
# Docker container for GIS 101

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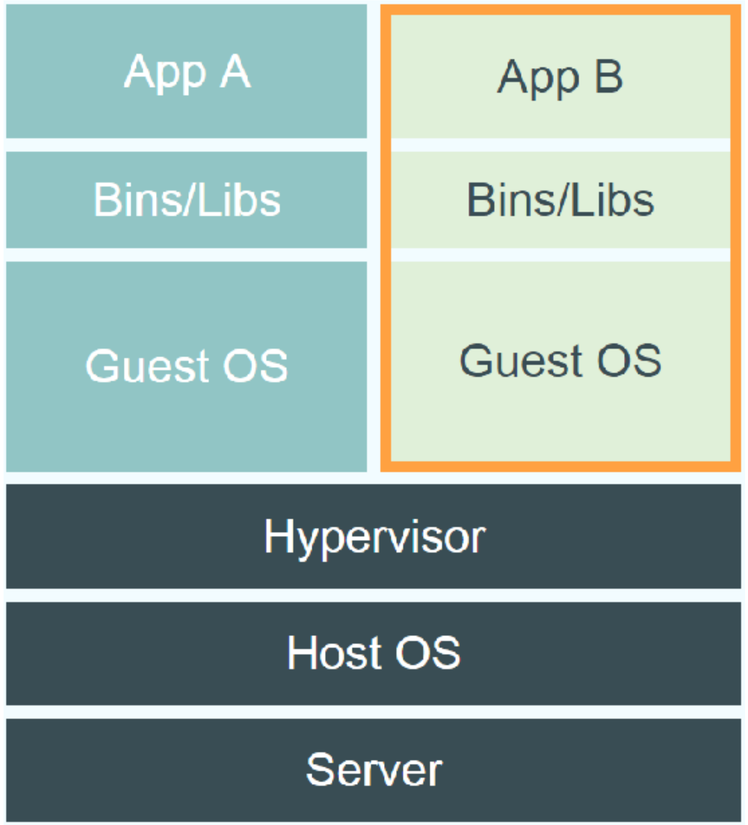
THE GEOMATICS COMPANY

# What is Docker?

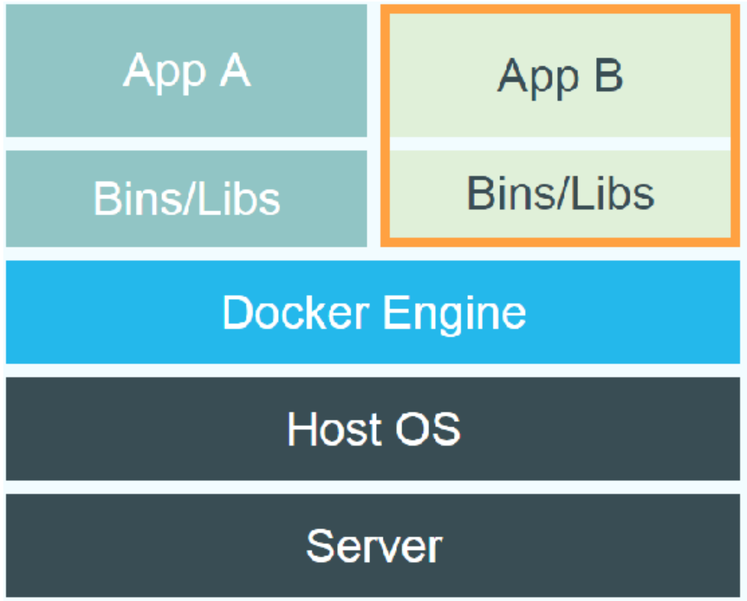
*Docker is an open-source project that automates the deployment of applications inside software containers, by providing an additional layer of abstraction and automation of operating system–level virtualization on Linux.*

[en.wikipedia.org]

# Docker vs. Virtual Machine




**Virtual Machine**



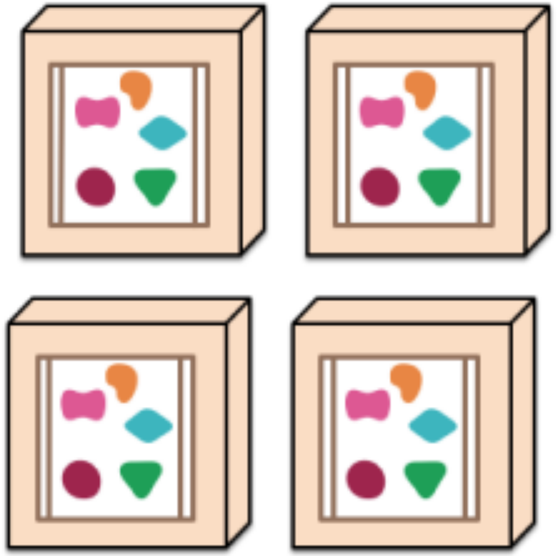

**Docker**

*“ Container ≠ Virtual Machine ”*

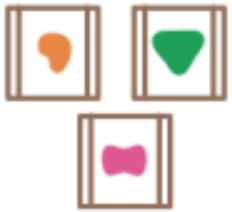
# MicroService Concept.

*A monolithic application puts all its functionality into a single process...*

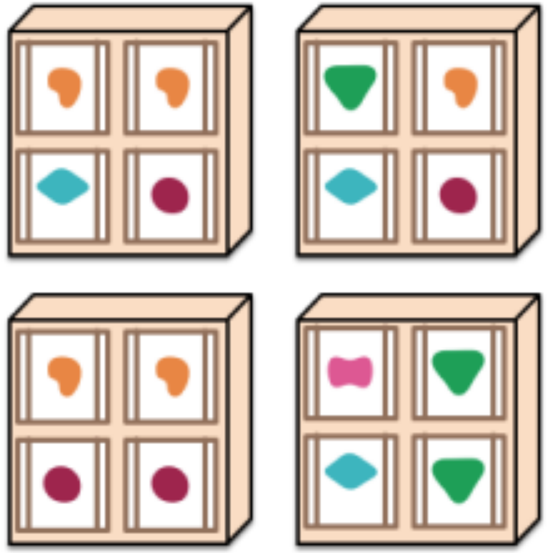
*... and scales by replicating the monolith on multiple servers*



*A microservices architecture puts each element of functionality into a separate service...*



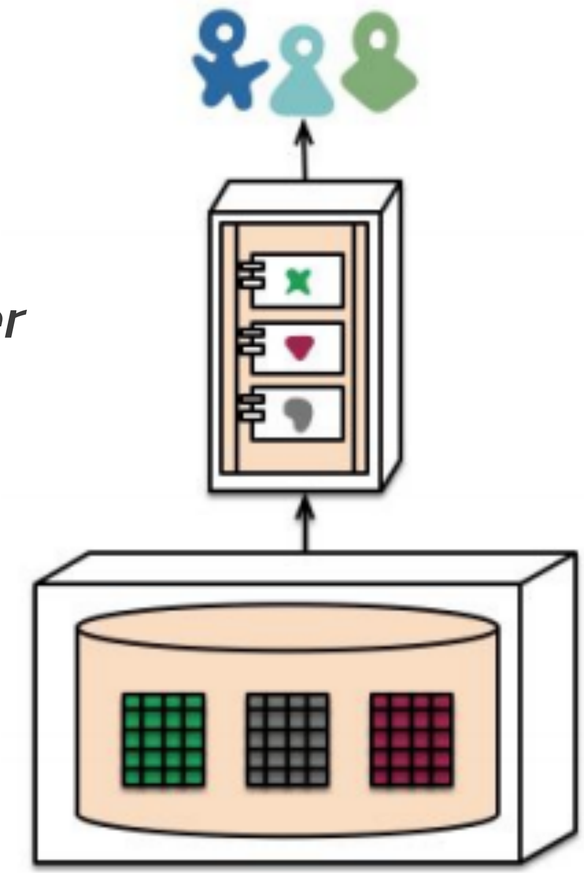
*... and scales by distributing these services across servers, replicating as needed.*



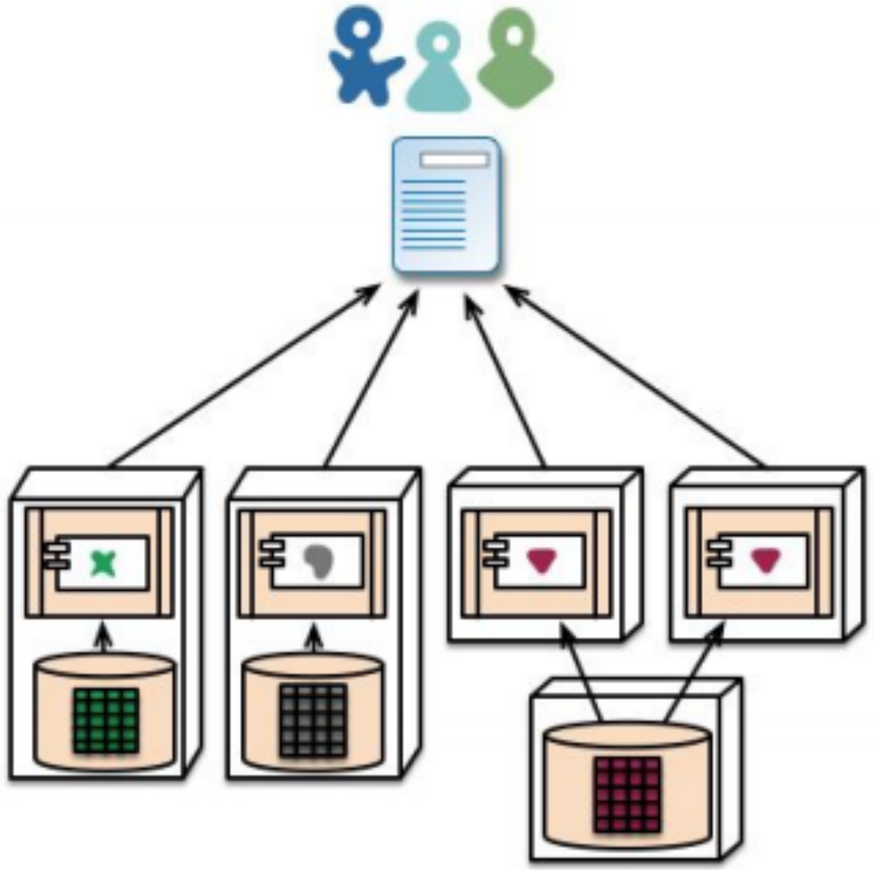
# MicroService Concept.

***STACK (Map Services)***

- *GeoServer*
- *PostgreSQL*
- *Apache WebServer*



monolith - single database



microservices - application databases

# Installations.

*https://www.docker.com/community-edition#/download*

# Try Us.

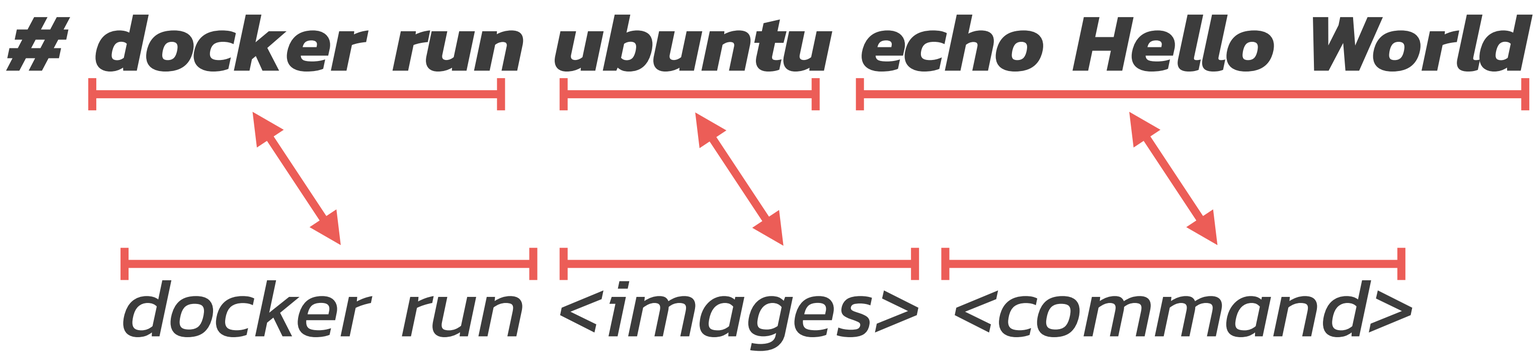
https://labs.play-with-docker.com/

*“ We cannot maintain the broken container “*

*“ Container born to die. ”*

[ME]

# Hello world.


# docker run ubuntu echo Hello World
docker run <images> <command>

# Hello world.

```
[node1] (local) root@192.168.0.13 ~
$ docker run ubuntu echo Hello World
Unable to find image 'ubuntu:latest' locally
latest: Pulling from library/ubuntu
7996ebd2246a: Pull complete
de532f9a4f9f: Pull complete
7de2709b2a83: Pull complete
70b6ac64a142: Pull complete
23caf550e032: Pull complete
Digest: sha256:30e04ddada6eb09c12330c7df72cad1573916c7100168c34076808169ff6d805
Status: Downloaded newer image for ubuntu:latest
Hello World
[node1] (local) root@192.168.0.13 ~
$
```

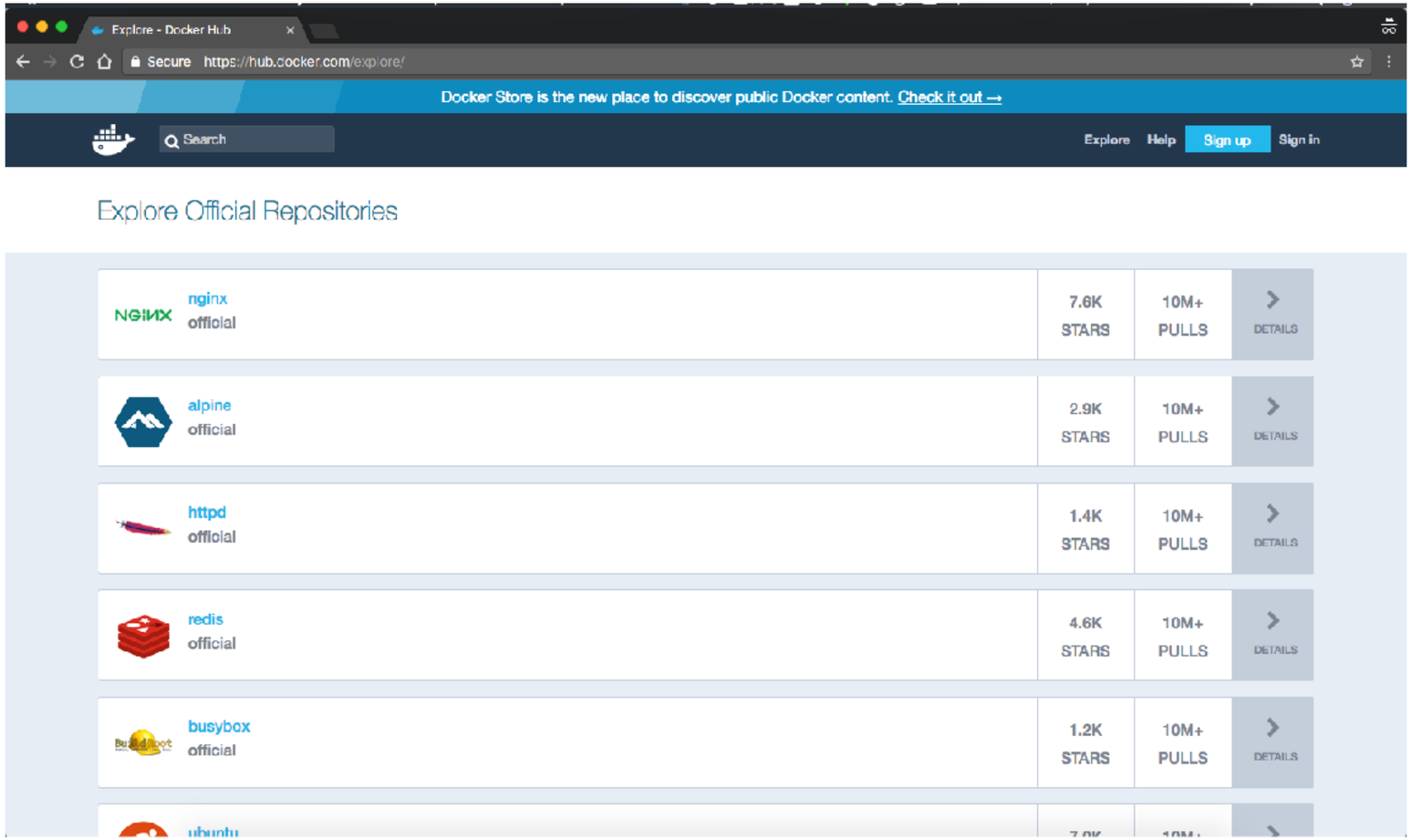
Docker Run command.

