Docker:Zero to Hero (Day 1)

By Praparn Luengphoonlap
Email: eva10409@gmail.com

Outline Day 1

- Docker principle
- Docker machine
- Image, Repository & Tag, container
- CPU, Memory and I/O
- Network
- Volume
- Inspect and Log
- Commit
- Docker Security
- Kitematic (Alpha)

Outline Day 2

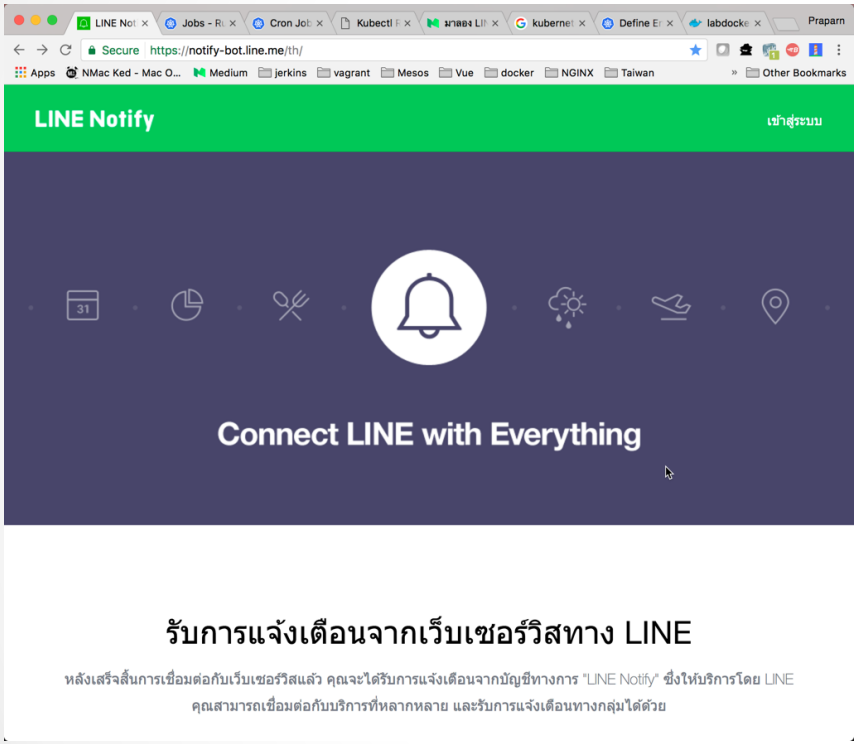
- Dockerfile and Build
- Compose
- Registry
- Swarm Mode
  - Conceptual of Swarm
  - Swarm Mode Architecture
  - Swarm init/join cluster system
  - Swarm service
  - Orchestrator Assignment
  - Config and Secret
  - Network Overlay and Ingress
  - HA Manager Role
  - Docker Stack Deploy (Compose Swarm Mode)
- portainer for Docker
- Q&A

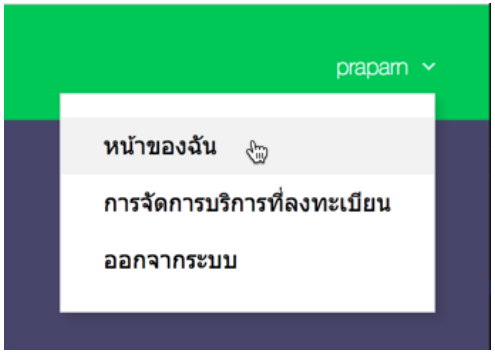
Prerequisite

- Windows (64 bit)/ Mac / Linux (64 bit)machine (ubuntu / alpine prefer)
- 1 email address (For register “hub.docker.com”) / hub.docker.com account
- Line Notify Token (https://notify-bot.line.me)
- Tool for editor (vscode etc)
- Tool for shell (putty / terminal etc)
- Tool for transfer file (winscp / scp)
- Basic understand for linux operate
- Basic text editor skill (vim prefer) and linux structure
- Internet for download / upload image

Prerequiste

- <u>Generate LINE Token</u>
  - https://notify-bot.line.me





Prerequiste

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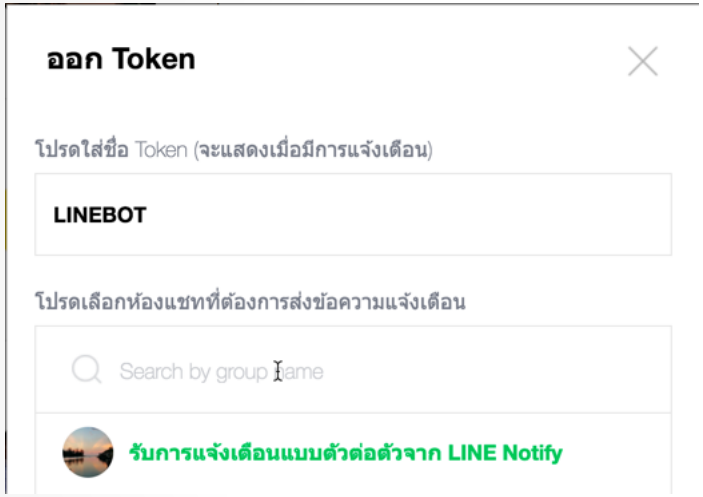
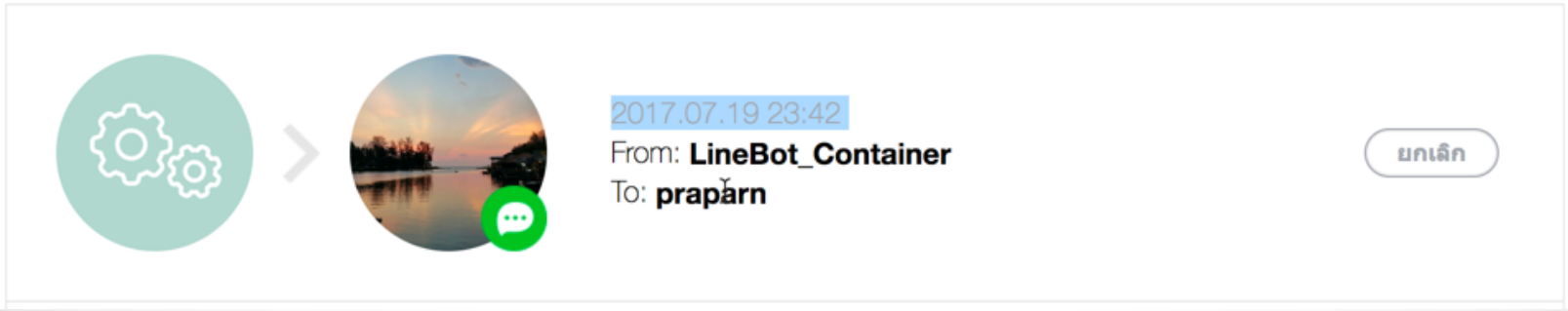




Lab Resource

- Repository for lab

Explore Help labdocker Sign up Log In

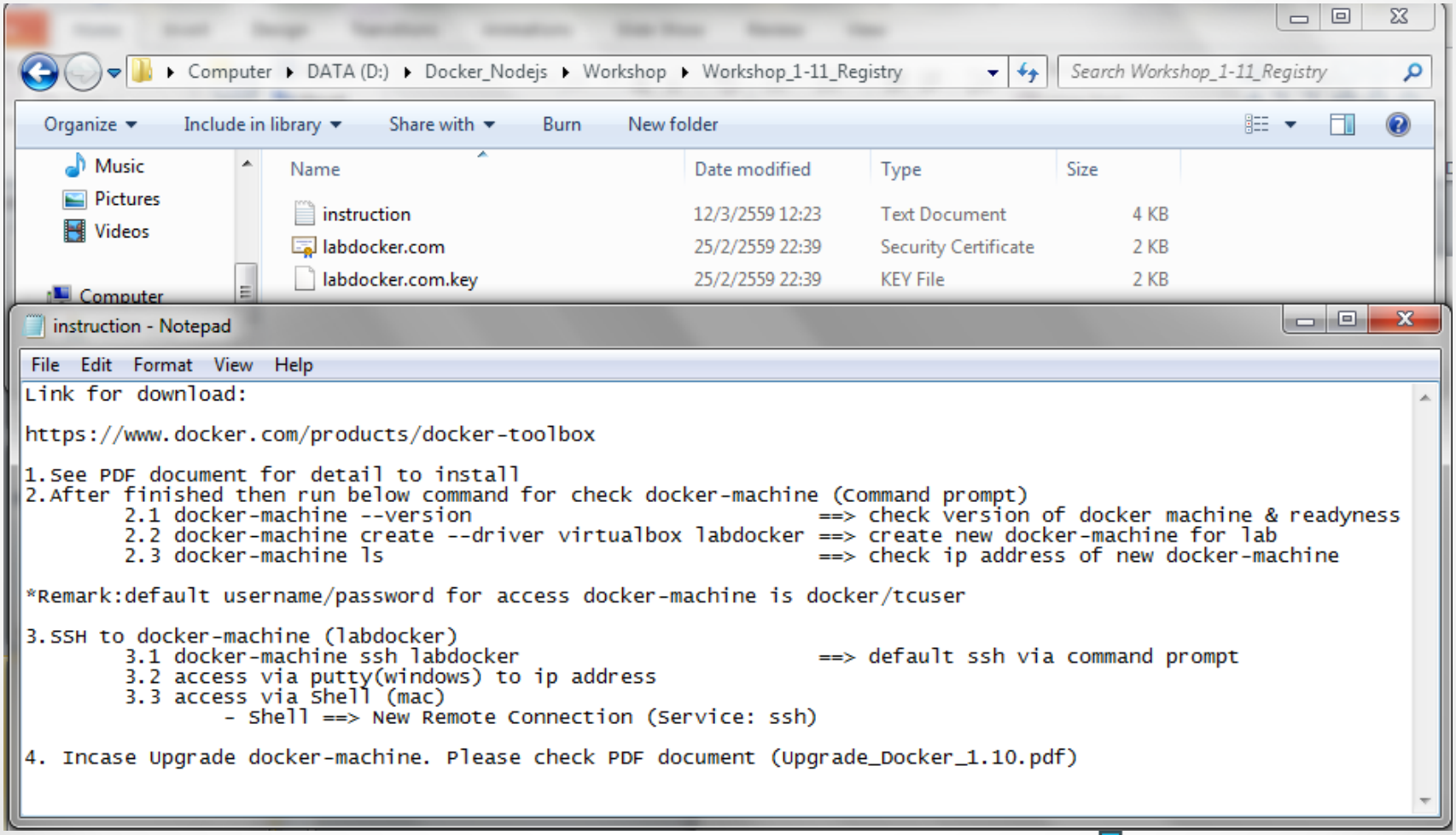
Repositories (7)

All

labdocker/alpineweb public	0 STARS	31 PULLS	DETAILS
labdocker/nginx public	0 STARS	16 PULLS	DETAILS
labdocker/alpine public	0 STARS	7 PULLS	DETAILS

