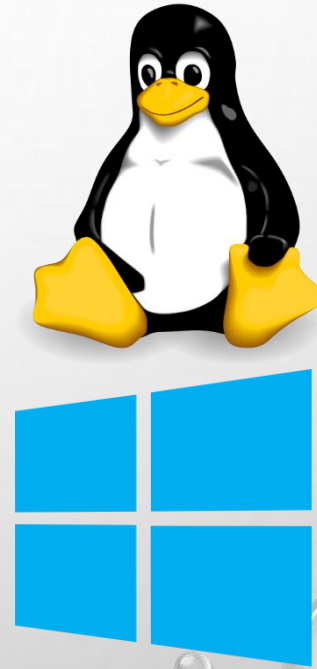
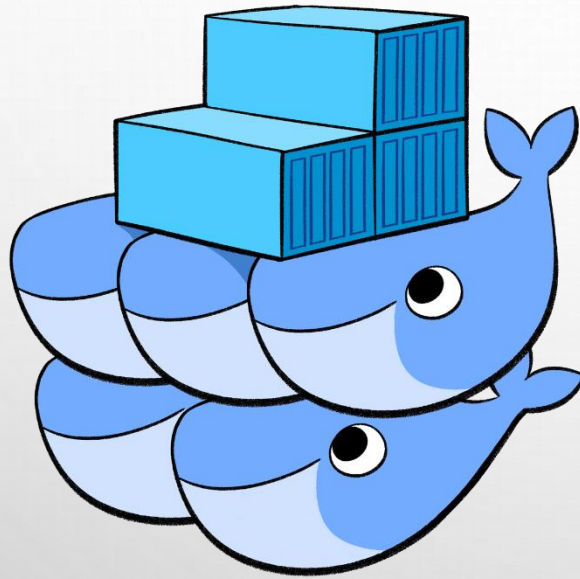


Run hybrid (Linux & Windows) applications with Docker Swarm



Runcy Oommen

<http://runcy.me>

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

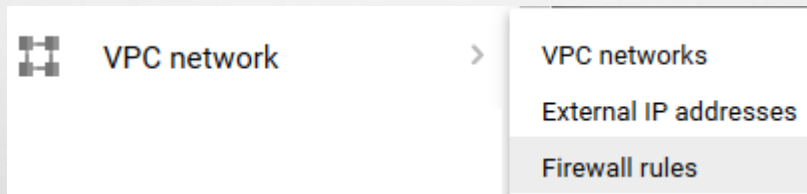


| <input type="checkbox"/> | Name ^ | Zone | Recommendation | Internal IP | External IP | Connect |
|--------------------------|-----------|------------|----------------|-------------|-------------|---------|
| <input type="checkbox"/> | ✓ lb | us-east1-b | | 10.142.0.6 | [REDACTED] | SSH ▾ ⋮ |
| <input type="checkbox"/> | ✓ manager | us-east1-b | | 10.142.0.2 | [REDACTED] | SSH ▾ ⋮ |
| <input type="checkbox"/> | ✓ worker1 | us-east1-b | | 10.142.0.3 | [REDACTED] | RDP ▾ ⋮ |
| <input type="checkbox"/> | ✓ worker3 | us-east1-b | | 10.142.0.7 | [REDACTED] | SSH ▾ ⋮ |
| <input type="checkbox"/> | ✓ workr2 | us-east1-b | | 10.142.0.5 | [REDACTED] | RDP ▾ ⋮ |

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



| | | | | | | | |
|--------------------------|-----------------|------------------|----------------------|------------------------------|-------|------|---------|
| <input type="checkbox"/> | docker-swarm | dockerdemomeetup | Subnetworks: default | tcp:2376, tcp:2377, 3 more ▾ | Allow | 1000 | default |
| <input type="checkbox"/> | 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