Docker engine can automatic pull image if not found.

Container ID

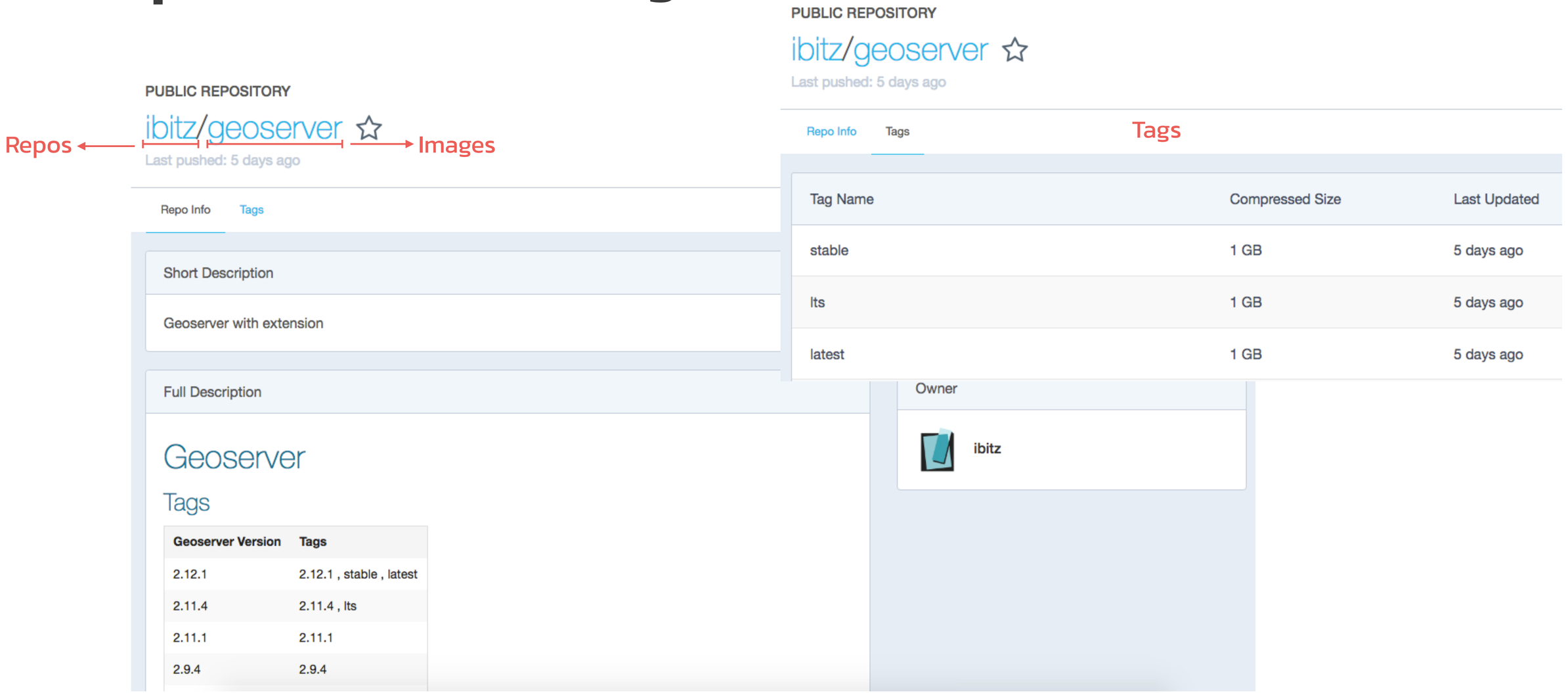
Result

# How to find docker images.




https://hub.docker.com/explore/

# Component of Docker Images.




**https://hub.docker.com/r/ibitz/geoserver/**

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***STACK (Map Services)***

- *GeoServer*
- *PostgreSQL (PostGIS)*
- *Apache WebServer*

# Case #1 Map Services

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***STACK (Map Services)***

- ***GeoServer***
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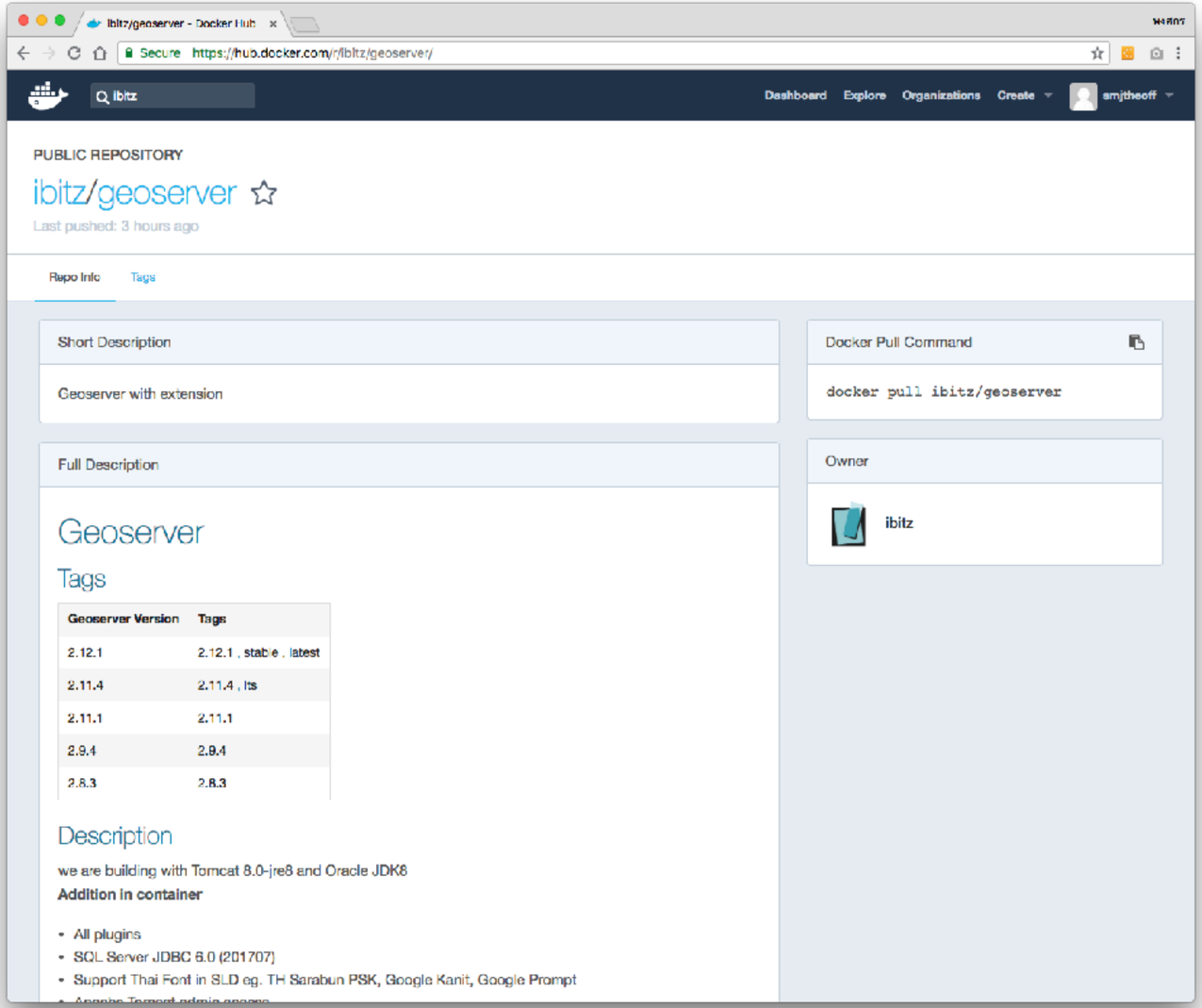


**https://hub.docker.com/r/ibitz/geoserver/**

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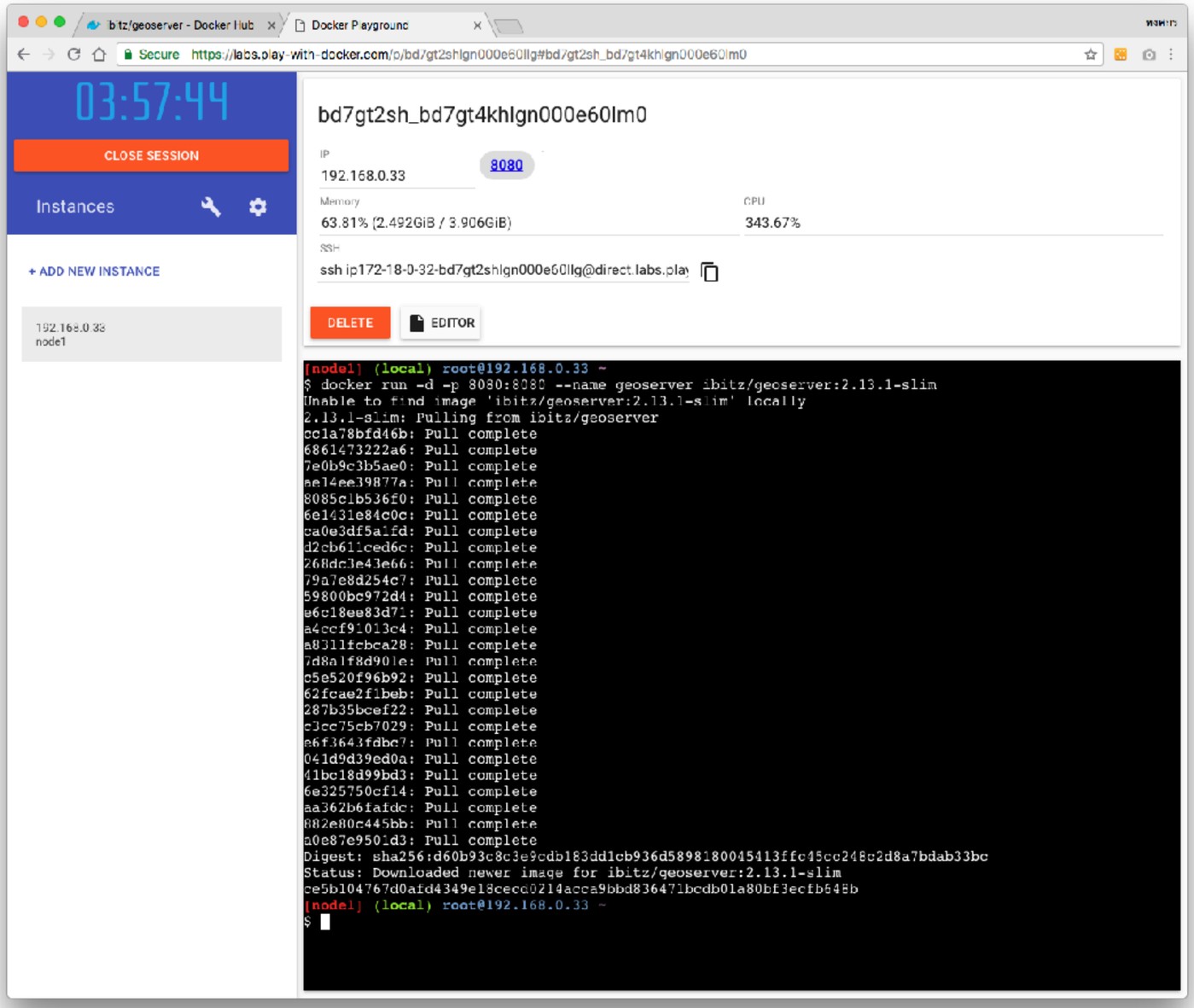
# Case #1 Map Services

***STACK (GeoServer)***

- ***GeoServer Basic***
- *GeoServer Keep Data*




# docker run -d -p 8080:8080 --name geoserver ibitz/geoserver:2.13.1-slim

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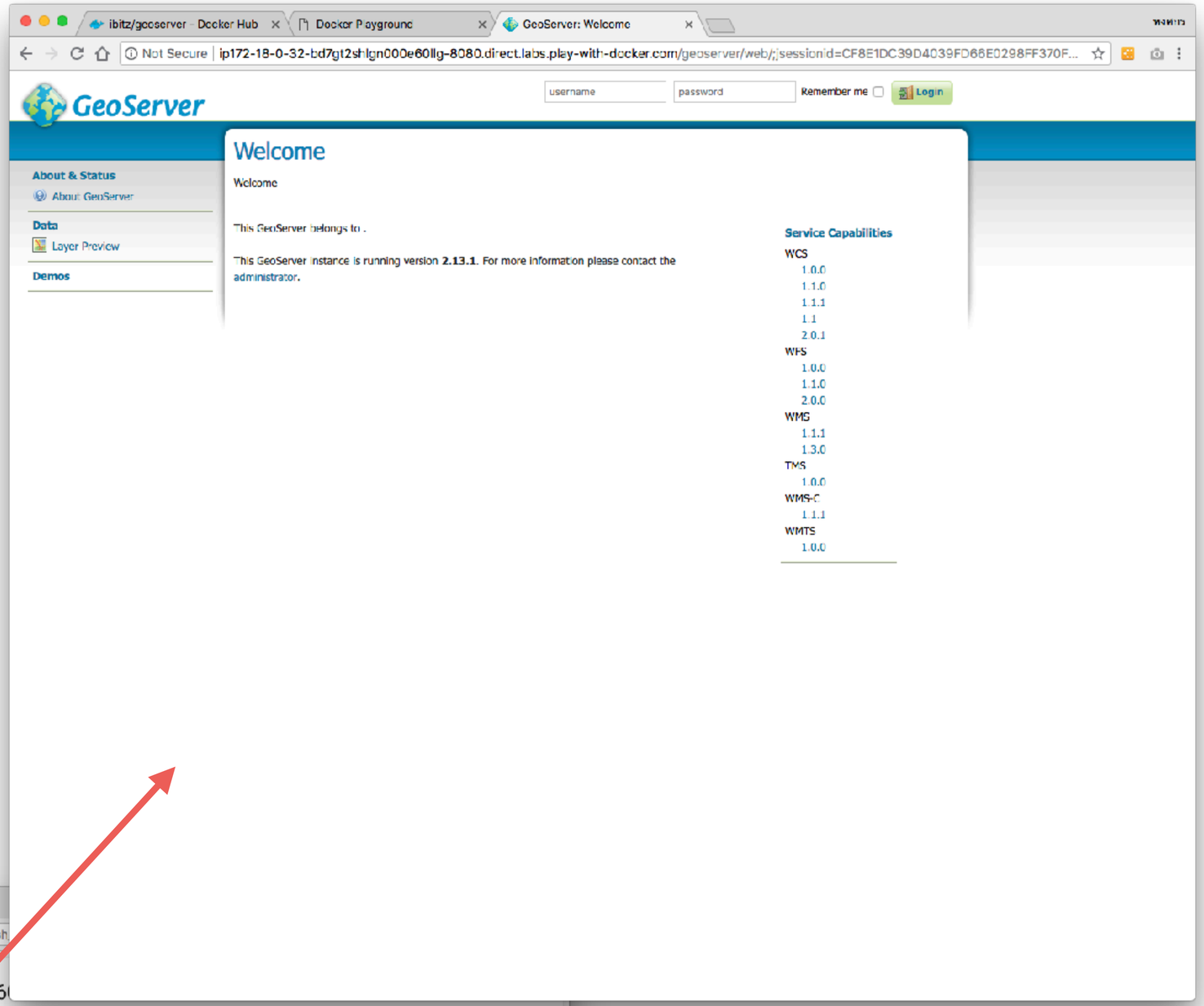
# Case #1 Map Services

