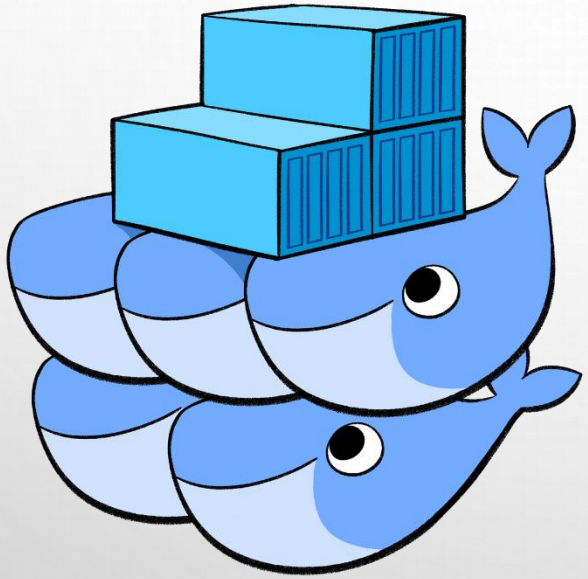
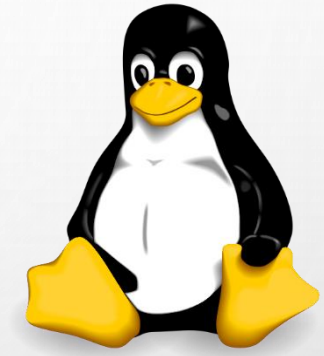
Run hybrid (Linux & Windows) applications with Docker Swarm





Runcy Oommen
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TO-DO LIST

- Bring up instances of Windows Server, Ubuntu, CentOS
- Initialize swarm and join workers
- Apply appropriate labels for identification
- Setup an overlay network
- Create specific services for Windows & Linux
- Scaling up the services and node promotion
- Load balancing (*BONUS*)

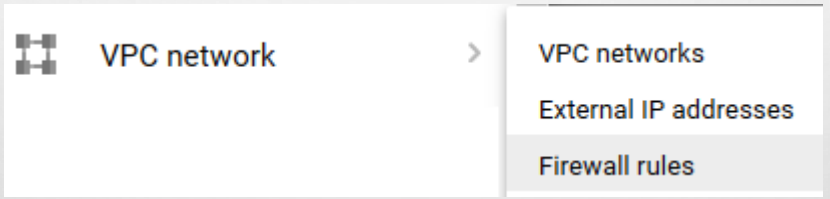
INSTANCES UP & RUNNING ON GCP

Name	Zone	Recommendation	Internal IP	External IP	Connect
lb	asia-east1-a		10.140.0.6	[redacted]	SSH
manager	asia-east1-a		10.140.0.3	[redacted]	RDP
worker1	asia-east1-a		10.140.0.2	[redacted]	RDP
worker2	asia-east1-a		10.140.0.4	[redacted]	SSH
worker3	asia-east1-a		10.140.0.5	[redacted]	SSH

REQUIRED OPEN PORTS

- TCP port `2376` for secure Docker client communication. This port is required for Docker Machine to work. Docker Machine is used to orchestrate Docker hosts.
- TCP port `2377`. This port is used for communication between the nodes of a Docker Swarm or cluster. It only needs to be opened on manager nodes.
- TCP and UDP port `7946` for communication among nodes (container network discovery).
- UDP port `4789` for overlay network traffic (container ingress networking).

CREATE GCP FIREWALL RULES



docker-swarm	dockerdemomeetup	Subnetworks: **default**	tcp:2376, tcp:2377, 3 more	Allow	1000	default
docker-swarm-eg	dockerdemomeetup	Subnetworks: **default**	tcp:2377, udp:2377	Allow	1000	default

RESET WINDOWS PASSWORD FOR RDP

```
Welcome to Cloud Shell! Type "help" to get started.
runcy_oommen@meetupdemo-177413:~$ gcloud beta compute --project <project_id> reset-windows-password <instance_name> --zone <zone_name>
```

INSTALL DOCKER (WINDOWS + LINUX)

- https://store.docker.com/editions/enterprise/docker-ee-server-windows
- https://store.docker.com/editions/community/docker-ce-server-centos
- https://store.docker.com/editions/community/docker-ce-server-ubuntu