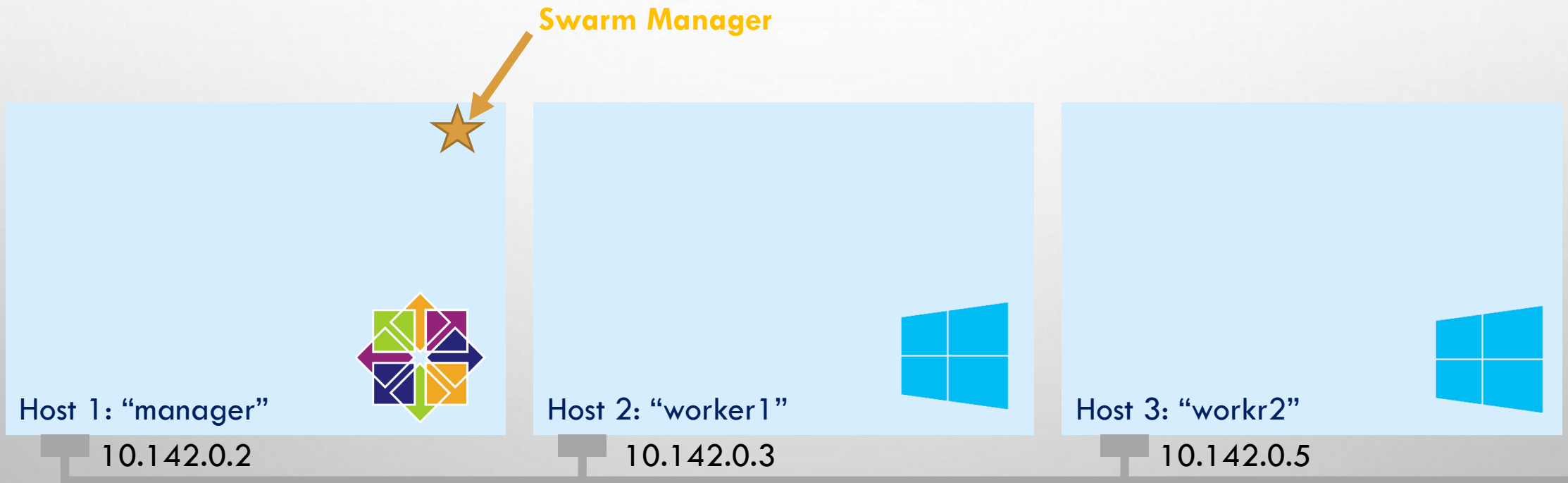
```
PS C:\Windows\system32> docker swarm join --token SWMTKN-1-66c4swbnnd0s4kmzr2b6cguvqcr8htb4rjt2hwln19hcgx47f1-0pmwdrbva7
ugbhgkqe629n873 10.140.0.3:2377
This node joined a swarm as a worker.
PS C:\Windows\system32>
```

```
[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

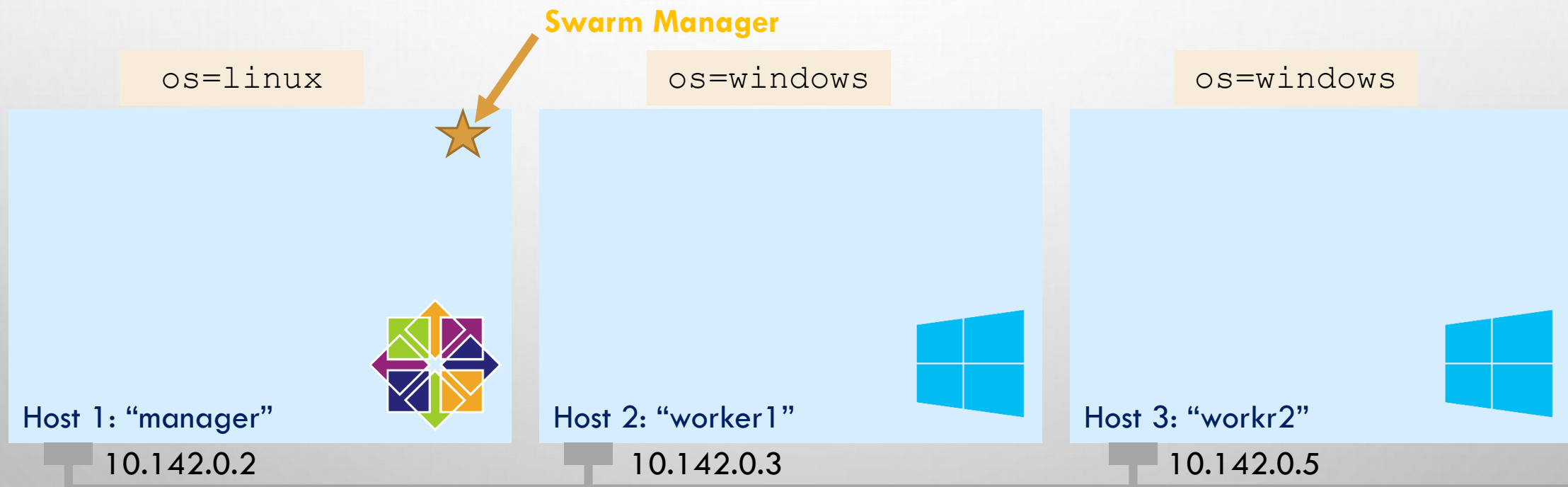
```
PS C:\dock> docker node ls
ID
67fxrta6pgyq2twfv0mh1fu1z *
tekj5w795sdvd441s584ewxn1
vgzipunqcgaj0gql0t34dfyxn
PS C:\dock>
```

| HOSTNAME | STATUS | AVAILABILITY | MANAGER STATUS |