## *STACK (GeoServer)*

- ***GeoServer Basic***
- *GeoServer Keep Data*





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# Case #1 Map Services

***STACK (GeoServer)***

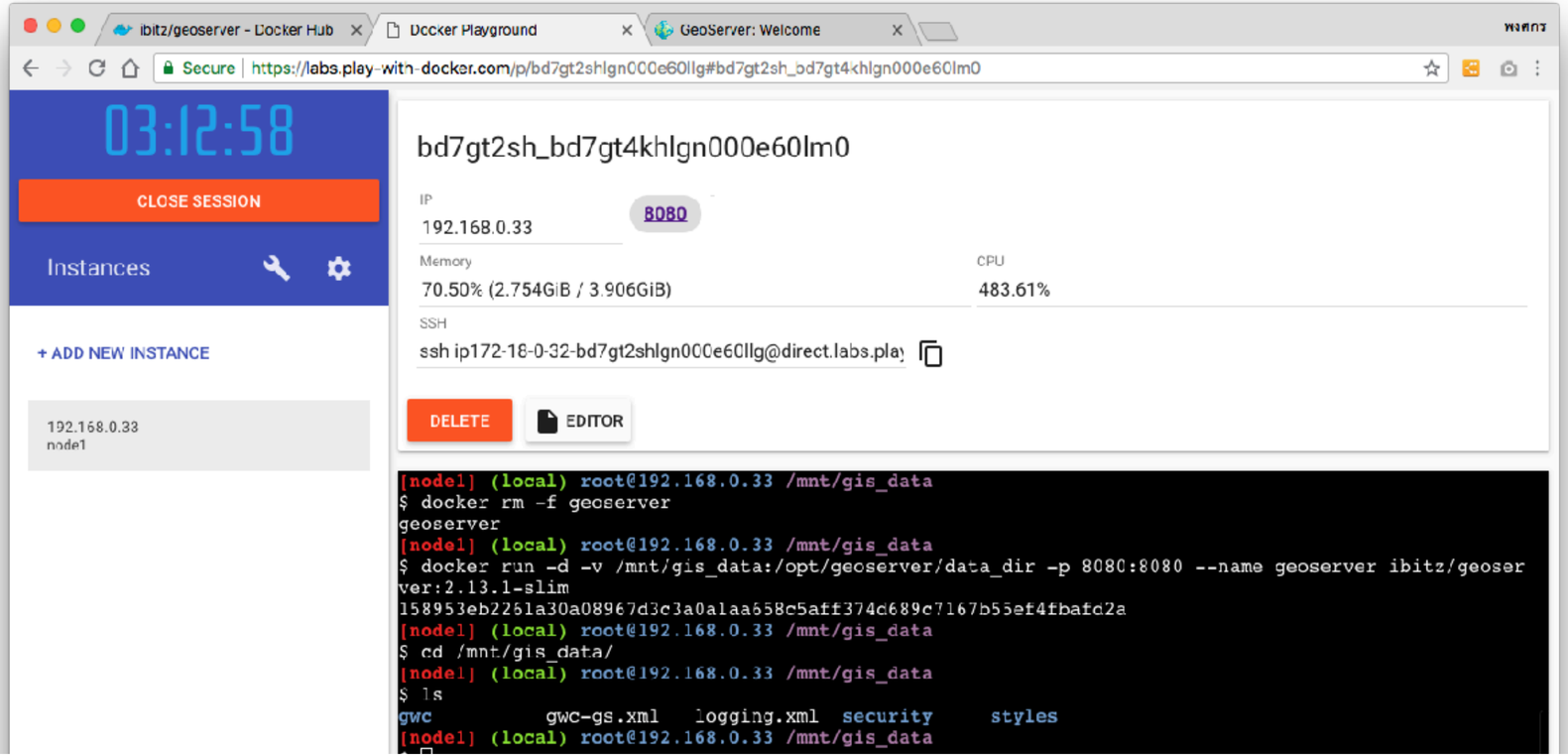
- *GeoServer Basic*
- ***GeoServer Keep Data***

***Command***

**$ docker rm -f geoserver**
(Remove Old container)

**$ mkdir /mnt/gis_data**
(Make Directory for keep data )

**$ docker run -d -v /mnt/gis_data:/opt/geoserver/data_dir -p 8080:8080 --name geoserver ibitz/geoserver:2.13.1-slim**

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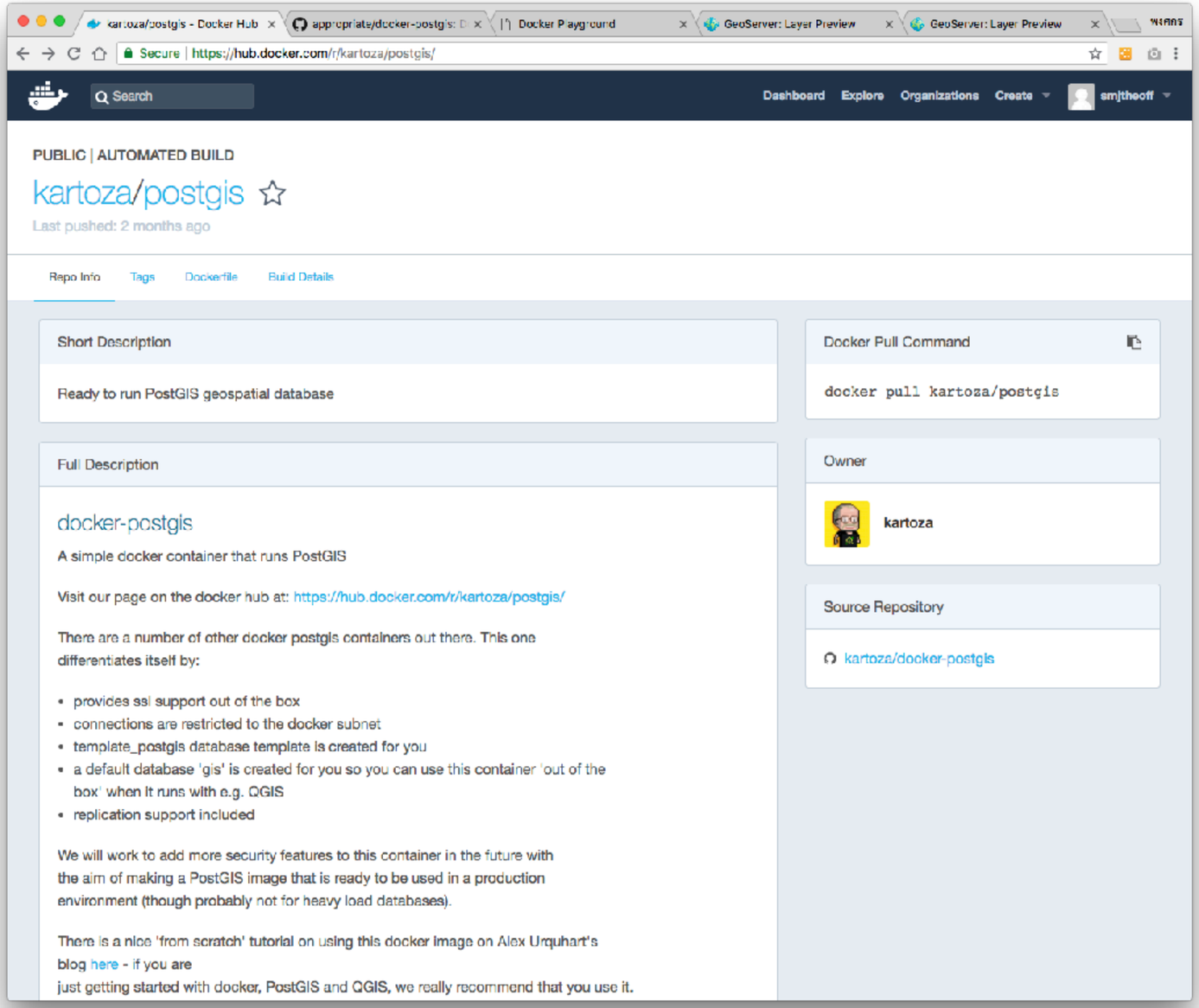
# Case #1 Map Services

***STACK (Map Services)***

- *GeoServer*
- ***PostgreSQL (PostGIS)***
- *Apache WebServer*




**https://hub.docker.com/r/kartoza/postgis/**

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# Case #1 Map Services

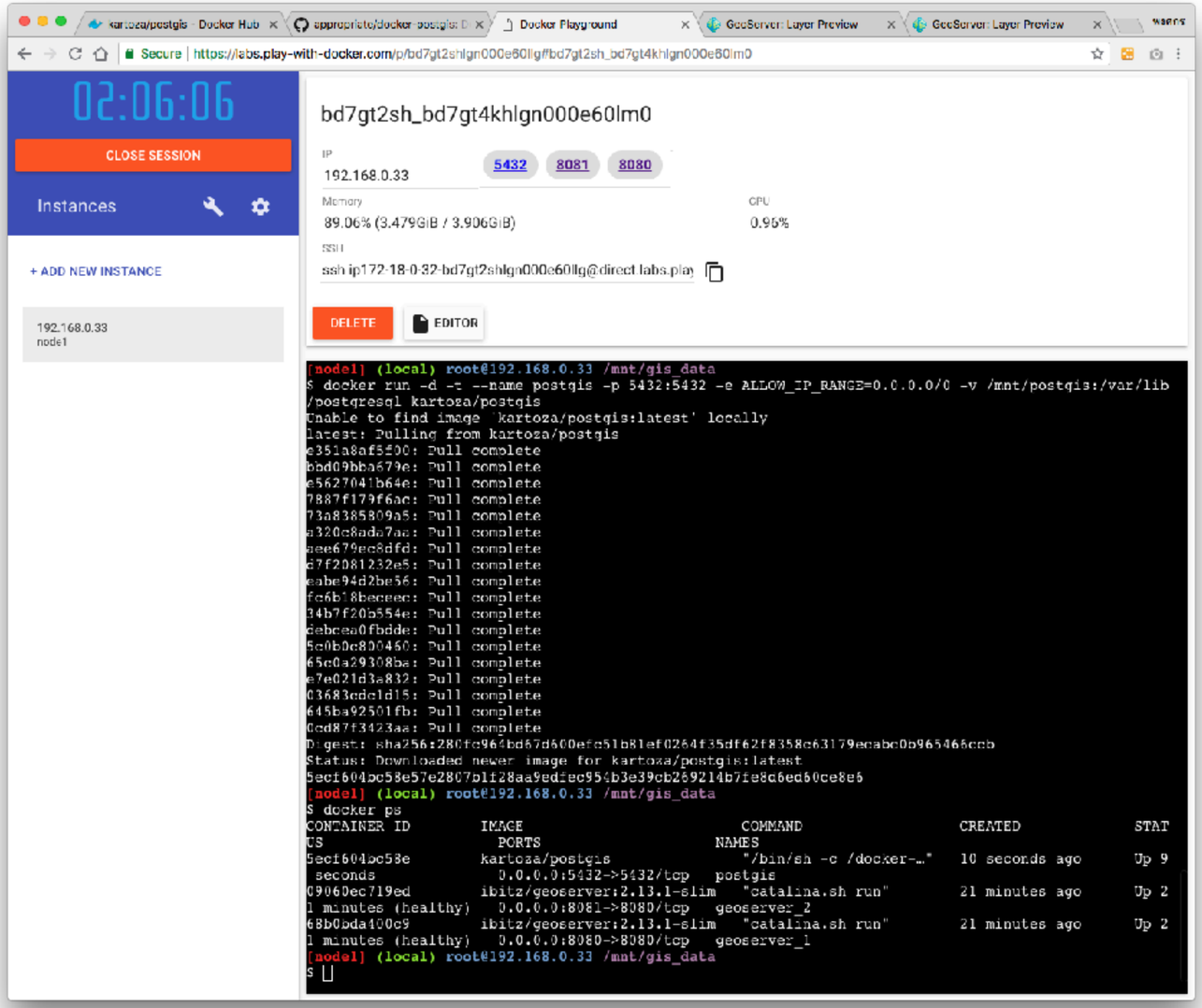
***STACK (Map Services)***

- *GeoServer*
- ***PostgreSQL (PostGIS)***
- *Apache WebServer*

***Command***

**$ mkdir /mnt/postgis**

(Make Directory for keep data )




# docker run -d -t --name postgis -p 5432:5432 -e ALLOW_IP_RANGE=0.0.0.0/0 -v /mnt/postgis:/var/lib/postgresql kartoza/postgis

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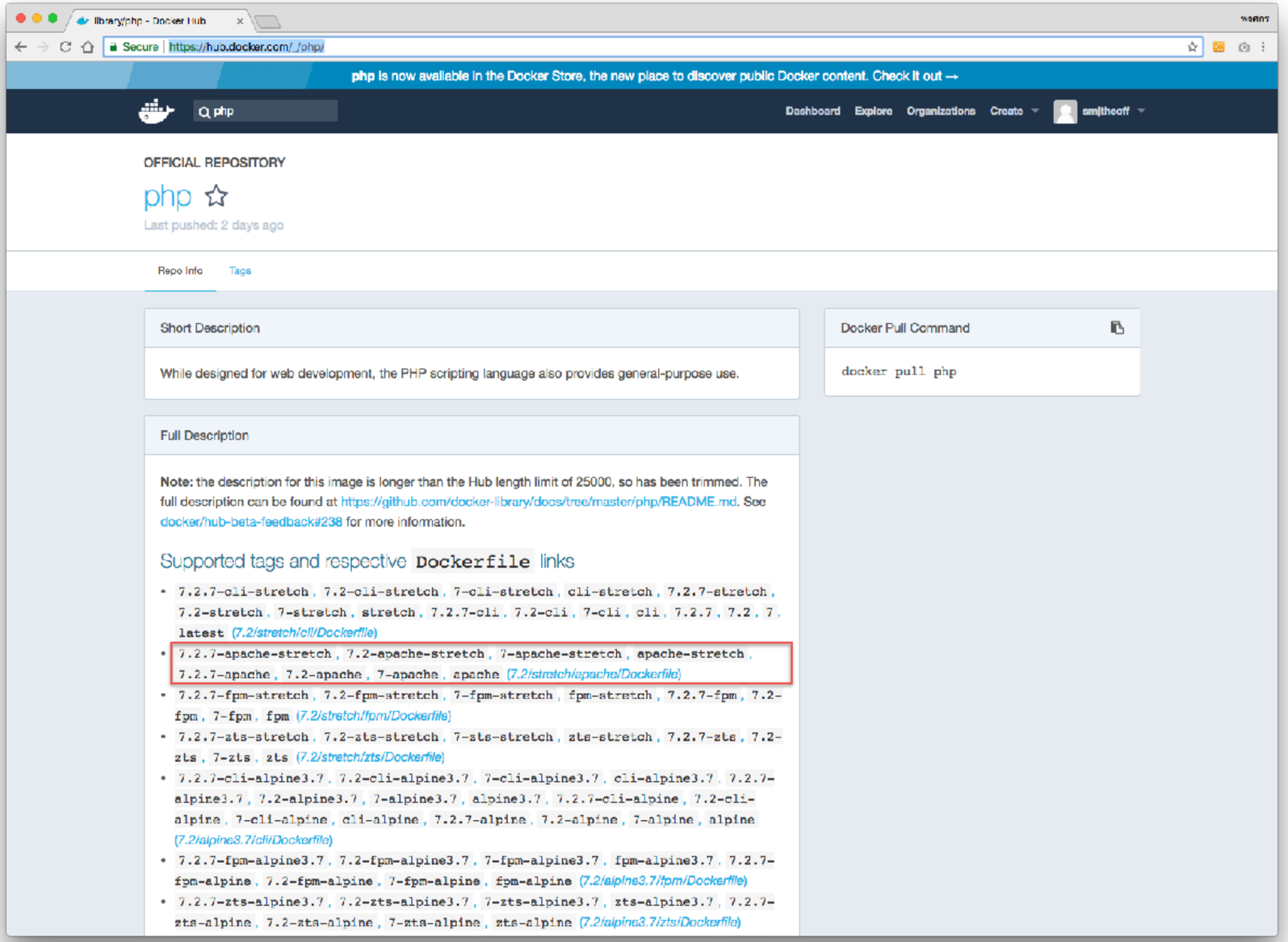
# Case #1 Map Services

