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DOF605 - Docker Compose, Docker Machine et Docker Swarm

Contenu du Module

- **DOF605 - Docker Compose, Docker Machine et Docker Swarm**
 - Contenu du Module
 - LAB #1 - Docker Compose
 - 1.1 - Installation
 - 1.2 - Installer Wordpress avec Docker Compose
 - LAB #2 - Docker Machine
 - 2.1 - Présentation
 - 2.2 - Création de Machines Virtuelles Docker
 - 2.3 - Lister les VM Docker
 - 2.4 - Obtenir l'adresse IP des VM
 - 2.5 - Se connecter à une VM Docker
 - LAB #3 - Docker Swarm
 - 3.1 - Présentation
 - 3.2 - Initialiser Docker Swarm
 - 3.3 - Le Statut Leader
 - 3.4 - Rejoindre le Swarm
 - 3.5 - Consulter les Informations de Swarm
 - 3.6 - Démarrer un Service
 - 3.7 - Augmentation et Réduction du Service
 - 3.8 - Consulter le Statut d'un Nœud
 - 3.9 - Haute Disponibilité
 - 3.10 - Supprimer un Service
 - 3.11 - Sauvegarder Docker Swarm

- 3.12 - Restaurer Docker Swarm

LAB #1 - Docker Compose

Docker Compose est un utilitaire de compilation d'images et de gestion de conteneurs multiples, tous intégrés dans une seule et unique application logicielle. Son rôle est de rendre plus aisée la manipulation d'éléments multiples interconnectés. Pour ce faire, Docker Compose utilise un fichier dénommé **docker-compose.yml** au format **YAML**.

Ce fichier, appelé par la commande **docker-compose build** commence avec un mot clef **image** ou **build** selon que l'image est récupérée sur un registre ou provient du répertoire cité dans le fichier. Le reste du fichier contient des instructions pour définir la compilation des images constituant, pour lier des conteneurs et pour définir l'environnement.

Une fois totalement construite, l'application peut ensuite être pilotée très simplement par l'utilisation de la commande **docker-compose** qui réagit de la même manière que la commande **docker** mais cette fois-ci sur tous les conteneurs définis dans le fichier **docker-compose.yml**.

De cette façon il est possible de démarrer l'application avec la commande **docker-compose up**, de l'arrêter avec la commande **docker-compose stop** ou de la redémarrer avec la commande **docker-compose restart**. De la même manière que la commande **docker**, la commande **docker-compose** donne accès aux journaux grâce à la commande **docker-compose logs**.

1.1 - Installation

Récupérez docker-compose avec **curl** :

```
root@debian11:~# curl -L "https://github.com/docker/compose/releases/download/v2.0.1/docker-compose-$(uname -s)-$(uname -m)" -o /usr/local/bin/docker-compose
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left   Speed
  0     0    0     0    0     0      0     0  --:--:--  --:--:--  --:--:--    0
100 24.7M 100 24.7M    0     0 45.5M     0  --:--:--  --:--:--  --:--:-- 45.5M
```

Vérifiez la version installée :

```
root@debian11:~# docker-compose --version
Docker Compose version v2.0.1
```

Rendez **/usr/local/bin/docker-compose** exécutable :

```
root@debian11:~# chmod +x /usr/local/bin/docker-compose

root@debian11:~# ls -l /usr/local/bin/docker-compose
-rwxr-xr-x 1 root root 25907200 Dec 16 12:15 /usr/local/bin/docker-compose
```

Les options de la commande **docker-compose** sont :

```
root@debian11:~# docker-compose --help

Usage:  docker compose [OPTIONS] COMMAND

Docker Compose

Options:
  --ansi string          Control when to print ANSI control
                        characters ("never"|"always"|"auto")
                        (default "auto")
  --compatibility        Run compose in backward compatibility mode
  --env-file string     Specify an alternate environment file.
  -f, --file stringArray Compose configuration files
  --profile stringArray Specify a profile to enable
  --project-directory string Specify an alternate working directory
                        (default: the path of the Compose file)
  -p, --project-name string Project name

Commands:
  build      Build or rebuild services
  convert    Converts the compose file to platform's canonical format
  cp        Copy files/folders between a service container and the local filesystem
```

```
create    Creates containers for a service.
down      Stop and remove containers, networks
events    Receive real time events from containers.
exec      Execute a command in a running container.
images    List images used by the created containers
kill      Force stop service containers.
logs      View output from containers
ls        List running compose projects
pause     pause services
port      Print the public port for a port binding.
ps        List containers
pull      Pull service images
push      Push service images
restart   Restart containers
rm        Removes stopped service containers
run       Run a one-off command on a service.
start     Start services
stop      Stop services
top       Display the running processes
unpause   unpause services
up        Create and start containers
```

Run 'docker compose COMMAND --help' for more information on a command.

1.2 - Installer Wordpress avec Docker Compose

Créez maintenant le répertoire **wordpress1** dans /root :

```
root@debian9:~# mkdir wordpress1
```

Placez-vous dans le répertoire et créer le fichier **docker-compose.yaml**

```
root@debian9:~# cd wordpress1
```

```
root@debian9:~/wordpress1# vi docker-compose.yml
root@debian9:~/wordpress1# cat docker-compose.yml
version: "3.3"
services:
  db:
    image: mysql:5.7
    volumes:
      - db_data:/var/lib/mysql
    restart: always
    environment:
      MYSQL_ROOT_PASSWORD: fenestros
      MYSQL_DATABASE: wordpress
      MYSQL_USER: wordpress
      MYSQL_PASSWORD: wordpress
  wordpress:
    depends_on:
      - db
    image: wordpress:latest
    ports:
      - "8000:80"
    restart: always
    environment:
      WORDPRESS_DB_HOST: db:3306
      WORDPRESS_DB_USER: wordpress
      WORDPRESS_DB_PASSWORD: wordpress
      WORDPRESS_DB_NAME: wordpress
volumes:
  db_data: {}
```

Exécutez la commande docker-compose :

```
root@debian11:~/wordpress1# docker-compose up -d
[+] Running 12/12
::: db Pulled
```

```
16.0s
  :: 20e4dcae4c69 Pull complete
5.7s
  :: 1c56c3d4ce74 Pull complete
5.8s
  :: e9f03a1c24ce Pull complete
5.9s
  :: 68c3898c2015 Pull complete
6.2s
  :: 6b95a940e7b6 Pull complete
6.3s
  :: 90986bb8de6e Pull complete
6.3s
  :: ae71319cb779 Pull complete
7.4s
  :: ffc89e9dfd88 Pull complete
7.4s
  :: 43d05e938198 Pull complete
15.2s
  :: 064b2d298fba Pull complete
15.3s
  :: df9a4d85569b Pull complete
15.3s
[+] Running 4/4
  :: Network wordpress1_default      Created
0.1s
  :: Volume "wordpress1_db_data"     Created
0.0s
  :: Container wordpress1-db-1       Started
10.7s
  :: Container wordpress1-wordpress-1 Started
1.5s
```