|----------|--------|--------------|----------------|
| manager | Ready | Active | Leader |
| worker2 | Ready | Active | |
| worker1 | Ready | Active | |



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

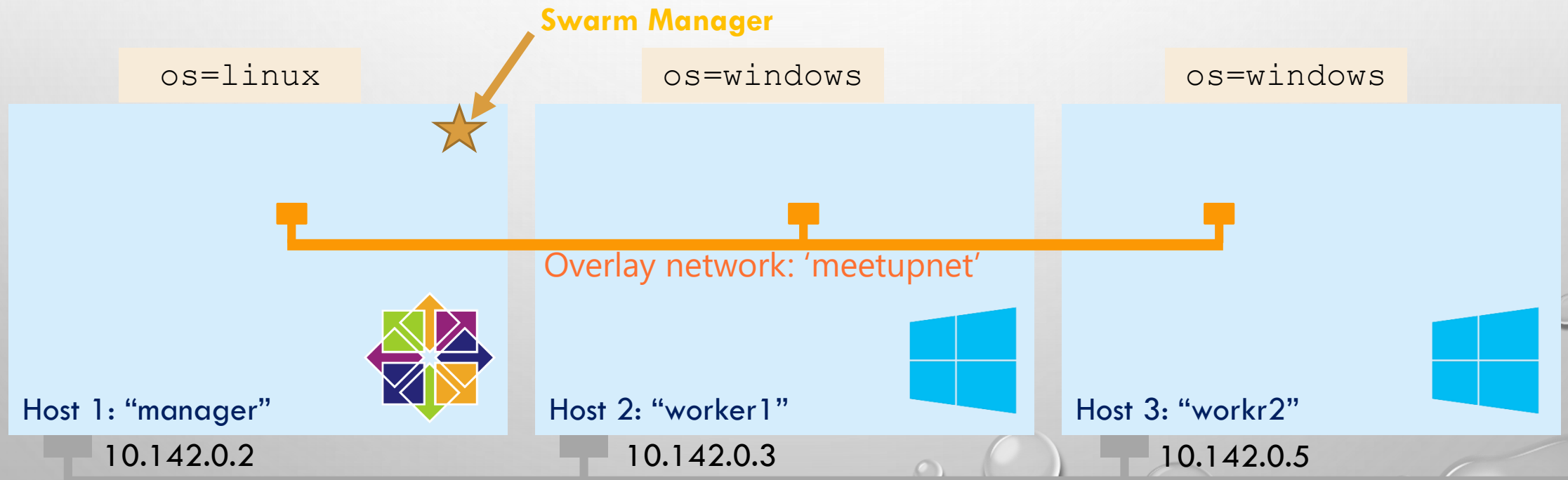
```
PS C:\dock> docker node inspect manager | findstr 'OS'
"OS": "windows"
PS C:\dock> docker node inspect worker1 | findstr 'OS'
"OS": "windows"
PS C:\dock> docker node inspect worker2 | findstr 'OS'
"OS": "linux"
PS C:\dock> _
```

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