## *STACK (Map Services)*

- *GeoServer*
- *PostgreSQL (PostGIS)*
- ***Apache WebServer***




**https://hub.docker.com/_/php/**

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# Case #1 Map Services

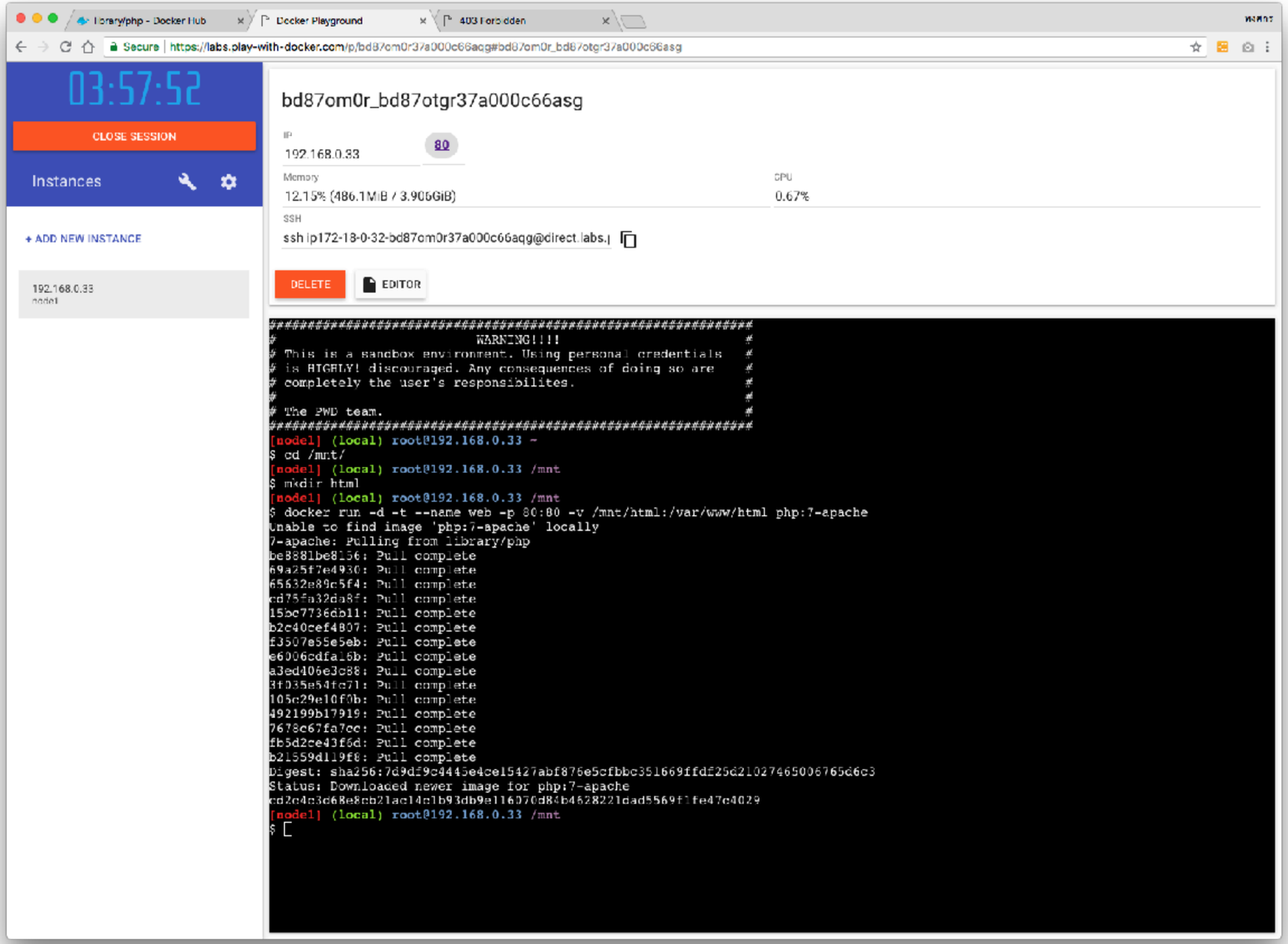
***STACK (Map Services)***

- *GeoServer*
- *PostgreSQL (PostGIS)*
- ***Apache WebServer***

***Command***

**$ mkdir /mnt/html**

(Make Directory for keep data )




# docker run -d -t --name web -p 80:80 -v /mnt/html:/var/www/html php:7-apache

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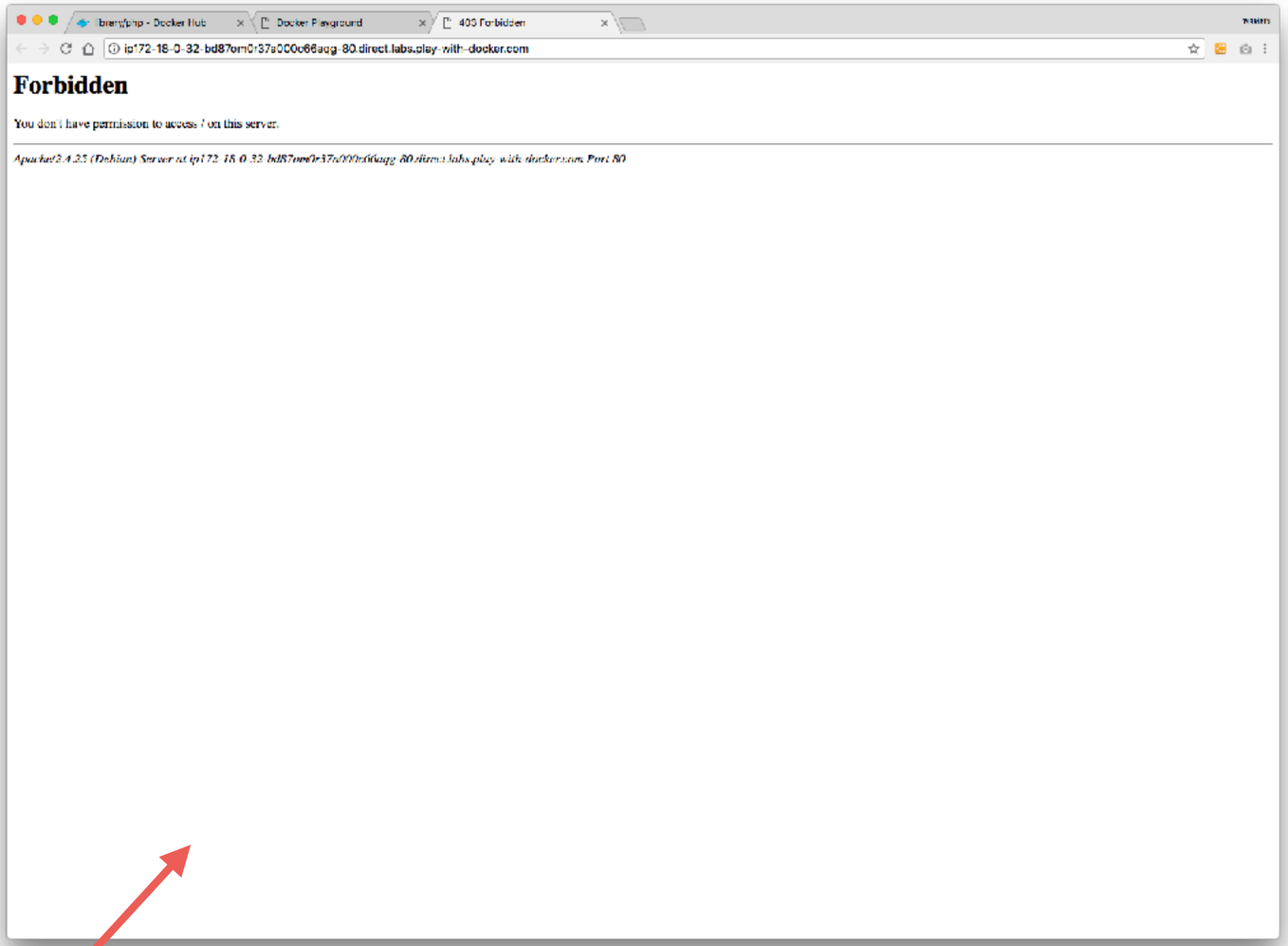
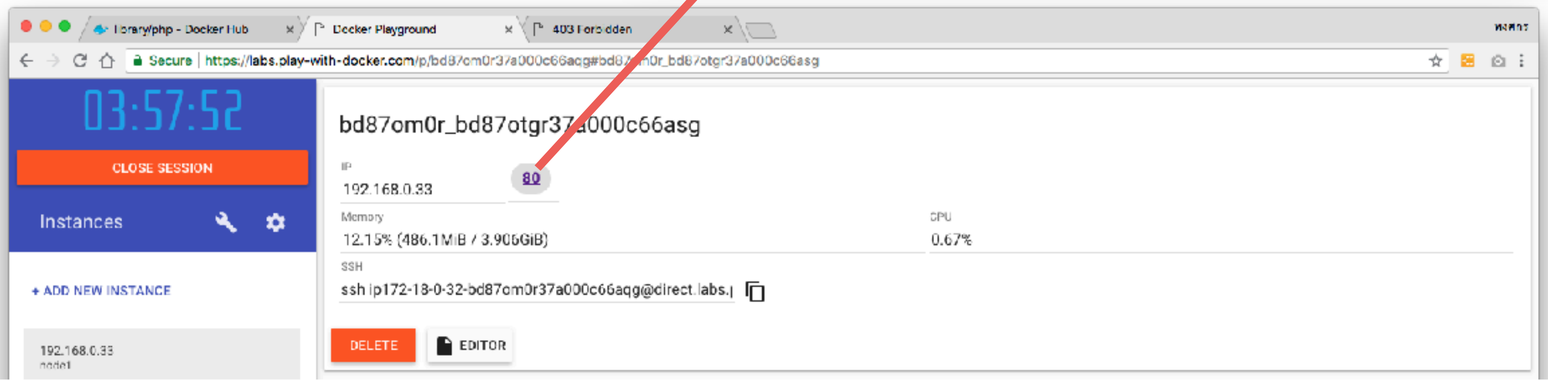
# Case #1 Map Services

***STACK (Map Services)***

- *GeoServer*
- *PostgreSQL (PostGIS)*
- ***Apache WebServer***

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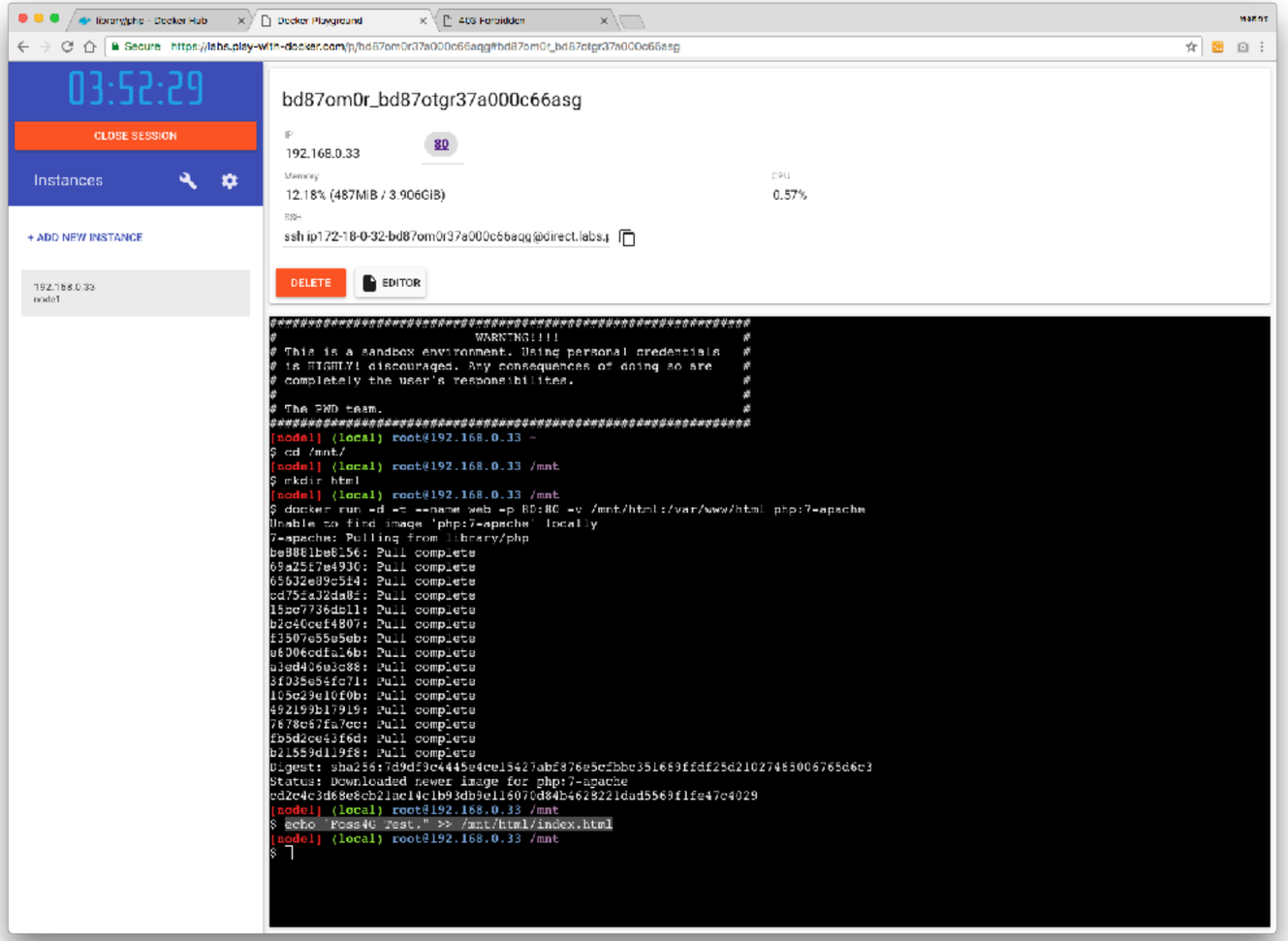
# Case #1 Map Services