Vérifiez que le Wordpress fonctionne :

```
root@debian11:~/wordpress1# lynx --dump http://10.0.2.46:8000
```

```
WordPress
```

```
Select a default language [English (United States)_____]
```

```
Continue
```

```
root@debian11:~/wordpress1# docker ps
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS
9475874569e1	wordpress:latest	"docker-entrypoint.s..."	51 seconds ago	Up 49
seconds	0.0.0.0:8000->80/tcp, :::8000->80/tcp	wordpress1-wordpress-1		
5983cdf711ec	mysql:5.7	"docker-entrypoint.s..."	About a minute ago	Up 50
seconds	3306/tcp, 33060/tcp	wordpress1-db-1		
cf27f30654d2	dockersamples/examplevotingapp_worker	"dotnet Worker.dll"	20 hours ago	Up 20 hours
worker				
33a264a36bdc	dockersamples/examplevotingapp_result	"/usr/bin/tini -- no..."	20 hours ago	Up 20 hours
0.0.0.0:5001->80/tcp, :::5001->80/tcp	result			
81e6fcb9f692	dockersamples/examplevotingapp_vote	"unicorn app:app -b..."	20 hours ago	Up 20 hours
0.0.0.0:5000->80/tcp, :::5000->80/tcp	vote			
5083545dcbf8	postgres:9.4	"docker-entrypoint.s..."	20 hours ago	Up 20 hours
5432/tcp	db			
227554e3e4c1	redis	"docker-entrypoint.s..."	20 hours ago	Up 20 hours
6379/tcp	redis			
63fec083f4d6	wordpress	"docker-entrypoint.s..."	21 hours ago	Up 21 hours
10.0.2.46:80->80/tcp	wordpress			
db3732939266	mysql:latest	"docker-entrypoint.s..."	21 hours ago	Up 21 hours
3306/tcp, 33060/tcp	wordpressdb			
57e92a8b25d7	centos	"/bin/bash"	21 hours ago	Up 21 hours
centos3				
fc417b22a20d	centos	"/bin/bash"	21 hours ago	Up 21 hours
centos2				
cb2875ab1059	centos	"/bin/bash"	21 hours ago	Up 21 hours
centos1				
2126924504d8	centos	"/bin/bash"	21 hours ago	Up 21 hours
resotest				

```
root@debian11:~/wordpress1# docker inspect wordpress1-wordpress-1 | grep IPAddress
    "SecondaryIPAddresses": null,
    "IPAddress": "",
        "IPAddress": "172.18.0.3",
root@debian11:~/wordpress1# lynx --dump http://172.18.0.3
WordPress
Select a default language [English (United States)_____]

Continue
```



Important - La commande **docker-compose up** est une abréviation des commandes **docker-compose build && docker-compose run**. L'option **-d** a le même effet de son homologue de la commande **docker**.

LAB #2 - Docker Machine

2.1 - Présentation

Docker Machine est un outil qui vous permet d'installer docker sur des hôtes virtuels et de gérer les hôtes en utilisant des commandes spécifiques à docker-machine. Il est donc possible d'utiliser cet outil pour créer des hôtes docker localement, sur le réseau, dans un data center ou dans le cloud (Azure, AWS, Digital Ocean par exemple).

Le jeu de commandes de docker-machine permet de démarrer, surveiller, arrêter et re-démarrer un hôte géré, de mettre à jour le client/daemon docker et de configurer un client docker afin qu'il "parle" à votre machine hôte.

Pour installer docker-machine sur votre VM **debian11**, utilisez la commande suivante :

```
root@debian11:~/wordpress1# cd ~
```



```

root@debian11:~# curl -L https://github.com/docker/machine/releases/download/v0.16.2/docker-machine-`uname -s` -
`uname -m` >/tmp/docker-machine && chmod +x /tmp/docker-machine && cp /tmp/docker-machine /usr/local/bin/docker-
machine
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left   Speed
  0     0    0     0    0     0      0     0  --:--:--  --:--:--  --:--:--    0
100 32.6M 100 32.6M    0     0 48.5M     0  --:--:--  --:--:--  --:--:-- 48.5M

```

2.2 - Création de Machines Virtuelles Docker

La création d'une machine se fait simplement en utilisant la commande **docker-machine** avec la sous-commande **create**. Cette sous-commande prend l'option **-driver** ou **-d** qui indique le fournisseur à utiliser :

Fournisseur	driver
Amazon Web Services	amazonec2
Digital Ocean	digitalocean
Exoscale	exoscale
Google Compute Engine	google
IBM Softlayer	softlayer
Microsoft Hyper-V	hyperv
Microsoft Azure	azure
OpenStack	openstack
Oracle VirtualBox	virtualbox
Rackspace	rackspace
VMware Fusion	vmwarefusion
VMware vCloud Air	vmwarevcloudair
VMware vSphere	vmwarevsphere

Commencez par installer Oracle VirtualBox:

```

root@debian11:~# apt install virtualbox-6.1 -y

```

```
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libopengl0 linux-headers-5.10.0-15-amd64 linux-headers-5.10.0-15-common
Use 'apt autoremove' to remove them.
Recommended packages:
  linux-image
The following packages will be upgraded:
  virtualbox-6.1
1 upgraded, 0 newly installed, 0 to remove and 16 not upgraded.
Need to get 95.8 MB of archives.
After this operation, 53.2 kB disk space will be freed.
Get:1 http://download.virtualbox.org/virtualbox/debian bullseye/contrib amd64 virtualbox-6.1 amd64
6.1.48-159471~Debian~bullseye [95.8 MB]
Fetched 95.8 MB in 3s (31.4 MB/s)
apt-listchanges: Reading changelogs...
Preconfiguring packages ...
(Reading database ... 166797 files and directories currently installed.)
Preparing to unpack .../virtualbox-6.1_6.1.48-159471~Debian~bullseye_amd64.deb ...
Unpacking virtualbox-6.1 (6.1.48-159471~Debian~bullseye) over (6.1.46-158378~Debian~bullseye) ...
Setting up virtualbox-6.1 (6.1.48-159471~Debian~bullseye) ...
addgroup: The group `vboxusers' already exists as a system group. Exiting.
Processing triggers for hicolor-icon-theme (0.17-2) ...
Processing triggers for shared-mime-info (2.0-1) ...
Processing triggers for mailcap (3.69) ...
Processing triggers for desktop-file-utils (0.26-1) ...
```

Créez le fichier **/etc/vbox/networks.conf** :

```
root@debian11:~# vi /etc/vbox/networks.conf
root@debian11:~# cat /etc/vbox/networks.conf
* 10.0.0.0/8 192.168.0.0/16
```

Créez maintenant la machine virtuelle **manager1** :

```
root@debian11:~# docker-machine create --driver virtualbox manager1
Running pre-create checks...
(manager1) Image cache directory does not exist, creating it at /root/.docker/machine/cache...
(manager1) No default Boot2Docker ISO found locally, downloading the latest release...
(manager1) Latest release for github.com/boot2docker/boot2docker is v19.03.12
(manager1) Downloading /root/.docker/machine/cache/boot2docker.iso from
https://github.com/boot2docker/boot2docker/releases/download/v19.03.12/boot2docker.iso...
(manager1) 0%....10%....20%....30%....40%....50%....60%....70%....80%....90%....100%
Creating machine...
(manager1) Copying /root/.docker/machine/cache/boot2docker.iso to
/root/.docker/machine/machines/manager1/boot2docker.iso...
(manager1) Creating VirtualBox VM...
(manager1) Creating SSH key...
(manager1) Starting the VM...
(manager1) Check network to re-create if needed...
(manager1) Found a new host-only adapter: "vboxnet0"
(manager1) Waiting for an IP...
Waiting for machine to be running, this may take a few minutes...
Detecting operating system of created instance...
Waiting for SSH to be available...
Detecting the provisioner...
Provisioning with boot2docker...
Copying certs to the local machine directory...
Copying certs to the remote machine...
Setting Docker configuration on the remote daemon...
Checking connection to Docker...
Docker is up and running!
To see how to connect your Docker Client to the Docker Engine running on this virtual machine, run: docker-
machine env manager1
```

Les options de la commande **docker-machine** sont :

```
root@debian11:~# docker-machine --help
Usage: docker-machine [OPTIONS] COMMAND [arg...]

