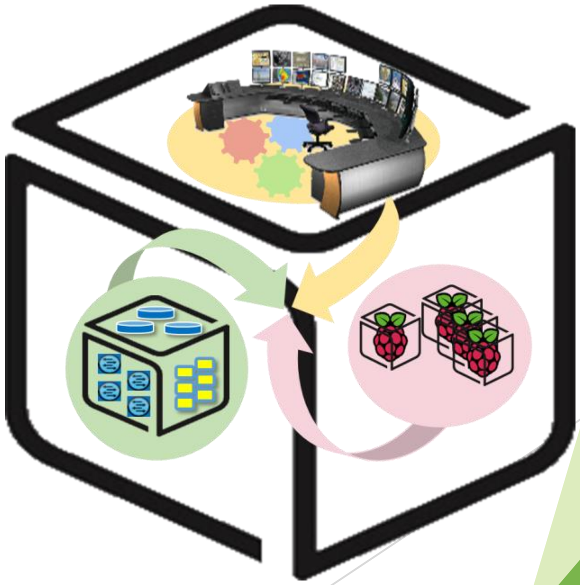
SmartX Labs for Computer Systems

Functions Lab
v1.4
(2018, Spring)
NetCS Lab



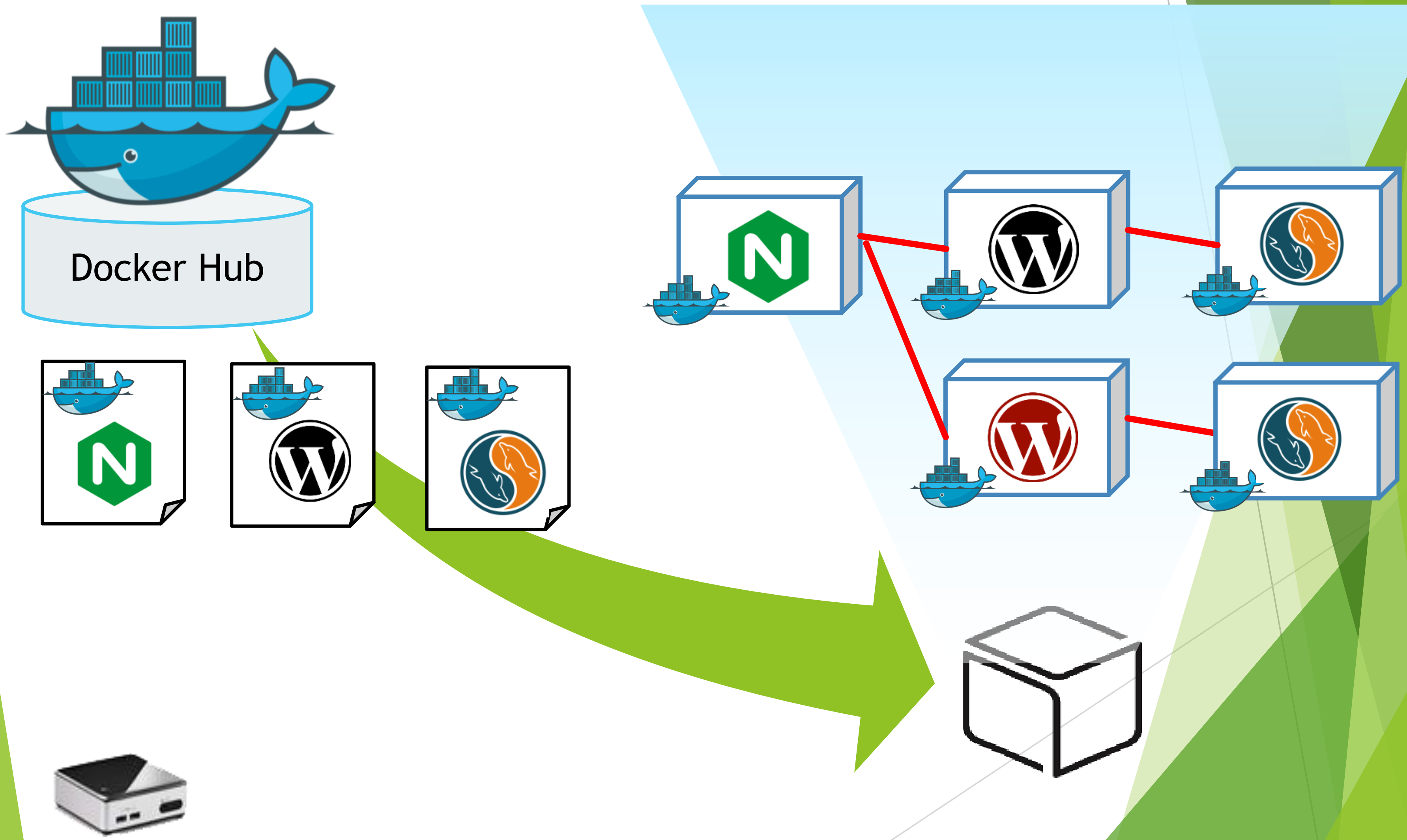
History and Contributor of Functions Lab (2016. 06. 01)

Version	Updated Date	Updated Contents	Contributor
v1.0	20160517	초고 완성	배 정 주
v1.1	20160601	p20, p32 wordpress url을 yourip -> localhost로 변경 (헷갈림 방지)	배 정 주
v1.2	20170510	Docker image 버전 업데이트 및 스크린샷 수정	권 진 철
V1.3	20180124	Container 내부 업데이트 및 iputils-ping패키지 다운	이 승 형
V1.4	20180522	Kubernetes 실습 추가	권 진 철

Functions Lab: Goal

- Strength of Docker: Docker Image
- Introduce Docker Hub
  + Searching and Getting Image from Docker Hub
- Running 3 Tier (nginx-wordpress-mysql) Web Application
- Understanding Docker basic network
  (--link option)

Functions Lab: Overall
- One of 3-Tier example



Functions Lab: Overall
- Background knowledge of goal

We will running one of web application: Wordpress
This web application is consisted with 3 containers: nginx, wordpress, mysql

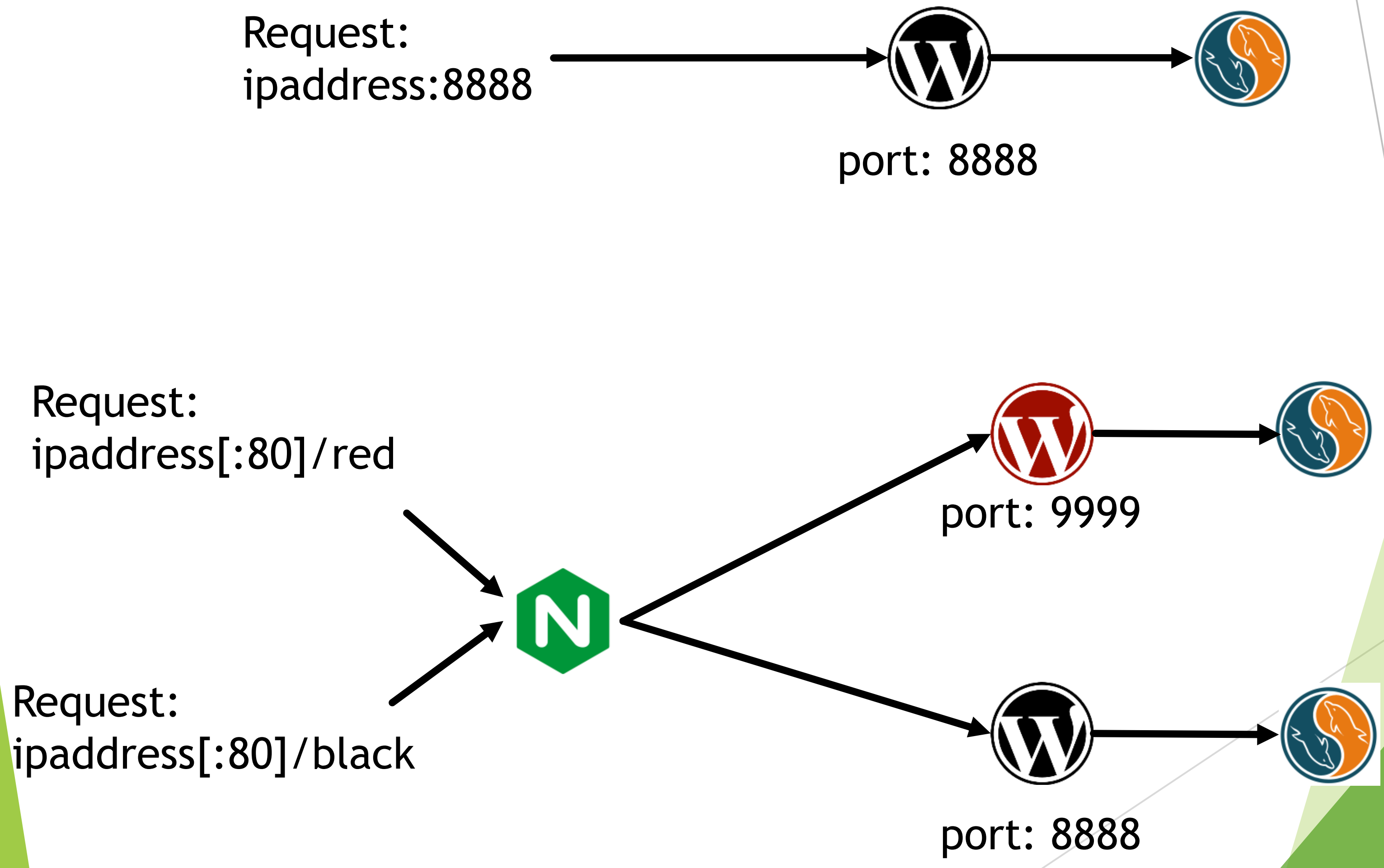
nginx
: A http server which has following features.
- Reverse proxying
- SSL TLS SNI support… and etc

Usually, It is compared by Apache.

wordpress
: It is web software to create website, blog, or application.

mysql
: Relational Database Management System(RDBMS)

Functions Lab: Overall
- Scenario



Prerequisite for Functions lab

Functions lab focus on (Docker container) functions of NUC

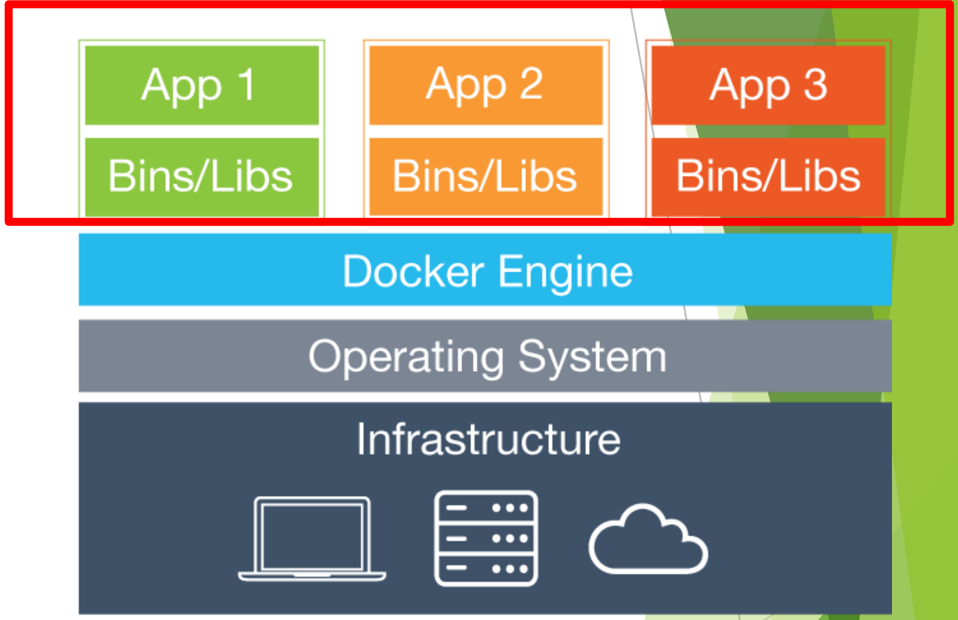
docker-engine (version: 1.10 or above)

Docker Background Knowledge
- Reminder: Docker Image

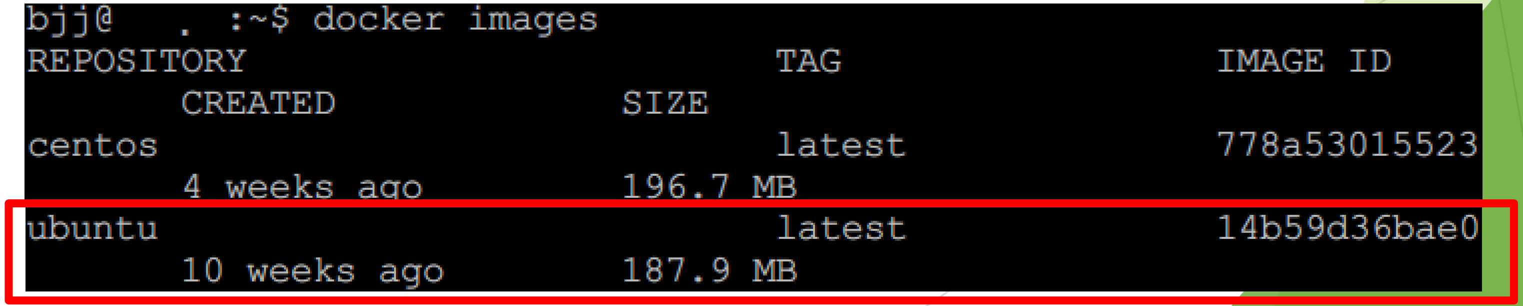
Docker image: A file which contains status of Docker container.
Similar to snapshot of VM.

It can be branched and versioned…

Docker image can be shared easily.
(It is important feature of Docker.)