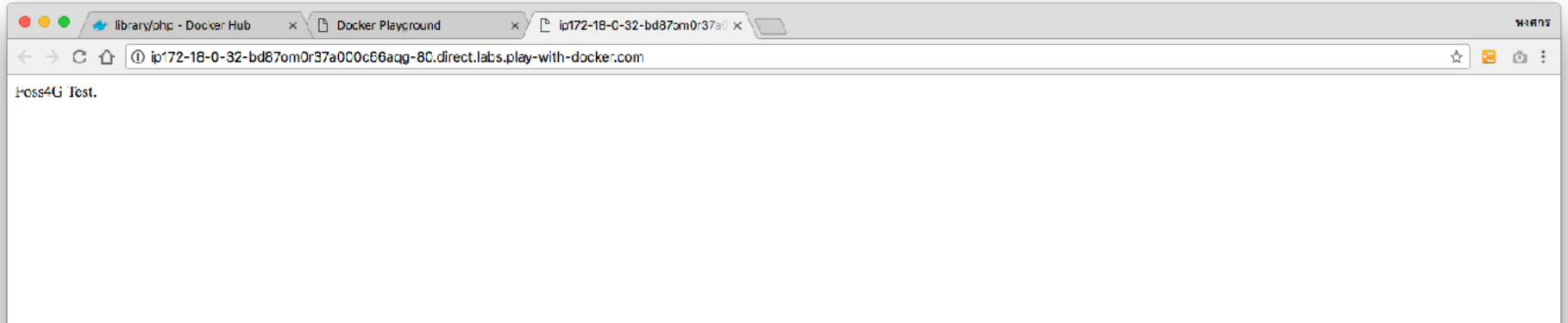
***STACK (Map Services)***

- *GeoServer*
- *PostgreSQL (PostGIS)*
- ***Apache WebServer***

***Test Command***

**$ echo "Foss4G Test." >> /mnt/html/index.html**
(Make Index test file.)

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***STACK (Map Services)***

- *GeoServer*
- *PostgreSQL (PostGIS)*
- *Apache WebServer*

# Case #1 Map Services

*“ Not Keep Important Data Inside Container “*

*“ Container born to die. ”*

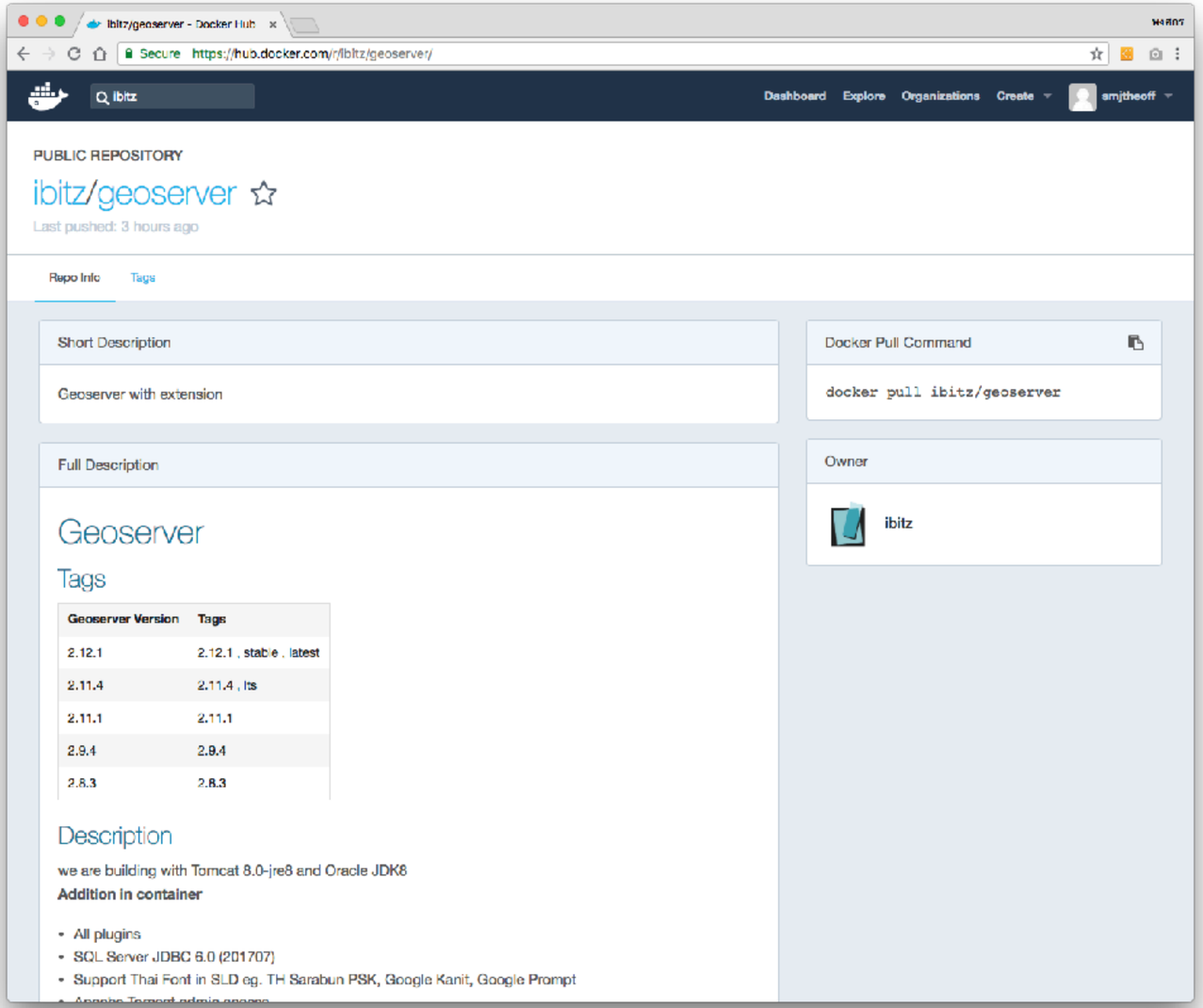
[ME]

# *GeoServer Clustering with Docker*

# GeoServer in Real World.

## *Checklist*

- *GeoServer Versions*
- *Tomcat ENV (setenv.sh)*
- *Networking*
- *LoadBalancer*
- *Data Storage*
- *Database*




**GeoServer Version. 2.0 +**

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# GeoServer in Real World.

## *Checklist*

- *GeoServer Versions*
- *Tomcat ENV (setenv.sh)*
- *Networking*
- *LoadBalancer*
- *Data Storage*
- *Database*

**-Xms >> Tomcat Start Memory Allocate**

**-Xmx >> Tomcat Maximum Memory Usage**

setenv.sh — UNREGISTERED

setenv.sh

```
#! /bin/sh

JAVA_OPTS="$JAVA_OPTS\
 -server\
 -Xms2G\
 -Xmx4G\
 -XX:+AggressiveOpts\
 -XX:+HeapDumpOnOutOfMemoryError\
 -XX:MaxPermSize=1024m\
 -XX:MaxNewSize=256m\
 -XX:NewRatio=2\
 -XX:NewSize=256m\
 -XX:SurvivorRatio=12\
 -XX:MaxTenuringThreshold=0\
 -XX:+UseConcMarkSweepGC\
 -XX:+CMSIncrementalMode\
 -XX:+CMSIncrementalPacing\
 -XX:+CMSClassUnloadingEnabled\
 -XX:+CMSPermGenSweepingEnabled\
 -XX:+DisableExplicitGC\
 -XX:+UseParNewGC\
 -XX:+UseTLAB\
 -XX:SoftRefLRUPolicyMSPerMB=36000\
 -XX:PerfDataSamplingInterval=500\
 -Djava.awt.headless=true\
 -DGEOSERVER_NODE_OPTS=id:$host_ip"
```

Line 1, Column 1 — Tab Size: 4 — Bourne Again Shell (bash)

**/usr/local/tomcat/bin/setenv.sh**

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# GeoServer in Real World.

## *Checklist*

- *GeoServer Versions*
- *Tomcat ENV (setenv.sh)*
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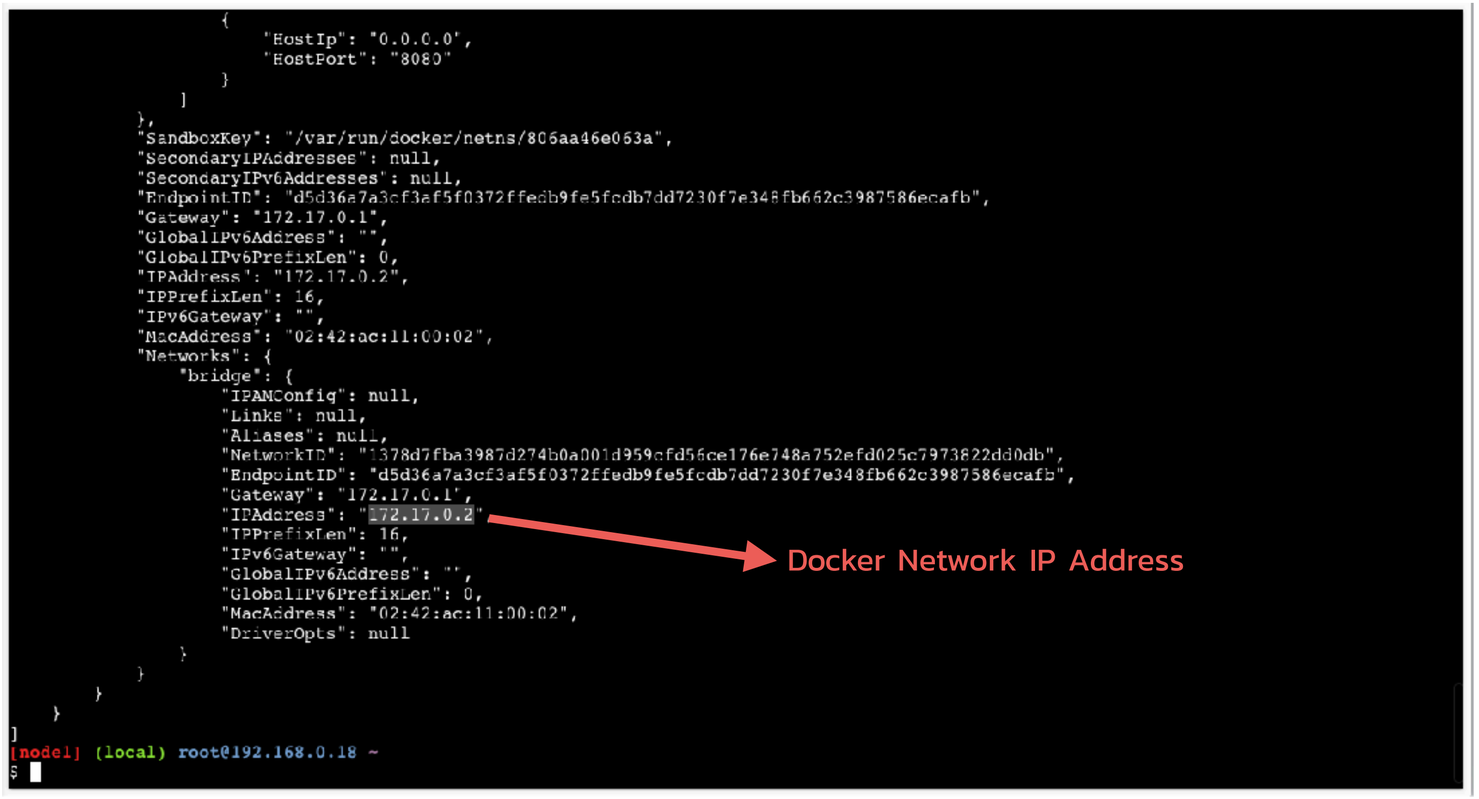
- *LoadBalancer*
- *Data Storage*
- *Database*




**Use Docker Local Network to connect inside machine**

**Use Machine Interface and port to connect outside machine**

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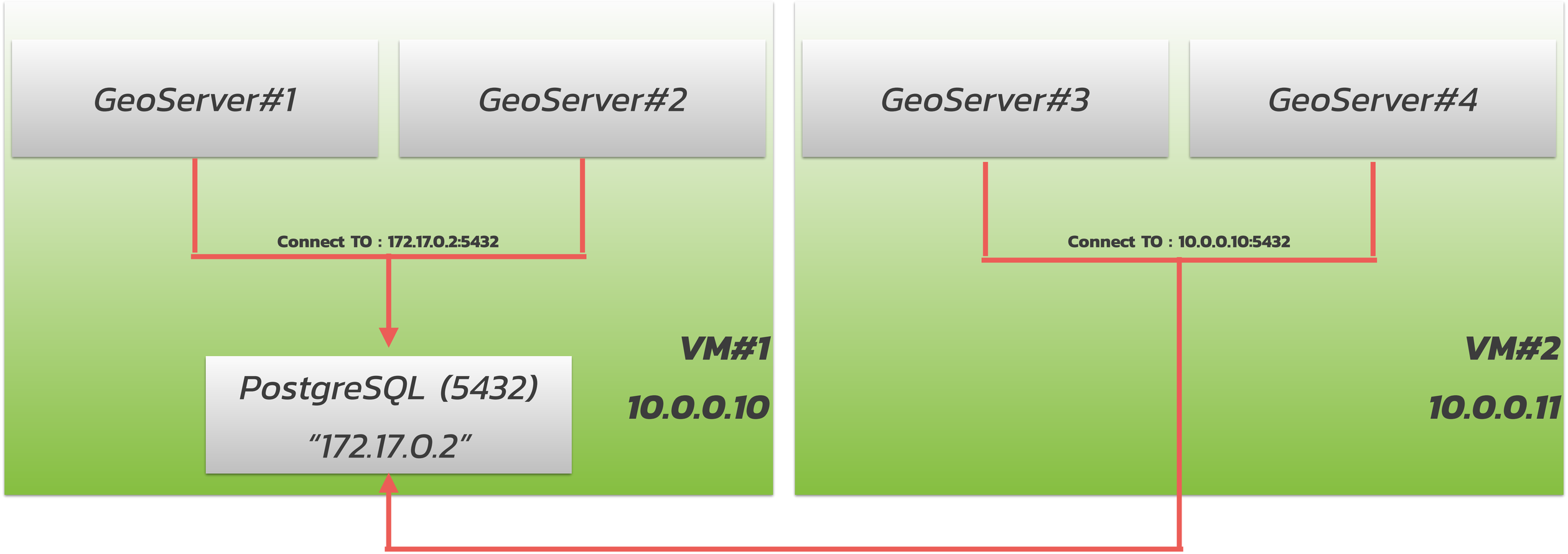
# Docker Networking

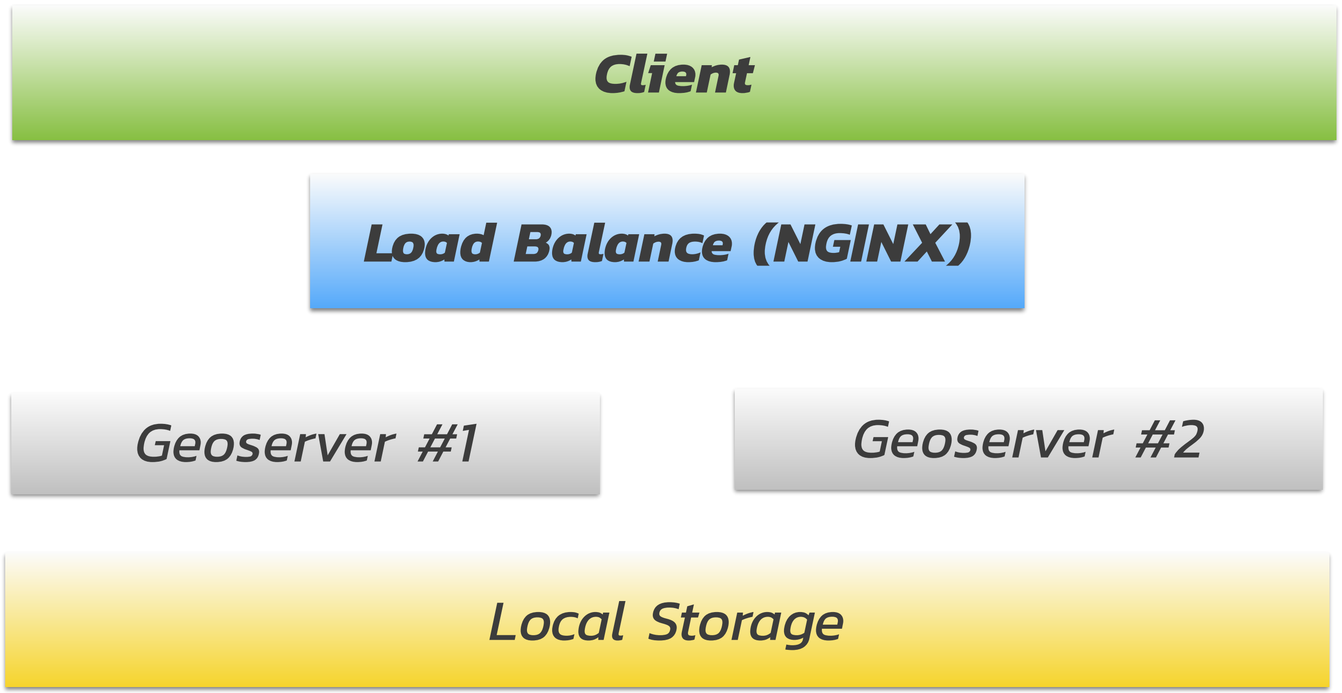



*127.0.0.1 == Loopback inside Container*

# GeoServer in Real World.

## Checklist

- GeoServer Versions
- Tomcat ENV (setenv.sh)
- Networking
- LoadBalancer
- Data Storage
- Database




nginx.LB.example.conf — UNREGISTERED

```
# Example NGINX Configuration for Load Balancer
# FOSS4G Thailand 2018

upstream upstreamServer {
        server 10.0.0.10:8080;
        server 10.0.0.11:8080;
}

server {
    listen 80;
    server_name geoserver.foss4g.in.th;

    location /{
        proxy_set_header Host $host;
        proxy_set_header X-Real-IP $remote_addr;
        proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
        proxy_set_header X-Forwarded-Proto $scheme;

        proxy_pass http://upstreamServer;
    }
}
```