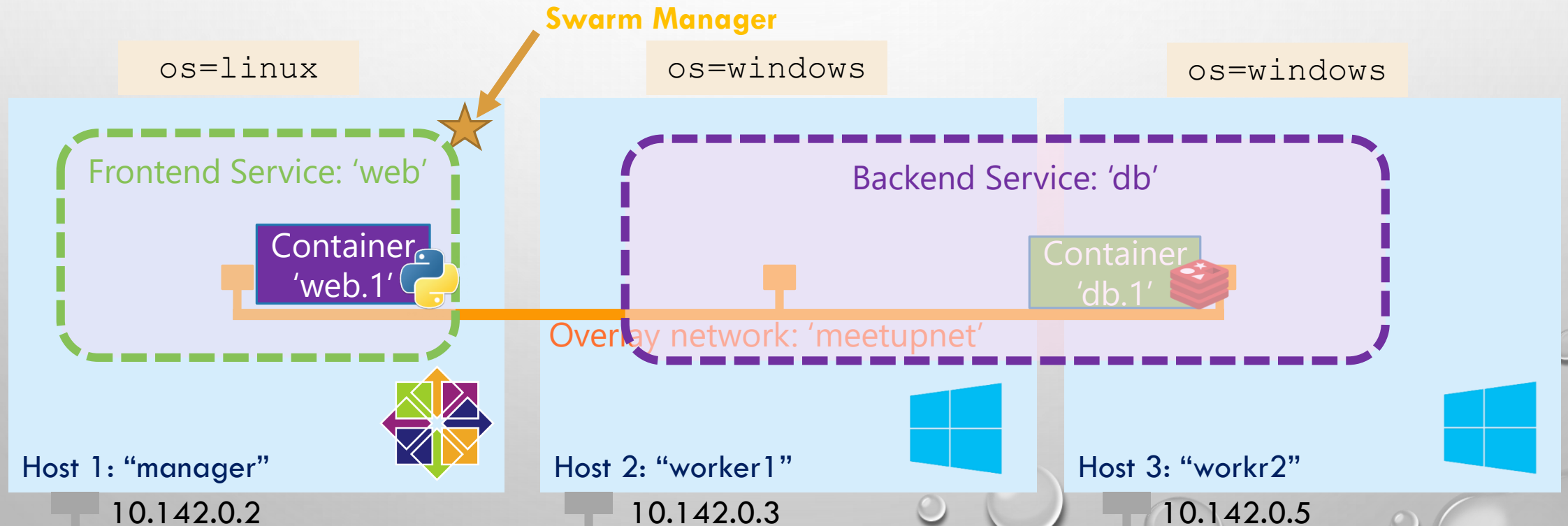
```
PS C:\dock> docker network create -d overlay meetupnet
f17cuimz7alu2zs0e03ra1lqz
PS C:\dock> docker network ls
NETWORK ID          NAME                DRIVER              SCOPE
nc30mwb9z7r8        ingress            overlay             swarm
f17cuimz7alu         meetupnet          overlay             swarm
f6819/0t8608         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 dnsrr redis:3.2.100-nanoserver_
```

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



SCALE UP “DB”