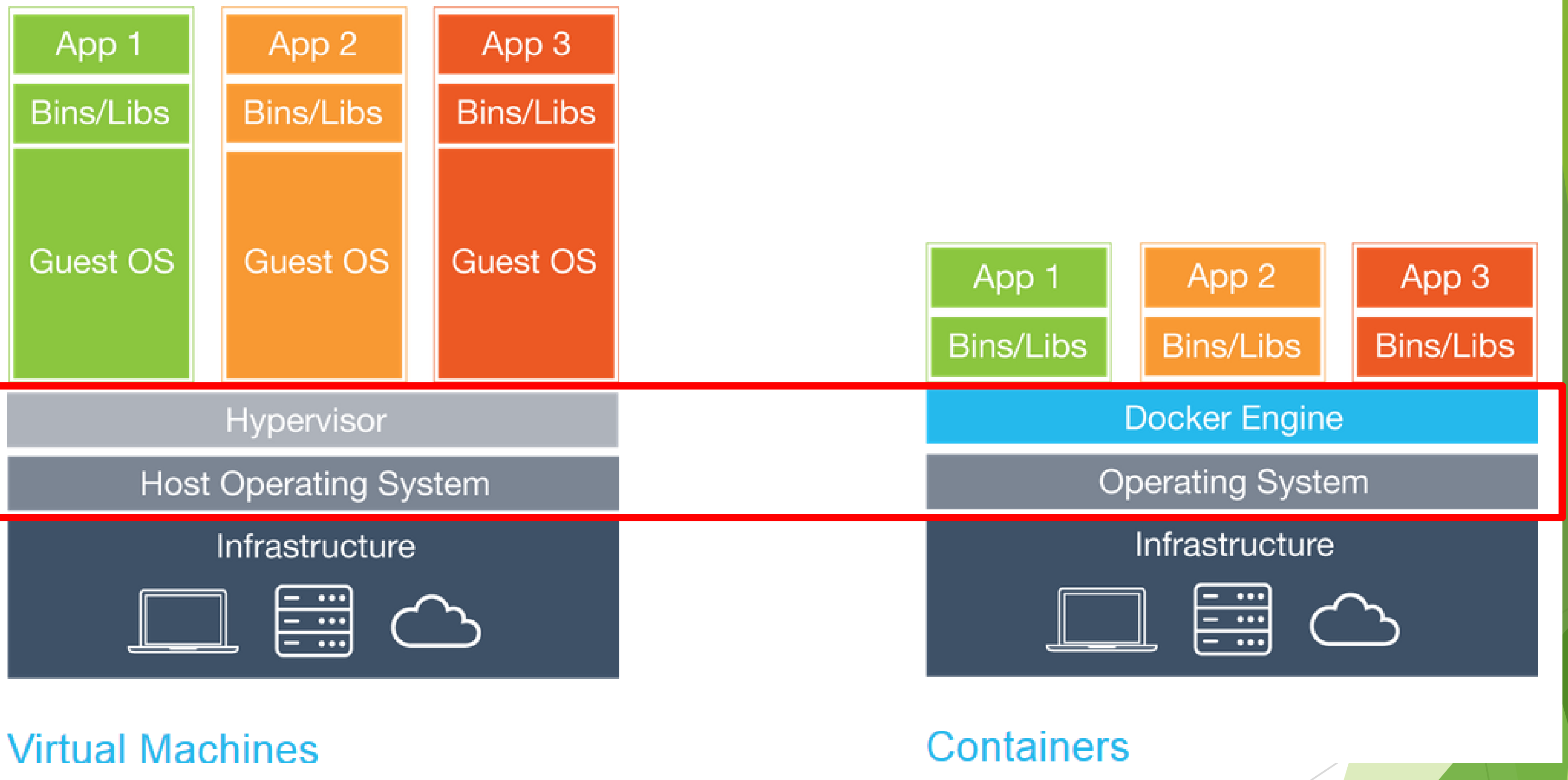


You can find Ubuntu image on your machine



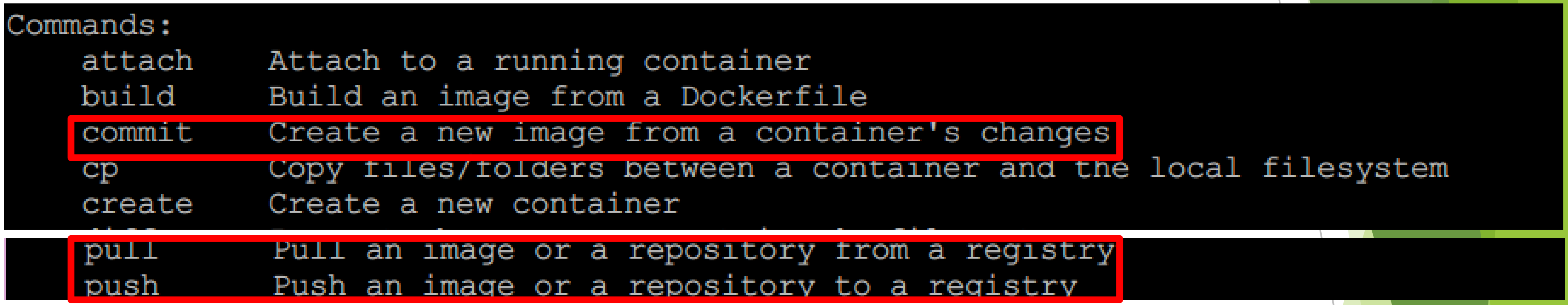
```
bjj@    . :~$ docker images
REPOSITORY                           TAG                 IMAGE ID
       CREATED                 SIZE
centos                               latest              778a53015523
       4 weeks ago             196.7 MB
ubuntu                               latest              14b59d36bae0
       10 weeks ago            187.9 MB
```

Docker Background Knowledge
- Reminder: Container restraint



Since container uses host kernel, OS of host should be Linux distribution.

Docker Background Knowledge
- Why Docker image can be shared easily? (1)



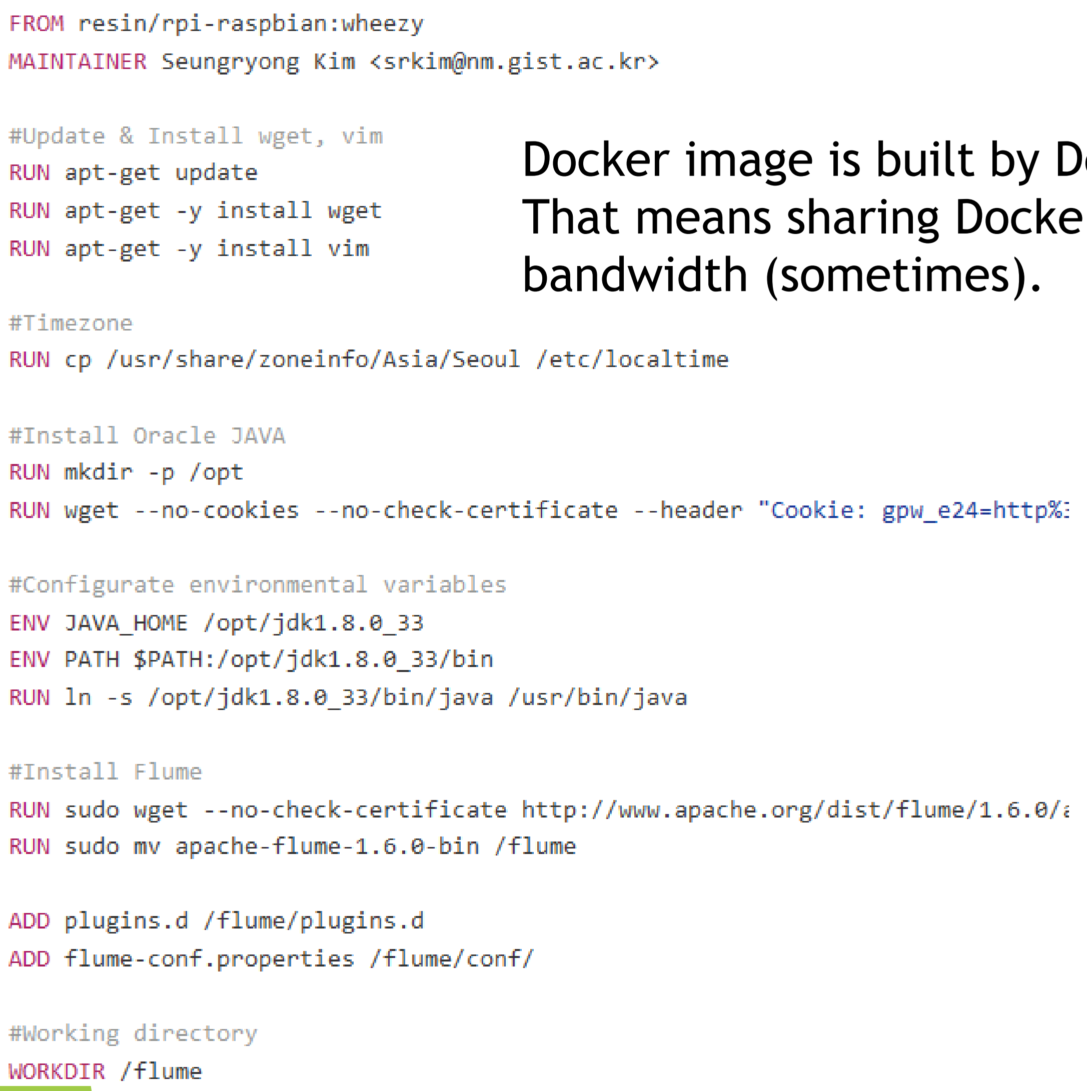
```
Commands:
    attach    Attach to a running container
    build     Build an image from a Dockerfile
    commit    Create a new image from a container's changes
    cp        Copy files/folders between a container and the local filesystem
    create    Create a new container
```

```
    pull      Pull an image or a repository from a registry
    push      Push an image or a repository to a registry
```

Docker provides related commands!

This usage is similar to code management system. (e.g, svn, git)

Docker Background Knowledge
- Why Docker image can be shared easily? (2)

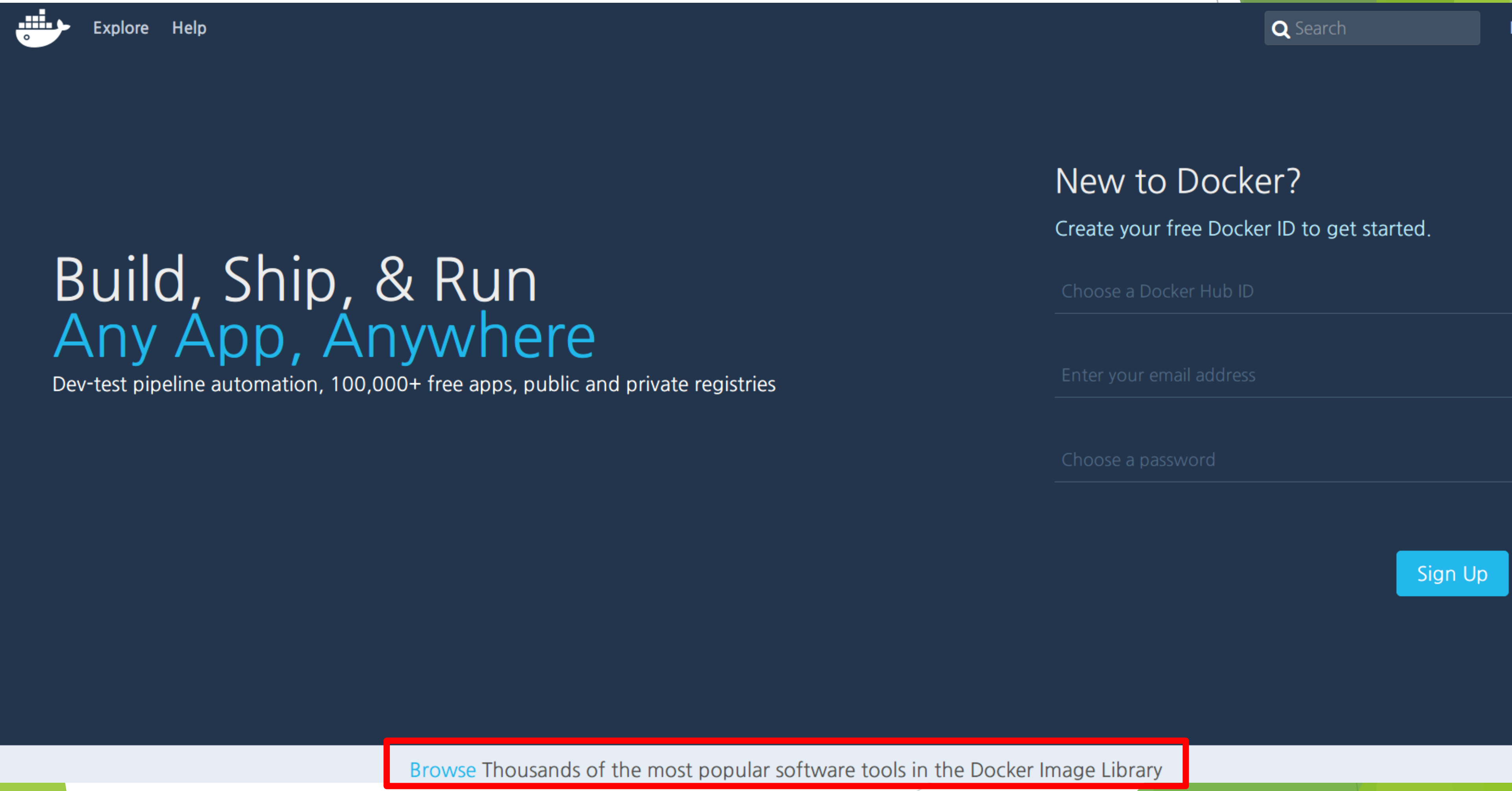


```
FROM resin/rpi-raspbian:wheezy
MAINTAINER Seungryong Kim <srkim@nm.gist.ac.kr>

#Update & Install wget, vim
RUN apt-get update
RUN apt-get -y install wget
RUN apt-get -y install vim

#Timezone
RUN cp /usr/share/zoneinfo/Asia/Seoul /etc/localtime

#Install Oracle JAVA
RUN mkdir -p /opt
RUN wget --no-cookies --no-check-certificate --header "Cookie: gpw_e24=http%3

#Configurate environmental variables
ENV JAVA_HOME /opt/jdk1.8.0_33
ENV PATH $PATH:/opt/jdk1.8.0_33/bin
RUN ln -s /opt/jdk1.8.0_33/bin/java /usr/bin/java

#Install Flume
RUN sudo wget --no-check-certificate http://www.apache.org/dist/flume/1.6.0/a
RUN sudo mv apache-flume-1.6.0-bin /flume

ADD plugins.d /flume/plugins.d
ADD flume-conf.properties /flume/conf/

#Working directory
WORKDIR /flume
```

Docker image is built by Dockerfile which is small text file. That means sharing Docker image does not requires huge bandwidth (sometimes).

Getting Docker Image
- Public Docker Image Repository: Docker Hub (1)

https://hub.docker.com/



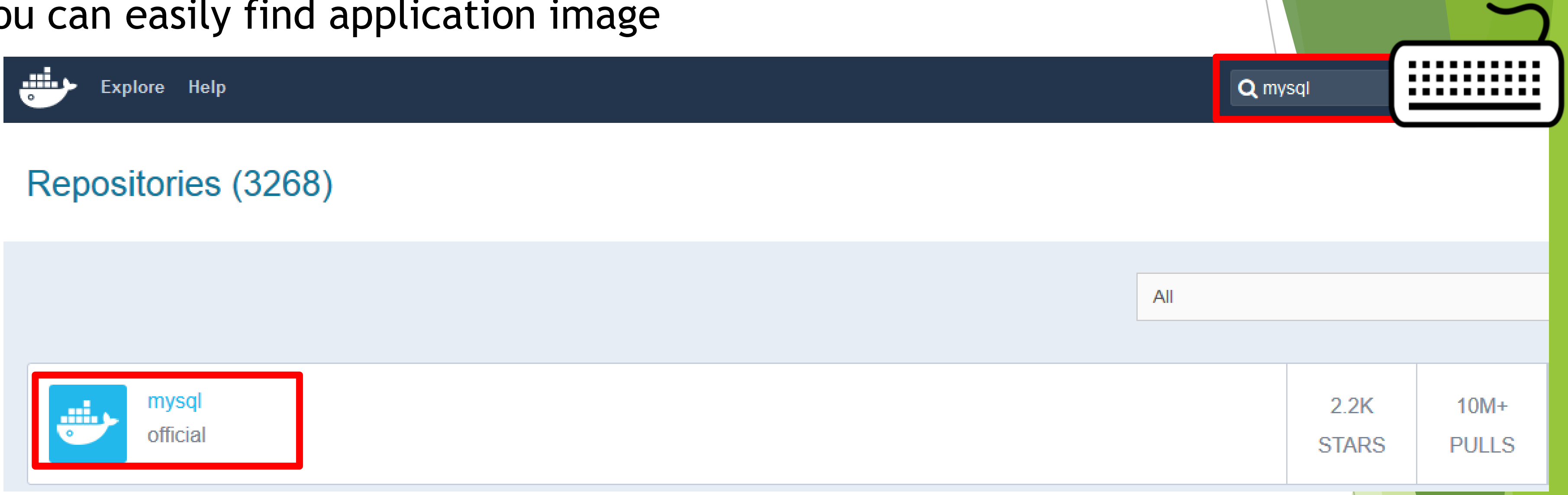
Build, Ship, & Run
Any App, Anywhere
Dev-test pipeline automation, 100,000+ free apps, public and private registries

New to Docker?
Create your free Docker ID to get started.