INITIALIZE SWARM MANAGER

```
PS C:\dock> docker swarm init --advertise-addr 10.140.0.3 --listen-addr 10.140.0.3:2377
Swarm initialized: current node (67fxrta6pgyq2twfv0mh1fu1z) is now a manager.

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

    docker swarm join \
    --token SWMTKN-1-66c4swbnnd0s4kmzr2b6cguvqcr8htb4rjt2hwln19hcgx47f1-0pmwdrbva7ugbhgkqe629n873 \
    10.140.0.3:2377

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

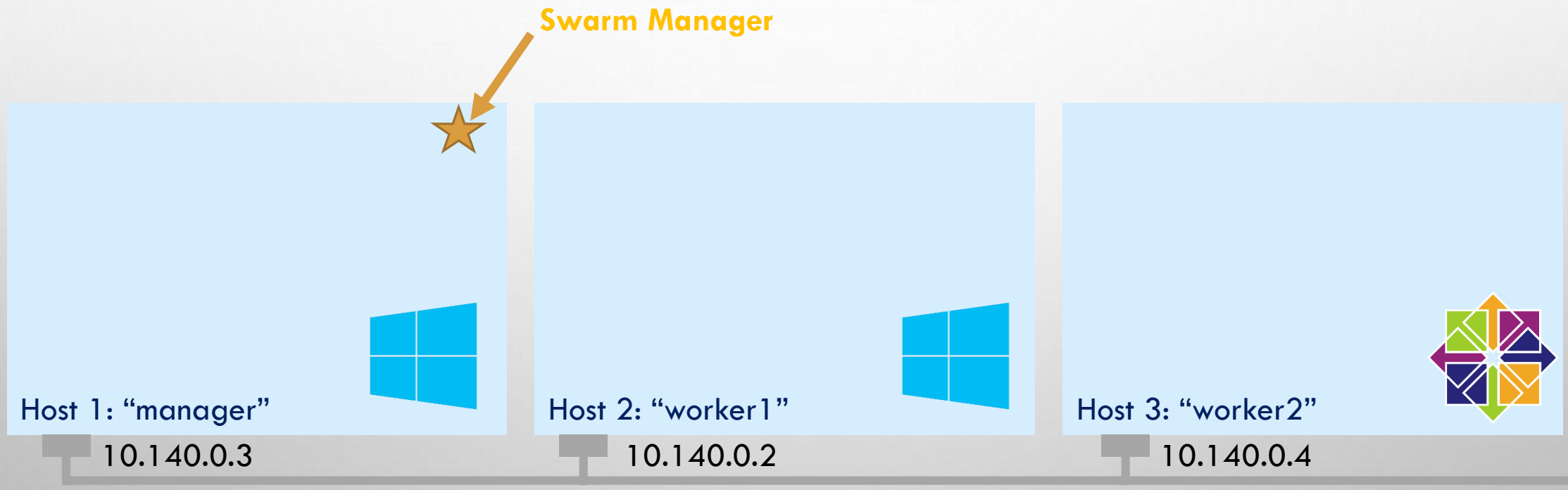
JOIN WORKER NODES

```
PS C:\Windows\system32> docker swarm join --token SWMTKN-1-66c4swbnnd0s4kmzr2b6cguvqcr8htb4rjt2hwln19hcgx47f1-0pmwdrbva7
ugbhgkqe629n873 10.140.0.3:2377
This node joined a swarm as a worker.
PS C:\Windows\system32>
```

```
[root@worker2 runcy_oommen]# docker swarm join --token SWMTKN-1-66c4swbnnd0s4kmzr2b6cguvqcr8htb4rjt2hwln19hcgx47
f1-0pmwdrbva7ugbhgkqe629n873 10.140.0.3:2377
This node joined a swarm as a worker.
[root@worker2 runcy_oommen]#
```

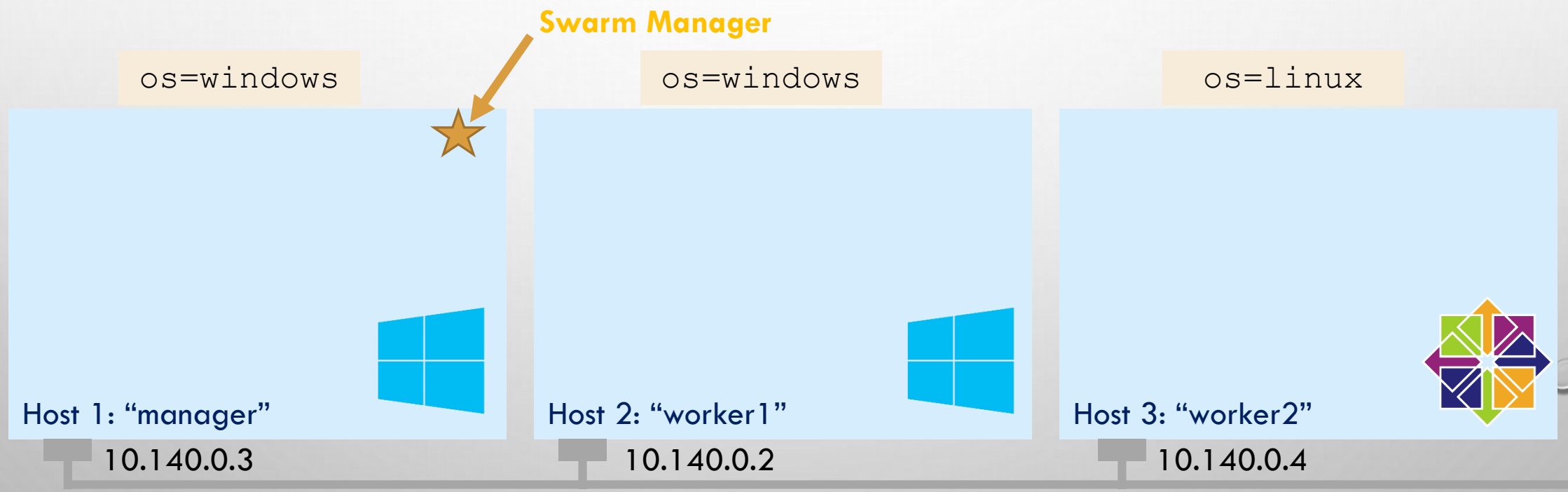
CURRENT SWARM STATUS

```
PS C:\dock> docker node ls
ID                            HOSTNAME  STATUS  AVAILABILITY  MANAGER STATUS
67fxrta6pgyq2twfv0mh1fu1z *   manager   Ready   Active        Leader
tekj5w795sdvd441s584ewxn1     worker2   Ready   Active
vgzipunqcgaj0gql0t34dfyxn     worker1   Ready   Active
PS C:\dock> _
```



LET'S LABEL 'EM