Create and manage machines running Docker.

Version: 0.16.2, build bd45ab13

Author:
  Docker Machine Contributors - <https://github.com/docker/machine>

Options:
  --debug, -D                Enable debug mode
  --storage-path, -s "/root/.docker/machine"  Configures storage path [$MACHINE_STORAGE_PATH]
  --tls-ca-cert              CA to verify remotes against [$MACHINE_TLS_CA_CERT]
  --tls-ca-key              Private key to generate certificates [$MACHINE_TLS_CA_KEY]
  --tls-client-cert        Client cert to use for TLS [$MACHINE_TLS_CLIENT_CERT]
  --tls-client-key         Private key used in client TLS auth [$MACHINE_TLS_CLIENT_KEY]
  --github-api-token       Token to use for requests to the Github API
[$MACHINE_GITHUB_API_TOKEN]
  --native-ssh              Use the native (Go-based) SSH implementation.
[$MACHINE_NATIVE_SSH]
  --bugsnag-api-token      BugSnag API token for crash reporting
[$MACHINE_BUGSNAG_API_TOKEN]
  --help, -h               show help
  --version, -v            print the version

Commands:
  active                    Print which machine is active
  config                   Print the connection config for machine
  create                   Create a machine
  env                      Display the commands to set up the environment for the Docker client
  inspect                  Inspect information about a machine
  ip                       Get the IP address of a machine
  kill                     Kill a machine
  ls                       List machines
```

```

provision          Re-provision existing machines
regenerate-certs  Regenerate TLS Certificates for a machine
restart           Restart a machine
rm                Remove a machine
ssh               Log into or run a command on a machine with SSH.
scp               Copy files between machines
mount             Mount or unmount a directory from a machine with SSHFS.
start             Start a machine
status            Get the status of a machine
stop              Stop a machine
upgrade           Upgrade a machine to the latest version of Docker
url               Get the URL of a machine
version           Show the Docker Machine version or a machine docker version
help              Shows a list of commands or help for one command
Run 'docker-machine COMMAND --help' for more information on a command.

```

Les options de la sous-commande **create** de la commande **docker-machine** sont :

```

root@debian11:~# docker-machine create --help
Usage: docker-machine create [OPTIONS] [arg...]

Create a machine

Description:
  Run 'docker-machine create --driver name --help' to include the create flags for that driver in the help text.

Options:
  --driver, -d "virtualbox"                Driver to
create machine with. [$MACHINE_DRIVER]
  --engine-env [--engine-env option --engine-env option] Specify
environment variables to set in the engine
  --engine-insecure-registry [--engine-insecure-registry option --engine-insecure-registry option] Specify
insecure registries to allow with the created engine
  --engine-install-url "https://get.docker.com" Custom

```

URL to use for engine installation [\$MACHINE_DOCKER_INSTALL_URL]	
--engine-label [--engine-label option --engine-label option]	Specify
labels for the created engine	
--engine-opt [--engine-opt option --engine-opt option]	Specify
arbitrary flags to include with the created engine in the form flag=value	
--engine-registry-mirror [--engine-registry-mirror option --engine-registry-mirror option]	Specify
registry mirrors to use [\$ENGINE_REGISTRY_MIRROR]	
--engine-storage-driver	Specify a
storage driver to use with the engine	
--swarm	Configure
Machine to join a Swarm cluster	
--swarm-addr	addr to
advertise for Swarm (default: detect and use the machine IP)	
--swarm-discovery	Discovery
service to use with Swarm	
--swarm-experimental	Enable
Swarm experimental features	
--swarm-host "tcp://0.0.0.0:3376"	ip/socket
to listen on for Swarm master	
--swarm-image "swarm:latest"	Specify
Docker image to use for Swarm [\$MACHINE_SWARM_IMAGE]	
--swarm-join-opt [--swarm-join-opt option --swarm-join-opt option]	Define
arbitrary flags for Swarm join	
--swarm-master	Configure
Machine to be a Swarm master	
--swarm-opt [--swarm-opt option --swarm-opt option]	Define
arbitrary flags for Swarm master	
--swarm-strategy "spread"	Define a
default scheduling strategy for Swarm	
--tls-san [--tls-san option --tls-san option]	Support
extra SANs for TLS certs	
--virtualbox-boot2docker-url	The URL
of the boot2docker image. Defaults to the latest available version [\$VIRTUALBOX_BOOT2DOCKER_URL]	
--virtualbox-cpu-count "1"	number of

CPU(s) for the machine (-1 to use the number of CPUs available) [\$VIRTUALBOX_CPU_COUNT]	
--virtualbox-disk-size "20000"	Size of
disk for host in MB [\$VIRTUALBOX_DISK_SIZE]	
--virtualbox-host-dns-resolver	Use the
host DNS resolver [\$VIRTUALBOX_HOST_DNS_RESOLVER]	
--virtualbox-hostonly-cidr "192.168.99.1/24"	Specify
the Host Only CIDR [\$VIRTUALBOX_HOSTONLY_CIDR]	
--virtualbox-hostonly-nicpromisc "deny"	Specify
the Host Only Network Adapter Promiscuous Mode [\$VIRTUALBOX_HOSTONLY_NIC_PROMISC]	
--virtualbox-hostonly-nictype "82540EM"	Specify
the Host Only Network Adapter Type [\$VIRTUALBOX_HOSTONLY_NIC_TYPE]	
--virtualbox-hostonly-no-dhcp	Disable
the Host Only DHCP Server [\$VIRTUALBOX_HOSTONLY_NO_DHCP]	
--virtualbox-import-boot2docker-vm	The name
of a Boot2Docker VM to import [\$VIRTUALBOX_BOOT2DOCKER_IMPORT_VM]	
--virtualbox-memory "1024"	Size of
memory for host in MB [\$VIRTUALBOX_MEMORY_SIZE]	
--virtualbox-nat-nictype "82540EM"	Specify
the Network Adapter Type [\$VIRTUALBOX_NAT_NICTYPE]	
--virtualbox-no-dns-proxy	Disable
proxying all DNS requests to the host [\$VIRTUALBOX_NO_DNS_PROXY]	
--virtualbox-no-share	Disable
the mount of your home directory [\$VIRTUALBOX_NO_SHARE]	
--virtualbox-no-vtx-check	Disable
checking for the availability of hardware virtualization before the vm is started [\$VIRTUALBOX_NO_VTX_CHECK]	
--virtualbox-share-folder	Mount the
specified directory instead of the default home location. Format: dir:name [\$VIRTUALBOX_SHARE_FOLDER]	
--virtualbox-ui-type "headless"	Specify
the UI Type: (gui sdl headless separate) [\$VIRTUALBOX_UI_TYPE]	

Créez maintenant 5 travailleurs - **worker1** jusqu'à **worker5** :

```
root@debian11:~# docker-machine create --driver virtualbox worker1
Running pre-create checks...
```