Line 2, Column 23; Saved ~/Documents/OSO_I-Bitz_Temp/nginx.LB.example.conf (UTF-8) — Tab Size: 4 — nginx

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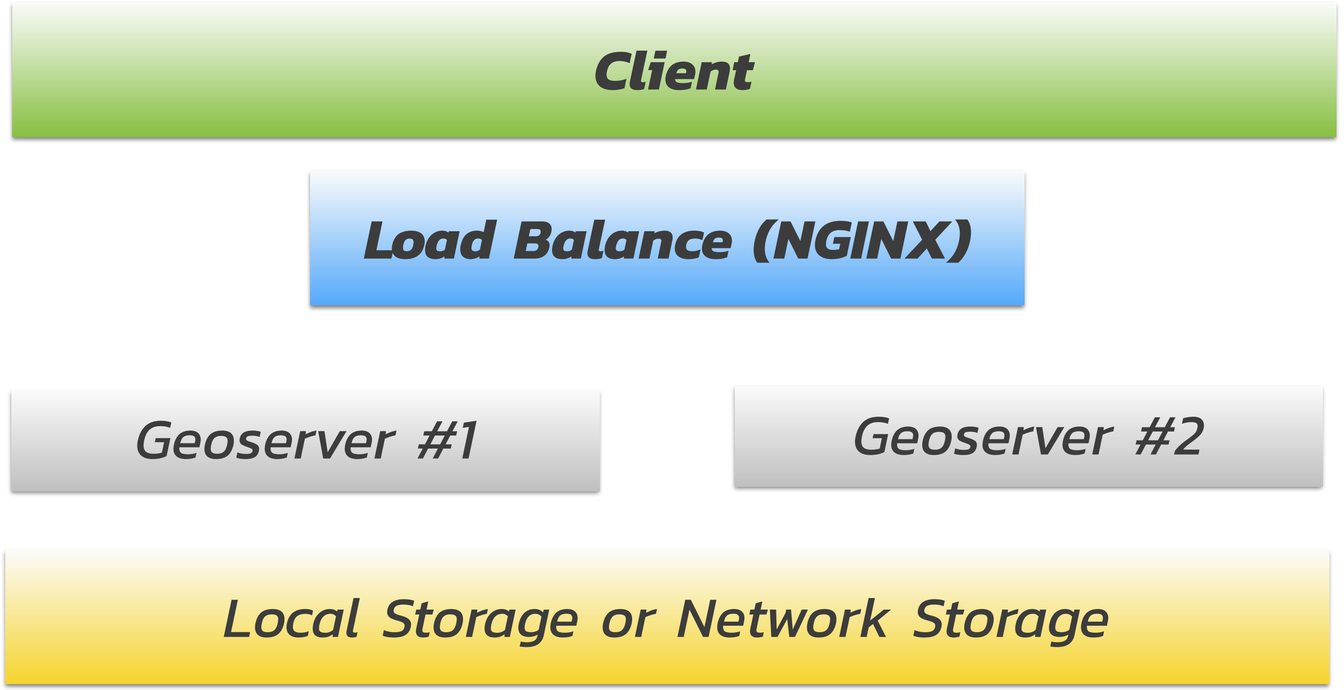
# GeoServer in Real World.

## Checklist

- GeoServer Versions
- Tomcat ENV (setenv.sh)
- Networking
- LoadBalancer
- Data Storage
- Database



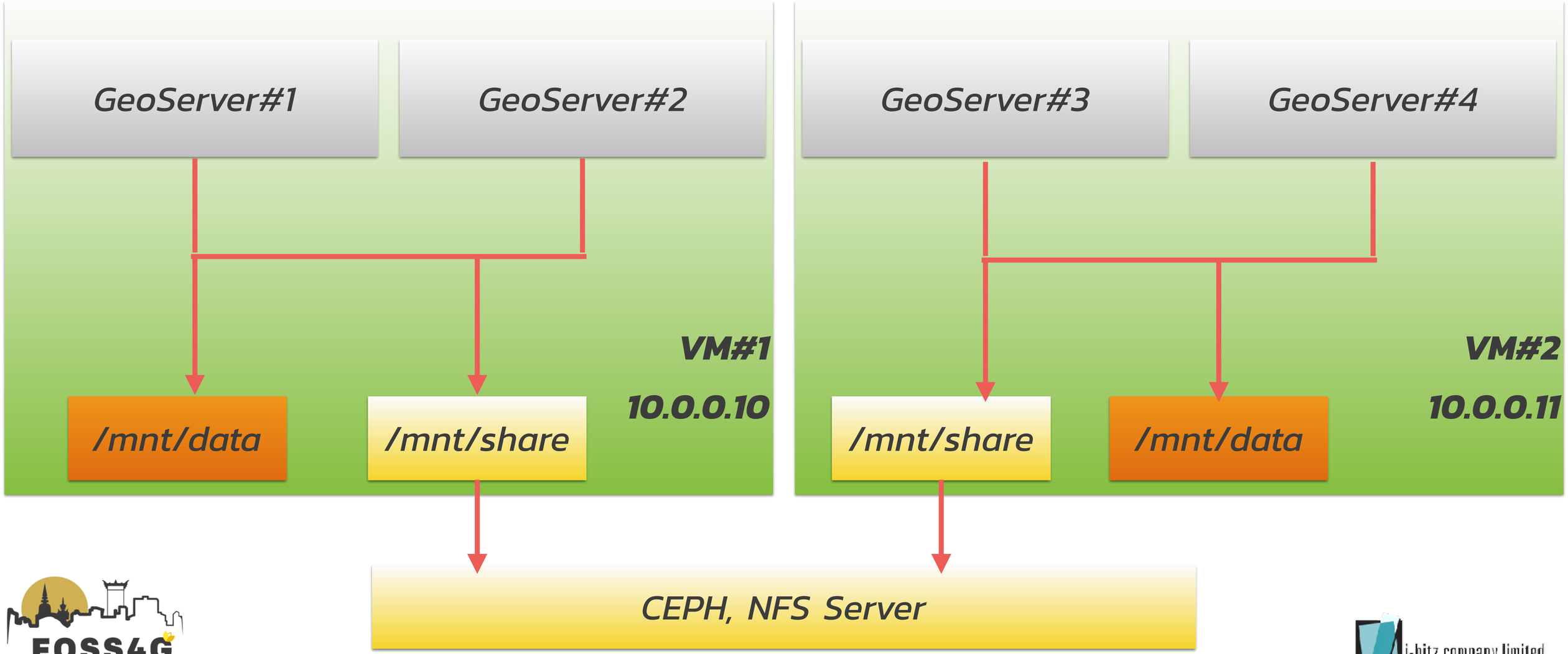

**Local Storage**

- File FS (NTFS, EXT4)
- SAN Storage

**Network Storage**

- NFS
- CEPH

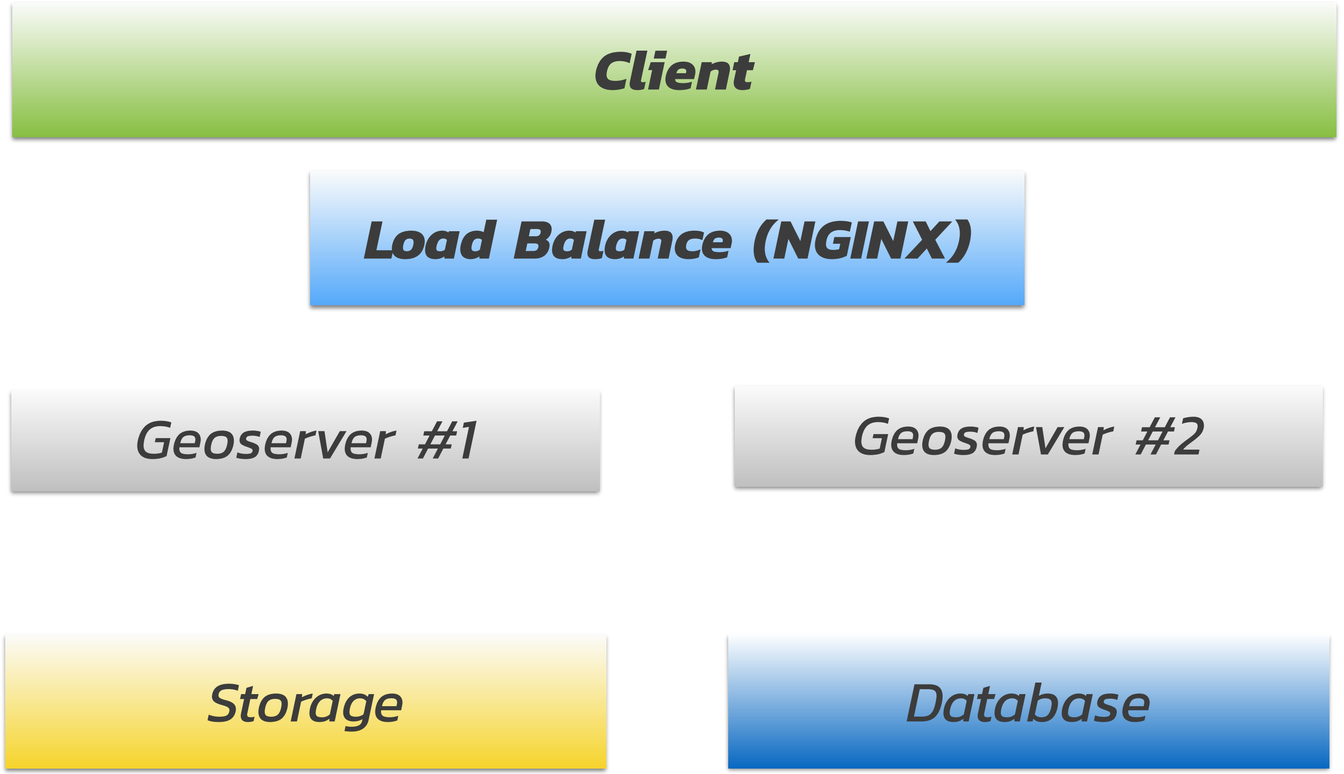
# Local Storage vs Network Storage



# GeoServer in Real World.

## Checklist

- GeoServer Versions
- Tomcat ENV (setenv.sh)
- Networking
- LoadBalancer
- Data Storage
- Database