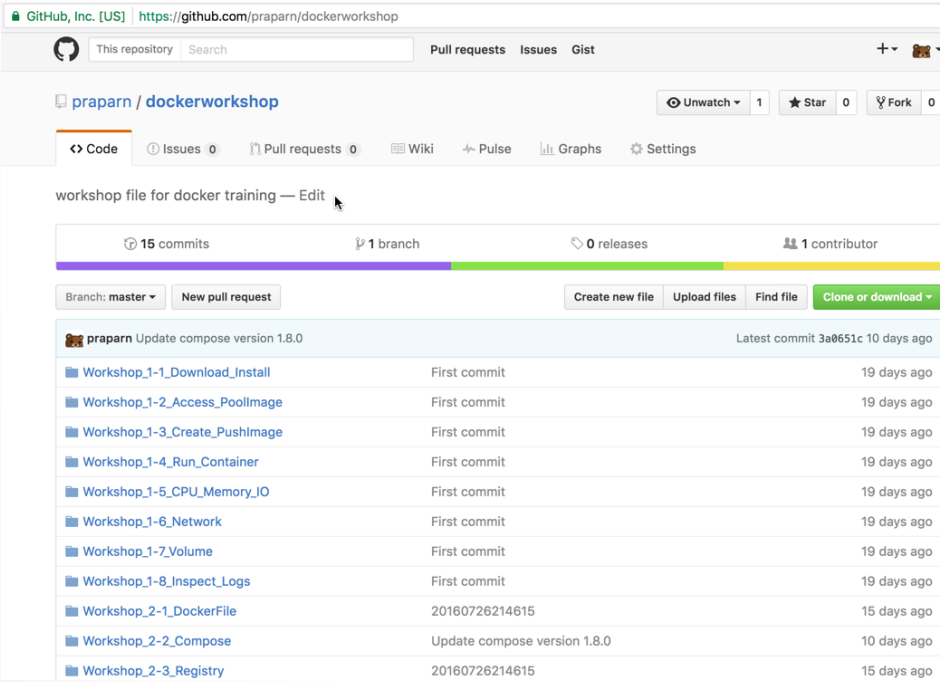
Lab Resource

- Software in lab



Lab Resource

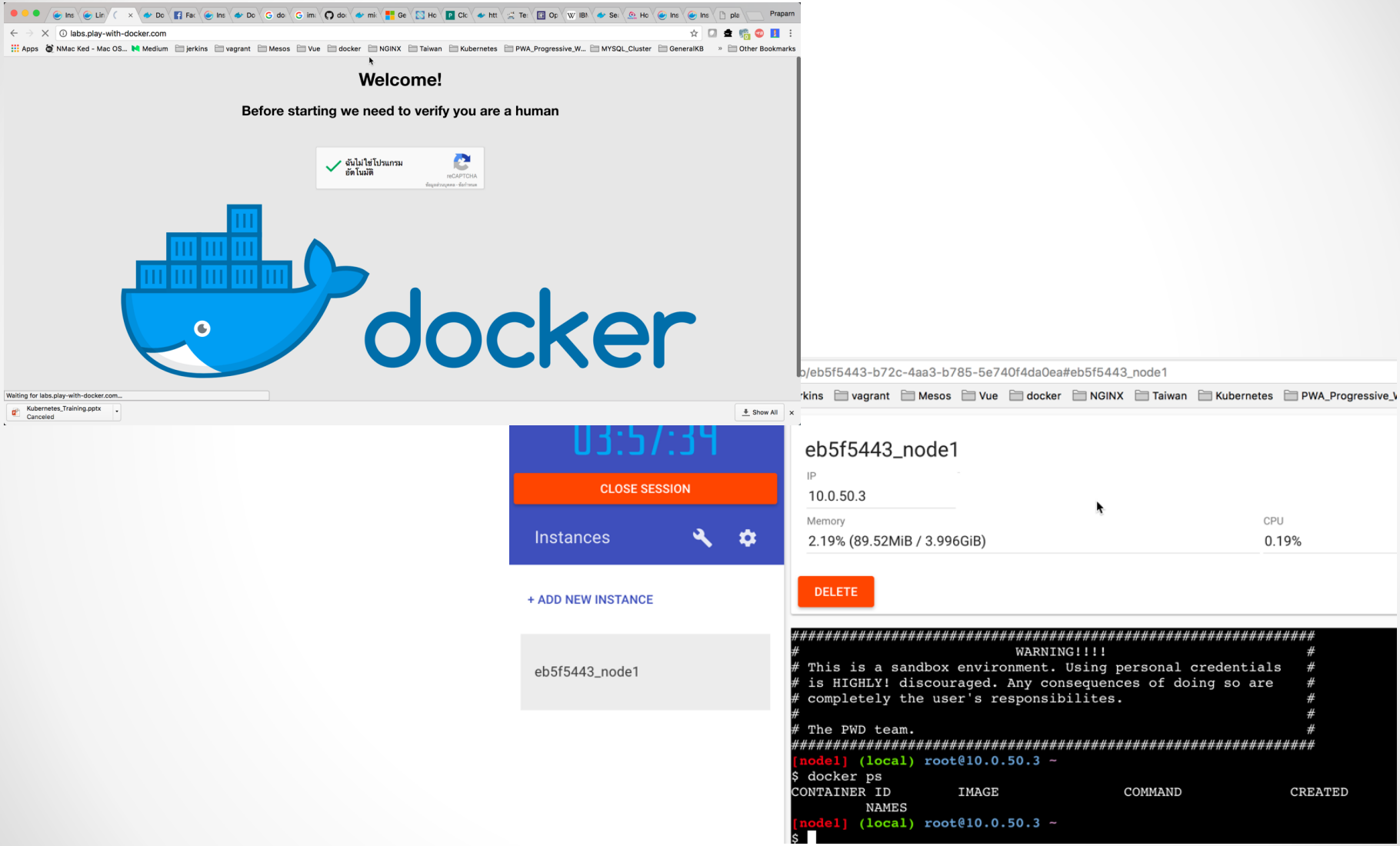
- Download on Google Drive
  - https://goo.gl/3uPTvq
  - Download on GitHub
  - git@github.com:praparn/docker_meetup_20180618.git



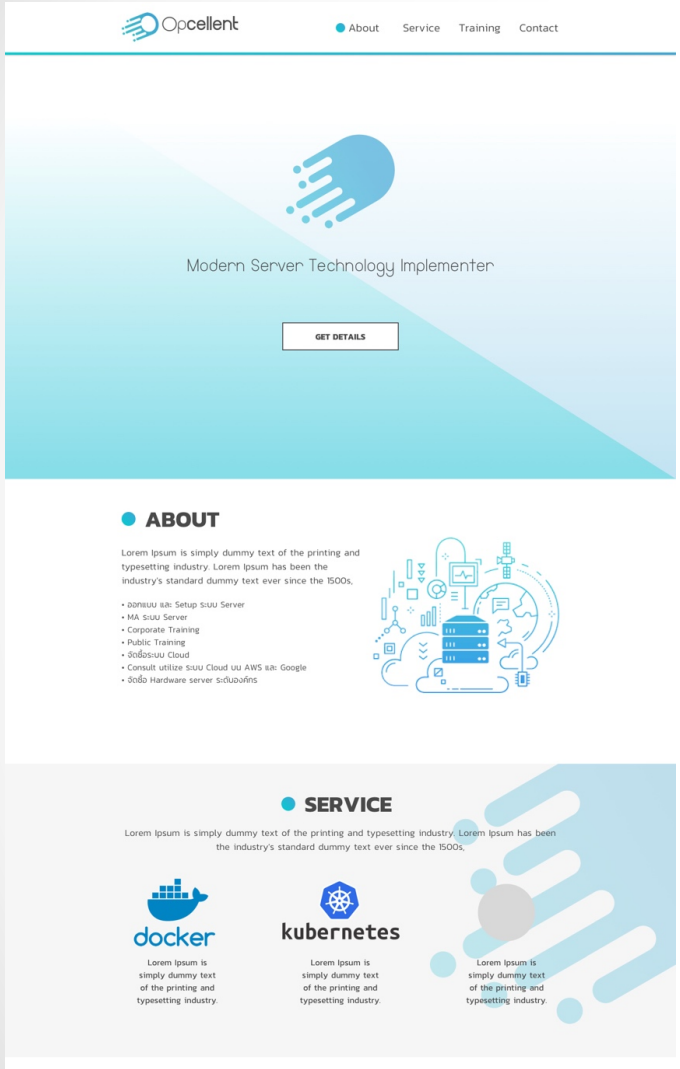
Workshop 1-1: Download & Install

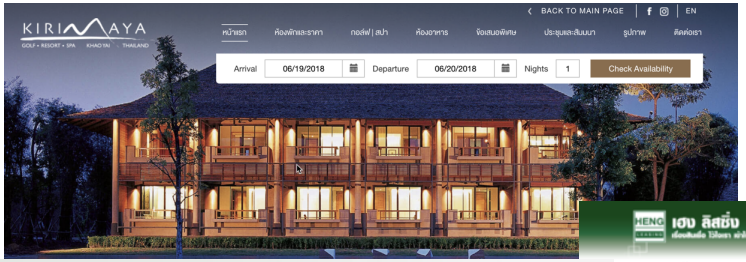
- https://www.docker.com/products/docker-toolbox
- Install the software
  - Windows : Windows_Install_Docker.pdf
  - Mac OS: Mac_Install_Docker.pdf

Workshop 1-1: Download & Install



Who are we ? (Opcellent)

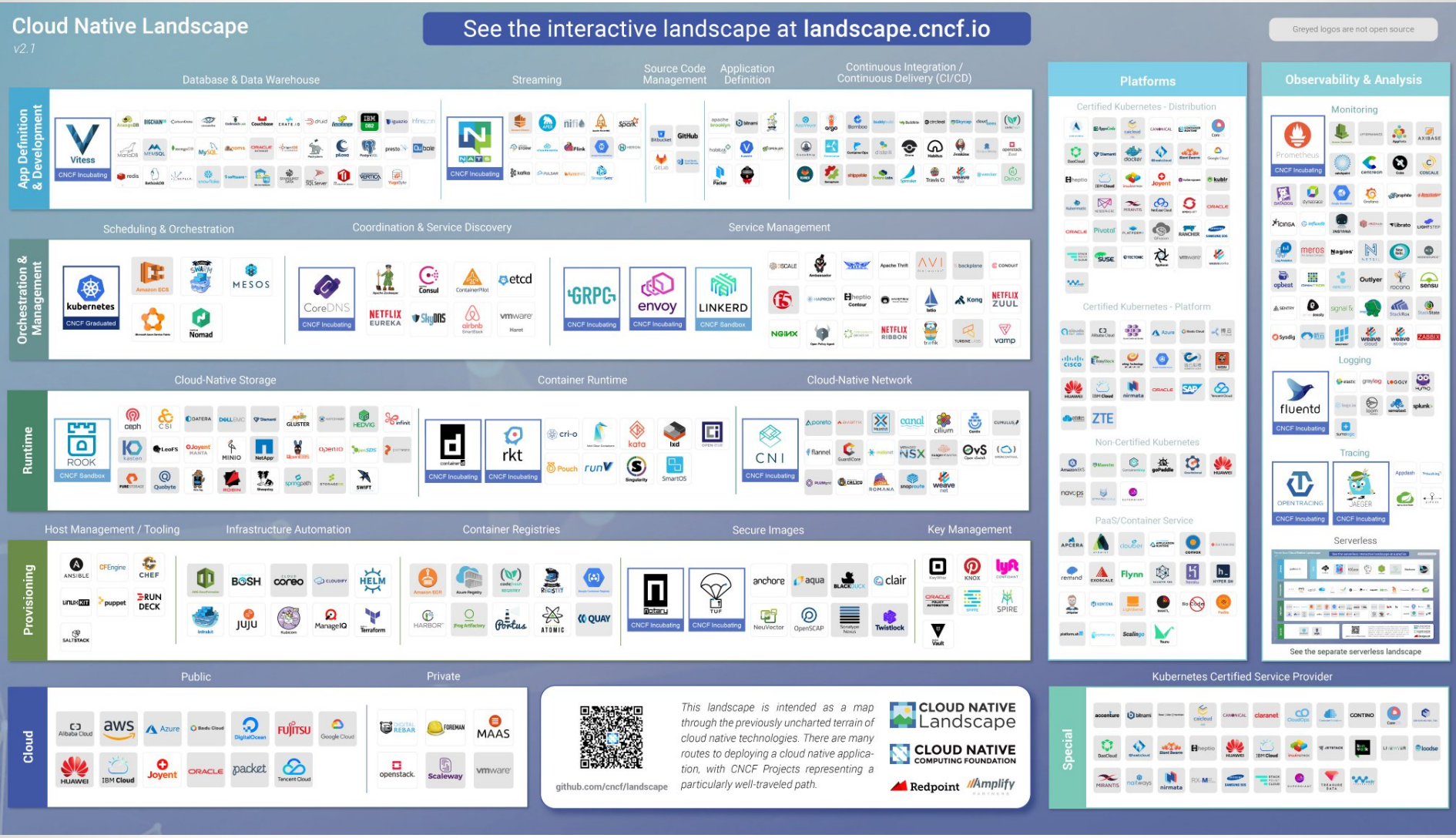




Present by: Praparn L. (eva10409@gmail.com)