Browse Thousands of the most popular software tools in the Docker Image Library

Getting Docker Image
- Public Docker Image Repository: Docker Hub (2)

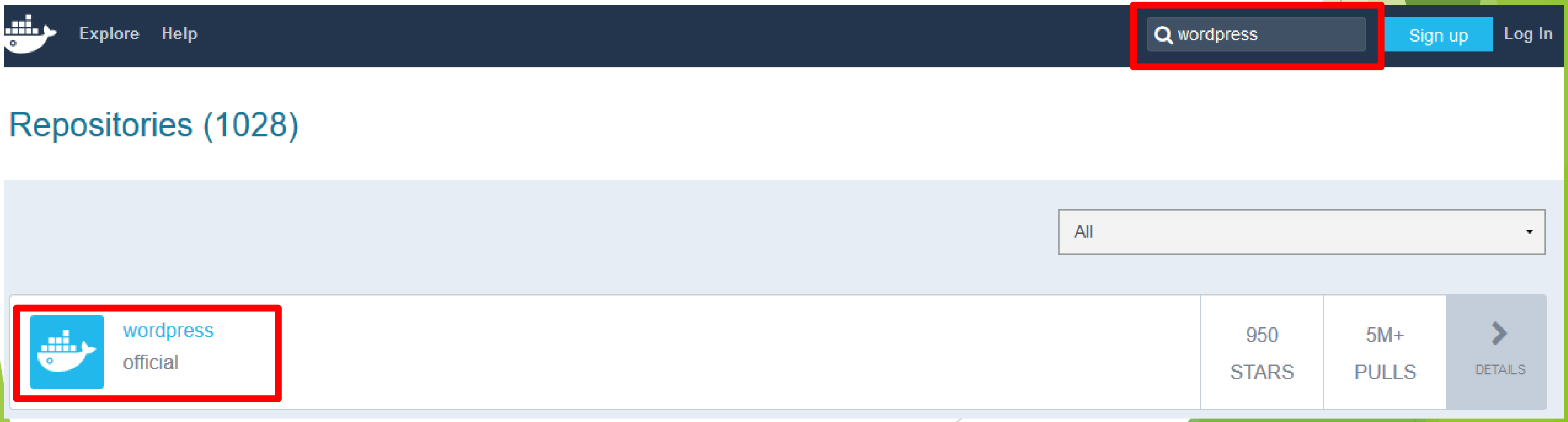
You can easily find application image



Repositories (3268)

All

mysql official	2.2K STARS	10M+ PULLS



Repositories (1028)

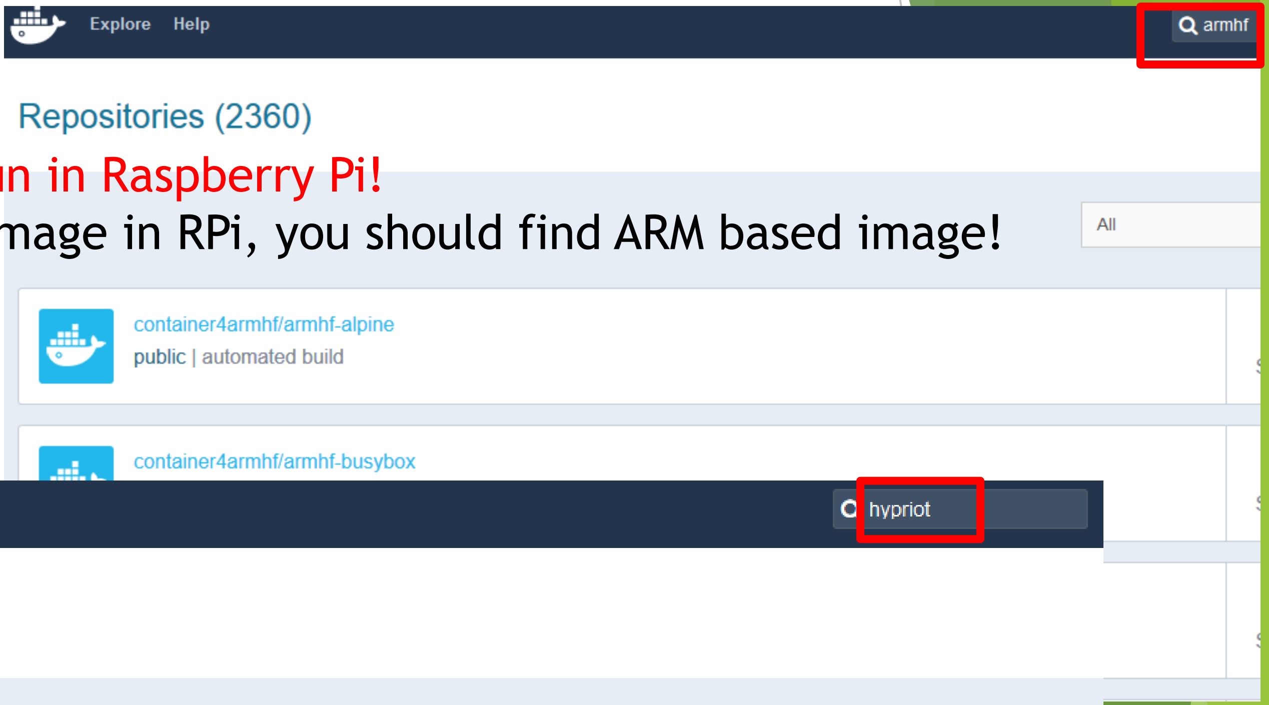
All

wordpress official	950 STARS	5M+ PULLS	DETAILS

Getting Docker Image
- Be aware!

x86 based image can not run in Raspberry Pi!

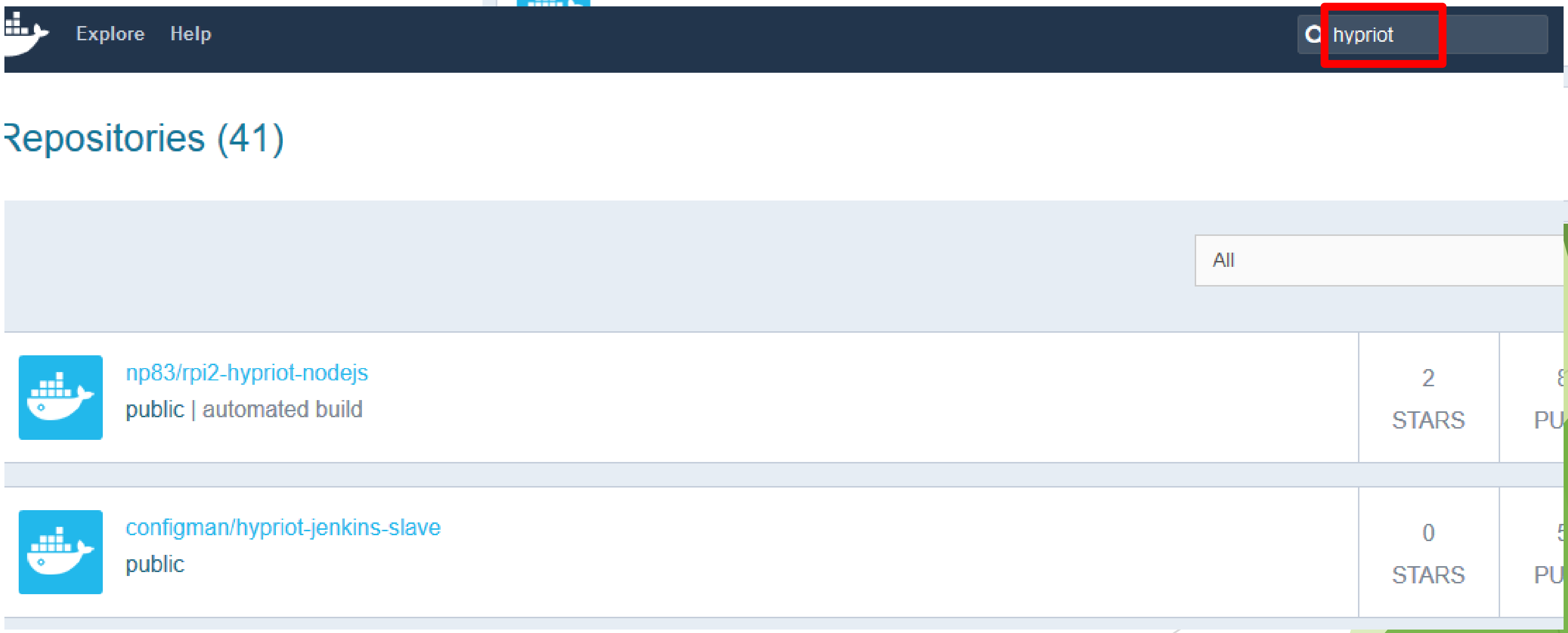
If you want to use Docker image in RPi, you should find ARM based image!



Repositories (2360)

container4armhf/armhf-alpine
public | automated build

container4armhf/armhf-busybox

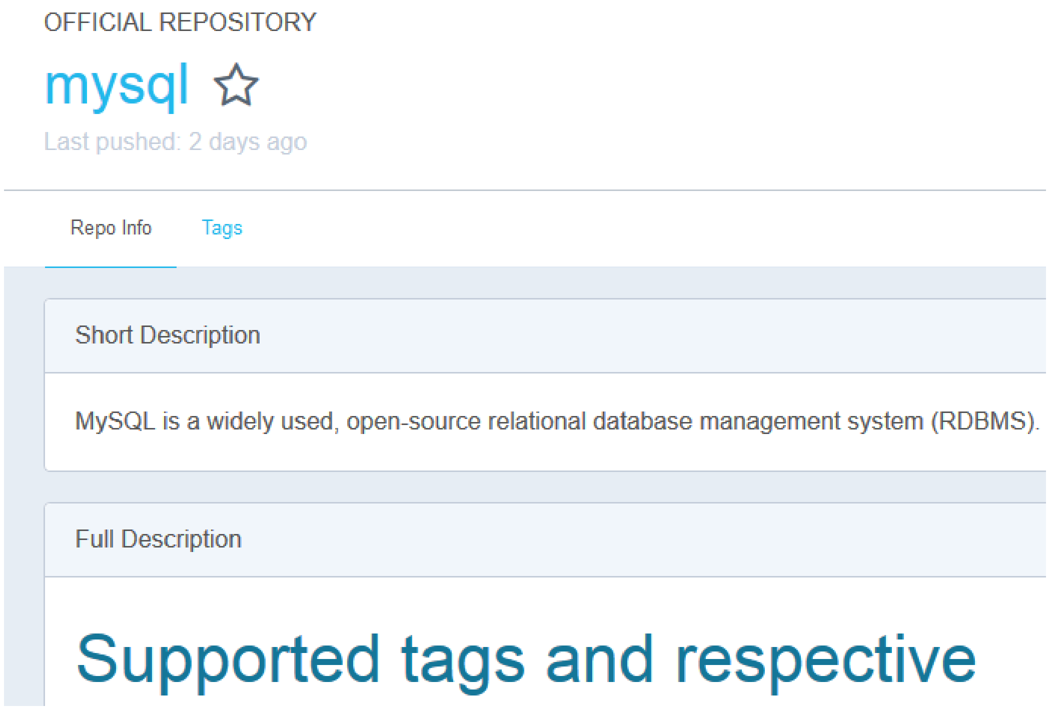


Repositories (41)

np83/rpi2-hypriot-nodejs public | automated build	2 STARS	PU
configman/hypriot-jenkins-slave public	0 STARS	PU

Getting Docker Image
- Public Docker Image Repository: Docker Hub (3)

Before using Docker image, you should read description.
It is very important because required option rely on image.



OFFICIAL REPOSITORY

mysql ☆

Last pushed: 2 days ago

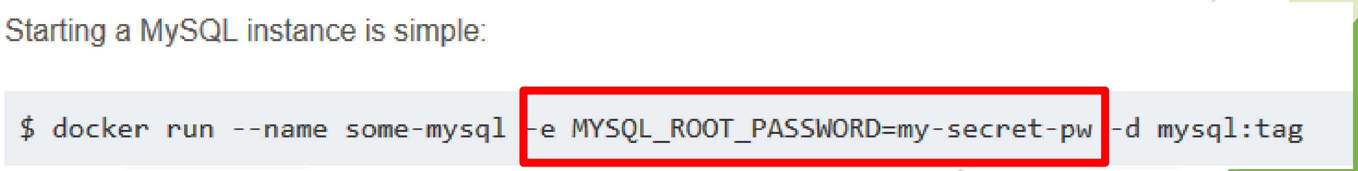
Repo Info Tags

Short Description

MySQL is a widely used, open-source relational database management system (RDBMS).

Full Description

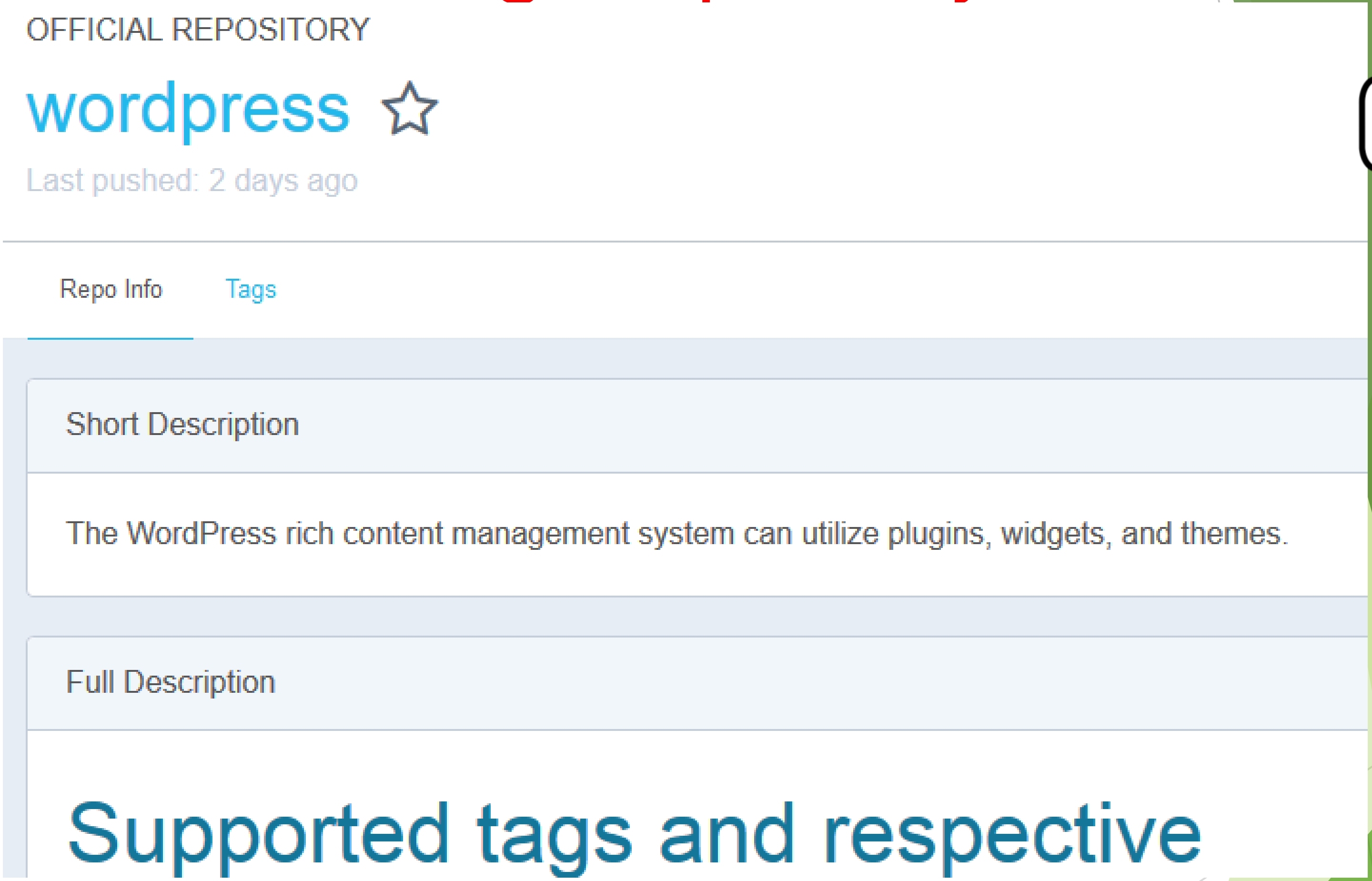
Supported tags and respective



Starting a MySQL instance is simple:

```
$ docker run --name some-mysql -e MYSQL_ROOT_PASSWORD=my-secret-pw -d mysql:tag
```

Getting Docker Image
- Public Docker Image Repository: Docker Hub (4)


OFFICIAL REPOSITORY

wordpress

Last pushed: 2 days ago

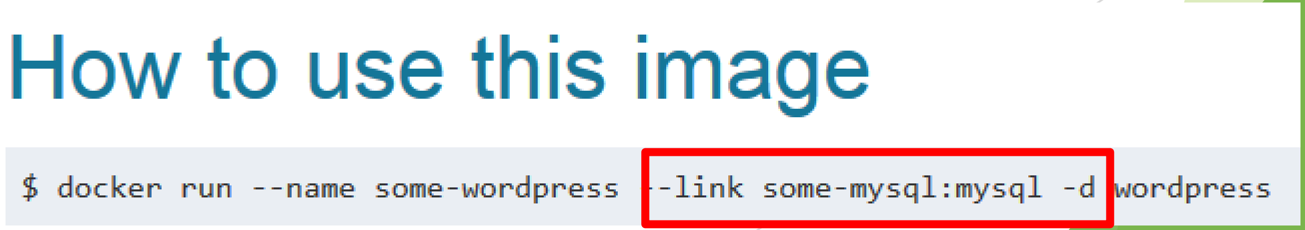
Repo Info Tags

Short Description

The WordPress rich content management system can utilize plugins, widgets, and themes.