**Can Scaling Database**

- PostgreSQL HA, Cluster
- Microsoft SQL Server HA, Cube Processing, Sharding

# Case #2 Scaling GeoServer

***STACK (GeoServer)***

- *GeoServer Basic*
- *GeoServer Keep Data*
- ***Multiple Geoserver Nodes***

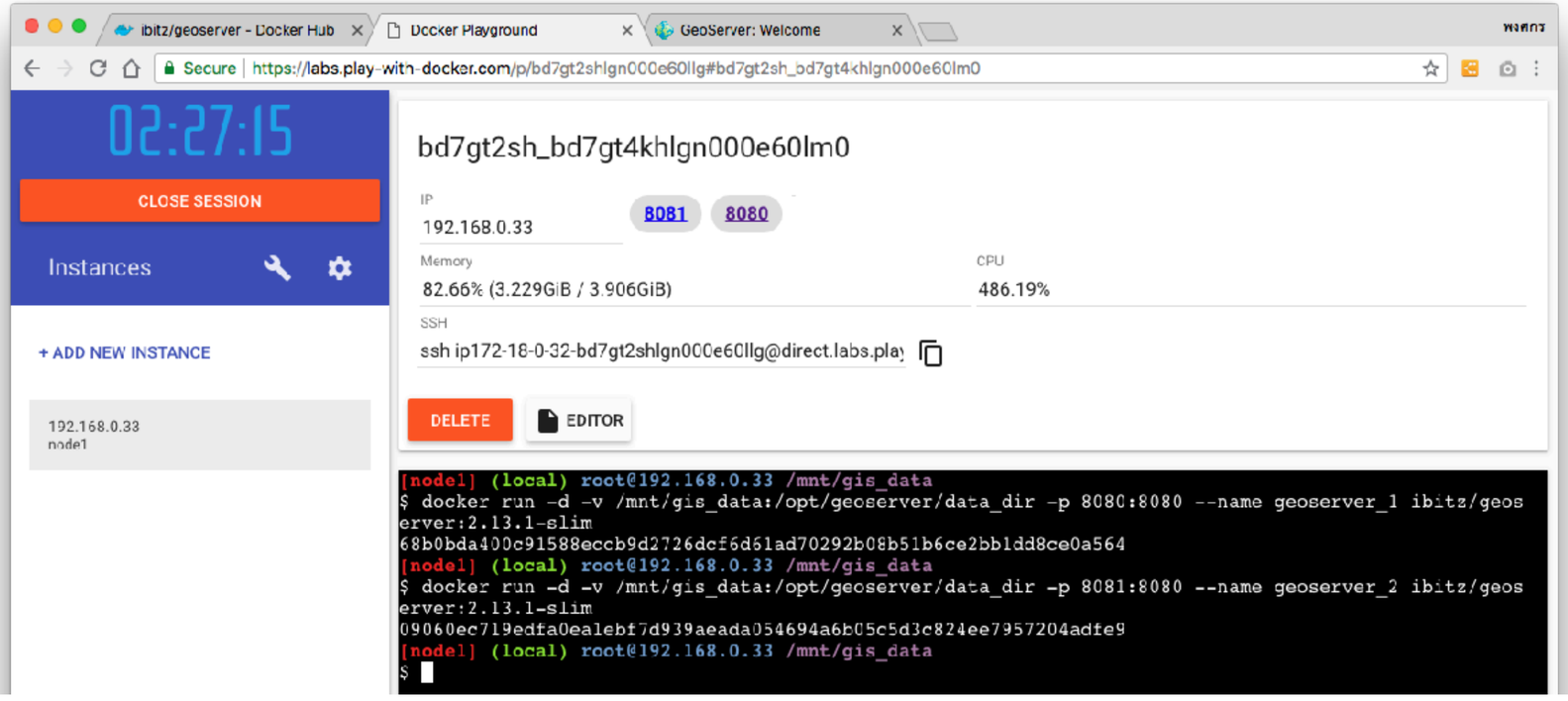
***Command***

**$ docker rm -f geoserver**
(Remove Old container)

**$ mkdir /mnt/gis_data**
(Make Directory for keep data )

**$ docker run -d -v /mnt/gis_data:/opt/geoserver/data_dir -p 8080:8080 --name geoserver_1 ibitz/geoserver:2.13.1-slim**

**$ docker run -d -v /mnt/gis_data:/opt/geoserver/data_dir -p 8081:8080 --name geoserver_2 ibitz/geoserver:2.13.1-slim**

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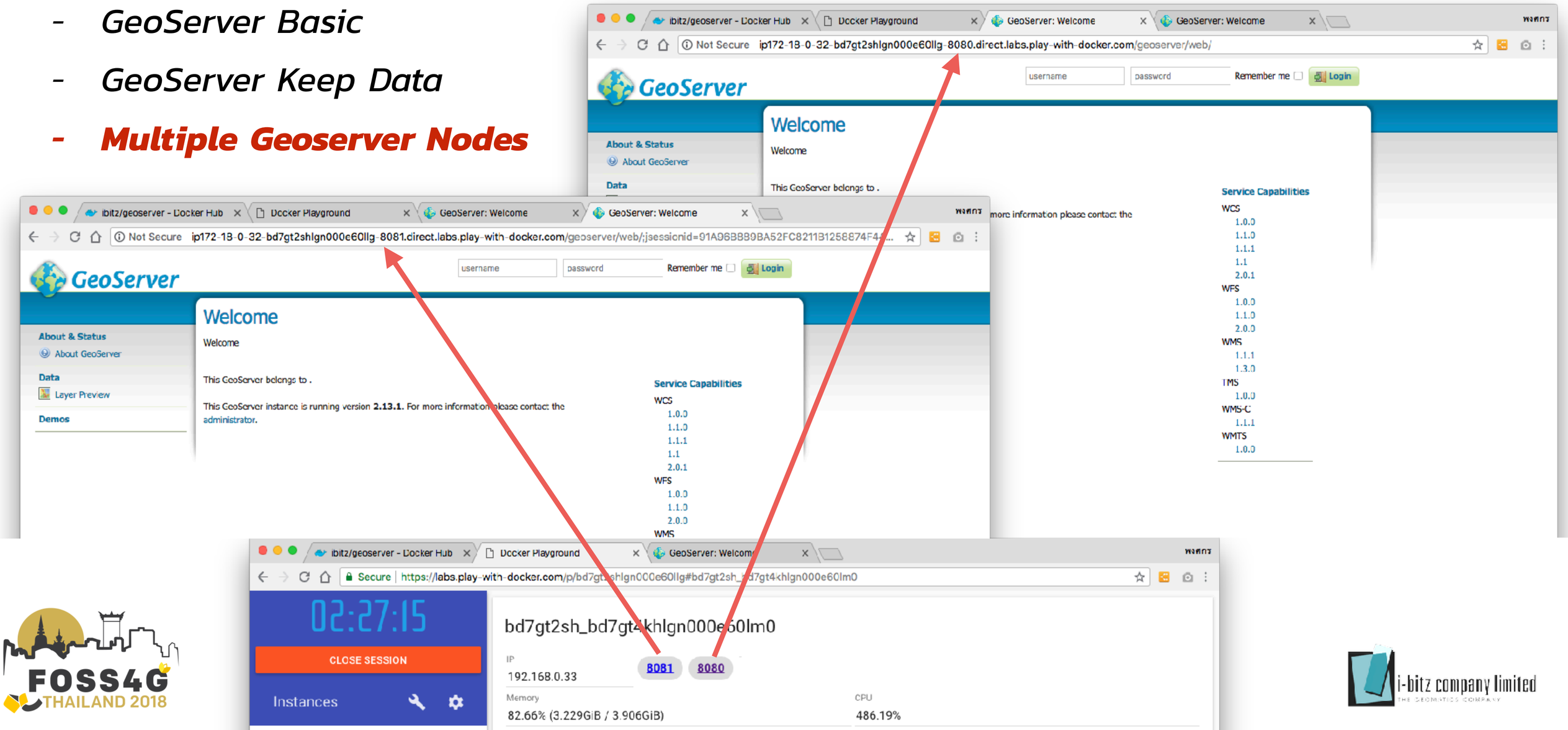
# Case #1 Map Services

## *STACK (GeoServer)*

- *GeoServer Basic*
- *GeoServer Keep Data*
- ***Multiple Geoserver Nodes***

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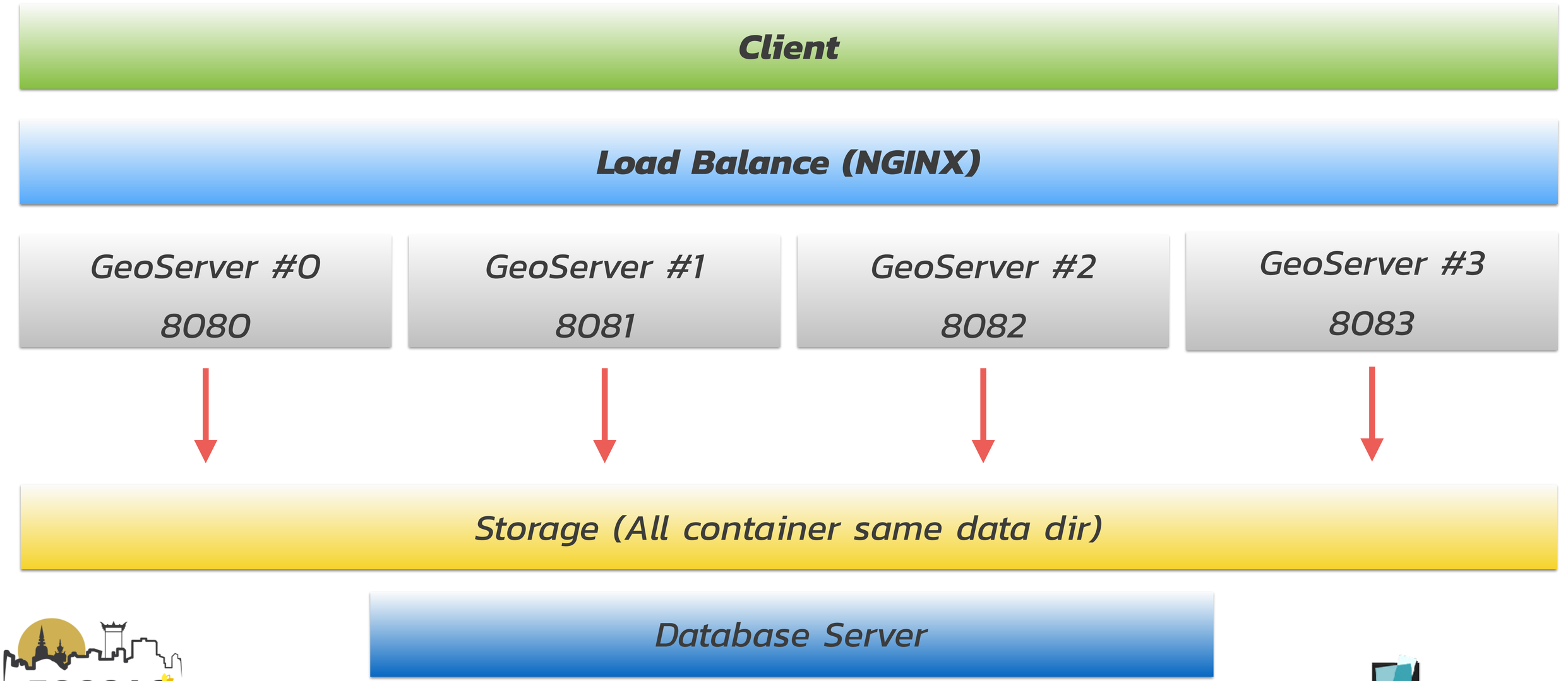
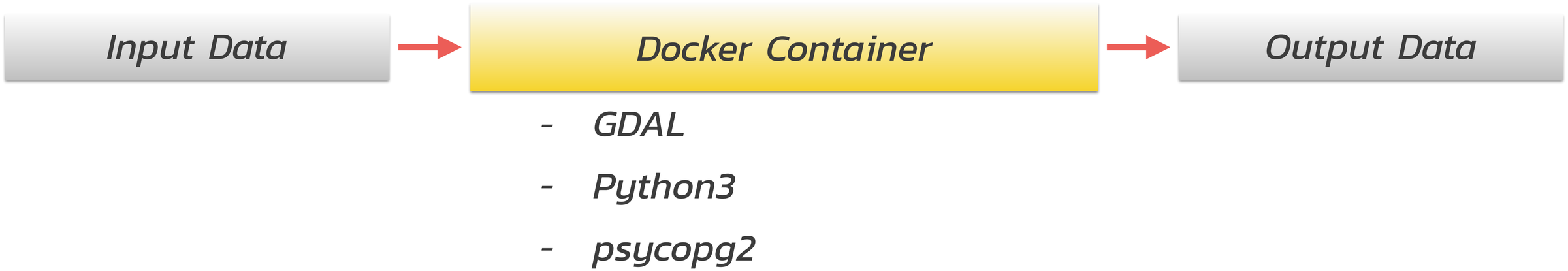
# GeoServer Cluster easy ways.