docker

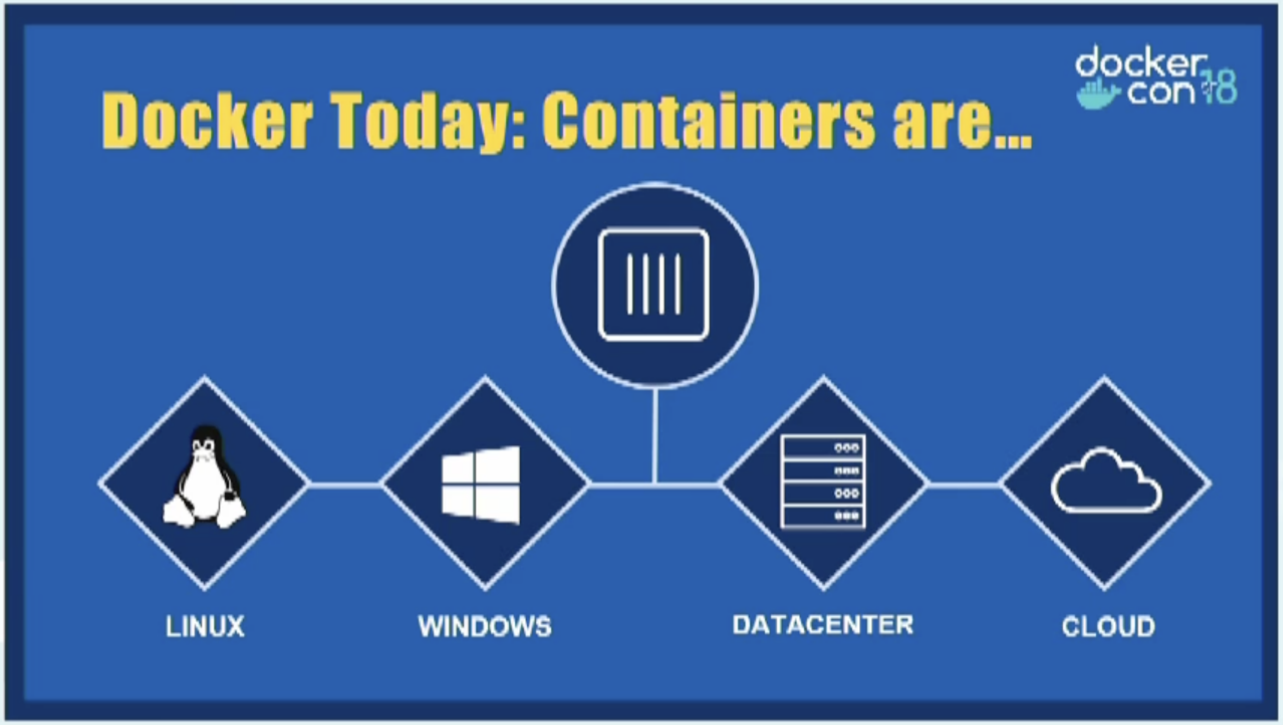
Landscape of the world now



Kubernetes: Production Workload Orchestration

docker

Landscape of the world now



docker con 2018 SF

docker

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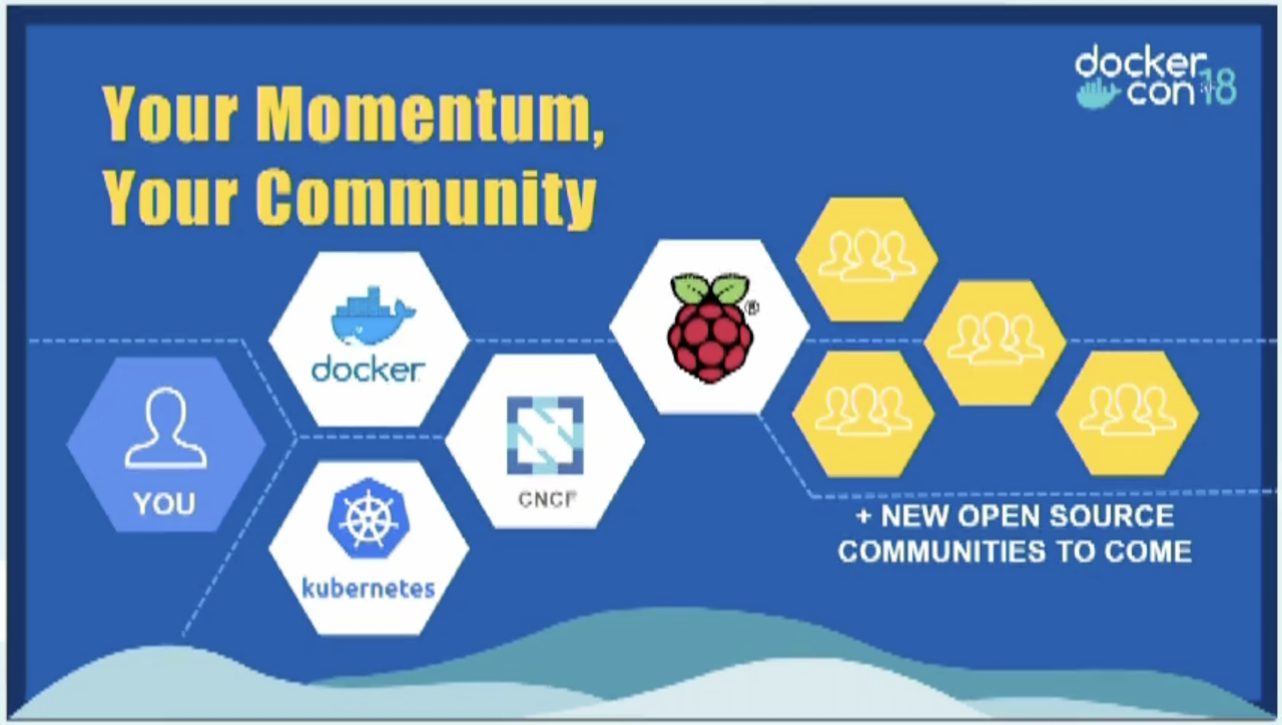

docker con 2018 SF

docker

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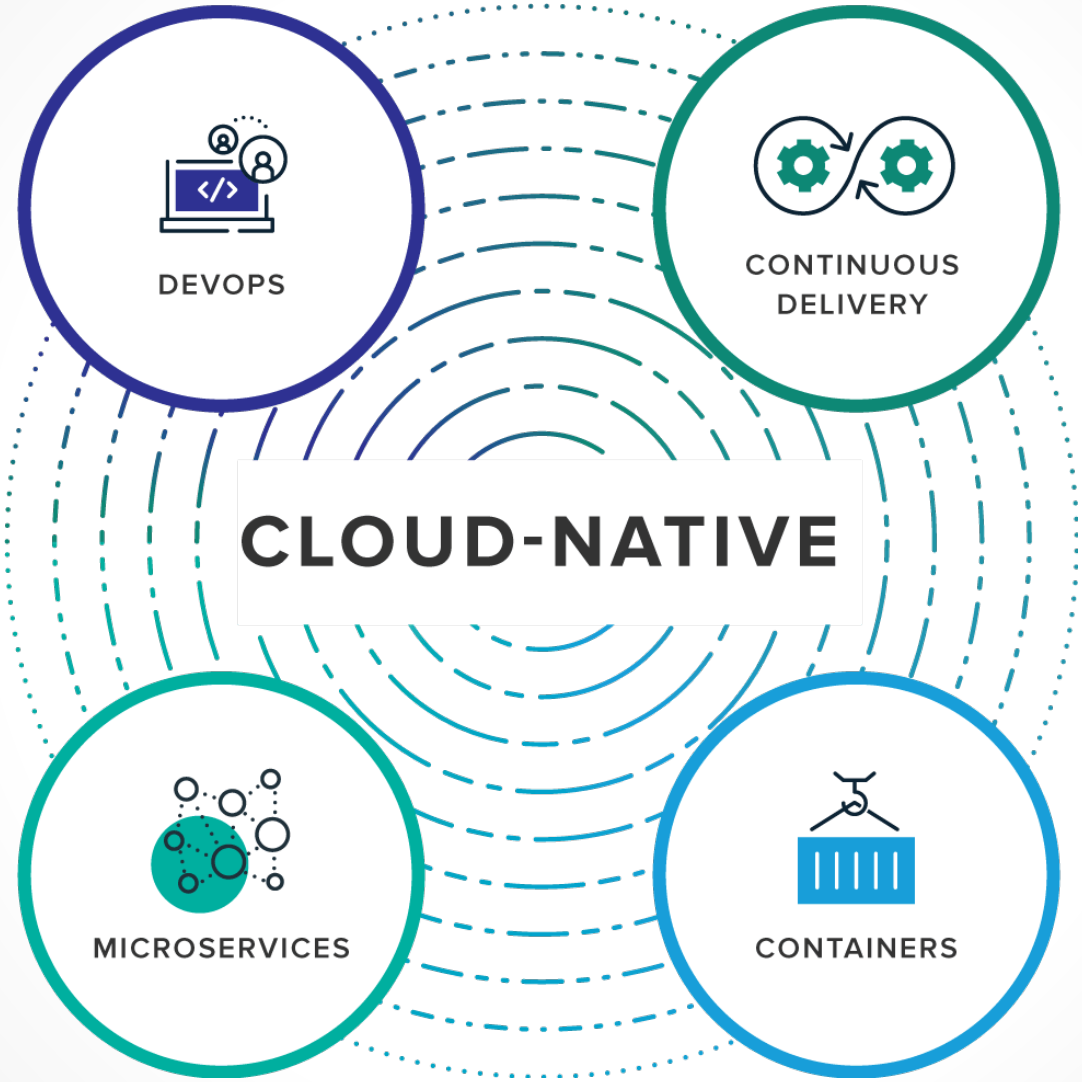
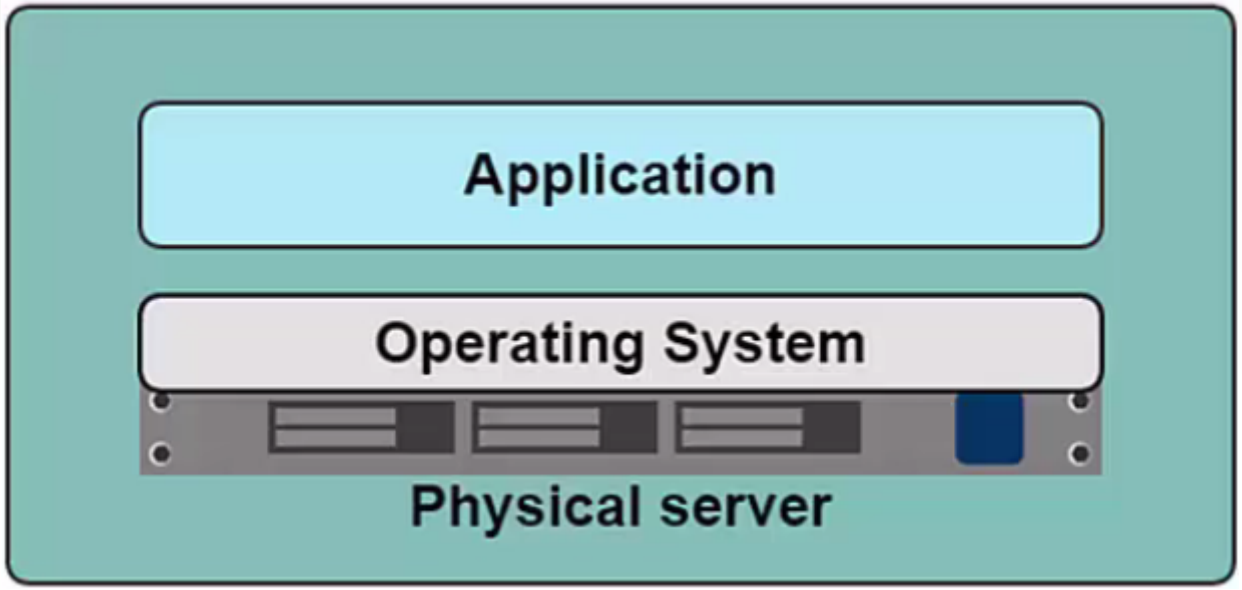


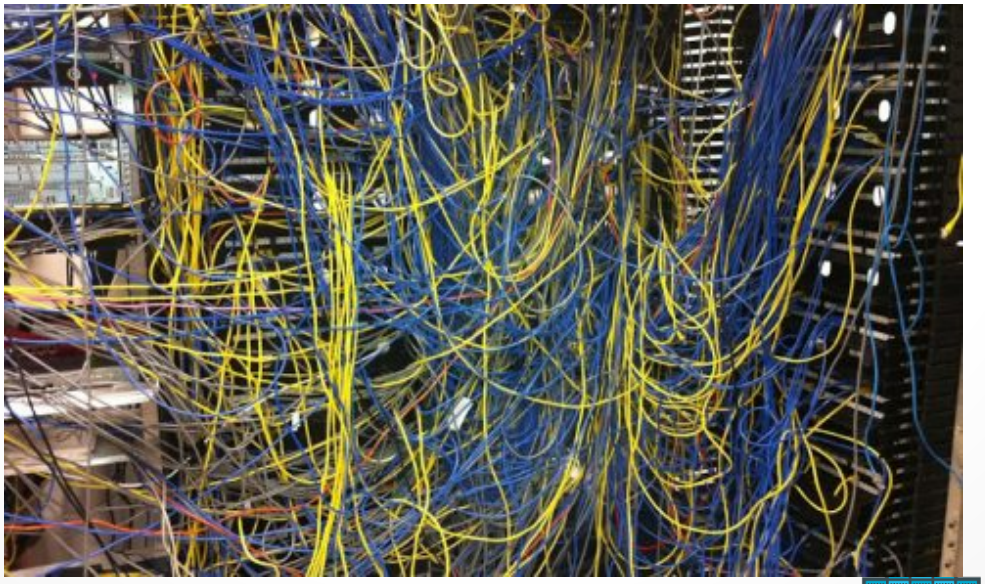
Docker Principle

...