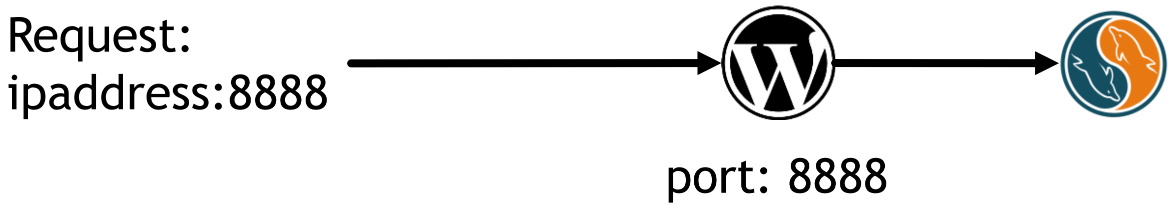
Full Description

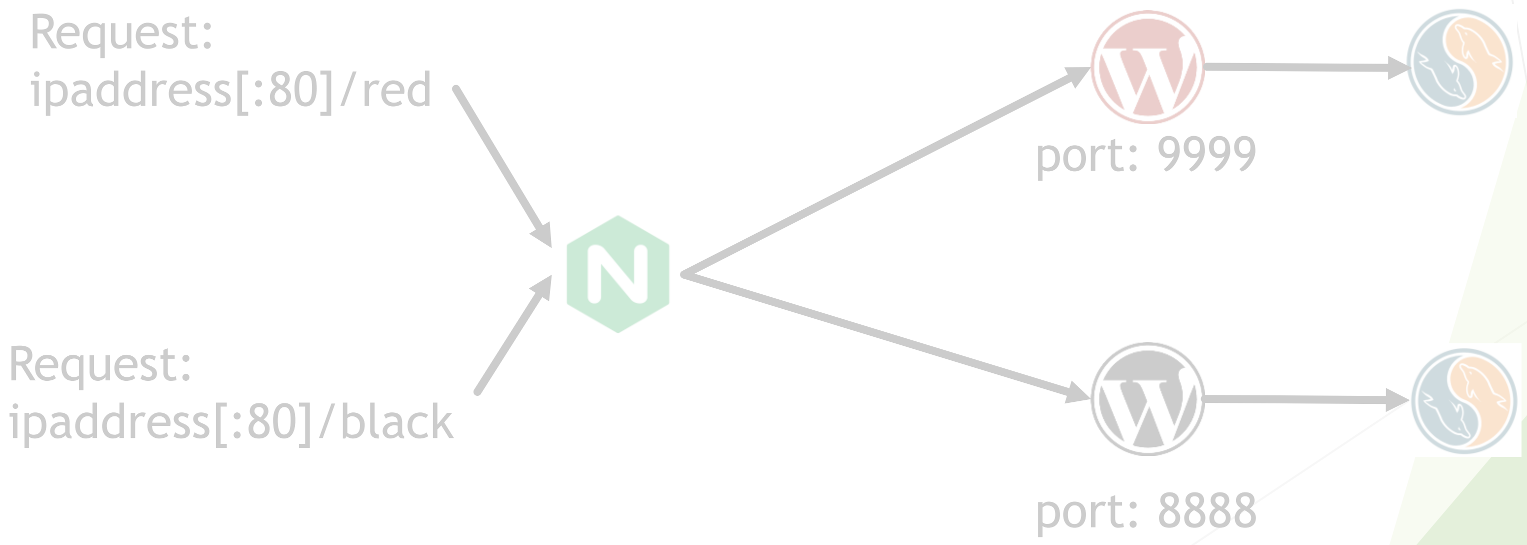
Supported tags and respective


How to use this image

```
$ docker run --name some-wordpress --link some-mysql:mysql -d wordpress
```

Functions Lab:
- Try: wordpress-mysql

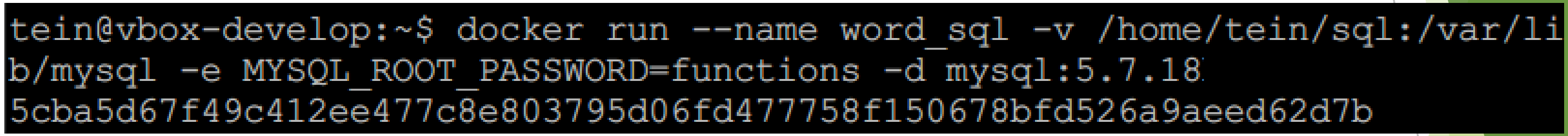




Running Web Application
- Run mysql container

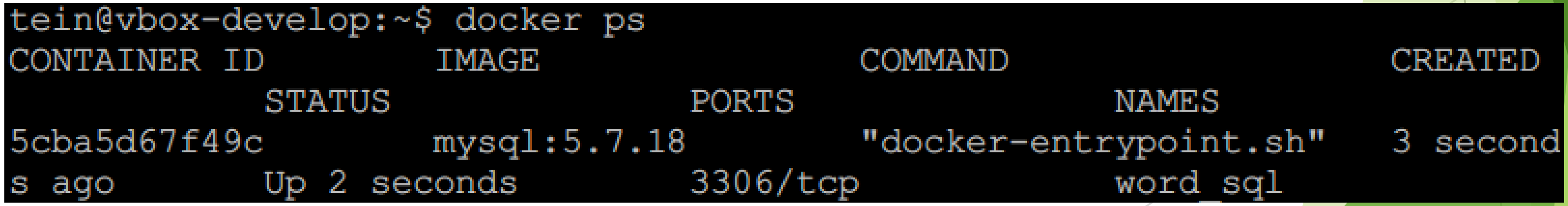
```
mkdir ~/sql

sudo docker run --name word_sql -v /home/[username]/sql:/var/lib/mysql -e
MYSQL_ROOT_PASSWORD=[password] -d mysql:5.7.18
```

Tag. Default is latest (Latest version)



```
tein@vbox-develop:~$ docker run --name word_sql -v /home/tein/sql:/var/li
b/mysql -e MYSQL_ROOT_PASSWORD=functions -d mysql:5.7.18
5cba5d67f49c412ee477c8e803795d06fd477758f150678bfd526a9aeed62d7b
```

```
sudo docker ps
```

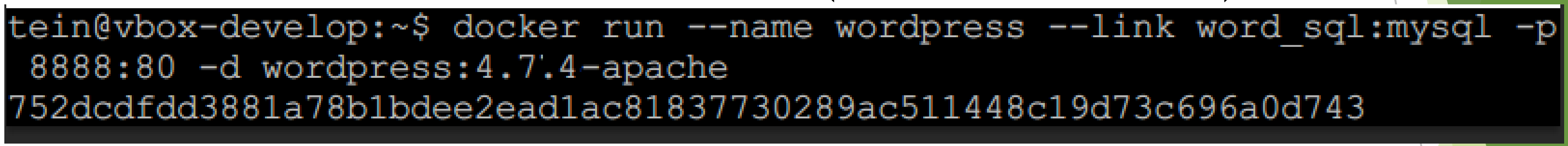


```
tein@vbox-develop:~$ docker ps
CONTAINER ID        IMAGE                    COMMAND                  CREATED
            STATUS              PORTS                    NAMES
5cba5d67f49c        mysql:5.7.18             "docker-entrypoint.sh"   3 second
s ago       Up 2 seconds        3306/tcp                 word_sql
```

Running Web Application
- Run wordpress container

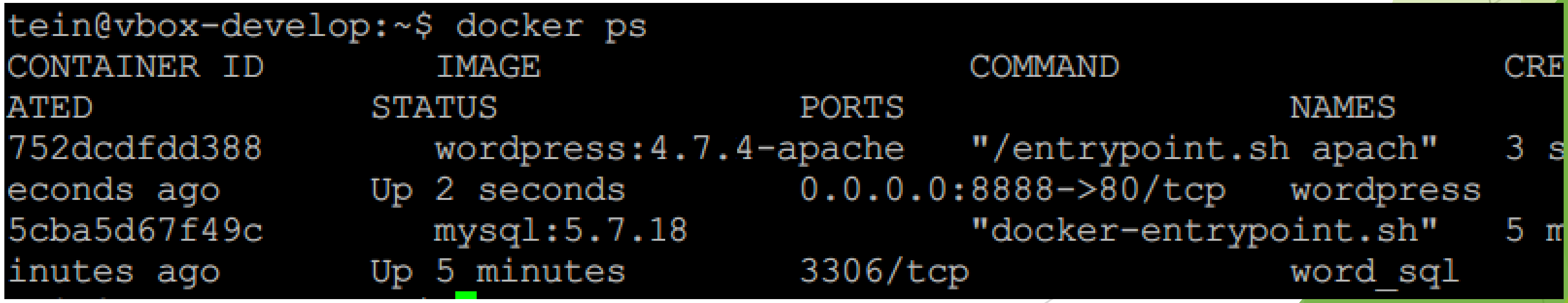
sudo docker run --name wordpress --link word_sql:mysql -p 8888:80 –d wordpress:4.7.4-apache

(Will be introduced)



```
tein@vbox-develop:~$ docker run --name wordpress --link word_sql:mysql -p
 8888:80 -d wordpress:4.7.4-apache
752dcdfdd3881a78b1bdee2ead1ac81837730289ac511448c19d73c696a0d743
```

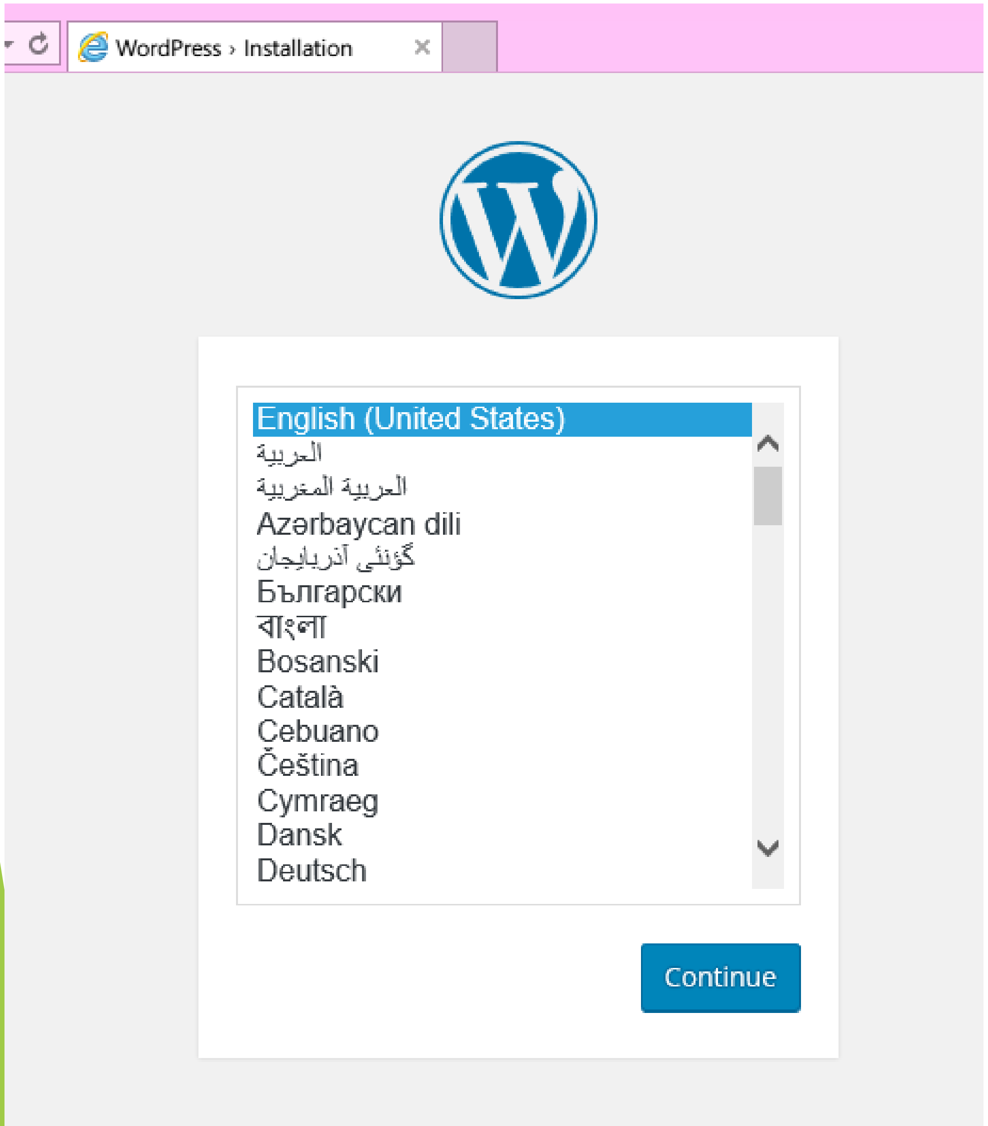
sudo docker ps



```
tein@vbox-develop:~$ docker ps
CONTAINER ID        IMAGE                      COMMAND                  CRE
ATED               STATUS                    PORTS                  NAMES
752dcdfdd388        wordpress:4.7.4-apache     "/entrypoint.sh apach"   3 s
econds ago         Up 2 seconds              0.0.0.0:8888->80/tcp   wordpress
5cba5d67f49c        mysql:5.7.18               "docker-entrypoint.sh"   5 m
inutes ago         Up 5 minutes              3306/tcp               word_sql
```

Running Web Application - Check wordpress!