```
Creating machine...
(worker1) Copying /root/.docker/machine/cache/boot2docker.iso to
/root/.docker/machine/machines/worker1/boot2docker.iso...
(worker1) Creating VirtualBox VM...
(worker1) Creating SSH key...
(worker1) Starting the VM...
(worker1) Check network to re-create if needed...
(worker1) Waiting for an IP...
Waiting for machine to be running, this may take a few minutes...
Detecting operating system of created instance...
Waiting for SSH to be available...
Detecting the provisioner...
Provisioning with boot2docker...
Copying certs to the local machine directory...
Copying certs to the remote machine...
Setting Docker configuration on the remote daemon...
Checking connection to Docker...
Docker is up and running!
To see how to connect your Docker Client to the Docker Engine running on this virtual machine, run: docker-
machine env worker1
```

```
root@debian11:~# docker-machine create --driver virtualbox worker2
...
root@debian11:~# docker-machine create --driver virtualbox worker3
...
root@debian11:~# docker-machine create --driver virtualbox worker4
...
root@debian11:~# docker-machine create --driver virtualbox worker5
...
```

2.3 - Lister les VM Docker

Pour lister les VM Docker ainsi que leurs états, il convient d'utiliser la sous-commande **ls** de la commande **docker-machine** :


```
root@debian11:~# docker-machine ls
NAME      ACTIVE  DRIVER      STATE     URL                         SWARM   DOCKER      ERRORS
manager1  -       virtualbox  Running  tcp://192.168.99.100:2376   -       v19.03.12
worker1   -       virtualbox  Running  tcp://192.168.99.101:2376   -       v19.03.12
worker2   -       virtualbox  Running  tcp://192.168.99.102:2376   -       v19.03.12
worker3   -       virtualbox  Running  tcp://192.168.99.103:2376   -       v19.03.12
worker4   -       virtualbox  Running  tcp://192.168.99.104:2376   -       v19.03.12
worker5   -       virtualbox  Running  tcp://192.168.99.105:2376   -       v19.03.12
```

2.4 - Obtenir l'adresse IP des VM

Une autre façon d'obtenir les adresses IP des VM est d'utiliser la sous-commande **ip** :

```
root@debian11:~# docker-machine ip manager1
192.168.99.100
root@debian11:~# docker-machine ip worker1
192.168.99.101
root@debian11:~# docker-machine ip worker2
192.168.99.102
root@debian11:~# docker-machine ip worker3
192.168.99.103
root@debian11:~# docker-machine ip worker4
192.168.99.104
root@debian11:~# docker-machine ip worker5
192.168.99.105
```

2.5 - Se connecter à une VM Docker

Pour se connecter à une VM Docker, il convient d'utiliser la sous-commande **ssh** de la commande **docker-machine** :

```
root@debian11:~# docker-machine ssh manager1
```

```
( '>')
/) TC (\   Core is distributed with ABSOLUTELY NO WARRANTY.
(/-_-_-_)      www.tinycorelinux.net

docker@manager1:~$ exit
logout
root@debian11:~#
```



Important - Notez que la distribution de la VM est **Boot2Docker**. Cette distribution est basée sur **Tiny Core Linux**, s'exécute entièrement dans la mémoire vive, pèse 27 Mo et démarre en approximativement 5 secondes.

Installez maintenant le paquet **mlocate** :

```
root@debian11:~# apt install mlocate -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libopengl0 linux-headers-5.10.0-15-amd64 linux-headers-5.10.0-15-common
Use 'apt autoremove' to remove them.
Suggested packages:
  nocache
The following NEW packages will be installed:
  mlocate
0 upgraded, 1 newly installed, 0 to remove and 16 not upgraded.
Need to get 98.3 kB of archives.
After this operation, 517 kB of additional disk space will be used.
Get:1 http://deb.debian.org/debian bullseye/main amd64 mlocate amd64 0.26-5 [98.3 kB]
Fetched 98.3 kB in 0s (1,985 kB/s)
Selecting previously unselected package mlocate.
```

```
(Reading database ... 166797 files and directories currently installed.)
Preparing to unpack .../mlocate_0.26-5_amd64.deb ...
Unpacking mlocate (0.26-5) ...
Setting up mlocate (0.26-5) ...
update-alternatives: using /usr/bin/mlocate to provide /usr/bin/locate (locate) in auto mode
Adding group `mlocate' (GID 123) ...
Done.
Created symlink /etc/systemd/system/timers.target.wants/mlocate.timer → /lib/systemd/system/mlocate.timer.
mlocate.service is a disabled or a static unit, not starting it.
Processing triggers for man-db (2.9.4-2) ...
```

Ayant été créées par root, les VM Docker ainsi que leurs fichiers associés sont stockés dans le répertoire **/root/.docker/machine/machines/** :

```
root@debian11:~# updatedb

root@debian11:~# locate manager1
/root/.docker/machine/machines/manager1
/root/.docker/machine/machines/manager1/boot2docker.iso
/root/.docker/machine/machines/manager1/ca.pem
/root/.docker/machine/machines/manager1/cert.pem
/root/.docker/machine/machines/manager1/config.json
/root/.docker/machine/machines/manager1/disk.vmdk
/root/.docker/machine/machines/manager1/id_rsa
/root/.docker/machine/machines/manager1/id_rsa.pub
/root/.docker/machine/machines/manager1/key.pem
/root/.docker/machine/machines/manager1/manager1
/root/.docker/machine/machines/manager1/server-key.pem
/root/.docker/machine/machines/manager1/server.pem
/root/.docker/machine/machines/manager1/manager1/Logs
/root/.docker/machine/machines/manager1/manager1/manager1.vbox
/root/.docker/machine/machines/manager1/manager1/manager1.vbox-prev
/root/.docker/machine/machines/manager1/manager1/Logs/VBox.log
```

LAB #3 - Docker Swarm

3.1 - Présentation

Docker Swarm est un utilitaire qui permet de gérer un cluster pour déployer des conteneurs en permettant une imitation du comportement de docker sur une seule machine.

3.2 - Initialiser Docker Swarm

Pour initialiser Docker swarm, il convient d'utiliser la commande **docker swarm init** à partir de la VM Docker **manager1** en stipulant l'adresse IP de manager1 :

```
root@debian11:~# docker-machine ssh manager1
( '>')
/) TC (\   Core is distributed with ABSOLUTELY NO WARRANTY.
(/-_-_-_)      www.tinycorelinux.net

docker@manager1:~$ docker swarm init --advertise-addr 192.168.99.100
Swarm initialized: current node (y0war0lijmwhnextrfhfflulsd) is now a manager.

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

    docker swarm join --token
    SWMTKN-1-25tbmsyx452cuhpiedymuc8n9llo9bjcbza93npdo35q1aaff-9teuxcpe09xw7v7xz1tnwpw4g 192.168.99.100:2377

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

Notez que les ports suivants doivent être ouverts sur un nœud manager : 22/tcp, 2376/tcp, 2377/tcp, 7946/tcp, 7946/udp et 4789/udp.

3.3 - Le Statut Leader

Consultez le statut de la VM Docker manager1 :

```
docker@manager1:~$ docker node ls
ID                                HOSTNAME            STATUS             AVAILABILITY       MANAGER STATUS
ENGINE VERSION
y0war0lijmwhnextrfhfflulsd *    manager1           Ready             Active              Leader
19.03.12
```

A un instant t il ne peut y avoir q'un seul **Leader**. Il est possible de créer d'autres nœuds de gestion en le rejoignant à swarm en utilisant le token prévu à cet effet. Par contre ces nœuds de gestion restent en attente d'une éventuelle défaillance du Leader actuel.