What is docker ?

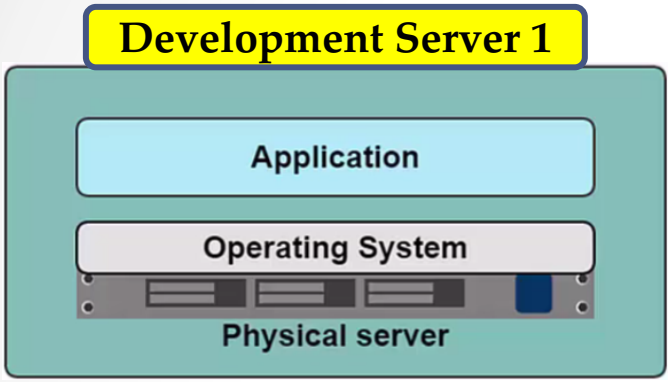


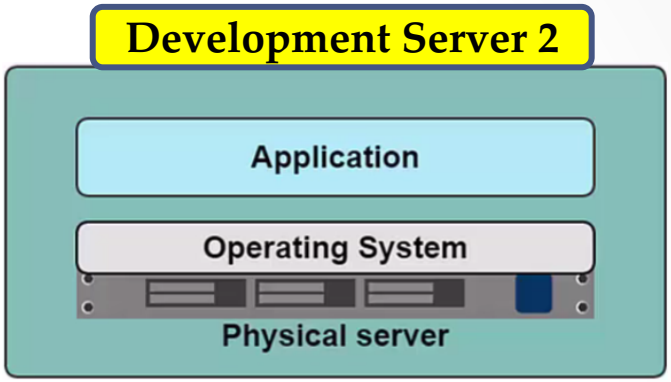
Existing Technology



Existing Technology

- Development Environment (Mix everything possible)





- Apache 2.20 Web Server
- PHP 5.5 Engine
- Larevel 4.1 Framework
- MaridDB 5.1
- Etc

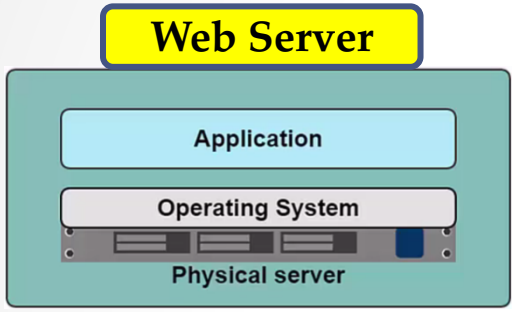
(All-in-One Server)

- IIS 8.0
- .Net Framework 3.5
- ASP.NET
- Etc

- Need concern about conflict component
- Survive among legacy dependency
- Lack for environment for fulfill develop & test (module test/integrate test/ UAT test / MOT test etc)
- Unexpected software conflict frequently occur
- Incomplete software's integrated test

Existing Technology

- <u>Production Environment (Best design)</u>
- Day 1: Application 1: Implement



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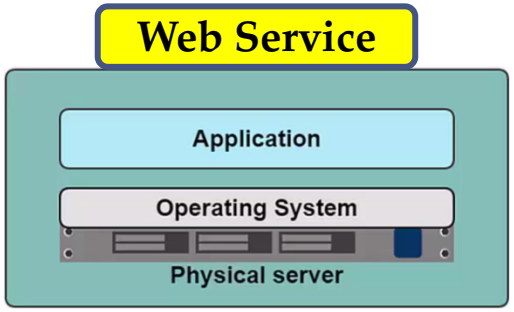
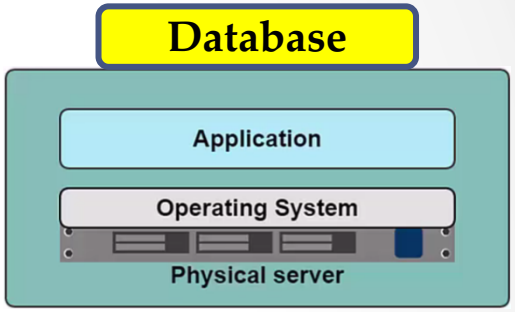


- IIS 8
- .Net FrameWork 3.5



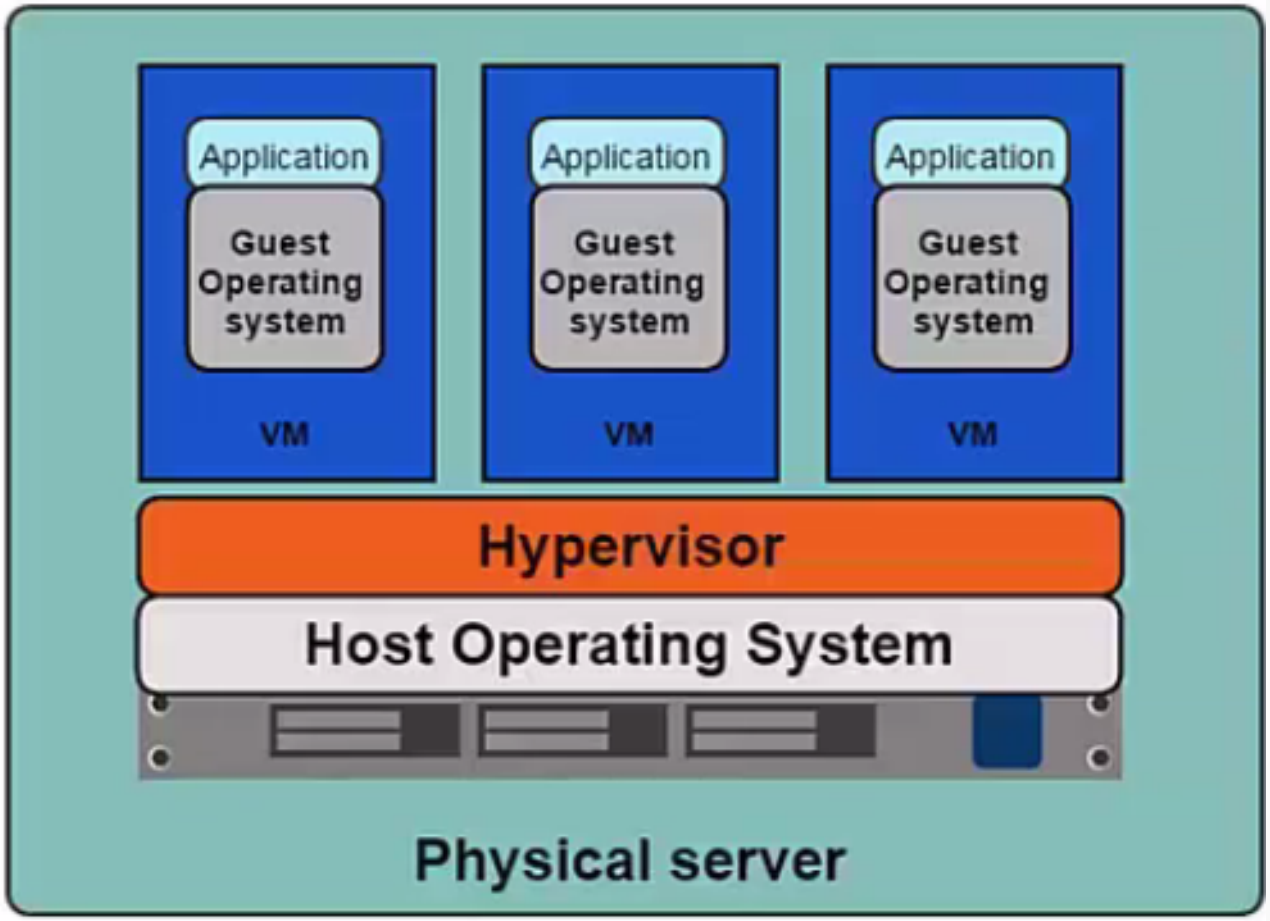
- MariaDB 5.1

- Day 2: Application 2: Need to implement
  - Need PHP 7.0 ?
  - MariaDB 10.1.14 (Need search feature on 10.1)
- Problem ?
  - Possible to upgrade PHP to 7.0 ? / How to test existing application ?
  - What effect to MariaDB upgrade ?

Existing Technology

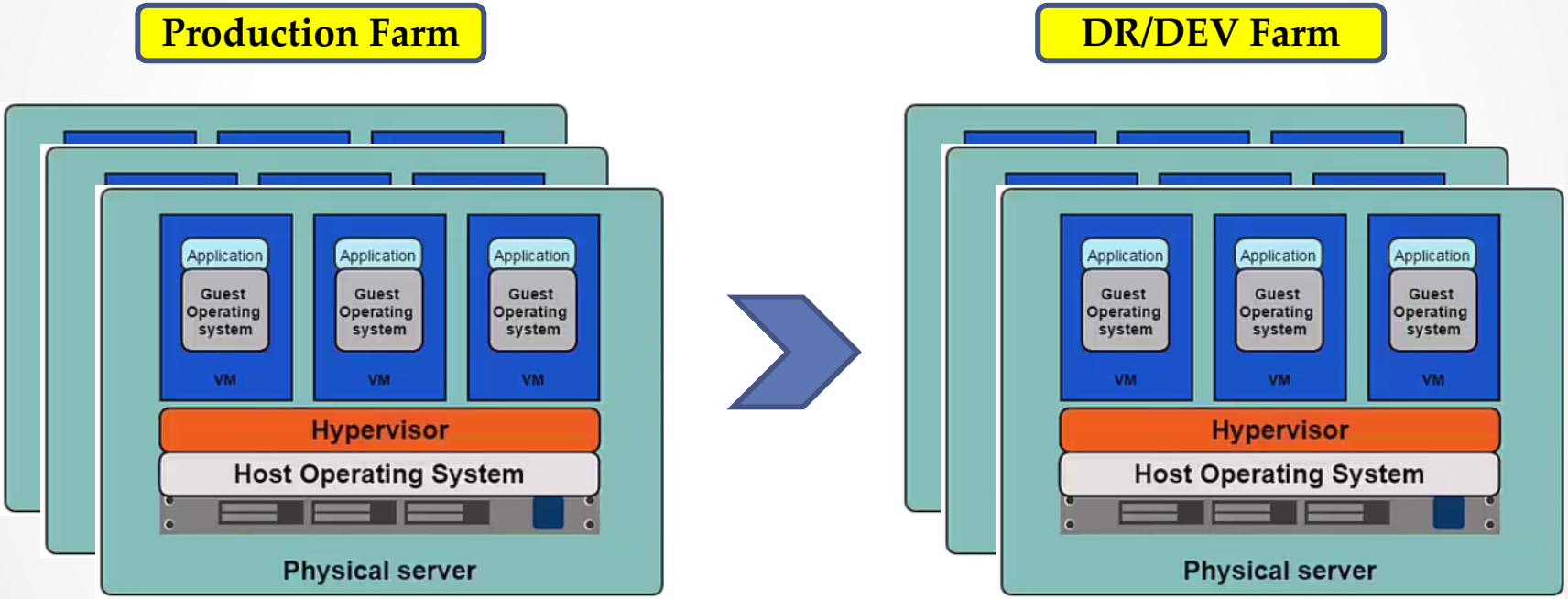
- What operation handle in production environment ?
  - Aware about huge of difference software component between development / production machine
  - Need to know in deep all application dependency (Wow !!!)
  - Take time for discussion and find solution to implement.
  - Possible to confusion and effect to other application that existing on share server.
  - Many unexpected problem & software bug.
  - Hard control software's quality assurance (QA)

What is docker ?