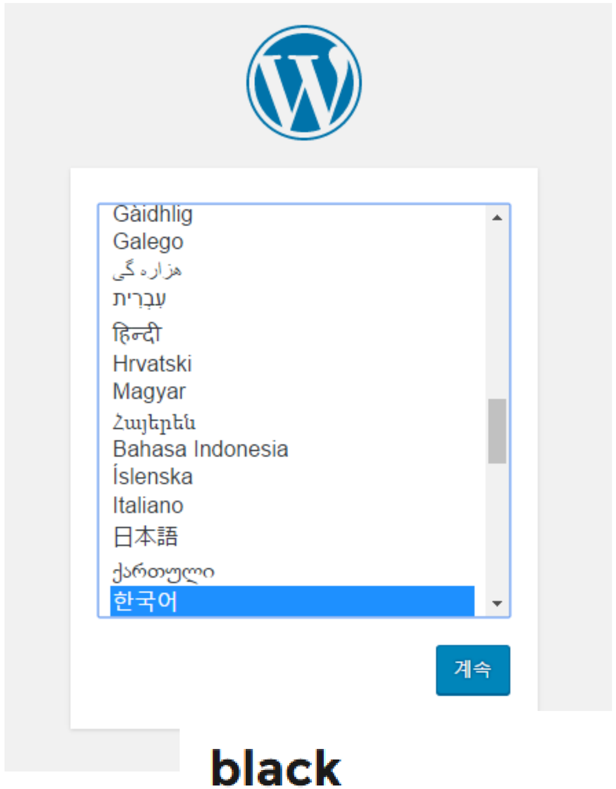
http://localhost:8888

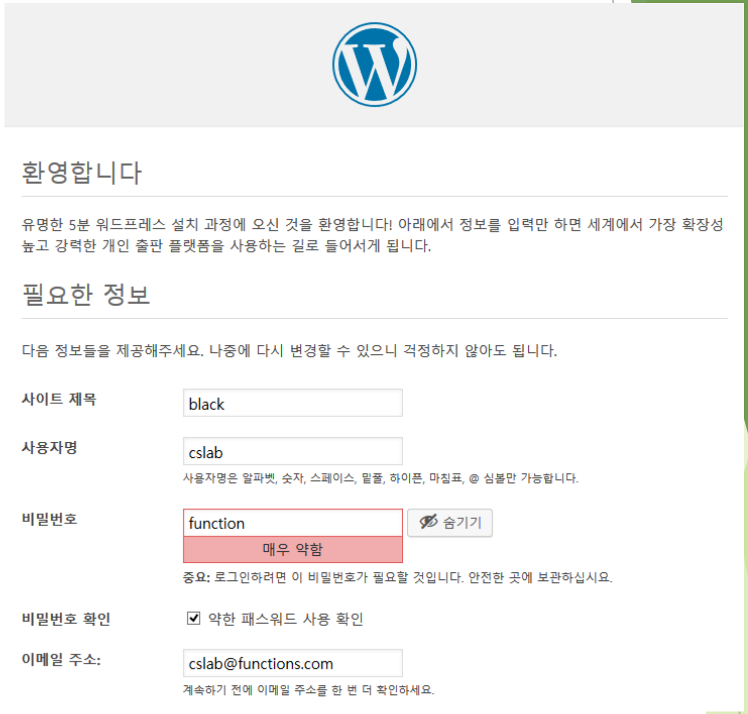


We typed just 2 line of commands to running wordpress!

This is one of major Docker strength :Easy deployment of software

Running Web Application
- Default configuration: Wordpress


Gàidhlig
Galego
هزاره گی
עִבְרִית
हिन्दी
Hrvatski
Magyar
Հայերեն
Bahasa Indonesia
Íslenska
Italiano
日本語
ქართული
한국어

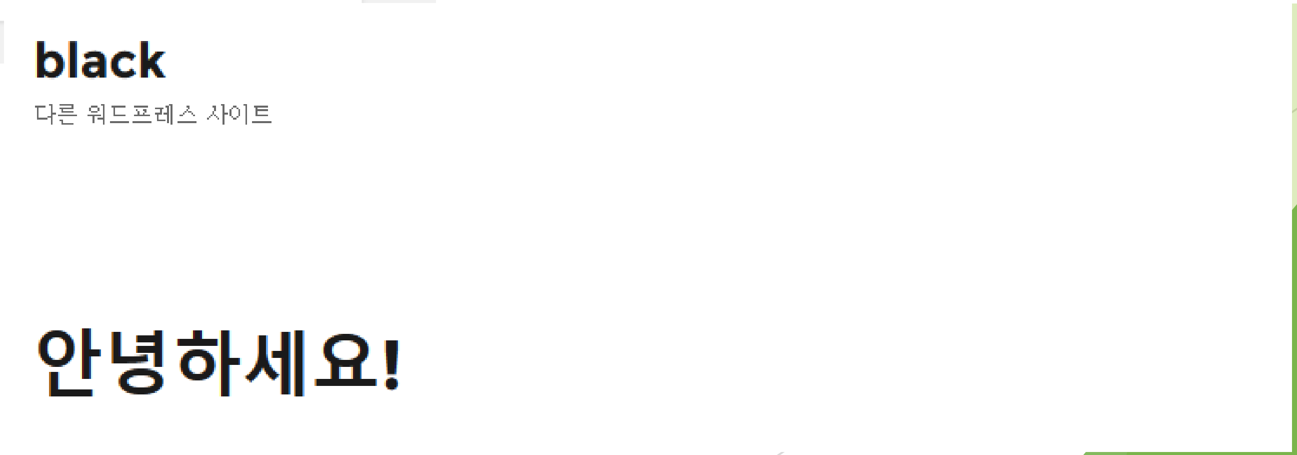

환영합니다

유명한 5분 워드프레스 설치 과정에 오신 것을 환영합니다! 아래에서 정보를 입력만 하면 세계에서 가장 확장성 높고 강력한 개인 출판 플랫폼을 사용하는 길로 들어서게 됩니다.

필요한 정보

다음 정보들을 제공해주세요. 나중에 다시 변경할 수 있으니 걱정하지 않아도 됩니다.

사이트 제목	black
사용자명	cslab 사용자명은 알파벳, 숫자, 스페이스, 밑줄, 하이픈, 마침표, @ 심볼만 가능합니다.
비밀번호	function 숨기기 매우 약함 **중요:** 로그인하려면 이 비밀번호가 필요할 것입니다. 안전한 곳에 보관하십시오.
비밀번호 확인	☑ 약한 패스워드 사용 확인
이메일 주소:	cslab@functions.com 계속하기 전에 이메일 주소를 한 번 더 확인하세요.


black

다른 워드프레스 사이트

안녕하세요!

Running Web Application
- About --link option (1)

(In official docs..)

Docker also has a linking system that allows you to link multiple containers together and send connection information from one to another. When containers are linked, information about a source container can be sent to a recipient container. This allows the recipient to see selected data describing aspects of the source container.

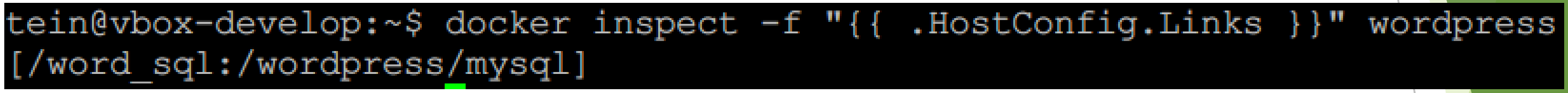
Links allow containers to discover each other and securely transfer information about one container to another container. When you set up a link, you create a conduit between a source container and a recipient container.

```
Usage: --link <name or id>:alias
       --link <name or id>
```

Naming container is important!

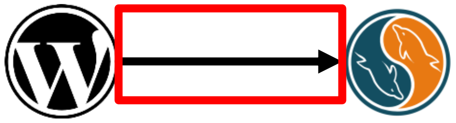
Running Web Application
- About --link option (2)

```
sudo docker inspect -f "{{ .HostConfig.Links }}" wordpress
```



```
tein@vbox-develop:~$ docker inspect -f "{{ .HostConfig.Links }}" wordpress
[/word_sql:/wordpress/mysql]
```

You can see wordpress container is linked with mysql container.



Conduit which is made by --link option

Running Web Application
- About --link option (3)

(In official docs..)

Docker creates a secure tunnel between the containers that doesn't need to expose any ports externally on the container.

That's a big benefit of linking: we don't need to expose the source container.

Review our commands: Creating mysql container
→ This container doesn't expose any ports.

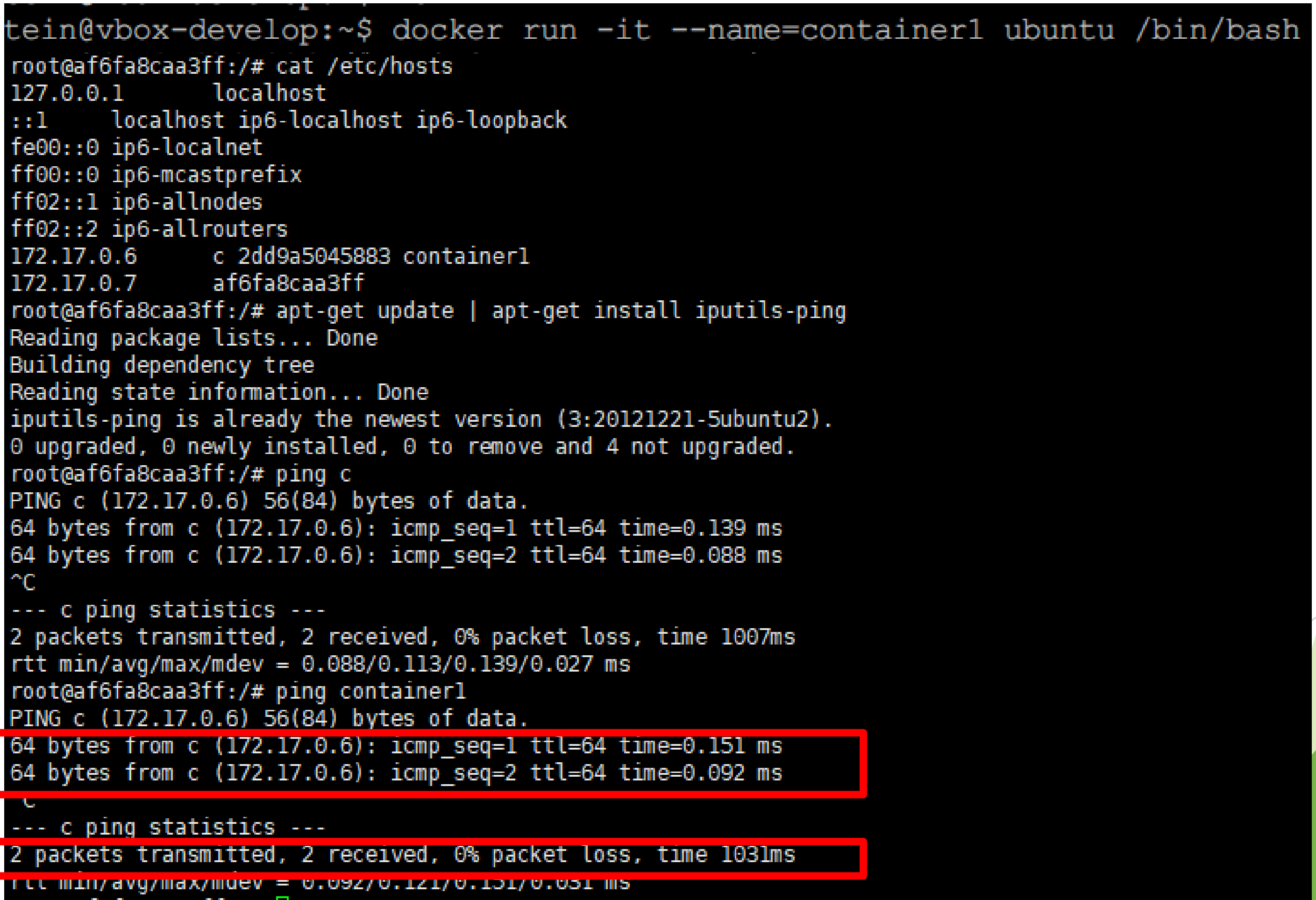
```
mkdir sql
sudo docker run --name word_sql -v /home/[username]/sql:/var/lib/mysql -e
MYSQL_ROOT_PASSWORD=[password] -d mysql
```

Also we don't need to type password of mysql when creating wordpress container

```
sudo docker run --name wordpress --link word_sql:mysql -p 80:80 -d
wordpress
```

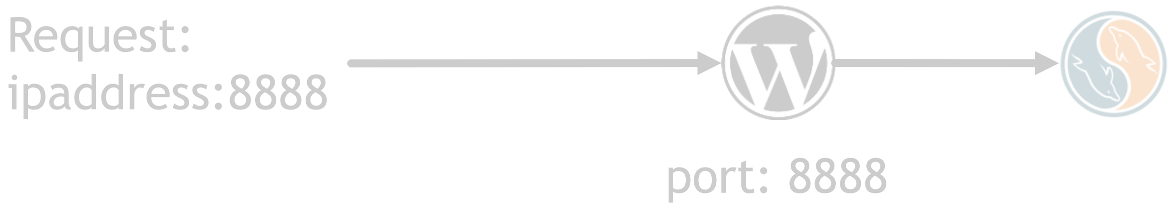
Running Web Application
- About --link option (4)

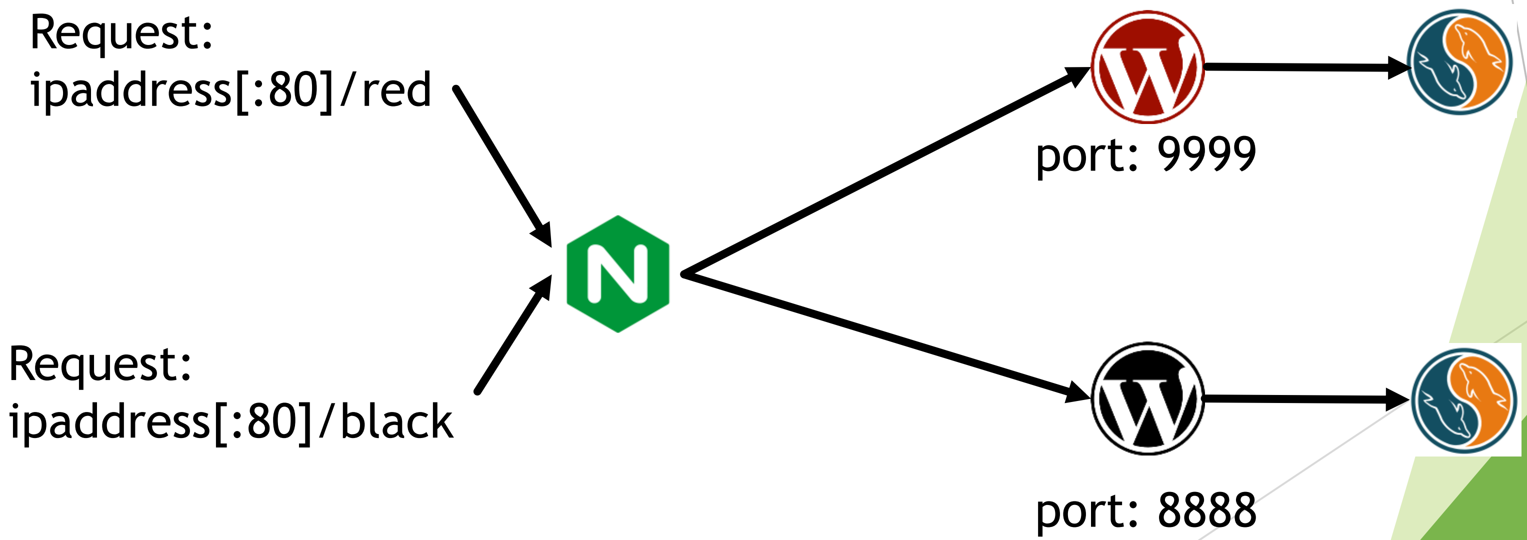
(In official docs..)
Functionality of this option is:
- Updating Environment variables
- Updating the /etc/hosts file