```
PS C:\dock> docker node update --label-add os=windows manager
manager
PS C:\dock> docker node update --label-add os=windows worker1
worker1
PS C:\dock> docker node update --label-add os=linux worker2
worker2
PS C:\dock> _
```



VIEW LABELS

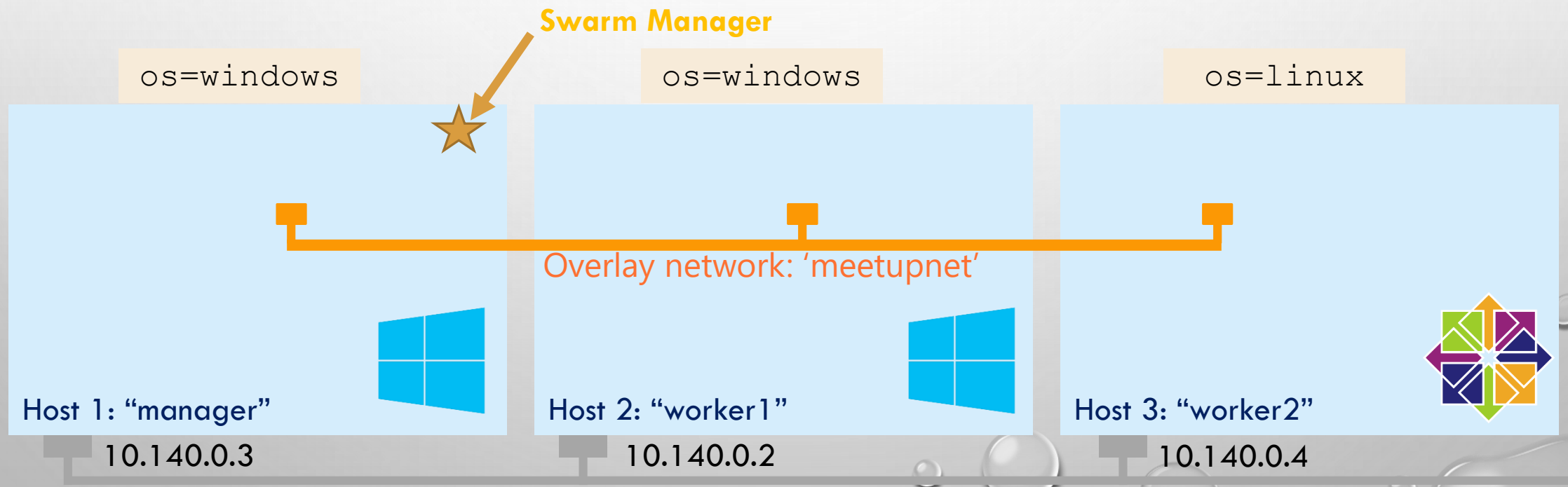
```
PS C:\dock> docker node inspect manager | findstr 'OS'
                "OS": "windows"
PS C:\dock> docker node inspect worker1 | findstr 'OS'
                "OS": "windows"
PS C:\dock> docker node inspect worker2 | findstr 'OS'
                "OS": "linux"
PS C:\dock> _
```

VIEW EXISTING NETWORKS