Existing Technology

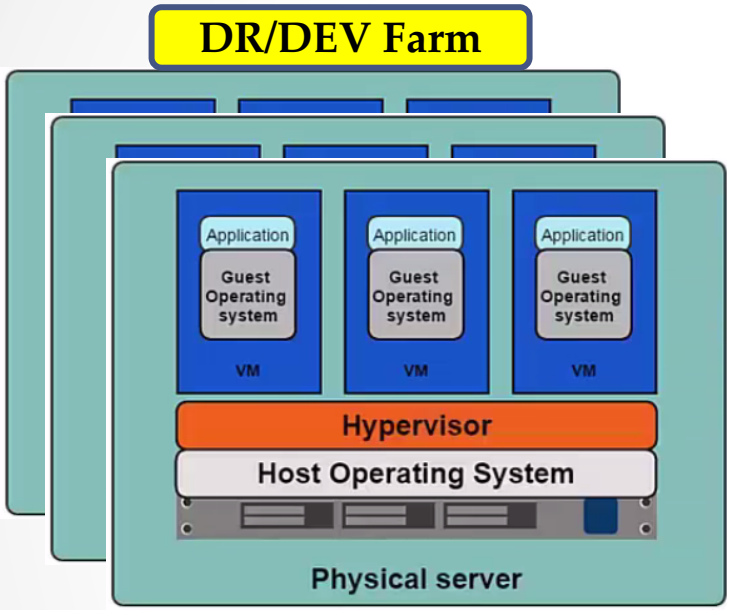
- 1 Physical server : 1 – N VMWare (&OS)
- Virtualize Hardware (CPU, Memory, Disk, Network etc)

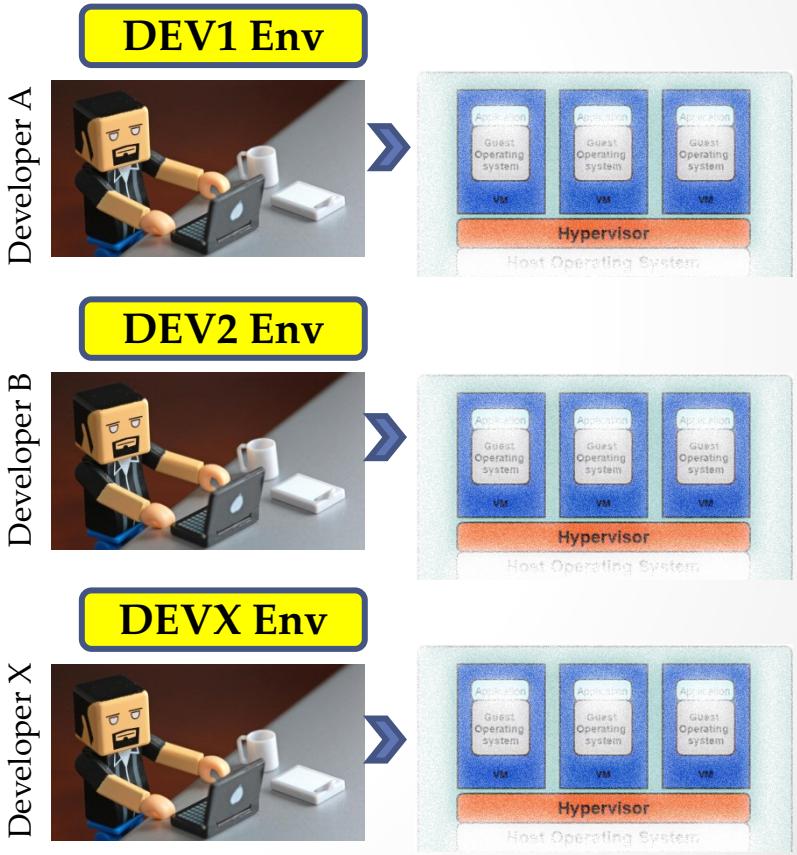


- Kernal-base virtual machine (KVM), Vmware, Virtualbox etc

Existing Technology

- Development Environment (Clone from Production)

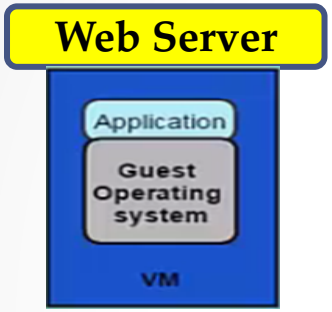


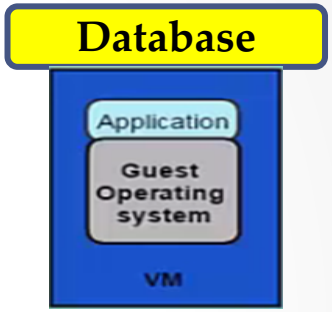


Virtual Machine reach limit:
- Resource insufficient (Almost from disk)
- Conflict version
- Huge of disk duplication
- Conflict & dependency still exist

Existing Technology

- <u>Production Environment</u>
- Day 1: Application 1: Implement





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- IIS 8
- .Net FrameWork 3.5

- MariaDB 5.1

- Day 2: Application 2: Need to implement
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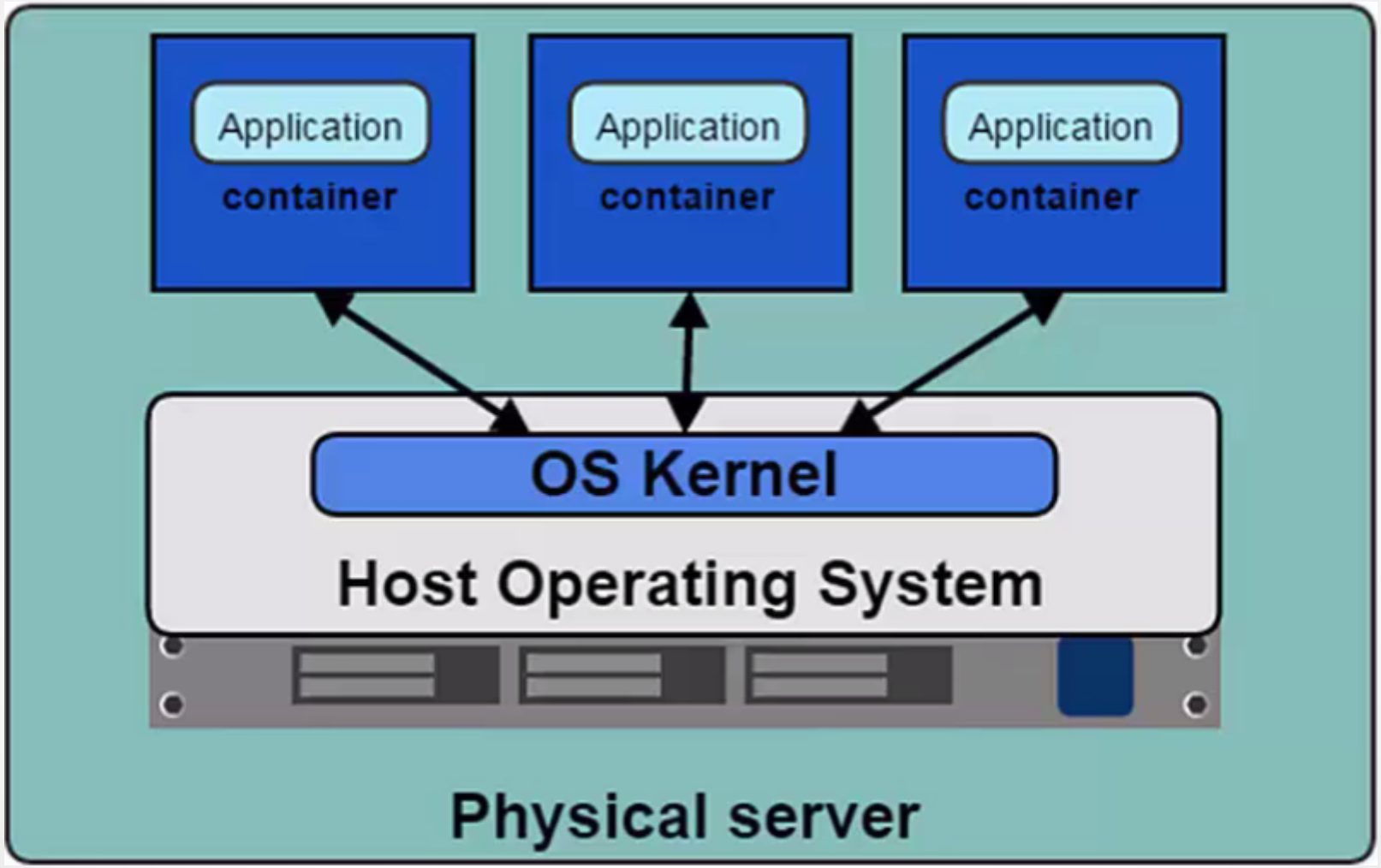
- So… The problem still exist.

What is docker ?



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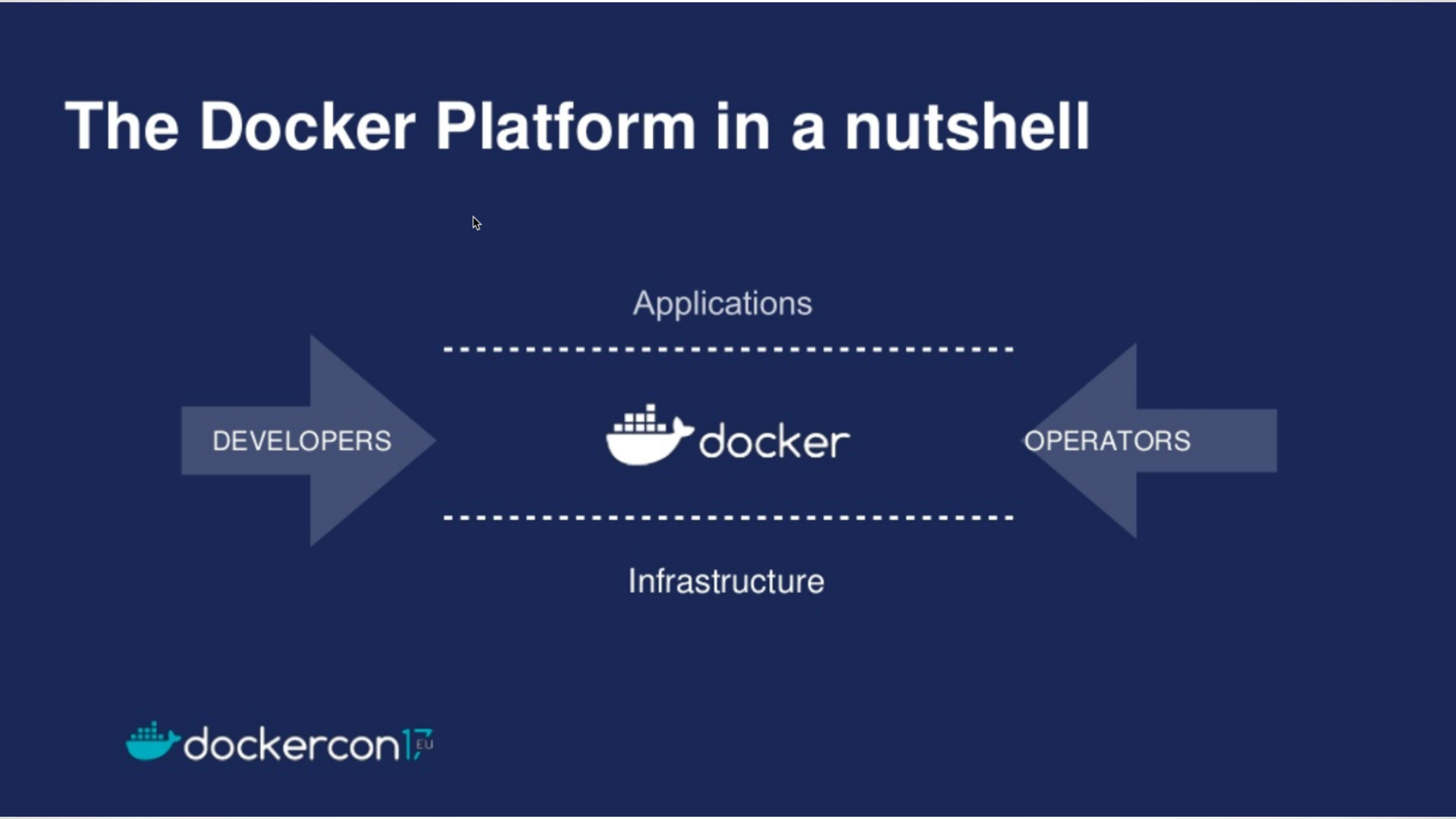


What is docker ?