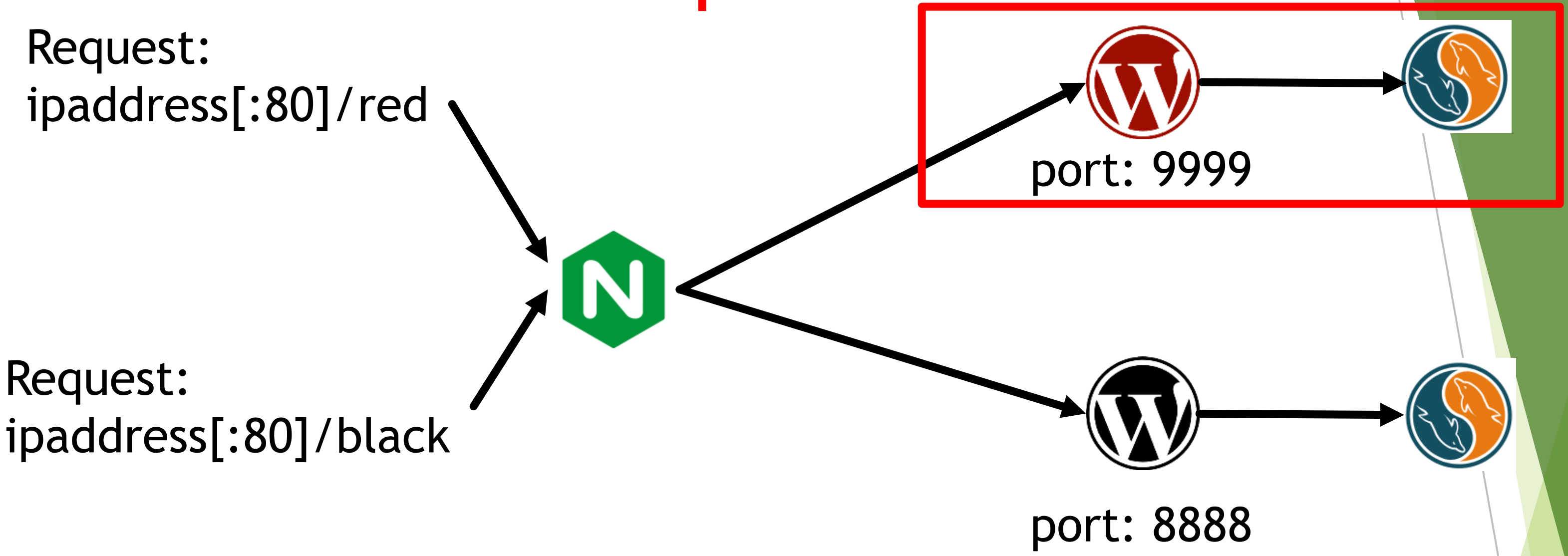
```
tein@vbox-develop:~$ docker run -it --name=container1 ubuntu /bin/bash
root@af6fa8caa3ff:/# cat /etc/hosts
127.0.0.1       localhost
::1     localhost ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
172.17.0.6      c 2dd9a5045883 container1
172.17.0.7      af6fa8caa3ff
root@af6fa8caa3ff:/# apt-get update | apt-get install iputils-ping
Reading package lists... Done
Building dependency tree
Reading state information... Done
iputils-ping is already the newest version (3:20121221-5ubuntu2).
0 upgraded, 0 newly installed, 0 to remove and 4 not upgraded.
root@af6fa8caa3ff:/# ping c
PING c (172.17.0.6) 56(84) bytes of data.
64 bytes from c (172.17.0.6): icmp_seq=1 ttl=64 time=0.139 ms
64 bytes from c (172.17.0.6): icmp_seq=2 ttl=64 time=0.088 ms
^C
--- c ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1007ms
rtt min/avg/max/mdev = 0.088/0.113/0.139/0.027 ms
root@af6fa8caa3ff:/# ping container1
PING c (172.17.0.6) 56(84) bytes of data.
64 bytes from c (172.17.0.6): icmp_seq=1 ttl=64 time=0.151 ms
64 bytes from c (172.17.0.6): icmp_seq=2 ttl=64 time=0.092 ms
^C
--- c ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1031ms
rtt min/avg/max/mdev = 0.092/0.121/0.151/0.031 ms
```

Functions Lab:
- Try: nginx-wordpress-mysql





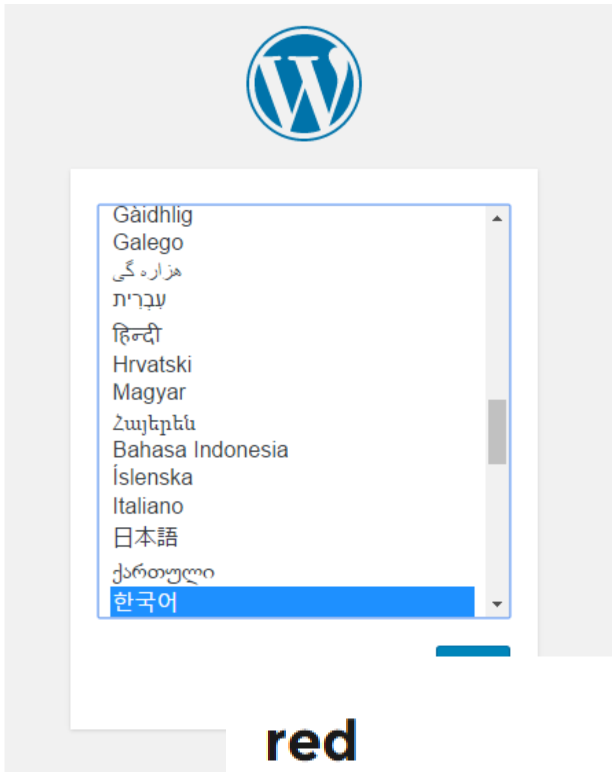
Running Web Application
- Make another wordpress container set



```
mkdir ~/sql2
sudo docker run --name word_sql2 -v /home/[username]/sql2:/var/lib/mysql -e
MYSQL_ROOT_PASSWORD=[password] -d mysql:5.7.18
```

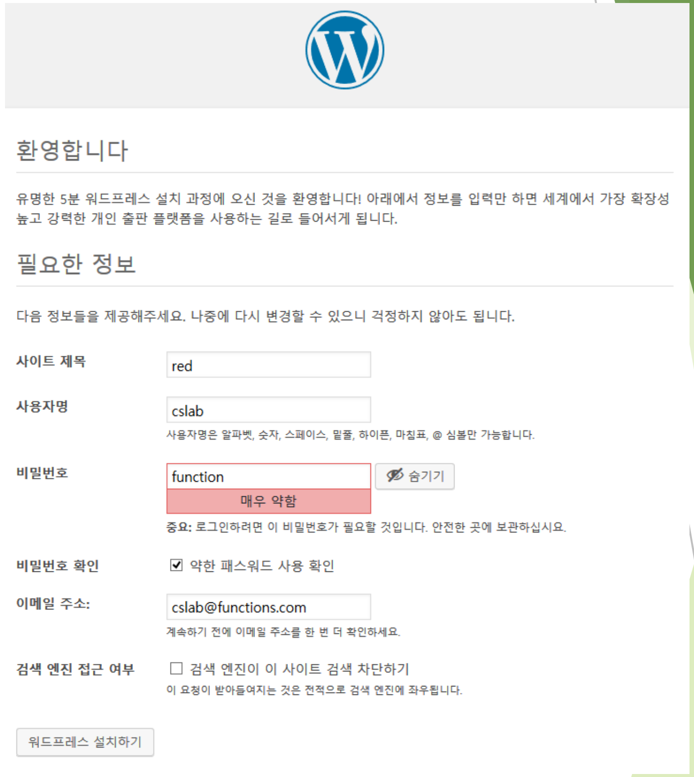
```
sudo docker run --name wordpress2 --link word_sql2:mysql -p 9999:80 -d
wordpress:4.7.4-apache
```

Running Web Application
- Default configuration: Wordpress


Gàidhlig
Galego
هزاره گی
עִבְרִית
हिन्दी
Hrvatski
Magyar
Հայերեն
Bahasa Indonesia
Íslenska
Italiano
日本語
ქართული
한국어

red

다른 워드프레스 사이트


환영합니다

유명한 5분 워드프레스 설치 과정에 오신 것을 환영합니다! 아래에서 정보를 입력만 하면 세계에서 가장 확장성 높고 강력한 개인 출판 플랫폼을 사용하는 길로 들어서게 됩니다.

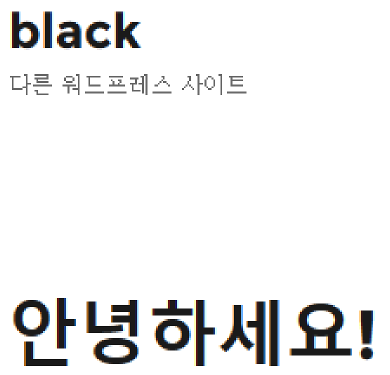
필요한 정보

다음 정보들을 제공해주세요. 나중에 다시 변경할 수 있으니 걱정하지 않아도 됩니다.

사이트 제목	red
사용자명	cslab 사용자명은 알파벳, 숫자, 스페이스, 밑줄, 하이픈, 마침표, @ 심볼만 가능합니다.
비밀번호	function 매우 약함 **중요:** 로그인하려면 이 비밀번호가 필요할 것입니다. 안전한 곳에 보관하십시오.
비밀번호 확인	☑ 약한 패스워드 사용 확인
이메일 주소:	cslab@functions.com 계속하기 전에 이메일 주소를 한 번 더 확인하세요.
검색 엔진 접근 여부	☐ 검색 엔진이 이 사이트 검색 차단하기 이 요청이 받아들여지는 것은 전적으로 검색 엔진에 좌우됩니다.

안녕하세요!

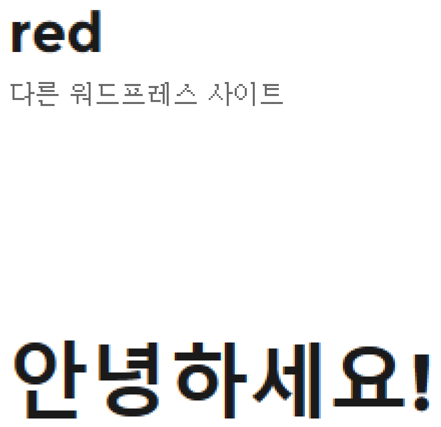
Running Web Application
- Current status


black

다른 워드프레스 사이트

안녕하세요!

ip:8888


red

다른 워드프레스 사이트

안녕하세요!

ip:9999

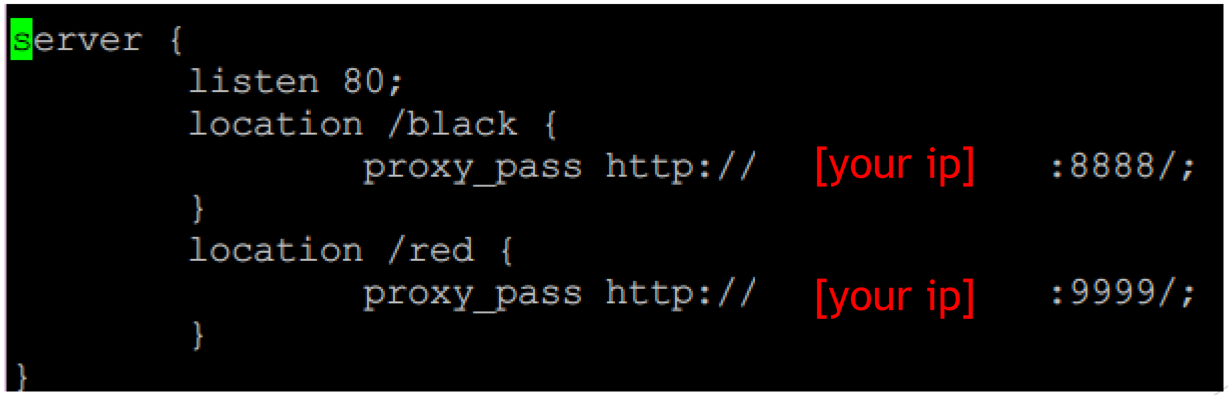
Running Web Application
- Make container for reverse proxy

```
sudo docker run -it --name=nginx $\boxed{-p 80:80}$ ubuntu:16.04
```

Forwarding host_port:container_port

Running Web Application
- Setting reverse proxy

```
sudo apt-get update
sudo apt-get install nginx
sudo apt-get install vim

cd /etc/nginx/sites-enabled
rm default
vi default
```

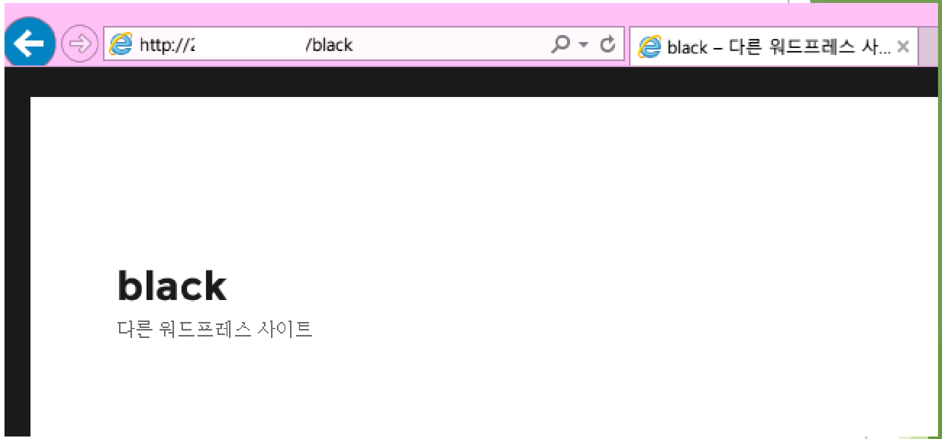


```
server {
        listen 80;
        location /black {
                proxy_pass http://   [your ip]    :8888/;
        }
        location /red {
                proxy_pass http://   [your ip]    :9999/;
        }
}
```

```
service nginx start
```

Running Web Application
- Setting reverse proxy

Try
http://localhost/black
http://localhost/red

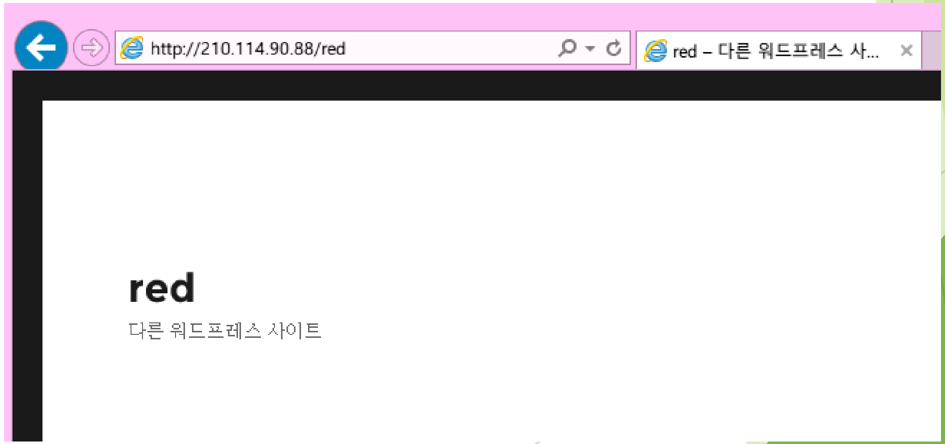


http://[redacted]/black

black – 다른 워드프레스 사...