Pour connaître le token nécessaire pour rejoindre swarm en tant que nœud de gestion, saisissez la commande suivante :

```
docker@manager1:~$ docker swarm join-token manager
To add a manager to this swarm, run the following command:

    docker swarm join --token
    SWMTKN-1-25tbmsyx452cuhpiedymuc8n9llo9bjcbza93npdo35q1aaff-1teue04djnc4vu2eufzty59ys 192.168.99.100:2377
```

3.4 - Rejoindre le Swarm

Rejoignez les 5 machines travailleurs à swarm en utilisant le token **worker** :

```
docker@manager1:~$ exit
logout

root@debian11:~# docker-machine ssh worker1
( '>' )
/) TC (\   Core is distributed with ABSOLUTELY NO WARRANTY.
(/-_-_-_)   www.tinycorelinux.net
```

```
docker@worker1:~$ docker swarm join --token
SWMTKN-1-25tbmsyx452cuhpiedymuc8n9llo9bjcbza93npdo35qlaaff-9teuxcpe09xw7v7xz1tnwpw4g 192.168.99.100:2377
This node joined a swarm as a worker.
```

```
docker@worker1:~$ exit
logout
```

```
root@debian11:~# docker-machine ssh worker2
( '>')
/) TC (\ Core is distributed with ABSOLUTELY NO WARRANTY.
(/-_-_-)\ www.tinycorelinux.net
```

```
docker@worker2:~$ docker swarm join --token
SWMTKN-1-25tbmsyx452cuhpiedymuc8n9llo9bjcbza93npdo35qlaaff-9teuxcpe09xw7v7xz1tnwpw4g 192.168.99.100:2377
This node joined a swarm as a worker.
```

```
docker@worker2:~$ exit
logout
```

```
root@debian11:~# docker-machine ssh worker3
( '>')
/) TC (\ Core is distributed with ABSOLUTELY NO WARRANTY.
(/-_-_-)\ www.tinycorelinux.net
```

```
docker@worker3:~$ docker swarm join --token
SWMTKN-1-25tbmsyx452cuhpiedymuc8n9llo9bjcbza93npdo35qlaaff-9teuxcpe09xw7v7xz1tnwpw4g 192.168.99.100:2377
This node joined a swarm as a worker.
```

```
docker@worker3:~$ exit
logout
```

```
root@debian11:~# docker-machine ssh worker4
( '>')
/) TC (\ Core is distributed with ABSOLUTELY NO WARRANTY.
```

```
(/_--_-\)          www.tinycorelinux.net

docker@worker4:~$ docker swarm join --token
SWMTKN-1-25tbmsyx452cuhpiedymuc8n9llo9bjbcba93npdo35q1aaff-9teuxcpe09xw7v7xz1tnwpw4g 192.168.99.100:2377
This node joined a swarm as a worker.

docker@worker4:~$ exit
logout

root@debian11:~# docker-machine ssh worker5
( '>')
/) TC (\   Core is distributed with ABSOLUTELY NO WARRANTY.
(/_--_-\)          www.tinycorelinux.net

docker@worker5:~$ docker swarm join --token
SWMTKN-1-25tbmsyx452cuhpiedymuc8n9llo9bjbcba93npdo35q1aaff-9teuxcpe09xw7v7xz1tnwpw4g 192.168.99.100:2377
This node joined a swarm as a worker.

docker@worker5:~$ exit
logout

root@debian11:~#
```

Notez que les ports suivants doivent être ouverts sur un nœud worker : 22/tcp, 2376/tcp, 7946/tcp, 7946/udp et 4789/udp.

L'état des VM Docker peut être consulté en utilisant de nouveau la commande **docker node ls** :

```
root@debian11:~# docker-machine ssh manager1
( '>')
/) TC (\   Core is distributed with ABSOLUTELY NO WARRANTY.
(/_--_-\)          www.tinycorelinux.net

docker@manager1:~$ docker node ls
ID                               HOSTNAME                STATUS                AVAILABILITY          MANAGER STATUS

```

ENGINE VERSION

y0war0lijmwhnextrfhfflulsd * 19.03.12	manager1	Ready	Active	Leader
v5ai62lmhfsdcauccqmjyu6qk 19.03.12	worker1	Ready	Active	
j4mr3d2ji30t7hu0trob5dpgz 19.03.12	worker2	Ready	Active	
pouo7nuvirq0qkuvvrp04a47h 19.03.12	worker3	Ready	Active	
mo0dd5ech6ifdgd8pa6cjz896 19.03.12	worker4	Ready	Active	
5am2vd39pybytu1nd3oooabtq 19.03.12	worker5	Ready	Active	

Notez que vous ne pouvez pas utiliser cette commande à partir d'un travailleur :

```
docker@manager1:~$ exit
logout
```

```
root@debian11:~# docker-machine ssh worker5
( '>')
/) TC (\ Core is distributed with ABSOLUTELY NO WARRANTY.
(/-_-_-)\ www.tinycorelinux.net
```

```
docker@worker5:~$ docker node ls
```

```
Error response from daemon: This node is not a swarm manager. Worker nodes can't be used to view or modify cluster state. Please run this command on a manager node or promote the current node to a manager.
```

```
docker@worker5:~$ exit
logout
exit status 1
```

```
root@debian11:~#
```


3.5 - Consulter les Informations de Swarm

Il est possible de visualiser les informations concernant le swarm en utilisant la commande **docker info** :

```
root@debian11:~# docker-machine ssh manager1
( '>')
/) TC (\   Core is distributed with ABSOLUTELY NO WARRANTY.
(/-_-_-_)   www.tinycorelinux.net

docker@manager1:~$ docker info
Client:
 Debug Mode: false

Server:
 Containers: 0
  Running: 0
  Paused: 0
  Stopped: 0
 Images: 0
 Server Version: 19.03.12
 Storage Driver: overlay2
  Backing Filesystem: extfs
  Supports d_type: true
  Native Overlay Diff: true
 Logging Driver: json-file
 Cgroup Driver: cgroupfs
 Plugins:
  Volume: local
  Network: bridge host ipvlan macvlan null overlay
  Log: awslogs fluentd gcplogs gelf journald json-file local logentries splunk syslog
 Swarm: active
  NodeID: y0war0lijmwhnextrfhfflulsd
  Is Manager: true
```

```
ClusterID: w3mq6i01k4siboyqv3w3nbyu7
Managers: 1
Nodes: 6
Default Address Pool: 10.0.0.0/8
SubnetSize: 24
Data Path Port: 4789
Orchestration:
  Task History Retention Limit: 5
Raft:
  Snapshot Interval: 10000
  Number of Old Snapshots to Retain: 0
  Heartbeat Tick: 1
  Election Tick: 10
Dispatcher:
  Heartbeat Period: 5 seconds
CA Configuration:
  Expiry Duration: 3 months
  Force Rotate: 0
Autolock Managers: false
Root Rotation In Progress: false
Node Address: 192.168.99.100
Manager Addresses:
  192.168.99.100:2377
Runtimes: runc
Default Runtime: runc
Init Binary: docker-init
containerd version: 7ad184331fa3e55e52b890ea95e65ba581ae3429
runc version: dc9208a3303feef5b3839f4323d9beb36df0a9dd
init version: fec3683
Security Options:
  seccomp
  Profile: default
Kernel Version: 4.19.130-boot2docker
Operating System: Boot2Docker 19.03.12 (TCL 10.1)
```

```
OStype: linux
Architecture: x86_64
CPUs: 1
Total Memory: 985.4MiB
Name: manager1
ID: UIL3:SNFZ:J2XE:4QVD:7XYM:MPB7:2LHC:NMY7:B4CU:QMUK:3A66:H3G6
Docker Root Dir: /mnt/sda1/var/lib/docker
Debug Mode: false
Registry: https://index.docker.io/v1/
Labels:
  provider=virtualbox
Experimental: false
Insecure Registries:
  127.0.0.0/8
Live Restore Enabled: false
Product License: Community Engine
```



Important - Quand le moteur Docker est en mode swarm, les noeuds de gestion implémentent le **Raft Consensus Algorithm** pour gérer l'état du cluster.