Core Principles of the Docker Platform

INDEPENDENCE

OPENNESS

SIMPLICITY

dockercon17 EU

docker

What is docker ?

- Docker คือ open platform solution ที่ทำงานภายใต้คอนเซ็ปต์ของ container virtualize technology (operating -system –level virtualization)
- ผู้ใช้สามารถสร้างสภาพแวดล้อมเพื่อใช้ในพัฒนาโปรแกรมและส่งมอบเพื่อใช้งานในสภาพเดียวกัน
- Build, Ship, Run
- เหมาะสำหรับ Developer, DevOps, Architecture, Engineer
- เขียนด้วยภาษา Go
- รองรับการติดตั้งบนบนลินุกซ์ 64 บิต (kernel 3.1.0) (Official)
  - Ubuntu
  - Debian
  - Red Hat Enterprise Linux
  - CentOS
  - Fedora
  - Microsoft Windows Server 2016
  - Suse Linux Enterprise Server
  - Rasberry PI

What is docker ?

Desktop

Platform	Docker CE x86_64	Docker CE ARM	Docker EE
Docker for Mac (macOS)	✓		
Docker for Windows (Microsoft Windows 10)	✓		

Cloud

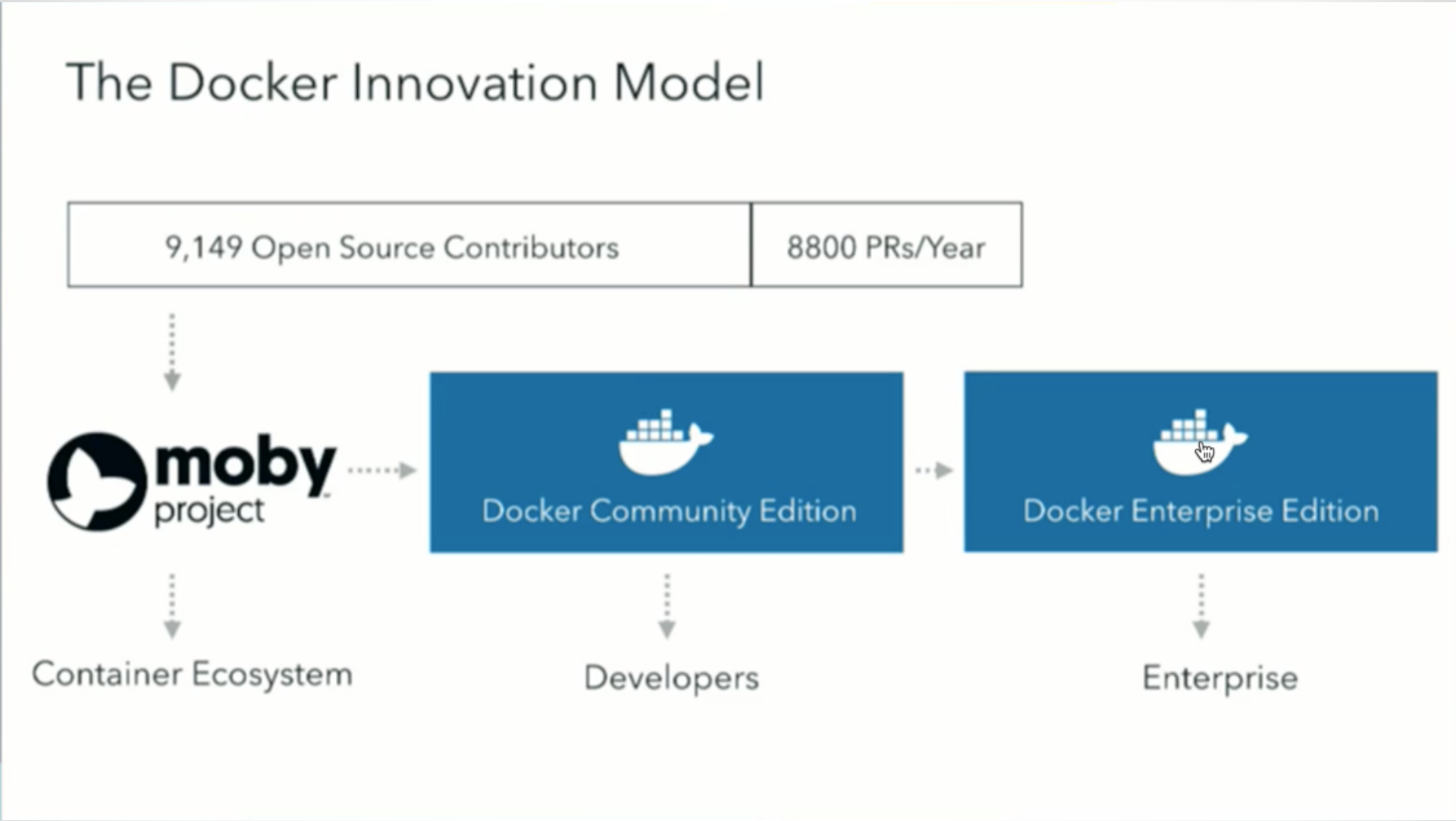
Platform	Docker CE x86_64	Docker CE ARM	Docker EE
Amazon Web Services	✓		✓
Microsoft Azure	✓		✓

See also Docker Cloud for setup instructions for Digital Ocean, Packet, SoftLink, or Bring Your Own Cloud.

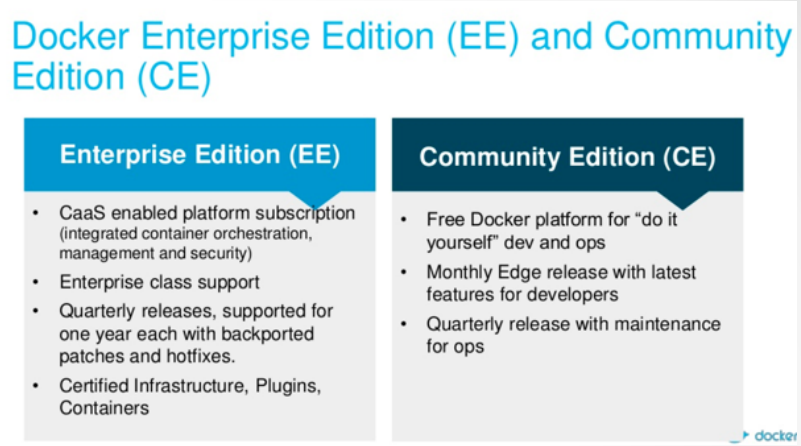
Server

Platform	Docker CE x86_64	Docker CE ARM	Docker CE System Z (s390x)	Docker EE
CentOS	✓			✓
Debian	✓	✓		
Fedora	✓			
Microsoft Windows Server 2016				✓
Oracle Linux				✓
Red Hat Enterprise Linux				✓
SUSE Linux Enterprise Server				✓
Ubuntu	✓	✓	✓	✓

What is docker ?

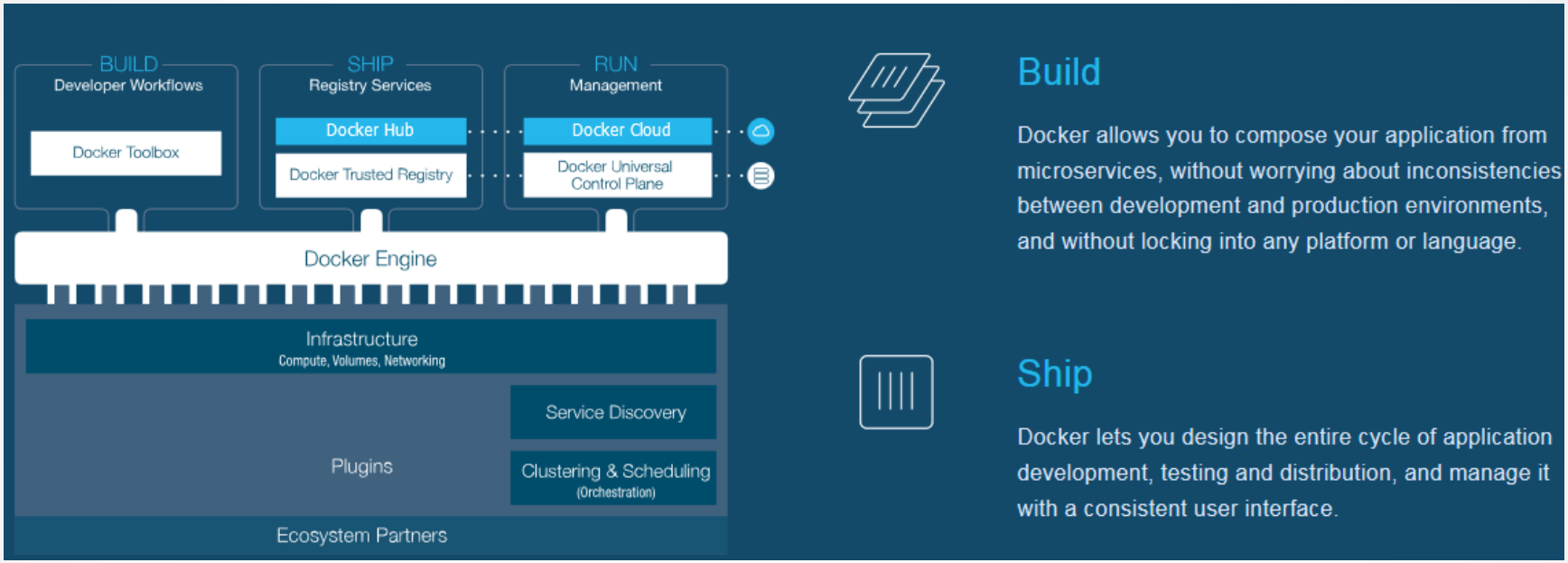


What is docker ?



Ref: https://blog.docker.com/2017/03/docker-online-meetup-recap-docker-enterprise-edition-ee-community-edition-ce/

What is docker ?



What is docker ?