black

다른 워드프레스 사이트



http://210.114.90.88/red

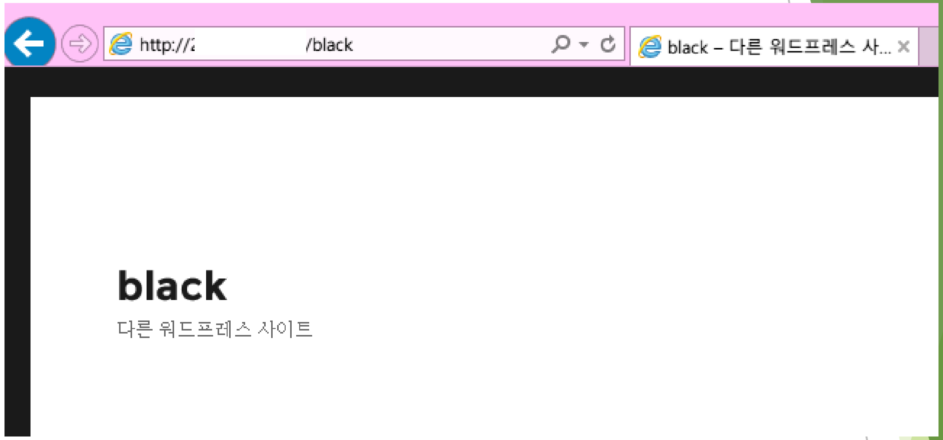
red – 다른 워드프레스 사...

red

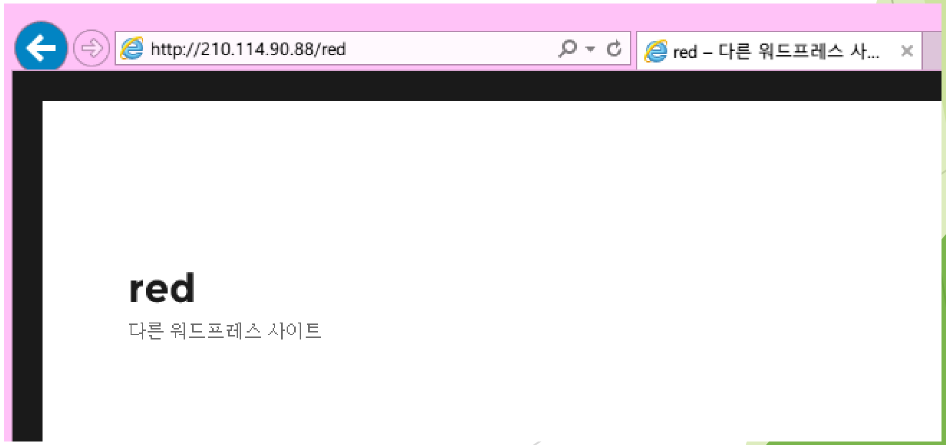
다른 워드프레스 사이트

Running Web Application
- Setting reverse proxy

Try
http://localhost/black
http://localhost/red


http://[redacted]/black
black – 다른 워드프레스 사...

black
다른 워드프레스 사이트


http://210.114.90.88/red
red – 다른 워드프레스 사...

red
다른 워드프레스 사이트

Running Web Application
- About Kubernetes (1)

Kubernetes is an open-source system for automating deployment, scaling, and management of containerized applications.

Kubernetes Features

- **Horizontal scaling:** Scale your application up and down with a simple command, with a UI, or automatically based on CPU usage.

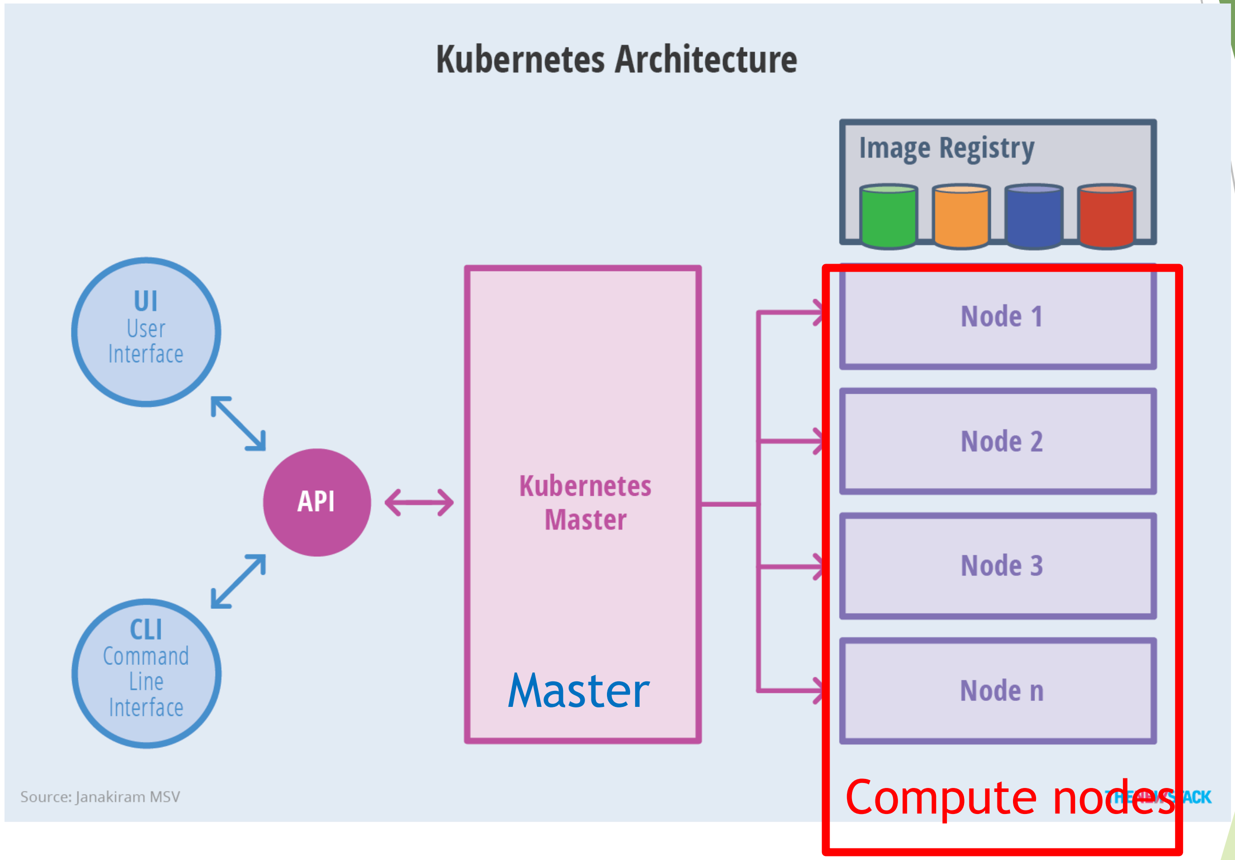
- **Self-healing:** Restarts containers that fail, replaces and reschedules containers when nodes die, kills containers that don't respond to your user-defined health check, and doesn't advertise them to clients until they are ready to serve.

- **Service discovery and load balancing:** No need to modify your application to use an unfamiliar service discovery mechanism. Kubernetes gives containers their own IP addresses and a single DNS name for a set of containers, and can load-balance across them.

- **Storage Orchestration:** Automatically mount the storage system of your choice, whether from local storage, a public cloud provider

https://kubernetes.io/

Running Web Application
- About Kubernetes (2)

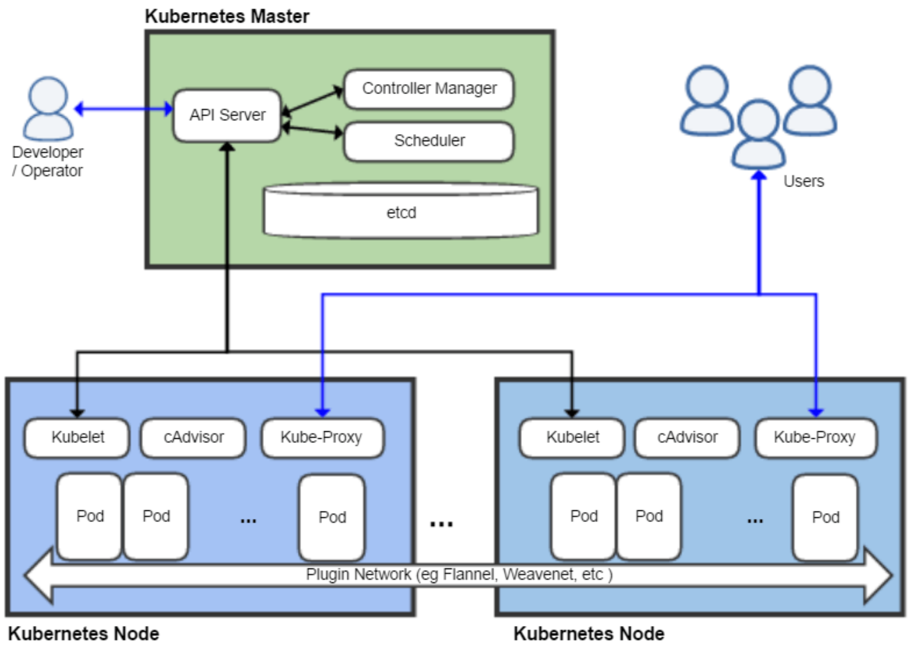


Kubernetes cluster consists of at least one master and multiple compute nodes.

- **Computing Cluster** is a form of computing in which a group of computers are linked together so that they can act like a single entity

  → You will be learn more in the next lab.

Running Web Application
- About Kubernetes (3)

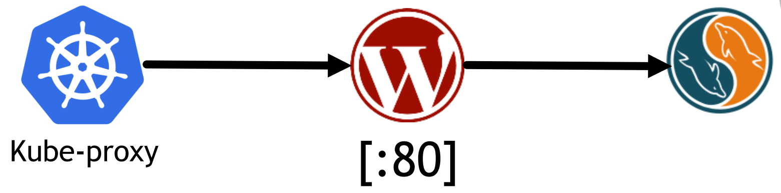


The **master** is responsible for exposing the application program interface (**API**), scheduling the deployments and managing the overall cluster.

Pod is consists of one or more containers that are guaranteed to be co-located on the host machine and can share resources. Each pod is assigned a unique IP address within the cluster, which allows applications to use ports without the risk of conflict.

Running Web Application
- Make a worpress container set With Kubernetes

Request:
ipaddress[:30080]



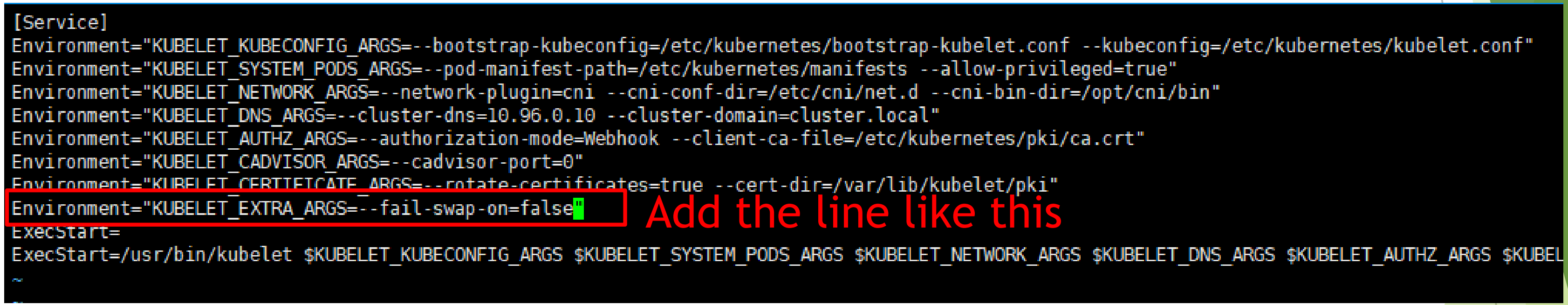
Install kubernetes

```
sudo su
apt-get update && apt-get install -y apt-transport-https curl
curl -s https://packages.cloud.google.com/apt/doc/apt-key.gpg | apt-key add -
cat <<EOF >/etc/apt/sources.list.d/kubernetes.list
>deb http://apt.kubernetes.io/ kubernetes-xenial main
>EOF
apt-get update
apt-get install -y kubelet kubeadm kubectl
```

Running Web Application
- Configure Kubernetes (1)

Edit kubernetes configure file

```
sudo vi /etc/systemd/system/kubelet.service.d/10-kubeadm.conf
```
→ *Add [* Environment="KUBELET_EXTRA_ARGS=--fail-swap-on=false“]
```
sudo systemctl daemon-reload
sudo systemctl restart kubelet
```



```
[Service]
Environment="KUBELET_KUBECONFIG_ARGS=--bootstrap-kubeconfig=/etc/kubernetes/bootstrap-kubelet.conf --kubeconfig=/etc/kubernetes/kubelet.conf"
Environment="KUBELET_SYSTEM_PODS_ARGS=--pod-manifest-path=/etc/kubernetes/manifests --allow-privileged=true"
Environment="KUBELET_NETWORK_ARGS=--network-plugin=cni --cni-conf-dir=/etc/cni/net.d --cni-bin-dir=/opt/cni/bin"
Environment="KUBELET_DNS_ARGS=--cluster-dns=10.96.0.10 --cluster-domain=cluster.local"
Environment="KUBELET_AUTHZ_ARGS=--authorization-mode=Webhook --client-ca-file=/etc/kubernetes/pki/ca.crt"
Environment="KUBELET_CADVISOR_ARGS=--cadvisor-port=0"
Environment="KUBELET_CERTIFICATE_ARGS=--rotate-certificates=true --cert-dir=/var/lib/kubelet/pki"
Environment="KUBELET_EXTRA_ARGS=--fail-swap-on=false"
ExecStart=
ExecStart=/usr/bin/kubelet $KUBELET_KUBECONFIG_ARGS $KUBELET_SYSTEM_PODS_ARGS $KUBELET_NETWORK_ARGS $KUBELET_DNS_ARGS $KUBELET_AUTHZ_ARGS $KUBEL
~
```

Add the line like this

Run these commands to make kubectl work for your non-root user.
Make sure that you are not in root

```
mkdir -p $HOME/.kube
sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
sudo chown $(id -u):$(id -g) $HOME/.kube/config
```

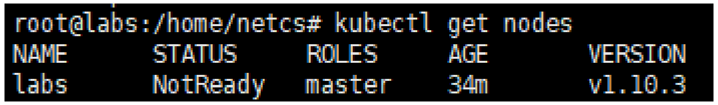
Running Web Application
- Configure Kubernetes (2)

Run a kubernetes cluster: Your NUC will be a Worker node as well as a Master.

```
sudo kubeadm reset
kubeadm init --skip-preflight-checks
```

Check your cluster status

```
sudo kubectl get nodes
```



```
root@labs:/home/netcs# kubectl get nodes
NAME      STATUS     ROLES    AGE     VERSION
labs      NotReady   master   34m     v1.10.3
```

Your NUC is running as a kubenetes master.
But pods are not allowed to be scheduled to run on the master

It allows pods to be scheduled to run on the Kubernetes master server

```
kubectl taint nodes --all node-role.kubernetes.io/master-
```

Running Web Application
- Configure Kubernetes (3)

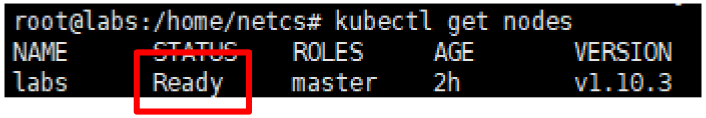
You MUST install a pod network add-on so that your pods can communicate with each other. We will use Weave in this lab.