```
PS C:\dock> docker service scale db=3
```

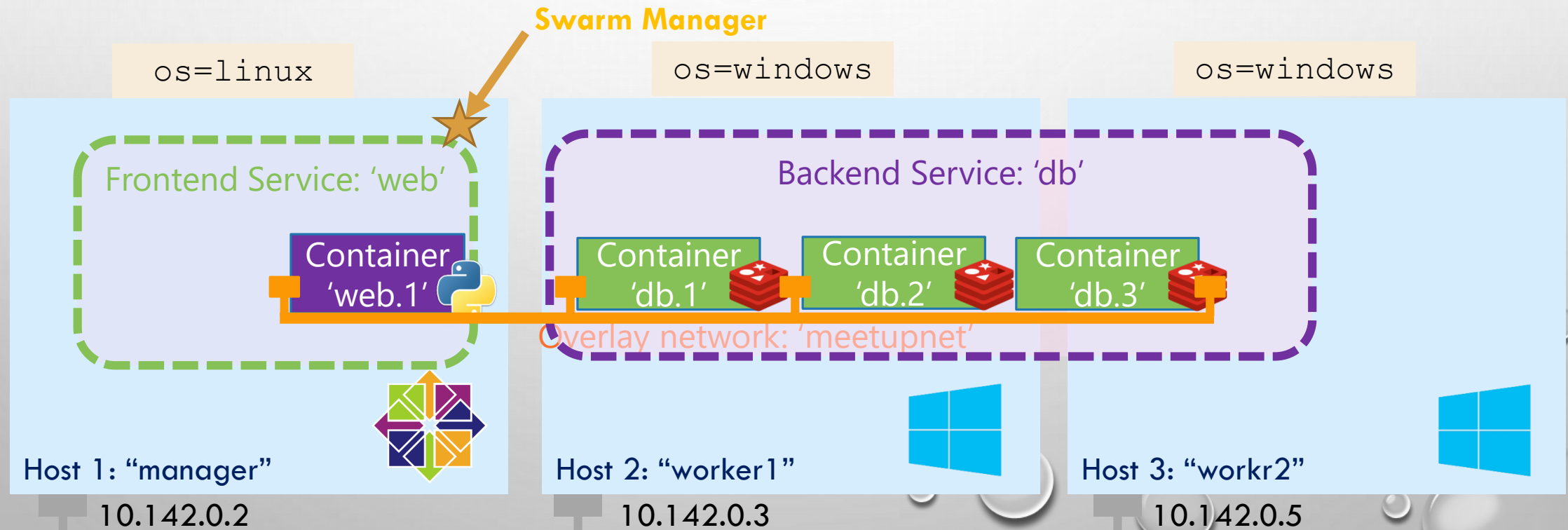
```
db scaled to 3
```