```
PS C:\dock> docker network ls
NETWORK ID          NAME                DRIVER              SCOPE
nc30mwb9z7r8        ingress             overlay             swarm
f681970f8608        nat                 nat                 local
d00cec06abdf        none                null                local
PS C:\dock> _
```

CREATE APPLICATION OVERLAY NETWORK

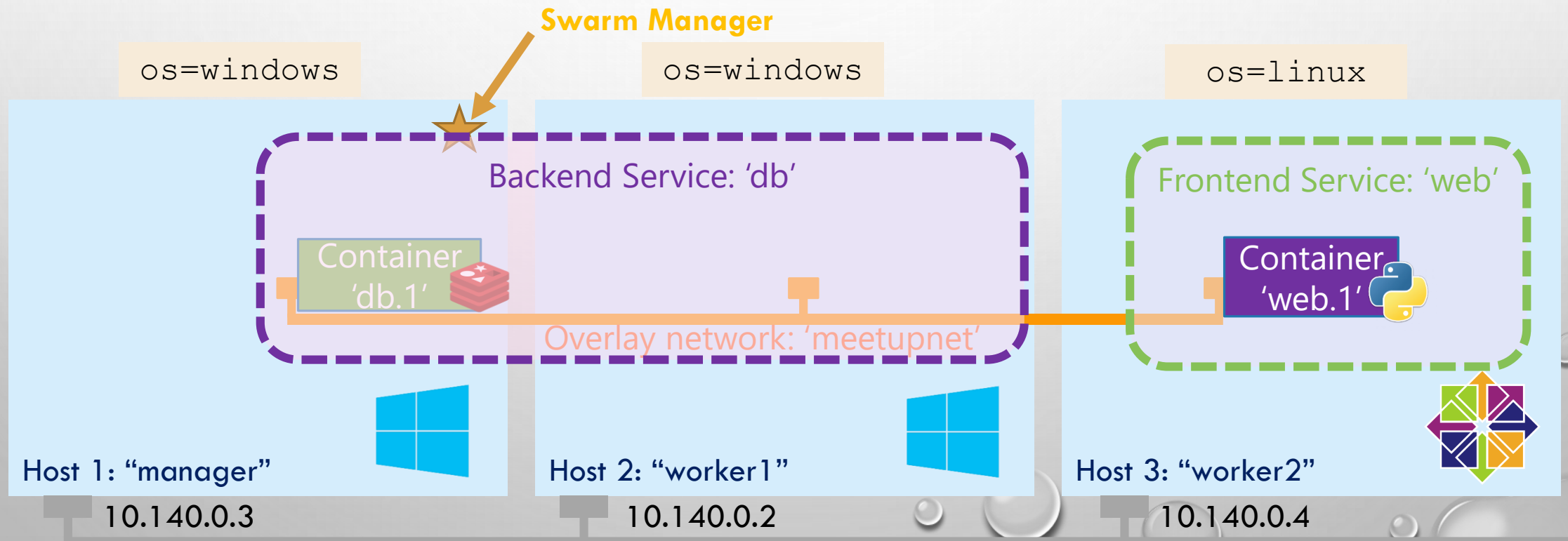
```
PS C:\dock> docker network create -d overlay meetupnet
fl7cuimz7alu2zs0e03ra1lqz
PS C:\dock> docker network ls
NETWORK ID          NAME                DRIVER              SCOPE
nc30mwb9z7r8        ingress             overlay             swarm
fl7cuimz7alu        meetupnet           overlay             swarm
f6819/0f8608        nat                 nat                 local
d00cec06abdf        none                null                local
PS C:\dock> _
```



CREATE “DB” & “WEB” SERVICES

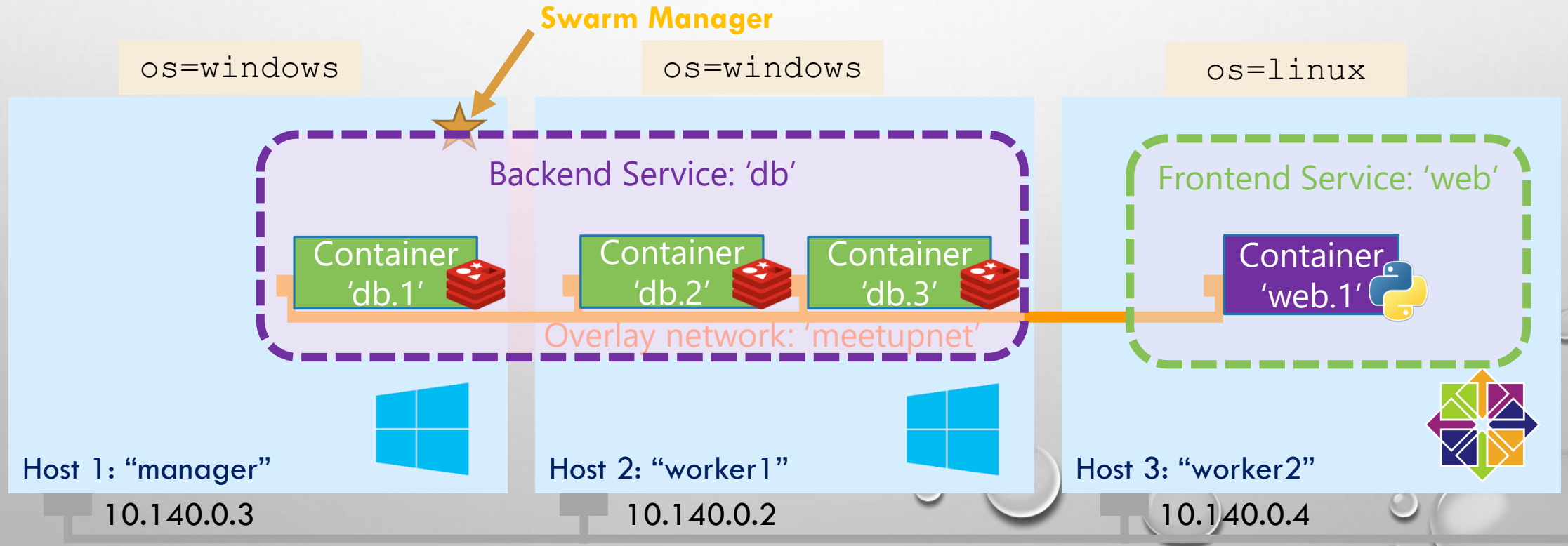
```
PS C:\dock> docker service create --name db --network meetupnet --constraint 'node.labels.os==windows' --endpoint-mode d
nsrr redis:3.2.100-nanoserver
```