# *Docker in GeoProcessing*

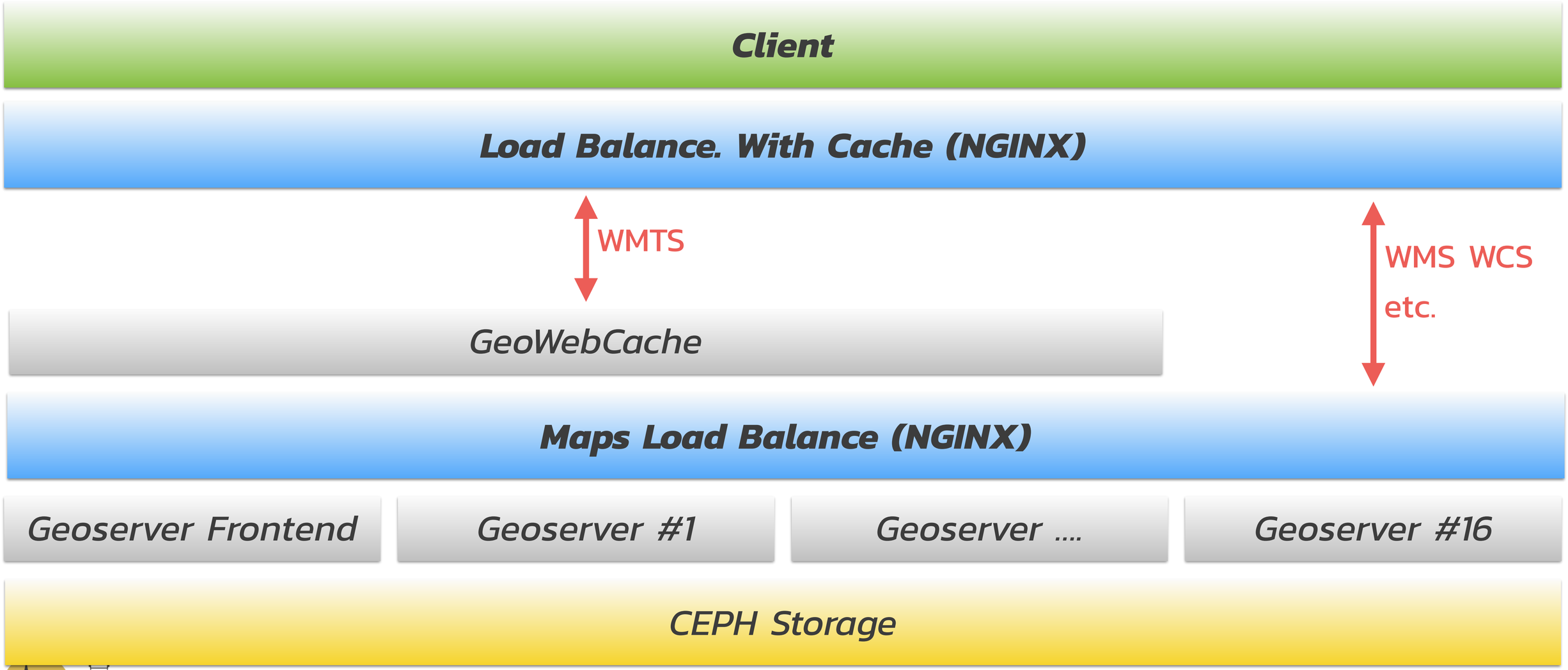
# Docker in GeoProcessing

- *GDAL GeoProcessing*
- *OGR2OGR*
- *Python GeoProcessing*

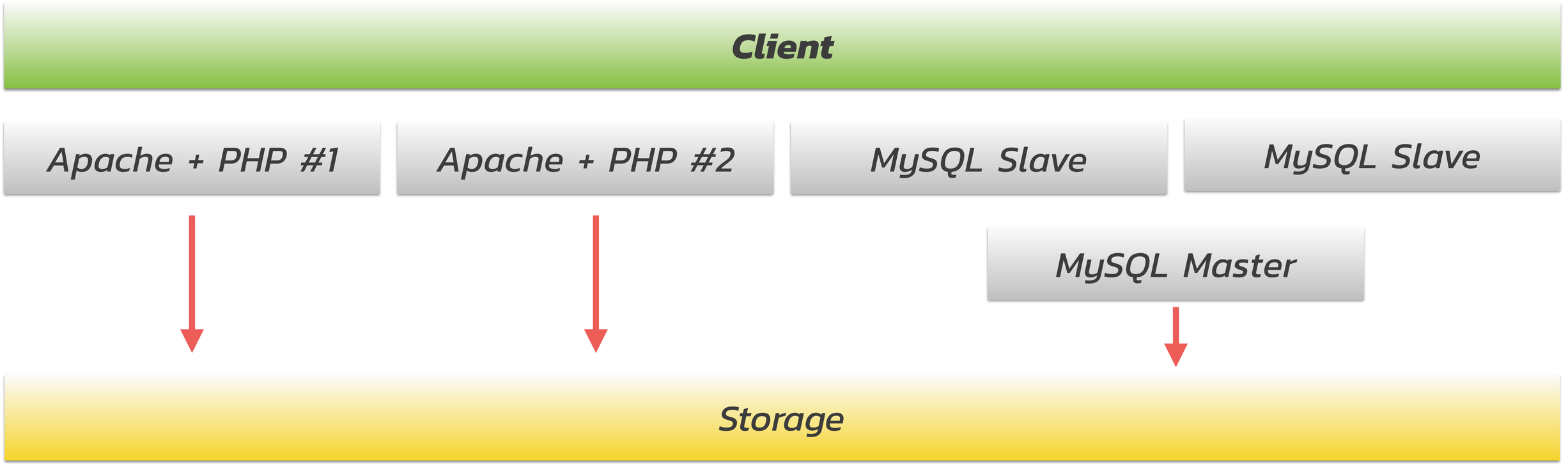


# *Showcase*

# Production Show. (Large Scale MapServices)

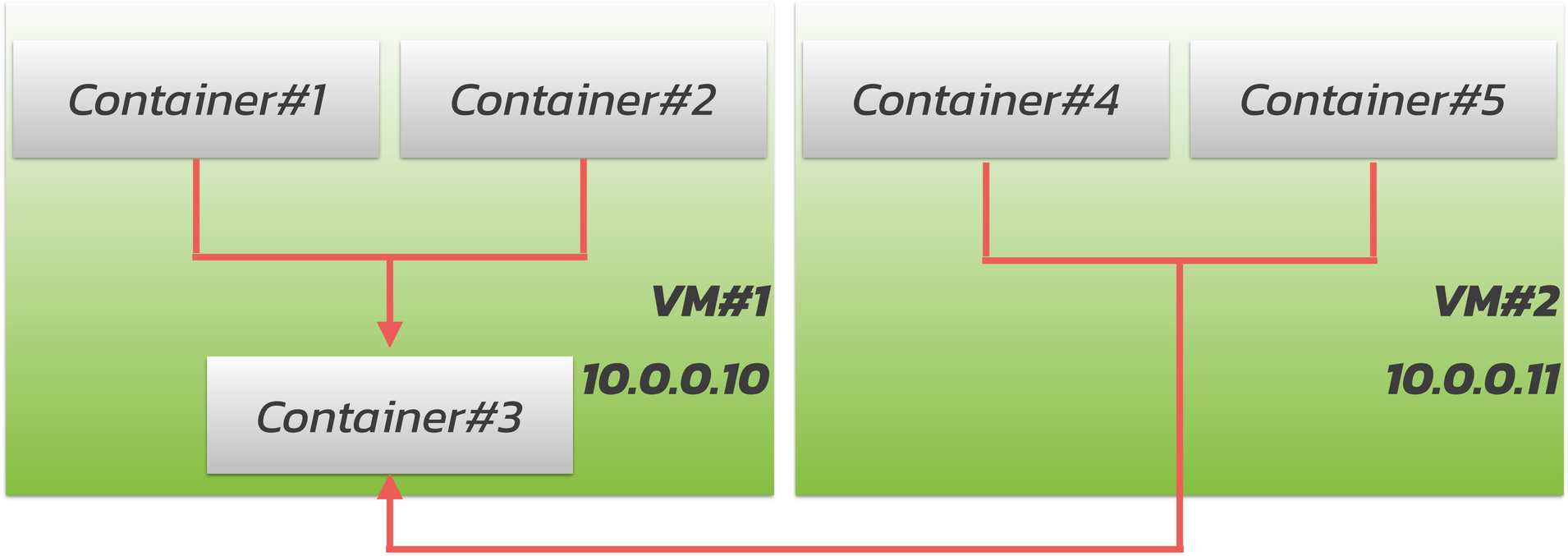


# High Scale And High Availability



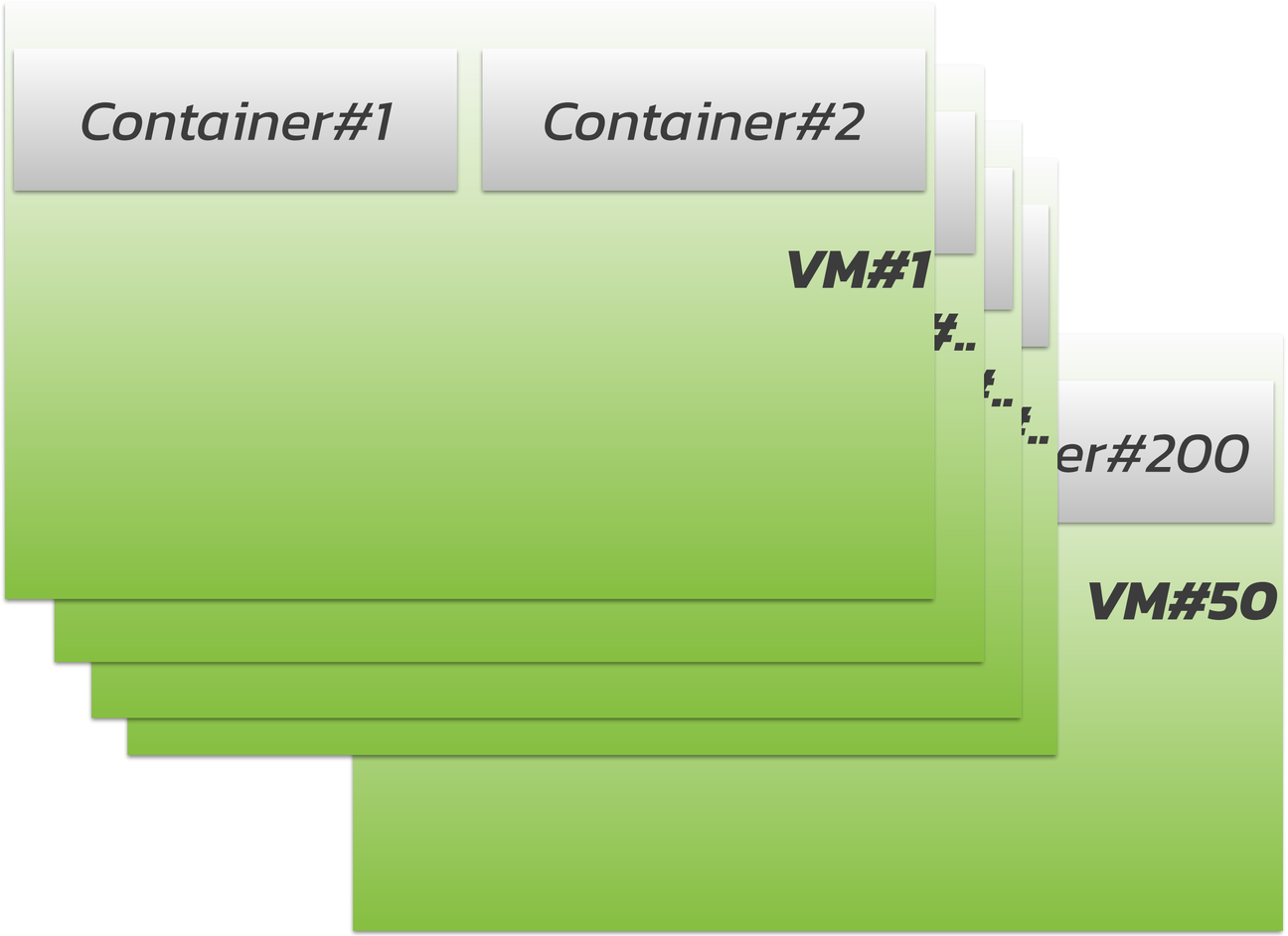
# *Container Orchestration*

# Container Pain Point




```
docker run -d -v /mnt/gis_data:/opt/geoserver/data_dir -p 8080:8080 --name Container1 ibitz/geoserver:2.13.1-slim
docker run -d -v /mnt/gis_data:/opt/geoserver/data_dir -p 8081:8080 --name Container2 ibitz/geoserver:2.13.1-slim
docker run -d -t --name Container3 -p 5432:5432 -v /mnt/postgis:/var/lib/postgresql kartoza/postgis
docker run -d -v /mnt/gis_data:/opt/geoserver/data_dir -p 8080:8080 --name Container4 ibitz/geoserver:2.13.1-slim
docker run -d -v /mnt/gis_data:/opt/geoserver/data_dir -p 8081:8080 --name Container5 ibitz/geoserver:2.13.1-slim
```

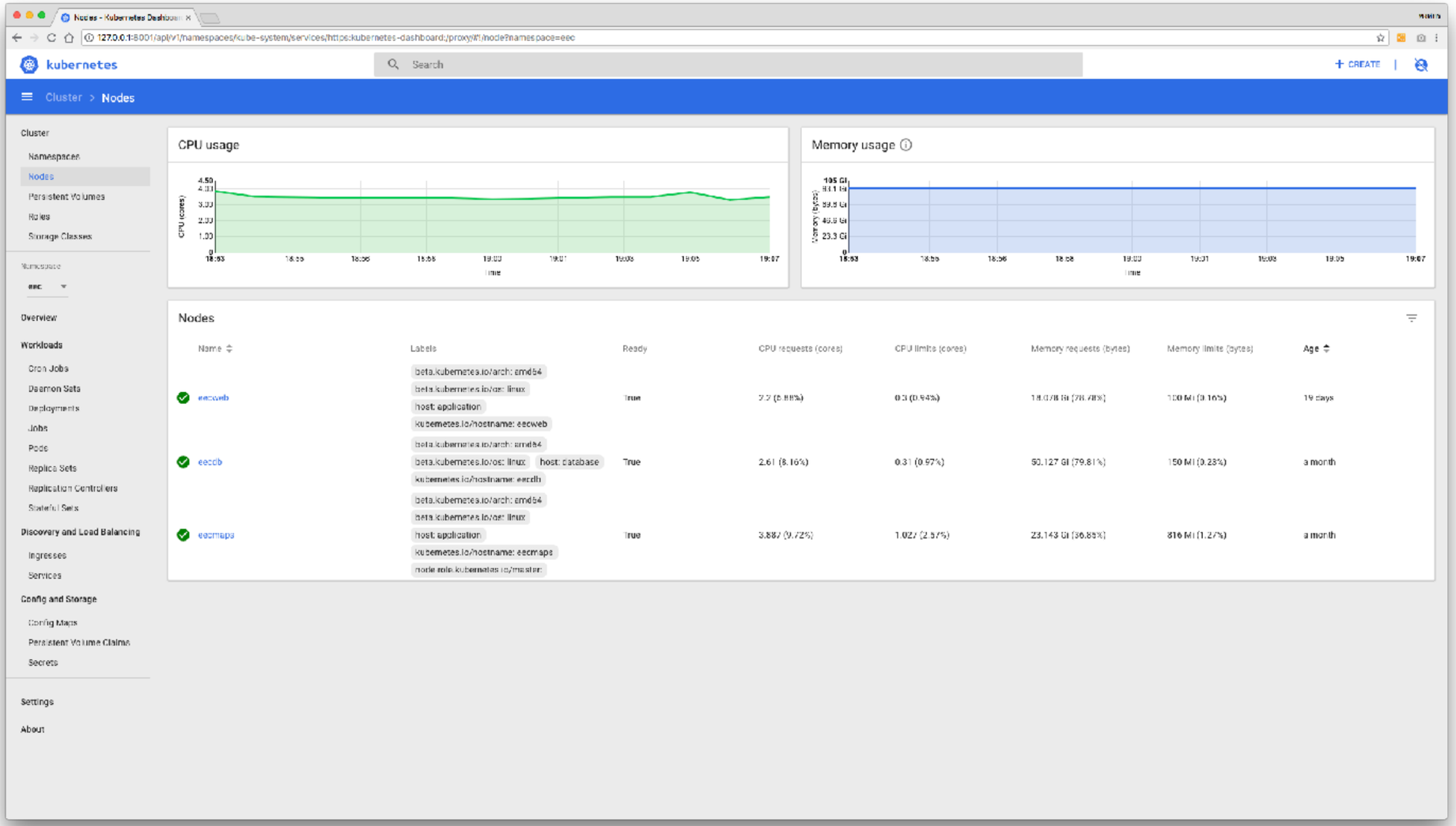
# Container Pain Point




*Can't Control.*

kubernetes

# Container Orchestration

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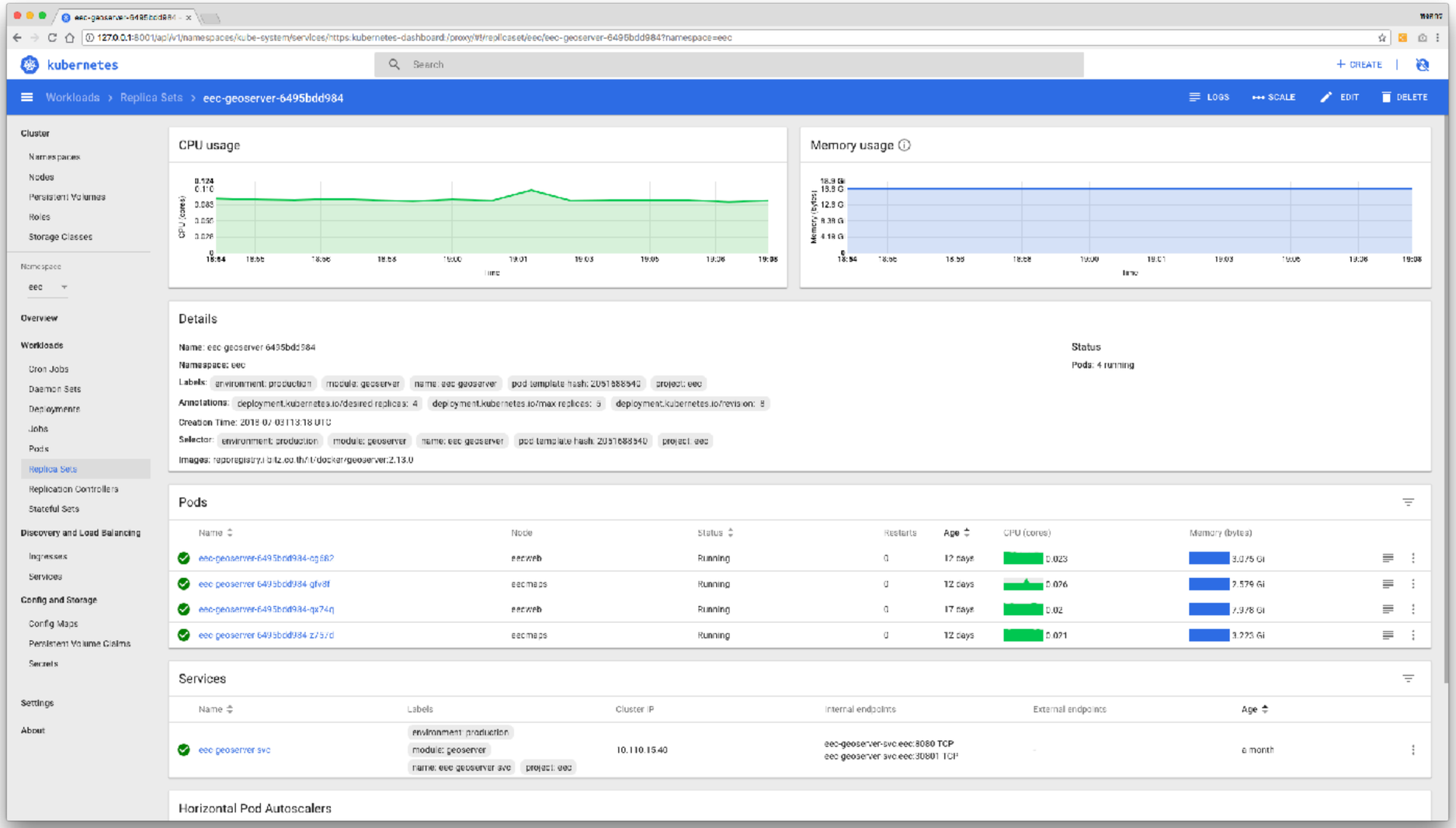


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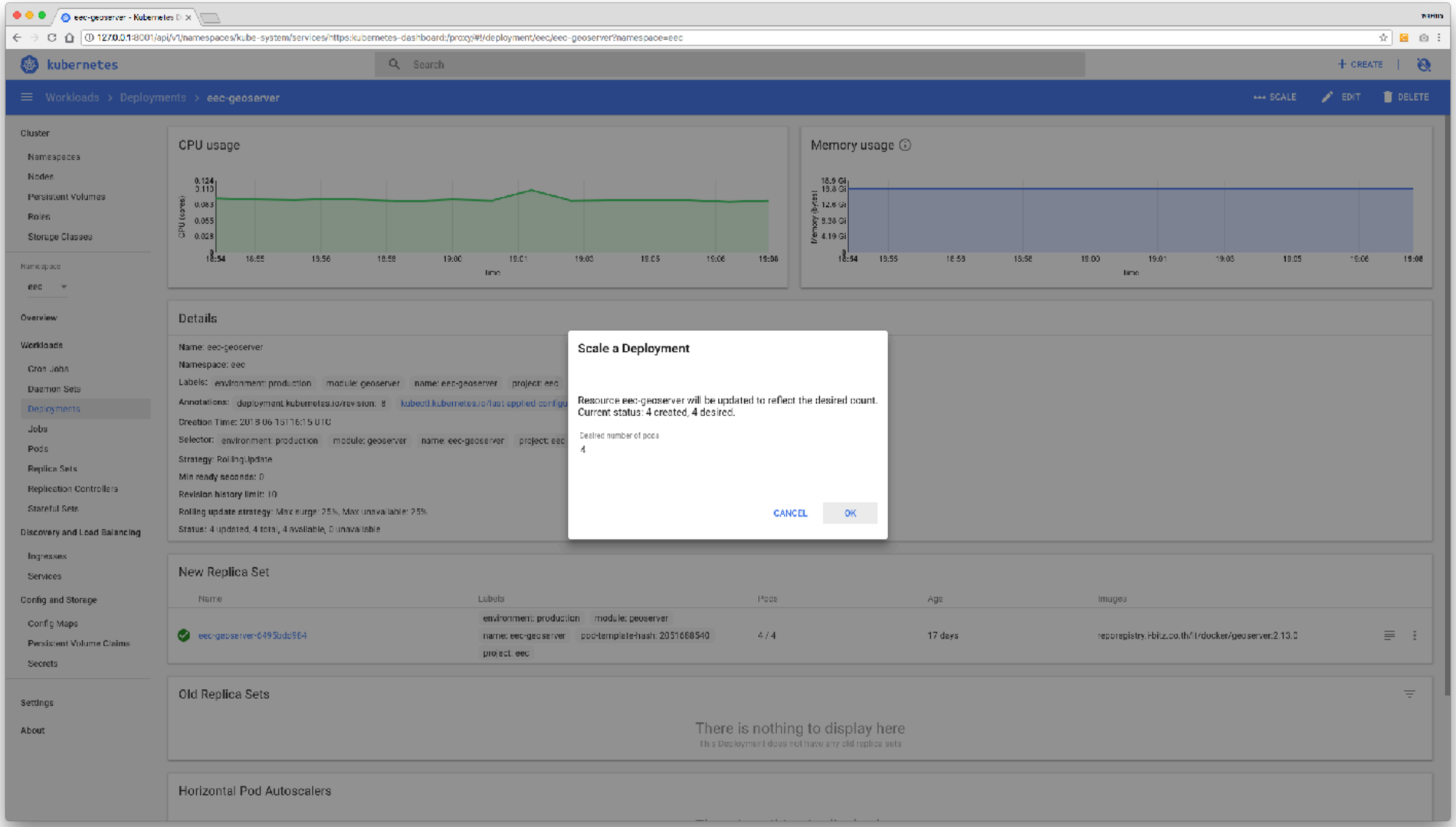


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*“ Container Must Go ON “*

*“ Thank  You. “*

[SMJTHEOFF]