```
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 | Running 19 hours ago | | |
| q6rx6hmg7o01 | db.2 | redis:3.2.100-nanoserver | worker1 | Running | Running | Running 4 seconds ago | | |
| gwwpwq9vho2t | db.3 | redis:3.2.100-nanoserver | manager | Running | Running | Running 4 seconds ago | | |

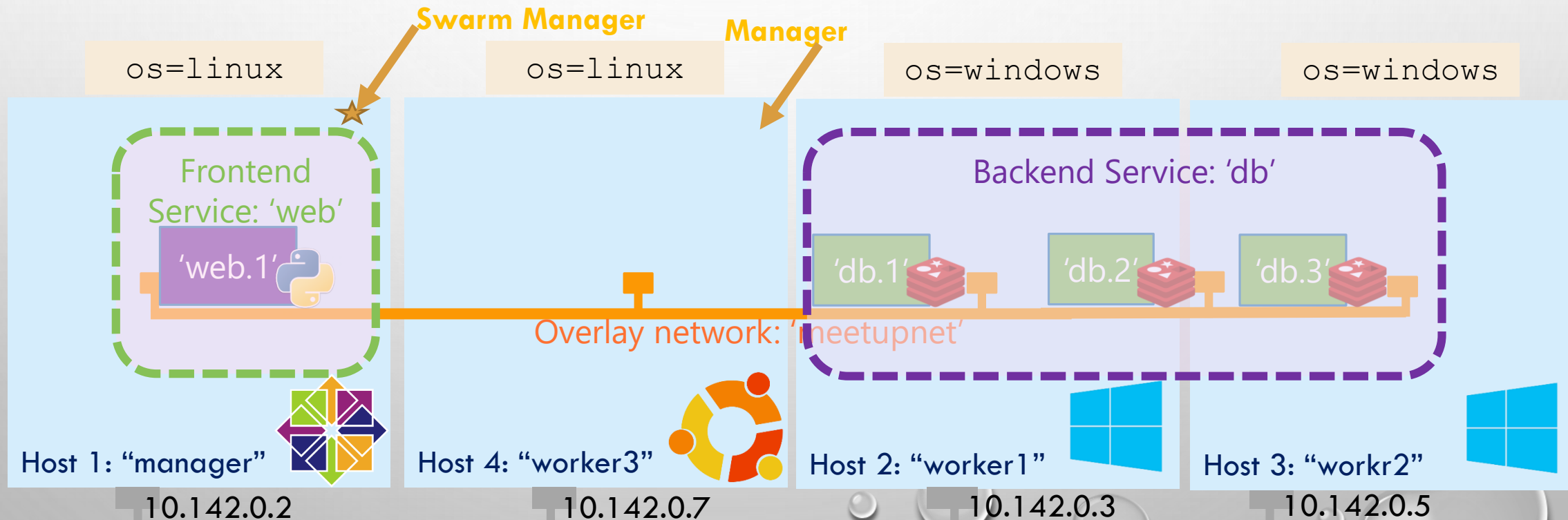


ADD LINUX NODE & PROMOTE TO MANAGER

```
root@worker3:/home/runcy_oommen# docker swarm join --token SWMTKN-1-66ptuwyohs8fhcm9bw9w3ugc7uyr5q5p631st8g1f3lt98rpg7-5fubxwj7579244dkxp7blxfy4 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 |
|-----------------------------|----------|--------|--------------|------------------|
| gph5x1yk6ytttzzj0q0or7ats | worker3 | Ready | Active | <u>Reachable</u> |
| q993on61py44gi2cd3x4hpatm | worker1 | Ready | Active | |
| qsu7q32lwzo4pd9vjh5sdfq1y | worker2 | Ready | Active | |
| todk1f9csjqb61p3mey2i0mr5 * | manager | Ready | Active | Leader |



SCALE UP “WEB”

```
PS C:\dock> docker service scale web=3
```

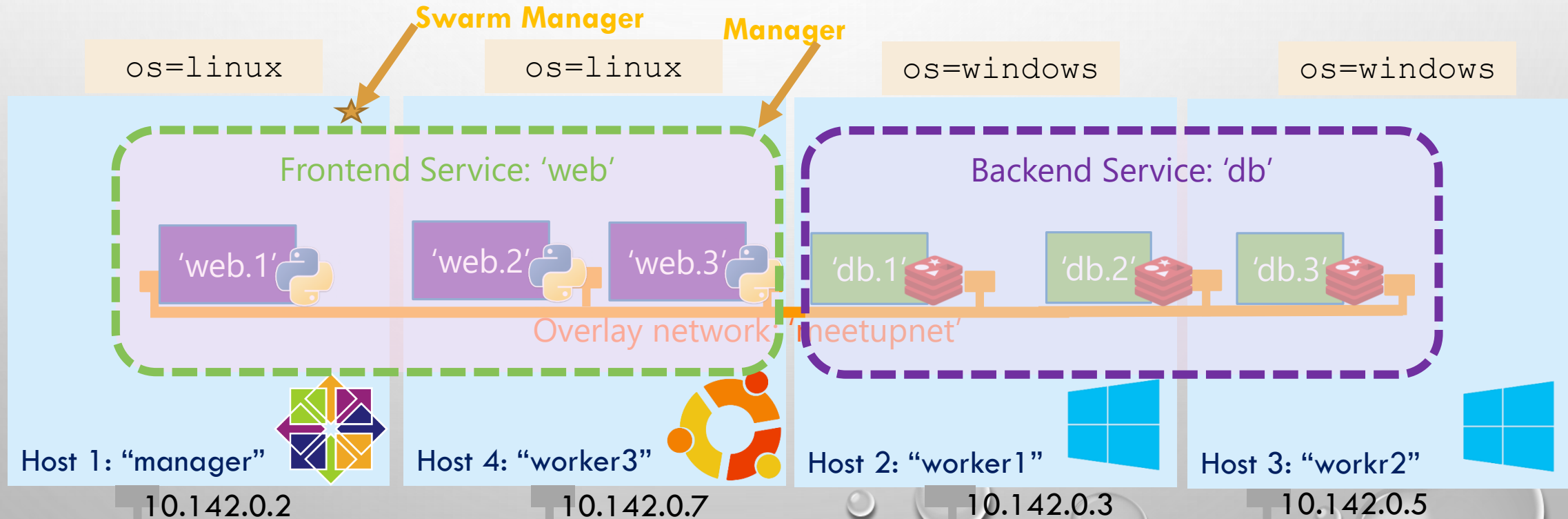
```
web scaled to 3
```