```
PS C:\dock> docker service create --name web --network meetupnet --constraint 'node.labels.os==linux' --publish 80:80 ra
dumatei/python-web
```



SCALE UP “DB”

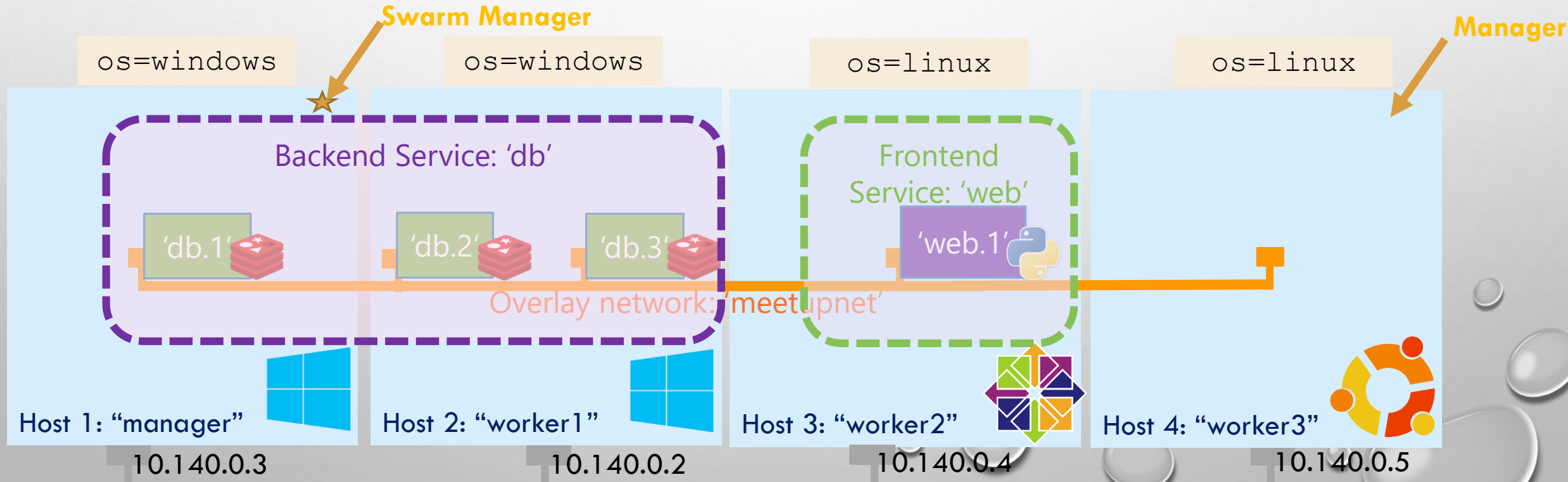
```
PS C:\dock> docker service scale db=3
db scaled to 3
PS C:\dock> docker service ls
ID            NAME  MODE         REPLICAS  IMAGE
jtvou9mv8ome  web   replicated   1/1       radumatei/python-web:latest
mnocx24g2d8s  db    replicated   3/3       redis:3.2.100-nanoserver
PS C:\dock> docker service ps db
ID            NAME      IMAGE                        NODE     DESIRED STATE  CURRENT STATE           ERROR  PORTS
wvsgoyn5j45r  db.1      redis:3.2.100-nanoserver     worker1  Running        Running 19 hours ago
q6rx6hmg7o01  db.2      redis:3.2.100-nanoserver     worker1  Running        Running 4 seconds ago
gwwpwq9vho2t  db.3      redis:3.2.100-nanoserver     manager  Running        Running 4 seconds ago
```



ADD LINUX NODE & PROMOTE TO MANAGER

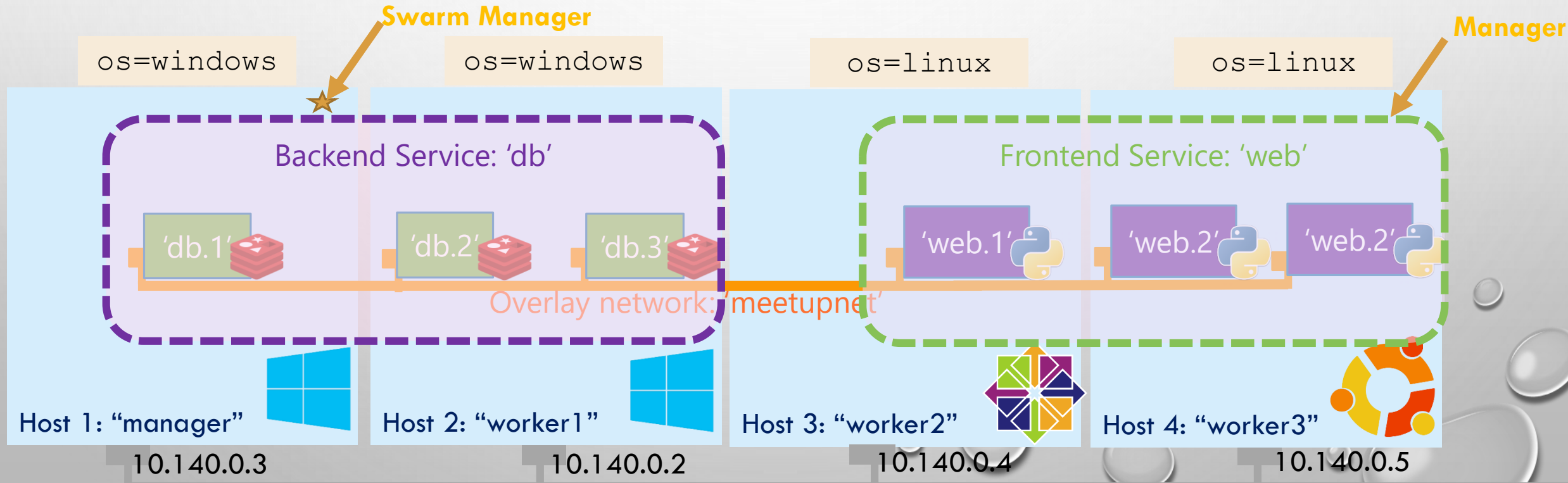
```
root@worker3:/home/runcy_oommen# docker swarm join --token SWMTKN-1-66ptuwyohs8fhcm9bw9w3ugc7uyr5q5p631st8g1f31t
98rpg7-5fubxwj7579244dkxp7blxfy4 10.140.0.3:2377
This node joined a swarm as a worker.
```