Docker Machine
Automated Docker provisioning

Docker Swarm
Host clustering and container scheduling

Docker Compose
Define multi-container applications

Docker Registry
Open source Docker image distribution (not included)

Docker Engine
Creates and runs Docker containers

Kitematic
Desktop GUI for Docker

Operating-system-level virtualization

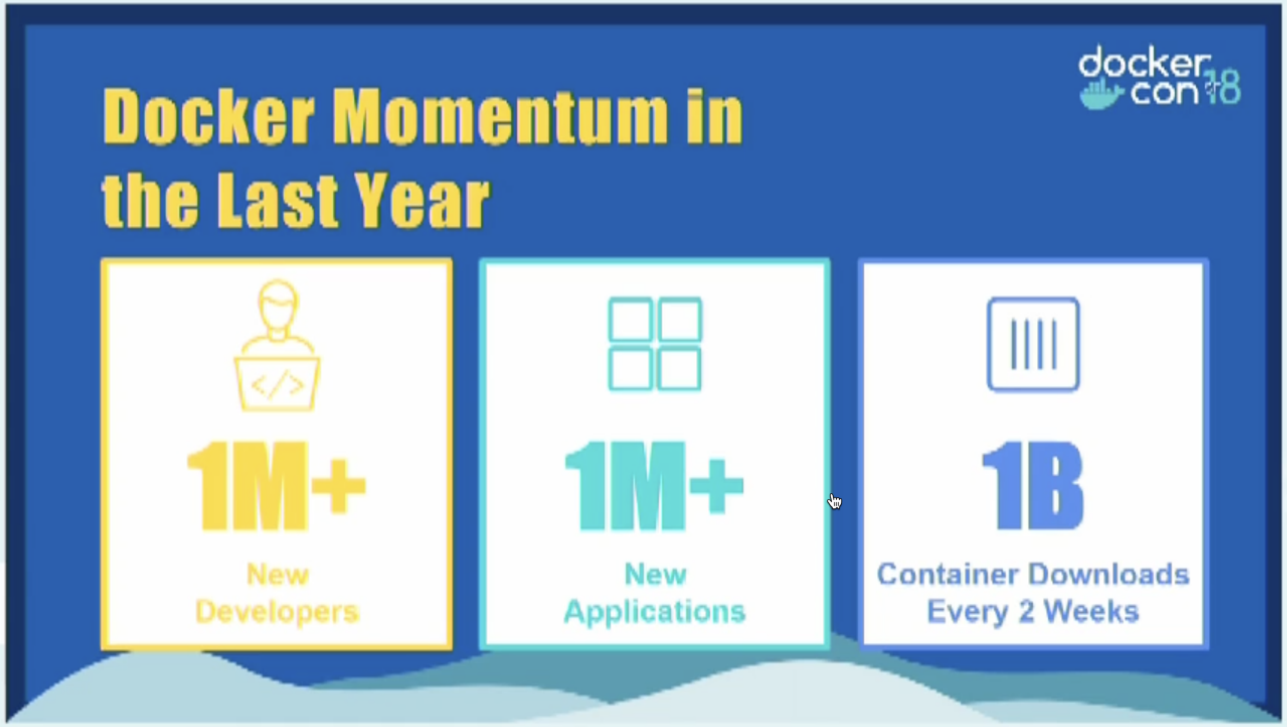
Mechanism	Operating system	License	Available since/between	Features									
				File system isolation	Copy on Write	Disk quotas	I/O rate limiting	Memory limits	CPU quotas	Network isolation	Nested virtualization	Partition checkpointing and live migration	Root privilege isolation
chroot	most UNIX-like operating systems	varies by operating system	1982	Partial[a]	No	No	No	No	No	No	Yes	No	No
Docker	Linux[7]	Apache License 2.0	2013	Yes	Yes	Not directly	Not directly	Yes	Yes	Yes	Yes	No	No
Linux-VServer (security context)	Linux	GNU GPLv2	2001	Yes	Yes	Yes	Yes[b]	Yes	Yes	Partial[c]	?	No	Partial[d]
lmctfy	Linux	Apache License 2.0	2013	Yes	Yes	Yes	Yes[b]	Yes	Yes	Partial[c]	?	No	Partial[d]
LXC	Linux	GNU GPLv2	2008	Yes[9]	Yes	Partial[e]	Partial[f]	Yes	Yes	Yes	Yes	No	Yes[9]
LXD	Linux	Apache License 2.0	2015	Yes	Yes	Partial(see LXC)	Partial(see LXC)	Yes	Yes	Yes	Yes	Partial[g]	Yes
OpenVZ	Linux	GNU GPLv2	2005	Yes	No	Yes	Yes[h]	Yes	Yes	Yes[i]	Partial[j]	Yes	Yes[k]
Virtuozzo	Linux, Windows	Proprietary	2000[14]	Yes	Yes	Yes	Yes[l]	Yes	Yes	Yes[i]	Partial[m]	Yes	Yes
Solaris Containers (Zones)	illumos (OpenSolaris), Solaris	CDDL, Proprietary	2004	Yes	Yes (ZFS)	Yes	Partial[n]	Yes	Yes	Yes[o][17][18]	Partial[p]	Partial[q][r]	Yes[s]
FreeBSD jail	FreeBSD	BSD License	2000[20]	Yes	Yes (ZFS)	Yes[t]	No	Yes[21]	Yes	Yes[22]	Yes	No	Yes[23]
sysjail	OpenBSD, NetBSD	BSD License	2006–2009 (As of March 3, 2009, it is no longer supported)	Yes	No	No	No	No	No	Yes	No	No	?
WPARs	AIX	Proprietary	2007	Yes	No	Yes	Yes	Yes	Yes	Yes[u]	No	Yes[25]	?
HP-UX Containers (SRP)[26]	HPUX	Proprietary	2007	Yes	No	Partial[v]	Yes	Yes	Yes	Yes	?	Yes	?
iCore Virtual Accounts	Windows XP	Proprietary/Freeware	2008	Yes	No	Yes	No	No	No	No	?	No	?
Sandboxie	Windows	Proprietary/Shareware	2004	Yes	Yes	Partial	No	No	No	Partial	No	No	Yes
Spoon	Windows	Proprietary	2012	Yes	Yes	No	No	No	No	Yes	No	No	Yes
VMware ThinApp	Windows	Proprietary	2008	Yes	Yes	No	No	No	No	Yes	No	No	Yes

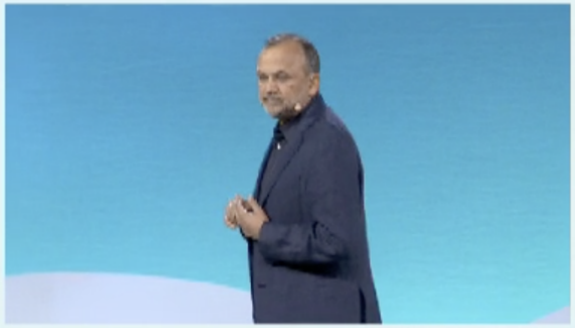
Reference: https://en.wikipedia.org/wiki/Operating-system-level_virtualization

Docker History

- A dotCloud (PAAS provider) project
- Initial commit January 18, 2013
- Docker 0.1.0 released March 25, 2013
- 18,600+ github stars, 3800+ forks,740 Contributors…. and continues
- dotCloud pivots to docker inc. October 29, 2013

Growth of Docker (2017 stats)





docker con 2018 SF

docker

Growth of Docker (Now)

docker con 2018 SF

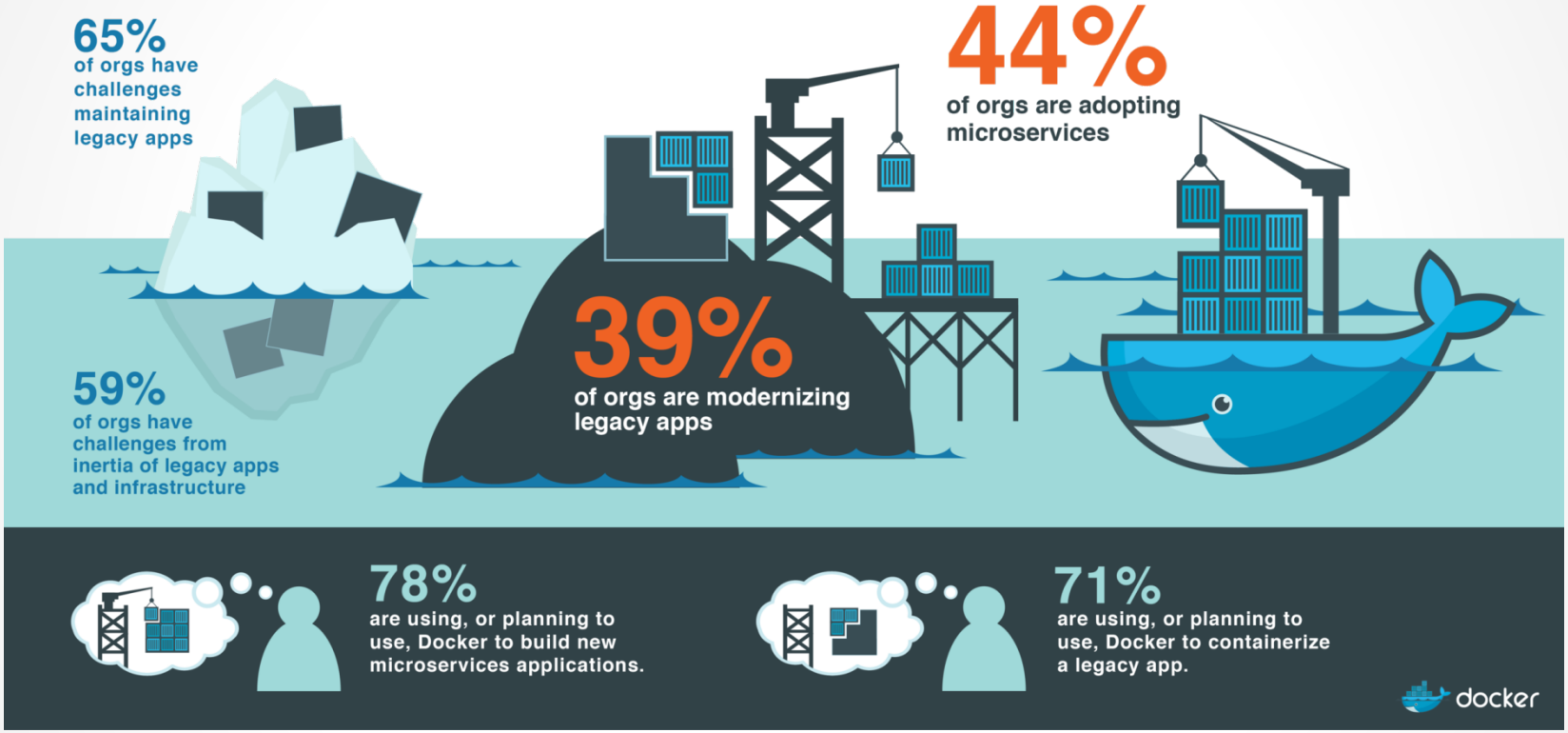
docker

Growth of Docker (Now)