3.6 - Démarrer un Service

Dans cet exemple, nous allons démarrer le service **nginx** avec les propriétés suivantes :

- Mappage du port nginx sur le port 80 de la machine hôte,
- 5 instances du service,
- Un nom unique de **web**.

```
docker@manager1:~$ docker service create --replicas 5 -p 80:80 --name web nginx
```

```
oree977o1unlk5ndos0y44i2h
overall progress: 5 out of 5 tasks
1/5: running [=====>]
2/5: running [=====>]
3/5: running [=====>]
4/5: running [=====>]
5/5: running [=====>]
verify: Service converged
```

Pour consulter l'état de ce service, utilisez la commande **docker service ls** :

```
docker@manager1:~$ docker service ls
```

ID	NAME	MODE	REPLICAS	IMAGE	PORTS
oree977o1unl	web	replicated	5/5	nginx:latest	*:80->80/tcp

Ce service fonctionne dans des conteneurs Docker :

```
docker@manager1:~$ docker service ps web
```

ID	NAME	IMAGE	NODE	DESIRED STATE	CURRENT STATE
son0vgc73drb	web.1	nginx:latest	worker4	Running	Running 48 seconds ago
ojqyweuo65jw	web.2	nginx:latest	worker5	Running	Running 49 seconds ago
mb40onnaxd0u	web.3	nginx:latest	manager1	Running	Running 49 seconds ago
4vwsho5x7i36	web.4	nginx:latest	worker2	Running	Running 49 seconds ago
sk9hr6j2u47c	web.5	nginx:latest	worker3	Running	Running 50 seconds ago



Important - Notez qu'il n'y a pas de conteneur sur worker1.

Pour constater le lancement du daemon nginx, lancez la commande **docker ps** sur la machine **manager1** :

```
docker@manager1:~$ docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED             STATUS              PORTS
244fec46312        nginx:latest       "/docker-entrypoint..." About a minute ago  Up About a minute  80/tcp
web.3.mb40onnaxd0u8t0nhbzx9rdih
```

Par contre la même commande exécutée sur **worker1** donne le résultat suivant :

```
docker@manager1:~$ exit
logout

root@debian11:~# docker-machine ssh worker1
( '>')
/) TC (\   Core is distributed with ABSOLUTELY NO WARRANTY.
(/-_-_-_)   www.tinycorelinux.net

docker@worker1:~$ docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED             STATUS              PORTS
docker@worker1:~$ exit
logout

root@debian11:~#
```

Connectez-vous sur chaque VM Docker pour constater que le service nginx fonctionne :

```
root@debian11:~# docker-machine ssh manager1
( '>')
/) TC (\   Core is distributed with ABSOLUTELY NO WARRANTY.
(/-_-_-_)   www.tinycorelinux.net

docker@manager1:~$ curl 192.168.99.100
```

```
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>
```

```
docker@manager1:~$ curl 192.168.99.101
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
```

```
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>
```

```
docker@manager1:~$ curl 192.168.99.102
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
```

```
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>

docker@manager1:~$ curl 192.168.99.103
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>

docker@manager1:~$ curl 192.168.99.104
<!DOCTYPE html>
<html>
```



```
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>

docker@manager1:~$ curl 192.168.99.105
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>
<body>
```

```
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>
```



Important - Notez que le service est même disponible en consultant l'adresse IP de worker1.

3.7 - Augmentation et Réduction du Service

Actuellement, il existe 5 conteneurs en cours d'exécution. Pour procéder à un scale-up à 8 conteneurs, il convient d'utiliser la commande **docker service scale** :

```
docker@manager1:~$ docker service scale web=8
web scaled to 8
overall progress: 8 out of 8 tasks
1/8: running  [=====>]
2/8: running  [=====>]
3/8: running  [=====>]
4/8: running  [=====>]
5/8: running  [=====>]
6/8: running  [=====>]
```

```
7/8: running [=====>]
8/8: running [=====>]
verify: Service converged
```

Notez que la commande **docker service ls** confirme le fait qu'il y a 8 replicas :

```
docker@manager1:~$ docker service ls
ID                NAME      MODE           REPLICAS        IMAGE          PORTS
oree977o1unl     web      replicated     8/8             nginx:latest  *:80->80/tcp
```

Des trois replicas supplémentaires, deux ont été lancés sur worker5 tandis que le troisième a été lancé sur worker1 :

```
docker@manager1:~$ docker service ps web
ID                NAME      IMAGE          NODE           DESIRED STATE  CURRENT STATE
ERROR            PORTS
son0vgc73drb     web.1     nginx:latest   worker4        Running         Running 9
minutes ago
ojqyweuo65jw     web.2     nginx:latest   worker5        Running         Running 9
minutes ago
mb40onnaxd0u     web.3     nginx:latest   manager1       Running         Running 9
minutes ago
4vwsho5x7i36     web.4     nginx:latest   worker2        Running         Running 9
minutes ago
sk9hr6j2u47c     web.5     nginx:latest   worker3        Running         Running 9
minutes ago
pui4dnkepu27     web.6     nginx:latest   worker1        Running         Running about
a minute ago
yj0kexdcuo5u     web.7     nginx:latest   worker5        Running         Running about
a minute ago
93jtbxqj2dyz     web.8     nginx:latest   worker1        Running         Running about
a minute ago
```

