
Swarm initialized: current node (k1ui6jpvr0f1t679me9ewvrkg) is now a manager.

To add a worker to this swarm, run the following command:

    docker swarm join --token SWMTKN-1-0iabdwepndt8wipfhnppwvcgcjydwcnvp9ylqzhzxmmgs0vx6f-cvfj79c4rgil26omxvoc7ug1s 172.31.84.230:2377

To add a manager to this swarm, run 'docker swarm join-token manager' and follow the instructions.
```

6. Copy docker swarm join command and run it on worker01 and worker02
7. On master node run **docker node ls** command , it will show all the nodes in cluster

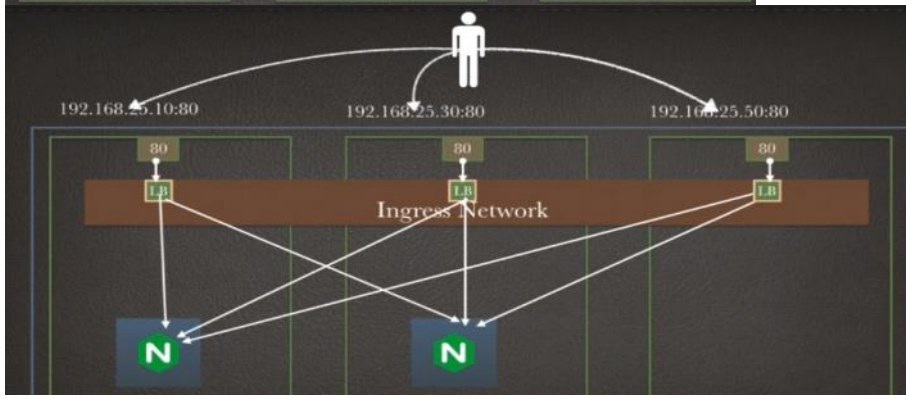
8.
```
root@master:/home/ubuntu# docker node ls
ID                            HOSTNAME            STATUS              AVAILABILITY        MANAGER STATUS      ENGINE VERSION
k1ui6jpvr0f1t679me9ewvrkg *   master              Ready               Active              Leader              18.09.7
w4tkg4vfpgwtep3eanotj6916     worker01            Ready               Active                                  18.09.7
8xp67hq694jbmgg0154jae8cz     worker02            Ready               Active                                  18.09.7
```

9. Command **docker swarm join-token worke**r will give token value for worker node
10. Command **docker swarm join-token manager** will give token value for the manage node
11. Command **docker info** will give you swarm information as well like it is active or not
12. Command **docker swarm leave** will leave the node(worker node) from the cluster and docker info will return Swarm as inactive
13. Command **docker node rm worker01** will remove the worker from the list.
14. Command **docker node rm -f worker02** will forcefully remove the worker from the list .
15. Command **docker node inspect worker01** will inspect worker01 node.
16. Command **docker node promote worker01 worker02** will promote worker01 and worker02 as manager node
17. Command **docker node demote worker01 worker02** will promote worker01 and worker02 as worker node
18. Command **watch docker container ls** will watch the running containers, run this command on each node (master as well as on worker nodes)
19. Command **docker service --help** will show the options related to service which helps to create the service.
20. Command **docker service create -d nginx** on master node and will create container in the cluster
21. Command docker service rm <<service name >> will remove the service
    docker service create --name nginx --replicas 3 -p 80:80 nginx

22. Command docker service scale m2fapj0o5s3t=2 to scale up or scale down
23. Command **docker service create --mode=global nginx** will create a service on each node
24. Command docker service create --replicas=3 --constraint="node.role==manager" nginx will run the containers on the master node only
25. Command docker service create --replicas=3 --constraint="node.role==worker" nginx will run the containers on the master node only
26. Docker swarm runs on overlay network

27.


Load Balancer in Overlay network

28.


Create an overlay network

docker network create -d overlay my-overlay

docker service create --name website --replicas 3 --network my-overlay --publish 84:80 hshar/webapp

create db service

docker service create --name db --replicas 1 --network my-overlay hshar/mysql:5.6

go inside db

```
mysql -u root -p
intelli
Create database docker;
Use docker;
mysql> create table emp(name varchar(30), phone varchar(30))
-> ;
Query OK, 0 rows affected (0.01 sec)
mysql> select * from emp;
Empty set (0.00 sec)
mysql> select * from emp;
+------+---------+
| name | phone |
+------+---------+
| xyz | 5555555 |
+------+---------+
1 row in set (0.00 sec)
```