```
PS C:\dock> docker node update --label-add os=linux worker3
worker3
PS C:\dock> docker node promote worker3
Node worker3 promoted to a manager in the swarm.
PS C:\dock> docker node ls
ID                            HOSTNAME   STATUS   AVAILABILITY   MANAGER STATUS
gph5x1yk6ytthzzj0q0or7ats     worker3    Ready    Active         Reachable
q993on61py44gi2cd3x4hpatm     worker1    Ready    Active
qsu7q32lwzo4pd9vjh5sdfq1y     worker2    Ready    Active
todk1f9csjqb61p3mey2i0mr5 *   manager    Ready    Active         Leader
```

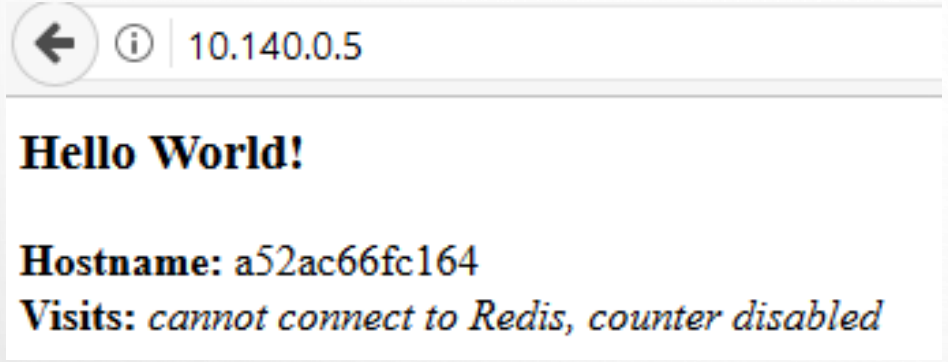


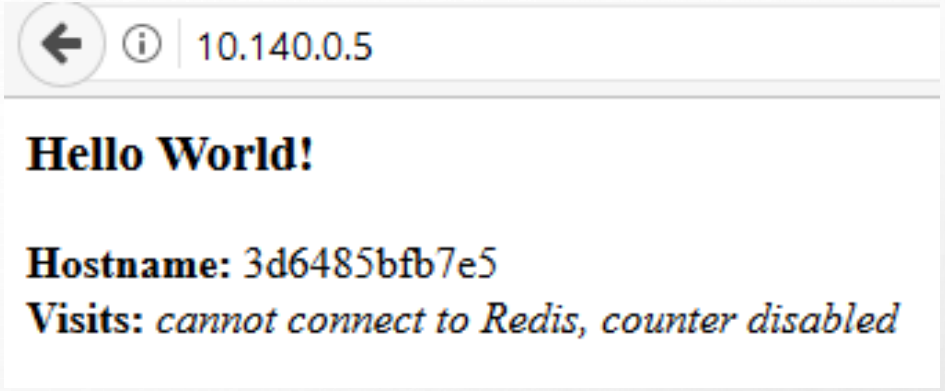
SCALE UP "WEB"