3.8 - Consulter le Statut d'un Noeud

Pour se renseigner sur le statut du nœud courant, il convient d'utiliser la commande **docker node inspect** avec le mot clef **self** :

```
docker@manager1:~$ docker node inspect self
[
  {
    "ID": "y0war0lijmwhnextrfhfflulsd",
    "Version": {
      "Index": 9
    },
    "CreatedAt": "2023-12-16T13:38:18.600836601Z",
    "UpdatedAt": "2023-12-16T13:38:19.126257379Z",
    "Spec": {
      "Labels": {},
      "Role": "manager",
      "Availability": "active"
    },
    "Description": {
      "Hostname": "manager1",
      "Platform": {
        "Architecture": "x86_64",
        "OS": "linux"
      },
      "Resources": {
        "NanoCPUs": 1000000000,
        "MemoryBytes": 1033252864
      },
      "Engine": {
        "EngineVersion": "19.03.12",
        "Labels": {
          "provider": "virtualbox"
        }
      },
    }
  ]
}
```

```
"Plugins": [  
  {  
    "Type": "Log",  
    "Name": "awslogs"  
  },  
  {  
    "Type": "Log",  
    "Name": "fluentd"  
  },  
  {  
    "Type": "Log",  
    "Name": "gcplogs"  
  },  
  {  
    "Type": "Log",  
    "Name": "gelf"  
  },  
  {  
    "Type": "Log",  
    "Name": "journald"  
  },  
  {  
    "Type": "Log",  
    "Name": "json-file"  
  },  
  {  
    "Type": "Log",  
    "Name": "local"  
  },  
  {  
    "Type": "Log",  
    "Name": "logentries"  
  },  
  {
```

```
    "Type": "Log",
    "Name": "splunk"
  },
  {
    "Type": "Log",
    "Name": "syslog"
  },
  {
    "Type": "Network",
    "Name": "bridge"
  },
  {
    "Type": "Network",
    "Name": "host"
  },
  {
    "Type": "Network",
    "Name": "ipvlan"
  },
  {
    "Type": "Network",
    "Name": "macvlan"
  },
  {
    "Type": "Network",
    "Name": "null"
  },
  {
    "Type": "Network",
    "Name": "overlay"
  },
  {
    "Type": "Volume",
    "Name": "local"
  }
```

```

    }
  ]
},
"TLSInfo": {
  "TrustRoot": "-----BEGIN CERTIFICATE-----
\nMIIIBazCCARCgAwIBAgIUbi2tpJHqoqK+BA/p9c+Y9AmtQSAwCgYIKoZIZj0EAwIw\nEzERMA8GA1UEAxMIc3dhcm0tY2EwHhcNMjMxMjE2MTMzMzAwW
hcnNDMxMjExMTMz\nMzAwWjATMREwDwYDVQQDEwhzd2FybS1jYTBZMBMGBYqGSM49AgEGCCqGSM49AwEH\nnA0IABKuD7Svum+bER9CszNtFt7
ASMr5gj6Vea0oM7SCrlyYMCn8ryaHXQ9J+iEIh\nfWrpKmjNtei3/j+le0VF0flpg20jQjBAMA4GA1UdDwEB/wQEAwIBBjAPBgNVHRMB\nnAf8EBTADAQH/MB0GA1UdDgQWBRRqLCTTUy9J0DtzaVecgmjID/M5kzAKBggqhkj0\nnPQQDAgNjADBGAiEA06sGunqGwd23lyjcUoczMWGQGlN9nv0pmm/riJ
QvB80CIQC9\nnvXNZUbC6U5LSQ7eGhfmmHi1JAfb88wGau0AlreBczw==\n-----END CERTIFICATE-----\n",
  "CertIssuerSubject": "MBMxETAPBgNVBAMTCHN3YXJtLWNh",
  "CertIssuerPublicKey":
"MFkwEwYHKoZIzj0CAQYIKoZIZj0DAQcDQgAEq4PtK+6b5sRH0KzM20W3sBIyvmCPpV5rSgztIKuXJgwKfyvJoddD0n6IQiF9aukqaM216Lf+P6V4
5UXR+WmDYw=="
}
},
"Status": {
  "State": "ready",
  "Addr": "192.168.99.100"
},
"ManagerStatus": {
  "Leader": true,
  "Reachability": "reachable",
  "Addr": "192.168.99.100:2377"
}
}
]

```

Pour se renseigner sur le statut d'un autre nœud, il convient d'utiliser la commande **docker node inspect** avec le nom du nœud concerné :

```

docker@manager1:~$ docker node inspect worker1
[
  {
    "ID": "v5ai62lmhfsdcauccqmjyu6qk",

```

```
"Version": {
  "Index": 15
},
"CreatedAt": "2023-12-16T13:40:08.301827885Z",
"UpdatedAt": "2023-12-16T13:40:08.453463845Z",
"Spec": {
  "Labels": {},
  "Role": "worker",
  "Availability": "active"
},
"Description": {
  "Hostname": "worker1",
  "Platform": {
    "Architecture": "x86_64",
    "OS": "linux"
  },
  "Resources": {
    "NanoCPUs": 1000000000,
    "MemoryBytes": 1033252864
  },
  "Engine": {
    "EngineVersion": "19.03.12",
    "Labels": {
      "provider": "virtualbox"
    },
    "Plugins": [
      {
        "Type": "Log",
        "Name": "awslogs"
      },
      {
        "Type": "Log",
        "Name": "fluentd"
      }
    ]
  }
}
```



```
{
  "Type": "Log",
  "Name": "gcplogs"
},
{
  "Type": "Log",
  "Name": "gelf"
},
{
  "Type": "Log",
  "Name": "journald"
},
{
  "Type": "Log",
  "Name": "json-file"
},
{
  "Type": "Log",
  "Name": "local"
},
{
  "Type": "Log",
  "Name": "logentries"
},
{
  "Type": "Log",
  "Name": "splunk"
},
{
  "Type": "Log",
  "Name": "syslog"
},
{
  "Type": "Network",
```

```
    "Name": "bridge"
  },
  {
    "Type": "Network",
    "Name": "host"
  },
  {
    "Type": "Network",
    "Name": "ipvlan"
  },
  {
    "Type": "Network",
    "Name": "macvlan"
  },
  {
    "Type": "Network",
    "Name": "null"
  },
  {
    "Type": "Network",
    "Name": "overlay"
  },
  {
    "Type": "Volume",
    "Name": "local"
  }
]
},
"TLSInfo": {
  "TrustRoot": "-----BEGIN CERTIFICATE-----
\nMIIIBazCCARCgAwIBAgIUbi2tpJHqoqK+BA/p9c+Y9AmtQSAwCgYIKoZIzj0EAwIw\nEzERMA8GA1UEAxMIc3dhcm0tY2EwHhcNMjMxMjE2MTMzMzAwW
hcNNDMxMjExMTMz\nMzAwWjATMREwDwYDVQQDEwhzd2FybS1jYTBZMBMGBYqGSM49AgEGCCqGSM49AwEH\nnA0IABKuD7Svum+bER9CszNtFt7ASMr5gj6Vea0oM7SCrlyYMCn8ryaHXQ9J+iEIh\nnfWrpKmjNtei3/j+lE0VF0flpg20jQjBAMA4GA1UdDwEB/wQEAwIBBjAPBgNVHRMB\n\nnAf8EBTADAQH/MB0GA1UdDgQWBBrqLCTTUy9JODtzaVecgmjID/M5kzAKBggqhkJ0\n\nnPQQDAgNjADBGAiEA06sGunqGwd23lyjcUoczMWGQGl9nv0pmm/riJ
```

```

QvB80CIQC9\nvXNZUbC6U5lSQ7eGhfmmHi1JAfb88wGau0AlreBczw==\n-----END CERTIFICATE-----\n",
    "CertIssuerSubject": "MBMxETAPBgNVBAMTCHN3YXJtLWNh",
    "CertIssuerPublicKey":
"MFkwEwYHKoZIzj0CAQYIKoZIzj0DAQcDQgAEq4PtK+6b5sRH0KzM20W3sBIyvmCPpV5rSgztIKuXJgwKfyvJoddD0n6IQiF9aukqaM216Lf+P6V4
5UXR+WmDYw=="
    }
  },
  "Status": {
    "State": "ready",
    "Addr": "192.168.99.101"
  }
}
]

```

L'option **-pretty** produit une sortie plus facilement lisible :

```

docker@manager1:/$ docker node inspect --pretty worker1
ID:                1f5qtolgtonqmhjk5ppwc8x1b
Hostname:          worker1
Joined at:         2017-09-08 11:48:42.011596185 +0000 utc
Status:
  State:           Ready
  Availability:    Active
  Address:         192.168.99.101
Platform:
  Operating System: linux
  Architecture:   x86_64
Resources:
  CPUs:           1
  Memory:         995.8MiB
Plugins:
  Log:            awslogs, fluentd, gcplogs, gelf, journald, json-file, logentries, splunk, syslog
  Network:        bridge, host, macvlan, null, overlay
  Volume:         local