```
PS C:\dock> docker service ls
```

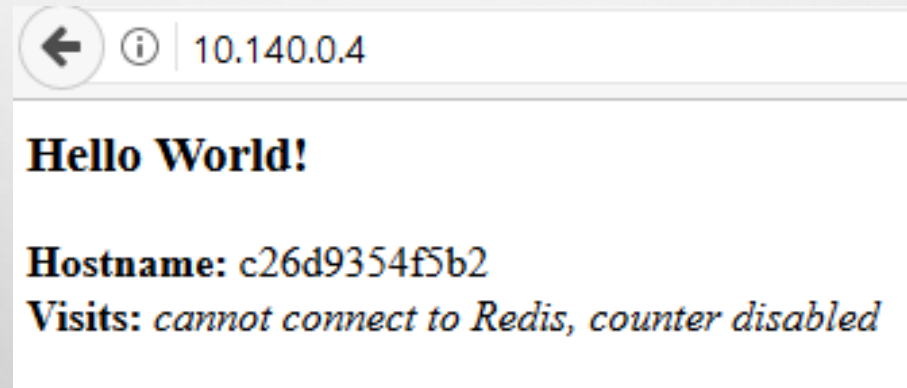
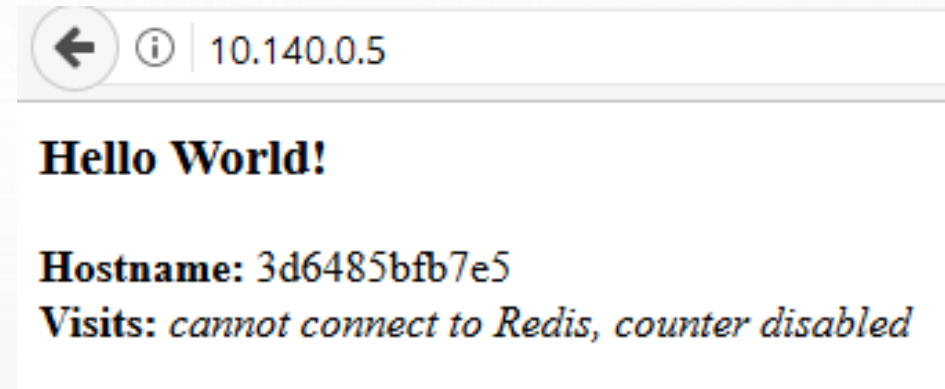
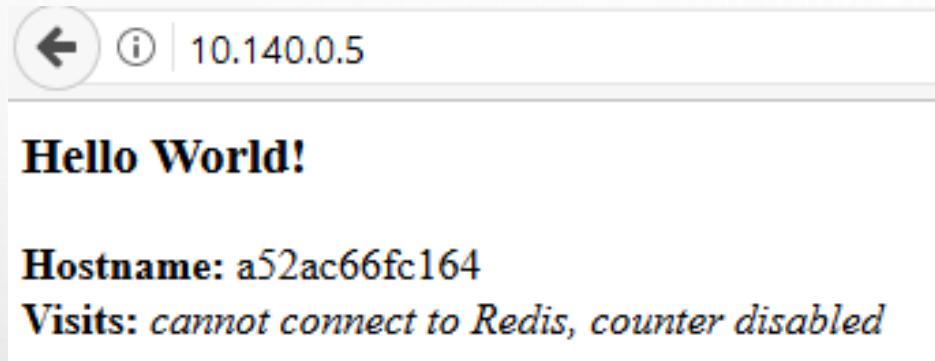
| ID | NAME | MODE | REPLICAS | IMAGE |
|--------------|------|------------|----------|-----------------------------|
| jtvou9mv8ome | web | replicated | 1/3 | radumatei/python-web:latest |
| mnocx24q2d8s | db | replicated | 3/3 | redis:3.2.100-nanoserver |