Install Weave (pod network add-on)

```
kubectl apply -f "https://cloud.weave.works/k8s/net?k8s-version=$(kubectl version | base64 | tr -d '\n')"
```

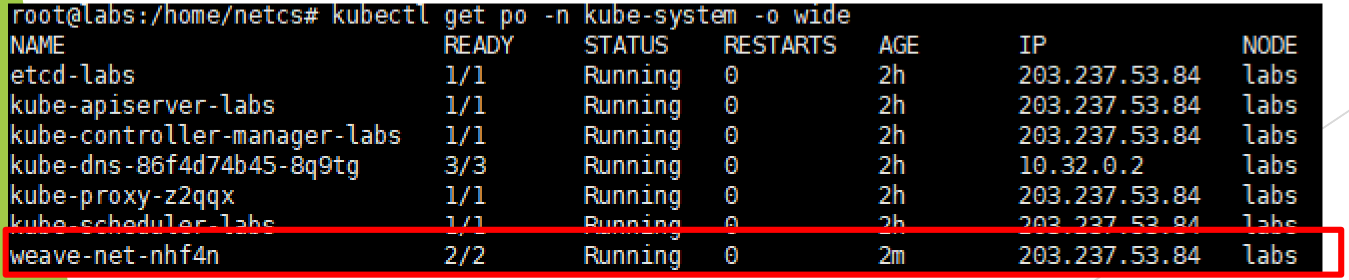
Make sure Weave(network add-on) works

```
sudo kubectl get nodes
```



```
root@labs:/home/netcs# kubectl get nodes
NAME      STATUS    ROLES     AGE       VERSION
labs      Ready     master    2h        v1.10.3
```

```
kubectl get po -n kube-system -o wide
```



```
root@labs:/home/netcs# kubectl get po -n kube-system -o wide
NAME                               READY     STATUS    RESTARTS   AGE       IP              NODE
etcd-labs                          1/1       Running   0          2h        203.237.53.84   labs
kube-apiserver-labs                1/1       Running   0          2h        203.237.53.84   labs
kube-controller-manager-labs       1/1       Running   0          2h        203.237.53.84   labs
kube-dns-86f4d74b45-8q9tg          3/3       Running   0          2h        10.32.0.2       labs
kube-proxy-z2qqx                   1/1       Running   0          2h        203.237.53.84   labs
kube-scheduler-labs                1/1       Running   0          2h        203.237.53.84   labs
weave-net-nhf4n                    2/2       Running   0          2m        203.237.53.84   labs
```

Running Web Application
- Run Wordpress application (1)

We will run Wordpress application using kubernetes template which describes how to run wordpress and sql container.

Get the yaml template

```
wget -O wordpress.yaml https://mirror.nm.gist.ac.kr/getWordpress
```

Using the template, deploy containers(pods) to run wordpress application

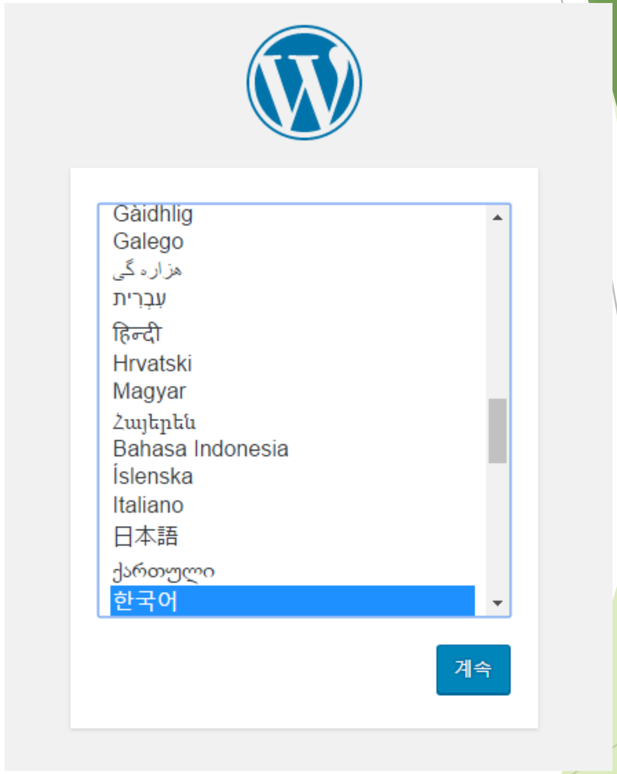
```
kubectl create secret generic mysql-pass --from-literal=password=YOUR PASSWORD
kubectl apply -f wordpress.yaml
```

Check the pods are running well (About 1 minute later)

```
kubectl get svc –o wide
```

Running Web Application
- Run Wordpress application (2)

Try
http://your NUC IP:30080



Appendix

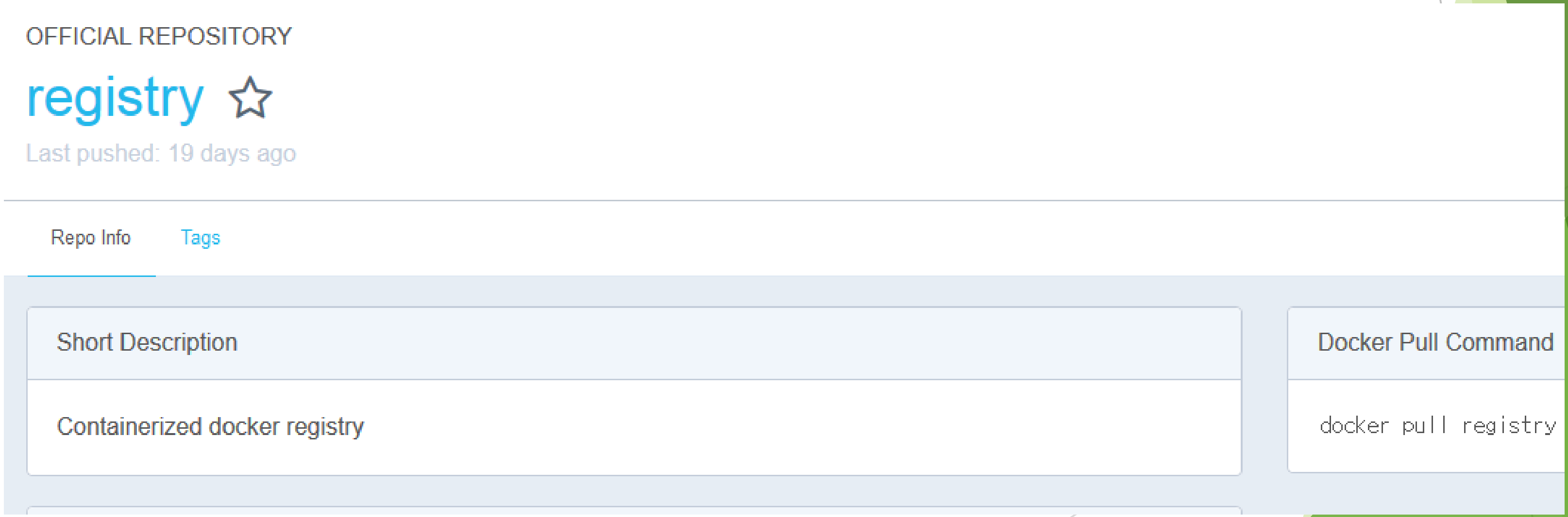
Control Tower: Docker Private Registry

Docker Private Registry
- About

In previous slides, Docker image is operated and maintained likes source code (e.g svn, git…)

Also we used Docker public repository, Docker Hub. (which looks like github)

Surely, Docker also provides private repository: Registry.



OFFICIAL REPOSITORY

registry ☆

Last pushed: 19 days ago

Short Description

Containerized docker registry

Docker Pull Command

```
docker pull registry
```

Docker Private Registry
- How to use (1)

Deployment(**In control tower**):

```
docker run -d -p 5000:5000 --restart=always --name registry registry:2
```

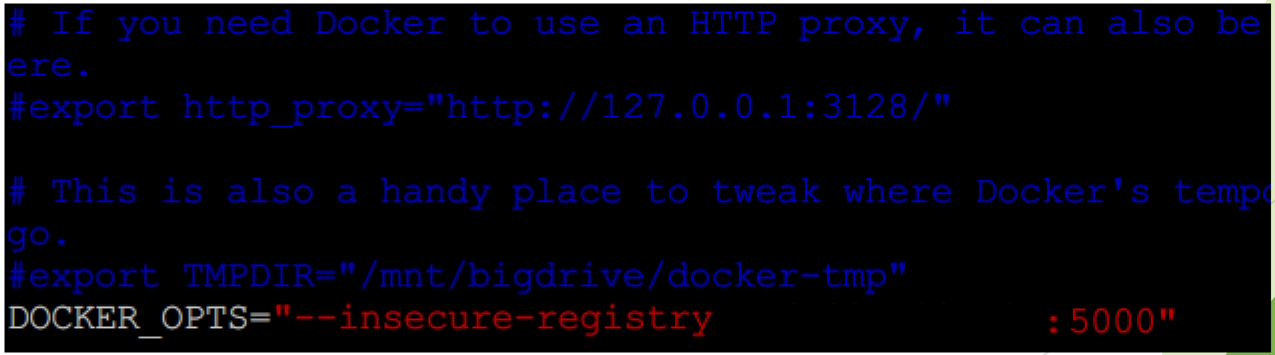
--restart=always means this container is already running even Docker host rebooted.

Docker Private Registry
- How to use (2)

You may configure insecure-registry options on NUC and Raspberry Pi
(Basic registry runs on insecure mode.)

Setting(**In NUC and RPi**):

```
sudo vi /etc/default/docker

DOCKER_OPTS="--insecure-registry [control tower ip]:5000"
```



```
# If you need Docker to use an HTTP proxy, it can also be
ere.
#export http_proxy="http://127.0.0.1:3128/"

# This is also a handy place to tweak where Docker's tempo
go.
#export TMPDIR="/mnt/bigdrive/docker-tmp"
DOCKER_OPTS="--insecure-registry [redacted]:5000"
```

If any DOCKER_OPTS is already been, just add this phrase to end of OPTS.

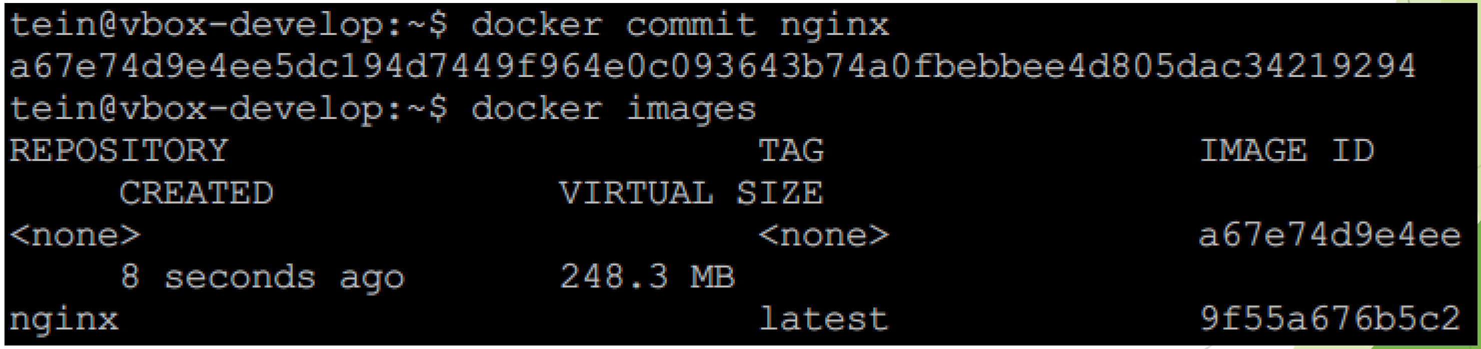
```
sudo service docker restart
```

Docker Private Registry
- How to push and pull image (1)

In this time, we make a image of nginx container and push to registry

Making container image and push to registry (**In NUC**):

```
docker commit nginx
docker images
```

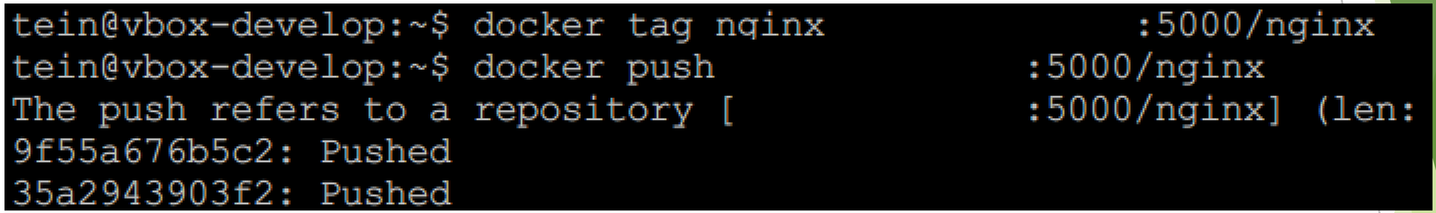


```
tein@vbox-develop:~$ docker commit nginx
a67e74d9e4ee5dc194d7449f964e0c093643b74a0fbebbee4d805dac34219294
tein@vbox-develop:~$ docker images
REPOSITORY                          TAG                 IMAGE ID
     CREATED             VIRTUAL SIZE
<none>                              <none>              a67e74d9e4ee
     8 seconds ago       248.3 MB
nginx                               latest              9f55a676b5c2
```

Docker Private Registry
- How to push and pull image (2)

Tagging image for pushing and push image

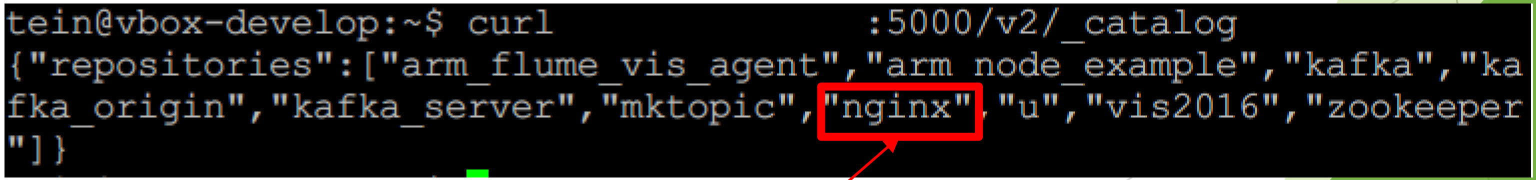
```
docker tag nginx [control tower ip]:5000/nginx
docker push [control tower ip]:5000/nginx
```



```
tein@vbox-develop:~$ docker tag nginx                  :5000/nginx
tein@vbox-develop:~$ docker push                  :5000/nginx
The push refers to a repository [                  :5000/nginx] (len:
9f55a676b5c2: Pushed
35a2943903f2: Pushed
```

Check!

```
curl [control tower ip]:5000/v2/_catalog
```



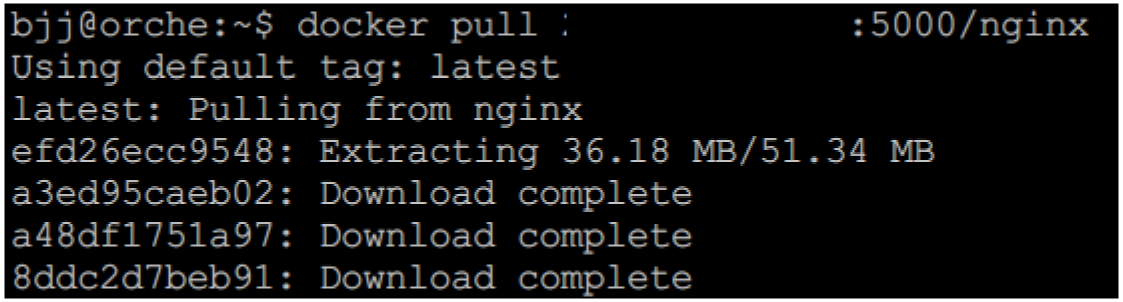
```
tein@vbox-develop:~$ curl                  :5000/v2/_catalog
{"repositories":["arm_flume_vis_agent","arm_node_example","kafka","ka
fka_origin","kafka_server","mktopic","nginx","u","vis2016","zookeeper
"]}
```

You can find!

Docker Private Registry
- How to push and pull image (3)

Pulling(In other machines):

```
docker pull [control tower ip]:5000/nginx
```



```
bjj@orche:~$ docker pull [redacted]:5000/nginx
Using default tag: latest
latest: Pulling from nginx
efd26ecc9548: Extracting 36.18 MB/51.34 MB
a3ed95caeb02: Download complete
a48df1751a97: Download complete
8ddc2d7beb91: Download complete
```

Thank You for Your Attention

Any Questions?