```

```
Engine Version:      17.06.2-ce
Engine Labels:
 - provider=virtualbox
TLS Info:
 TrustRoot:
-----BEGIN CERTIFICATE-----
MIIBajCCARCGAwIBAgIU4I89kxId2QXuľofRKxJa9XRcwCgYIKoZIZj0EAwIw
EzERMA8GA1UEAxMIc3dhcm0tY2EwHhcNMTcw0TA4MTEz0TAwWhcNMzcw0TAzMTEz
0TAwWjATMREwDwYDVQQDEwHzd2FybS1jYTBZMBMGByqGSM49AgEGCCqGSM49AwEH
A0IABEqgLUbyjyNuP35aAzW+aqVB8AkgHvpF5hq1KnMveHbl4Ilr+EyDjLYZkbnt
Gb/xmsy/t0P8uz598ZX/JlR4fZyjQjBAMA4GA1UdDwEB/wQEAwIBBjAPBgNVHRMB
Af8EBTADAQH/MB0GA1UdDgQWBBSzoKGrN0ELfEIMsjxuYj5LAcKD2jAKBggqhkJ0
PQQDAgNIADBFaiB34D0vDtIYjJ+GzbPMGu9Dd/cJGvy7CJg1tNUG3So0rAIhAJZ4
TJBucTomFSDsj5Y/R6TfhcpXpsksk7JwYgEglu44
-----END CERTIFICATE-----

Issuer Subject:     MBMxETAPBgNVBAMTCHN3YXJtLWNh
Issuer Public Key:
MFkwEwYHKoZIzj0CAQYIKoZIzj0DAQcDQgAEsqAtRvKPI24/fl0DNb5qpUHwCSCG+kXmGrUqcy94duXgiWv4TI00VhmRue0Zv/GazL+04/y7Pn3xl
f8mVHh9nA==
```

3.9 - Haute Disponibilité

Quand un nœud est actif, il est capable de recevoir de nouvelles tâches à partir du manager :

- pendant un scale-up,
- pendant une mise à jour progressive,
- quand un autre nœud reçoit une instruction de se mettre en indisponibilité,
- quand un service se met en échec sur un autre nœud

Rappelez-vous que la swarm contient 6 VM Docker :

```
docker@manager1:~$ docker node ls
```

ID	HOSTNAME	STATUS	AVAILABILITY	MANAGER STATUS
ENGINE VERSION y0war0lijmwhnextrfhfflulsd * 19.03.12	manager1	Ready	Active	Leader
v5ai62lmhfsdcauccqmjyu6qk 19.03.12	worker1	Ready	Active	
j4mr3d2jji30t7hu0trob5dpgz 19.03.12	worker2	Ready	Active	
pouo7nuvirq0qkuvvrp04a47h 19.03.12	worker3	Ready	Active	
mo0dd5ech6ifdgd8pa6cjz896 19.03.12	worker4	Ready	Active	
5am2vd39pybytu1nd3oooabtq 19.03.12	worker5	Ready	Active	

et que sur les 6 VM Docker, il y a 8 conteneurs,

```
docker@manager1:~$ docker service ps web
```

ID	NAME	IMAGE	NODE	DESIRED STATE	CURRENT STATE
ERROR	PORTS				
son0vgc73drb minutes ago	web.1	nginx:latest	worker4	Running	Running 12
ojqyweuo65jw minutes ago	web.2	nginx:latest	worker5	Running	Running 12
mb40onnaxd0u minutes ago	web.3	nginx:latest	manager1	Running	Running 12
4vwsho5x7i36 minutes ago	web.4	nginx:latest	worker2	Running	Running 12
sk9hr6j2u47c minutes ago	web.5	nginx:latest	worker3	Running	Running 12
pui4dnkepu27 minutes ago	web.6	nginx:latest	worker1	Running	Running 4
yj0kexdcuo5u minutes ago	web.7	nginx:latest	worker5	Running	Running 4

93jtbxqj2dyz minutes ago	web.8	nginx:latest	worker1	Running	Running 4
-----------------------------	-------	--------------	---------	---------	-----------

dont deux se trouvent sur worker1 :

```
docker@manager1:~$ docker node ps worker1
```

ID	NAME	IMAGE	NODE	DESIRED STATE	CURRENT STATE
ERROR	PORTS				
pui4dnkepu27 minutes ago	web.6	nginx:latest	worker1	Running	Running 4
93jtbxqj2dyz minutes ago	web.8	nginx:latest	worker1	Running	Running 4

Mettez worker1 en mode d'indisponibilité en utilisant l'option **-availability drain** :

```
docker@manager1:~$ docker node update --availability drain worker1
worker1
```

Constatez que le service web a été déplacé sur deux autres noeuds, **manager1** et **worker4** :

```
docker@manager1:~$ docker service ps web
```

ID	NAME	IMAGE	NODE	DESIRED STATE	CURRENT STATE
ERROR	PORTS				
son0vgc73drb minutes ago	web.1	nginx:latest	worker4	Running	Running 14
ojqyweuo65jw minutes ago	web.2	nginx:latest	worker5	Running	Running 14
mb40onnaxd0u minutes ago	web.3	nginx:latest	manager1	Running	Running 14
4vwsho5x7i36 minutes ago	web.4	nginx:latest	worker2	Running	Running 14
sk9hr6j2u47c minutes ago	web.5	nginx:latest	worker3	Running	Running 14
ag41oh489h4t	web.6	nginx:latest	manager1	Running	Running 3

seconds ago					
pui4dnkepu27	_ web.6	nginx:latest	worker1	Shutdown	Shutdown 4
seconds ago					
yj0kexdcuo5u	web.7	nginx:latest	worker5	Running	Running 5
minutes ago					
kv7ax6cwzpkf	web.8	nginx:latest	worker2	Running	Running 3
seconds ago					
93jtbxqj2dyz	_ web.8	nginx:latest	worker1	Shutdown	Shutdown 4
seconds ago					

3.10 - Supprimer un Service

Pour supprimer un service il convient d'utiliser la commande **docker service rm**

```
docker@manager1:~$ docker service rm web
web

docker@manager1:~$ docker service ls
ID                NAME                MODE                REPLICAS                IMAGE                PORTS
docker@manager1:~$ docker service inspect web
[]
Status: Error: no such service: web, Code: 1
```

3.11 - Sauvegarder Docker Swarm

La configuration de Docker Swarm est contenue dans le répertoire **/var/lib/docker/swarm** de chaque Manager dans le Swarm :

```
docker@manager1:~$ sudo su -
root@manager1:~# ls -l /var/lib/docker/swarm
total 20
```

```
drwxr-xr-x    2 root    root          4096 Dec 16 13:38 certificates
-rw-----    1 root    root           215 Dec 16 13:38 docker-state.json
drwx-----   4 root    root          4096 Dec 16 13:38 raft
-rw-----    1 root    root           70 Dec 16 13:38 state.json
drwxr-xr-x    2 root    root          4096 Dec 16 13:38 worker
```

Le processus de sauvegarde nécessite qu'il y ait au moins **deux** Managers dans le Swarm. Le procédure de sauvegarde est :

- arrêt du service Docker sur le Manager à sauvegarder,
- sauvegarde du répertoire **/var/lib/docker/swarm**,
- redémarrage du service Docker sur le Manager concerné.

3.12 - Restaurer Docker Swarm

Le procédure de restauration est :

- arrêt du service Docker sur un nouveau Manager,
- suppression du contenu du répertoire **/var/lib/docker/swarm** dans le nouveau Manager,
- restauration du répertoire **/var/lib/docker/swarm** dans le nouveau Manager à partir de la sauvegarde,
- exécution de la commande **docker swarm init -force-new-cluster** sur le nouveau Manager,
- ajout des Managers et Workers à Swarm.

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