```
PS C:\dock> docker service ps web
```

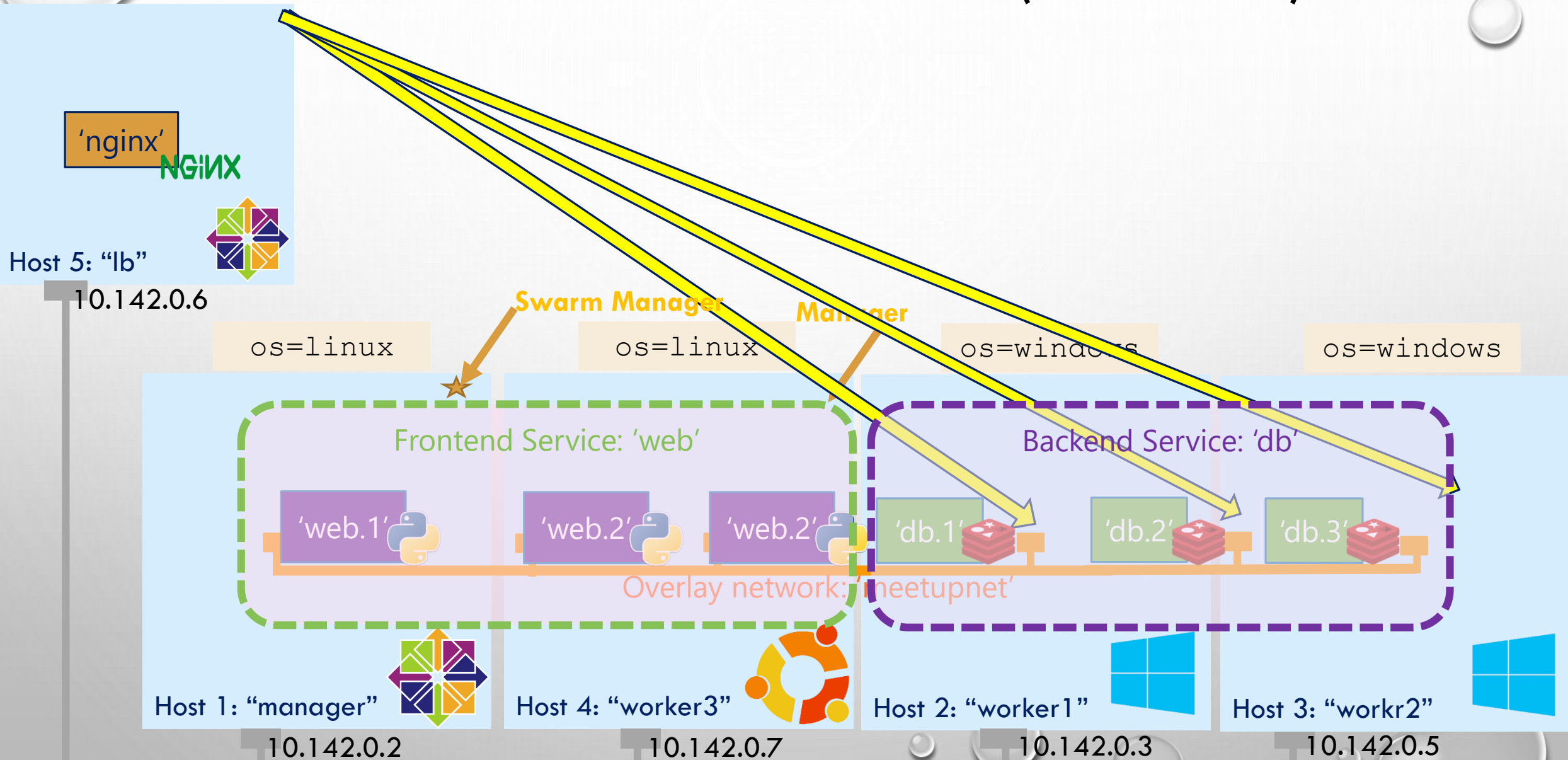
| ID | NAME | IMAGE | NODE | DESIRED STATE | CURRENT STATE | ERROR | PORTS |
|--------------|-------|-----------------------------|---------|---------------|------------------------|-------|-------|
| ei4freszsos6 | web.1 | radumatei/python-web:latest | worker2 | Running | Running 21 hours ago | | |
| 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! (BONUS LB)



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@1b runcy_oommen]# docker run -p 80:80 -d nginx:meetupdemo  
12bc40b8345c6c135b6e2da342744978b1a9d231f357b1543e2cec39cb720620
```

```
[root@1b 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 |

← ⓘ 10.140.0.6

Hello World!

Hostname: c26d9354f5b2

Visits: *cannot connect to Redis, counter disabled*

← ⓘ 10.140.0.6

Hello World!

Hostname: a52ac66fc164

Visits: *cannot connect to Redis, counter disabled*

← ⓘ 10.140.0.6

Hello World!

Hostname: 3d6485bf7e5

Visits: *cannot connect to Redis, counter disabled*



THANK YOU!

GitHub:

https://github.com/roommen/meetup/tree/master/Hybrid_DockerSwarm