```
PS C:\dock> docker service scale web=3
web scaled to 3
PS C:\dock> docker service ls
ID            NAME  MODE        REPLICAS  IMAGE
jtvou9mv8ome  web   replicated  1/3       radumatei/python-web:latest
mnocx24q2d8s  db    replicated  3/3       redis:3.2.100-nanoserver
PS C:\dock> docker service ps web
ID            NAME    IMAGE                          NODE     DESIRED STATE  CURRENT STATE           ERROR  PORTS
ei4freszsos6  web.1   radumatei/python-web:latest    worker2  Running        Running 21 hours ago
rsunlxf8dv0v  web.2   radumatei/python-web:latest    worker3  Running        Running 40 seconds ago
uc34ouzghdbx  web.3   radumatei/python-web:latest    worker3  Running        Running 41 seconds ago
```

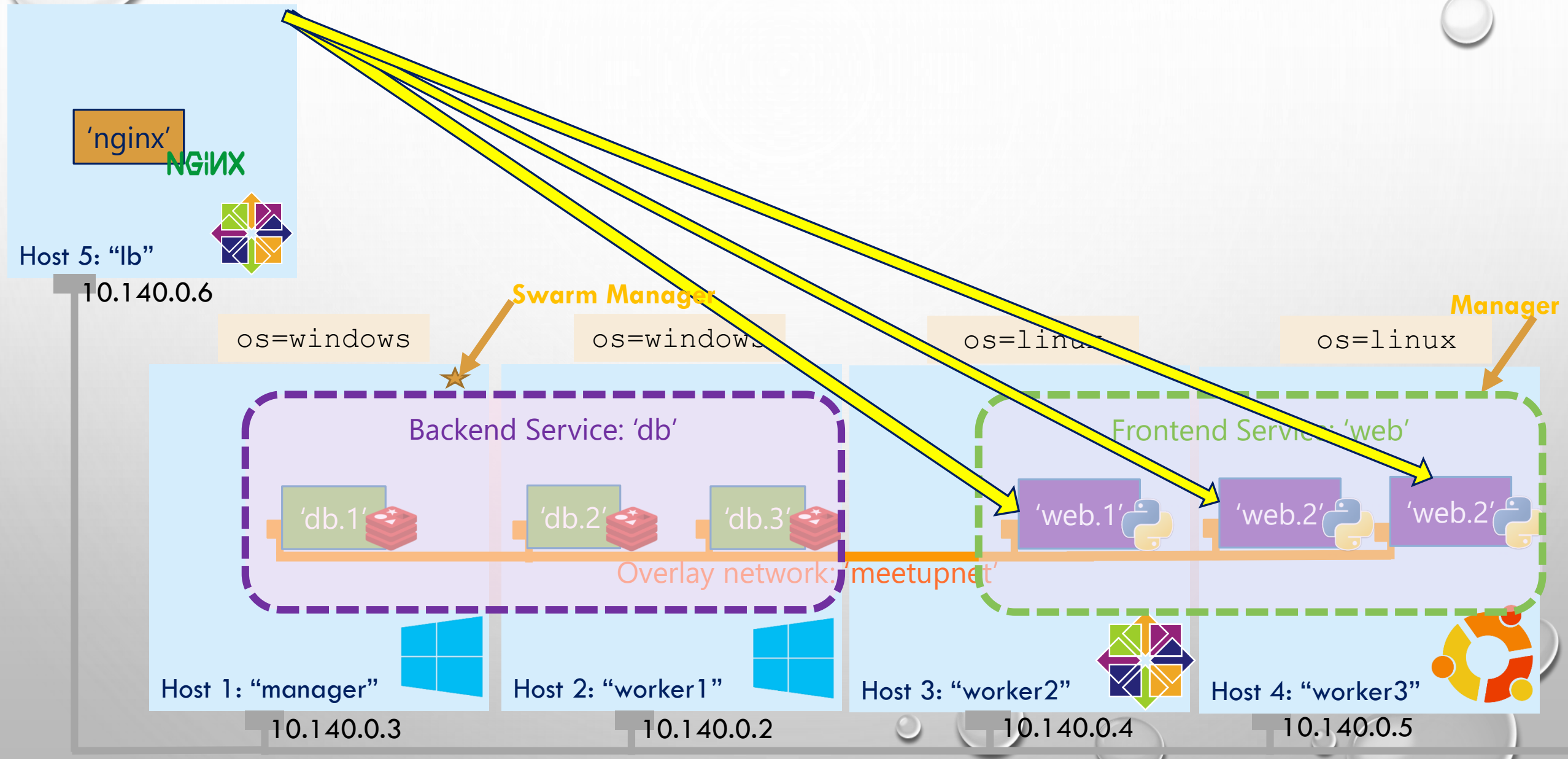


ACCESS THE APPLICATION



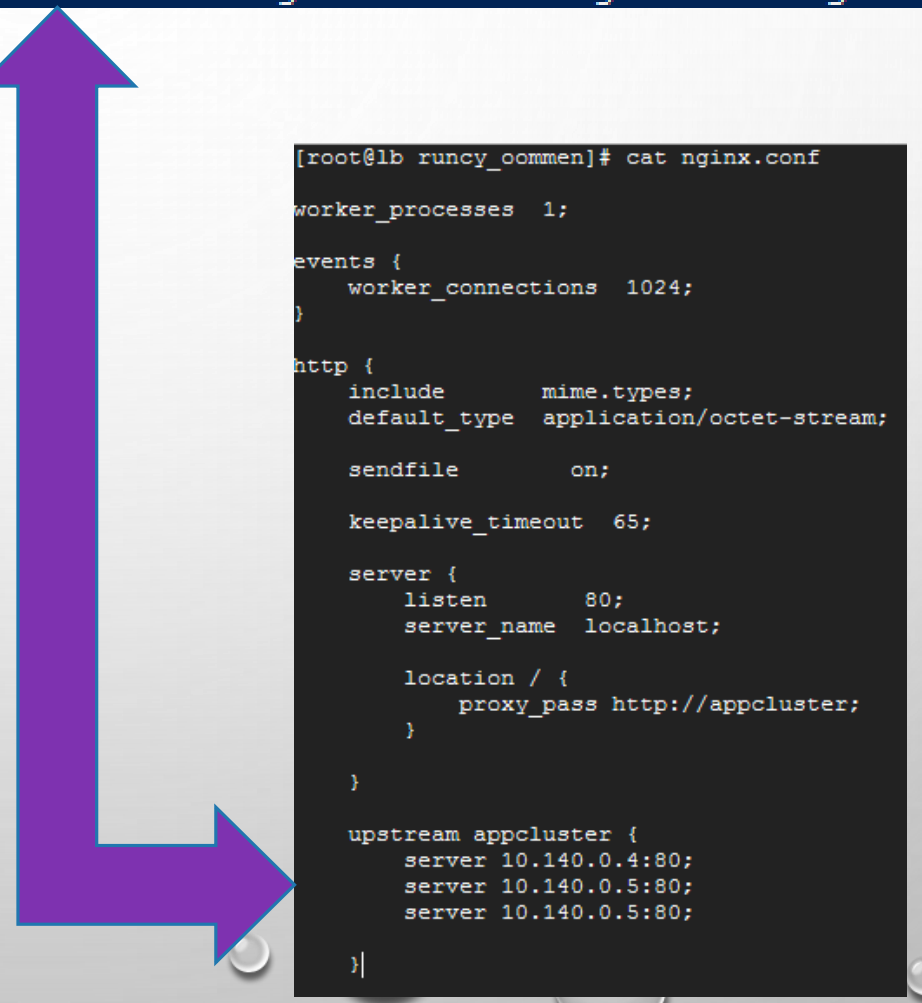


WE NEED A SINGLE URL!



SETUP NGINX.CONF

```
PS C:\dock> docker service ps web
ID             NAME    IMAGE                              NODE     DESIRED STATE  CURRENT STATE          ERROR  PORTS
ei4freszsos6   web.1   radumatei/python-web:latest   worker2  Running        Running 28 hours ago
rsunlxf8dv0v   web.2   radumatei/python-web:latest   worker3  Running        Running 7 hours ago
uc34ouzghdbx   web.3   radumatei/python-web:latest   worker3  Running        Running 7 hours ago
```



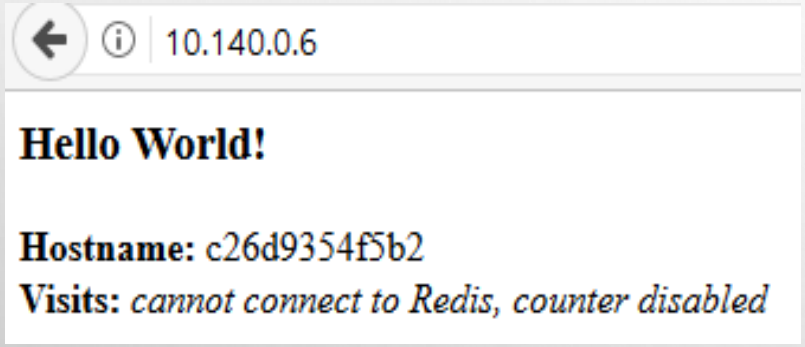
```
[root@lb runcy_oommen]# cat nginx.conf

worker_processes  1;

events {
    worker_connections  1024;
}

http {
    include       mime.types;
    default_type  application/octet-stream;

    sendfile        on;

    keepalive_timeout  65;

    server {
        listen       80;
        server_name  localhost;

        location / {
            proxy_pass http://appcluster;
        }

    }

    upstream appcluster {
        server 10.140.0.4:80;
        server 10.140.0.5:80;
        server 10.140.0.5:80;

    }
```

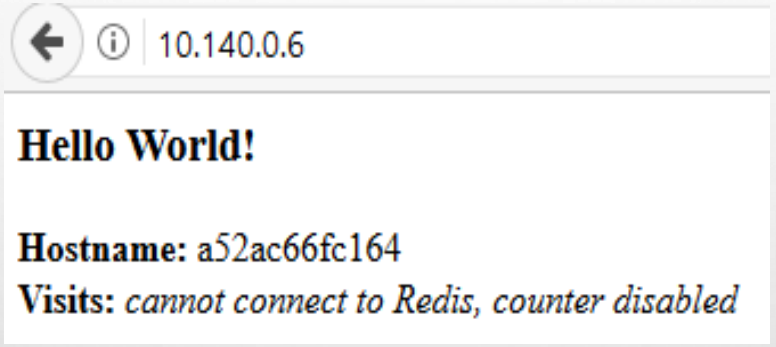
CREATE CUSTOM NGINX IMAGE

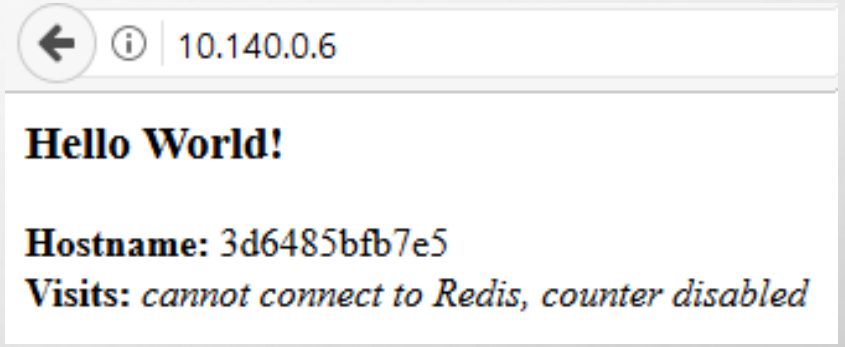
```
[root@lb runcy_oommen]# cat Dockerfile
FROM nginx

COPY nginx.conf /etc/nginx/nginx.conf
[root@lb runcy_oommen]# docker build . -t nginx:meetupdemo
Sending build context to Docker daemon  8.192kB
Step 1/2 : FROM nginx
 ---> b8efb18f159b
Step 2/2 : COPY nginx.conf /etc/nginx/nginx.conf
 ---> Using cache
 ---> 9e6bd2eb77c5
Successfully built 9e6bd2eb77c5
Successfully tagged nginx:meetupdemo
[root@lb runcy_oommen]# docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
nginx               meetupdemo          9e6bd2eb77c5        About an hour ago   107MB
nginx               latest              b8efb18f159b        4 weeks ago         107MB
```

RUN & VIEW THE APPLICATION

```
[root@lb runcy_oommen]# docker run -p 80:80 -d nginx:meetupdemo
12bc40b8345c6c135b6e2da342744978b1a9d231f357b1543e2cec39cb720620
[root@lb runcy_oommen]# docker ps
CONTAINER ID        IMAGE               COMMAND                  CREATED             STATUS              PORTS                  NAMES
12bc40b8345c        nginx:meetupdemo    "nginx -g 'daemon ..."   3 seconds ago       Up 2 seconds        0.0.0.0:80->80/tcp     keen_darwin
```







THANK YOU!

Command Reference:
https://gist.github.com/roommen/1cb4e04ab42721b9c61f9f154196744b
GitHub Repo:
https://github.com/roommen/meetup/tree/master/Hybrid_DockerSwarm