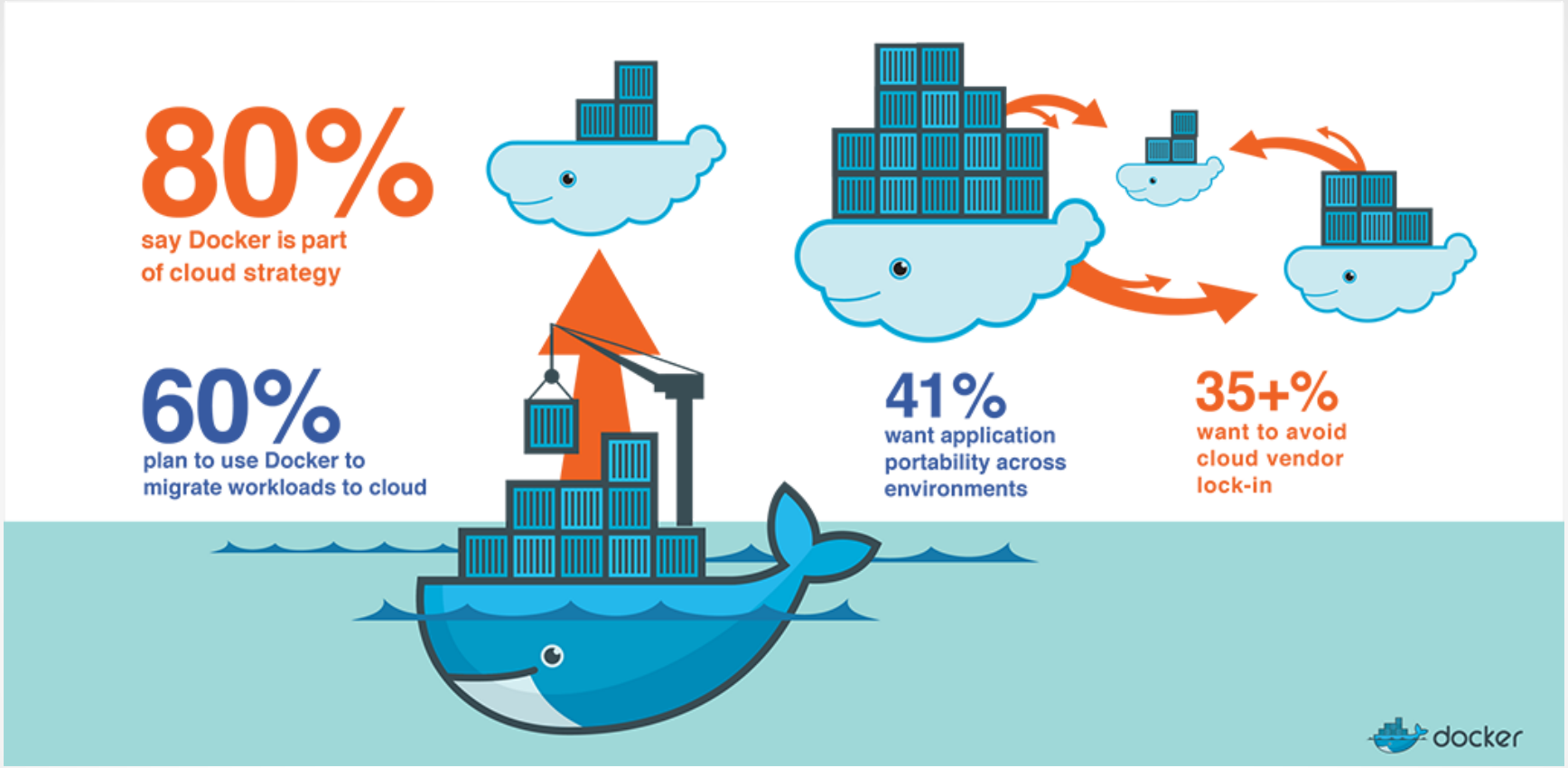
docker con 2018 SF

docker

Trend of Modernize Application



Could Strategy Survey



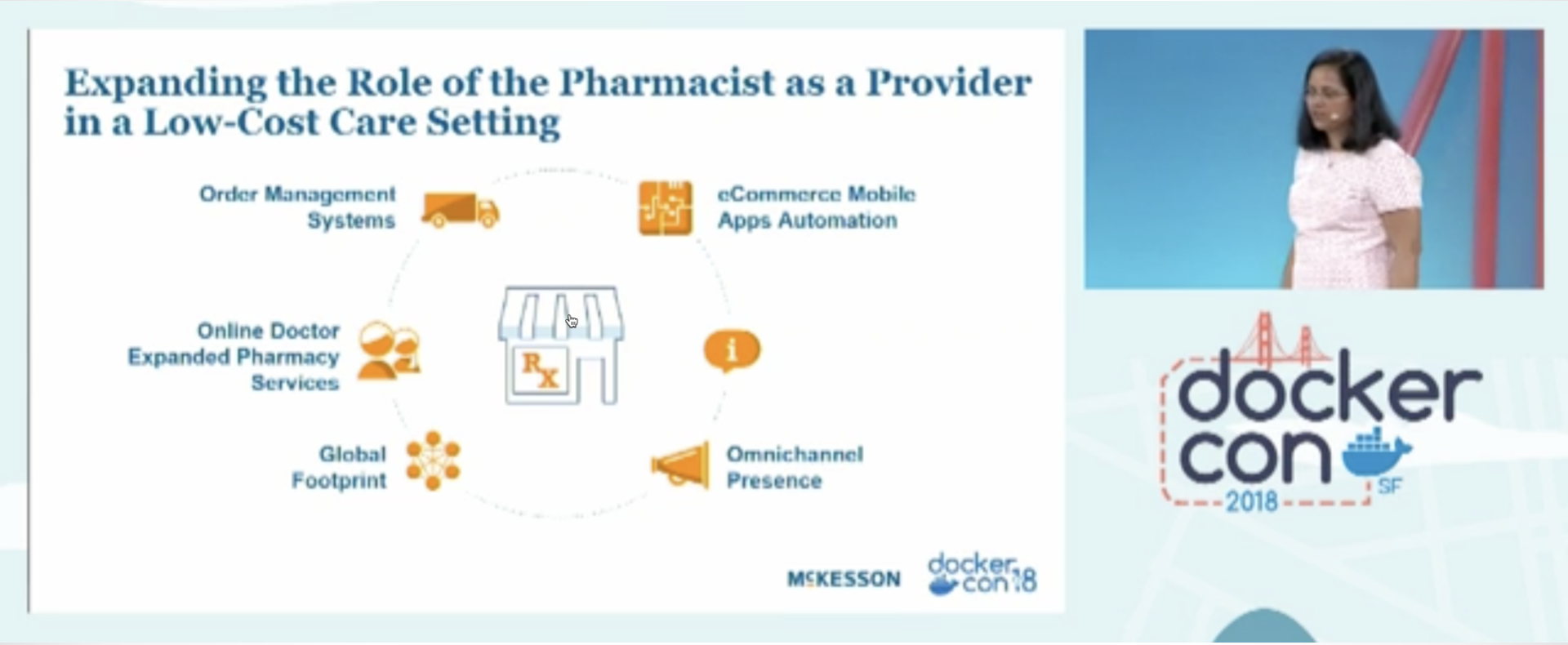
Docker in Thailand

- 3 Enterprise Communication on Implement Phase
- 2 Bank on R&D

Who use docker now ?

Who use docker now ?

Who use docker now ?

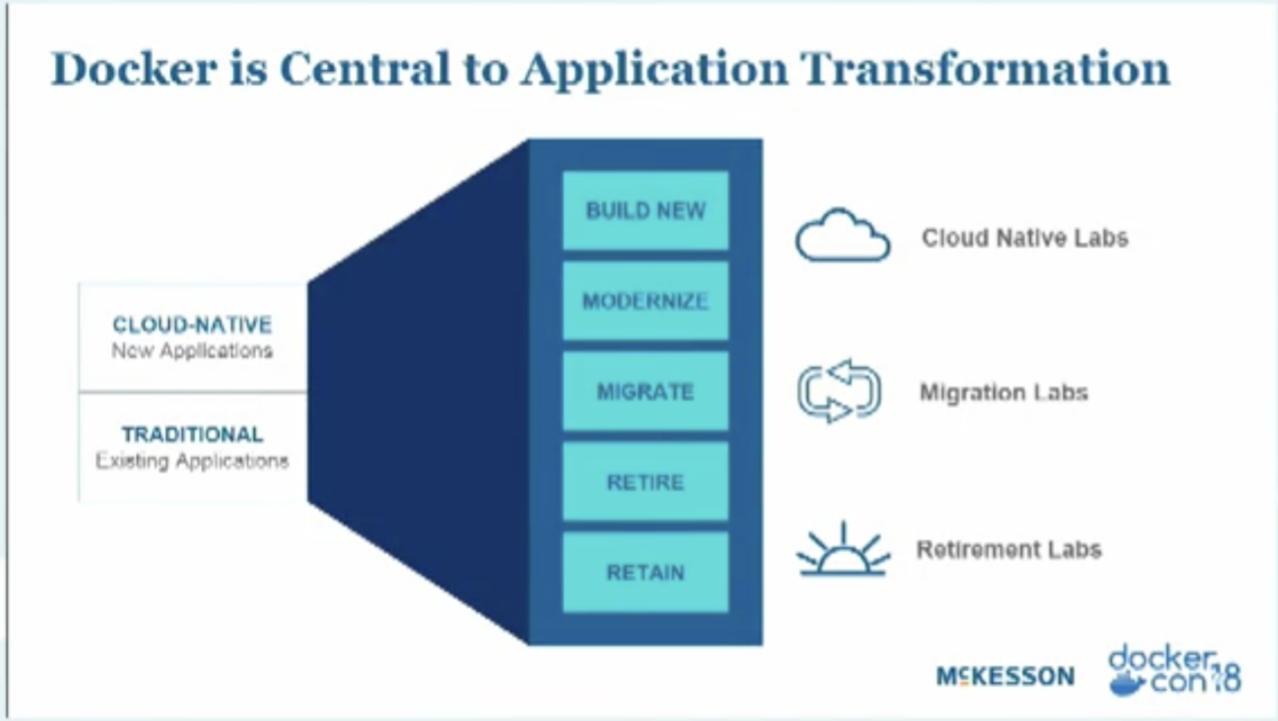


Who use docker now ?

docker con 2018 SF

docker

Who use docker now ?



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docker

Who use docker now ?

Who use docker now ?

Who use docker now ?

PayPal

Stage 1 Benefits

Decouple

Standardize deployments around Docker containers, rather than individual processes built around app stacks.

Modernize

With apps & dependencies Dockerized, move to modern OS & kernel.

10-20% performance boost to some apps for free.

150,000 containers **700+** apps **18** months

0 code changes

docker

Who use docker now ?

Later Stage Benefits

PayPal

1 Resource Efficiency

50% fewer vCPUs in QA

25% fewer vCPUs in Prod

2 Security

Revoke access to Prod

Automate patching

3 No VM Provisioning

Scale containers (fast)

Not VMs (slow)

4 Availability

Increased resiliency

"Anything can run anywhere"

5 Availability Zones

Application deployments of an entire AZ in a few hours.

6 Consistent Platform

Consistent tooling

Standard playbook across app stacks

> 50% boost

to developer local build-deploy-test speed

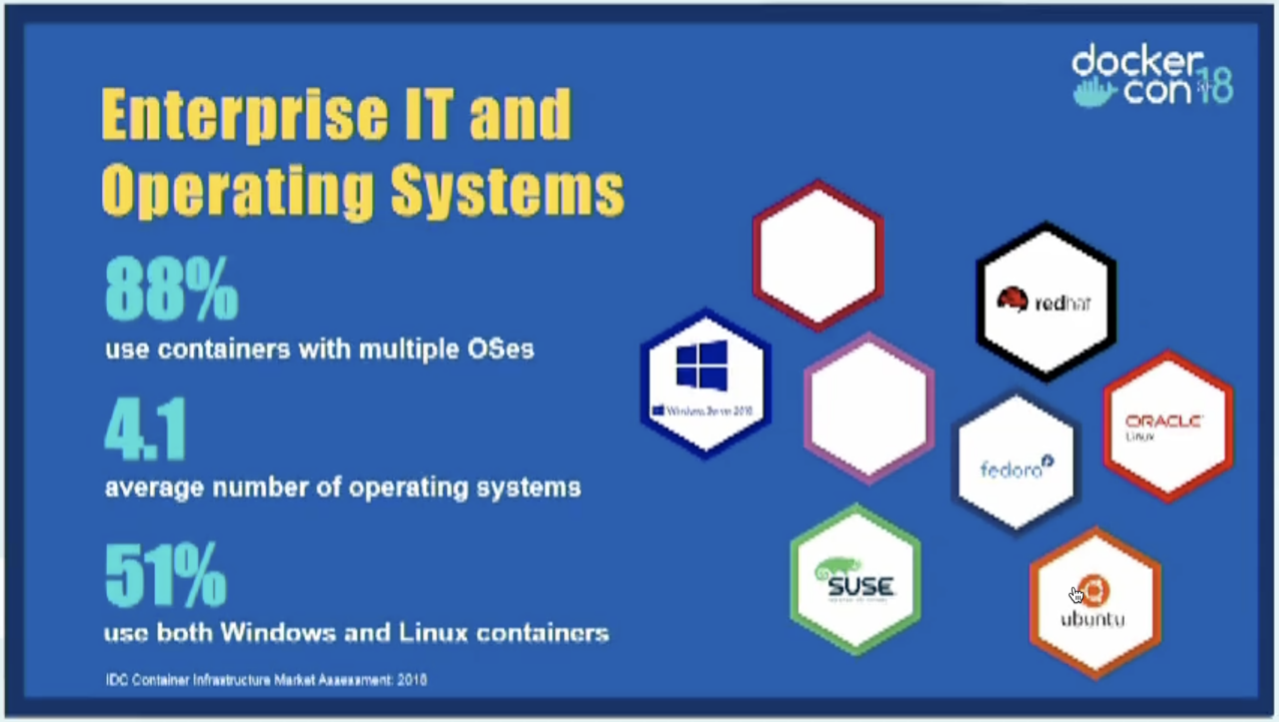
Developer Freedom

for greenfield apps

docker

Who use docker now ?

Who use docker now ?



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docker

Who use docker now ?

About MetLife

- Global Fortune 500® 128 Company
- 100 Million Customers
- $500 Billion total assets under investment
- $63 Billion in revenue in 2017

dockercon17

MetLife

Even Old Elephants Can Dance

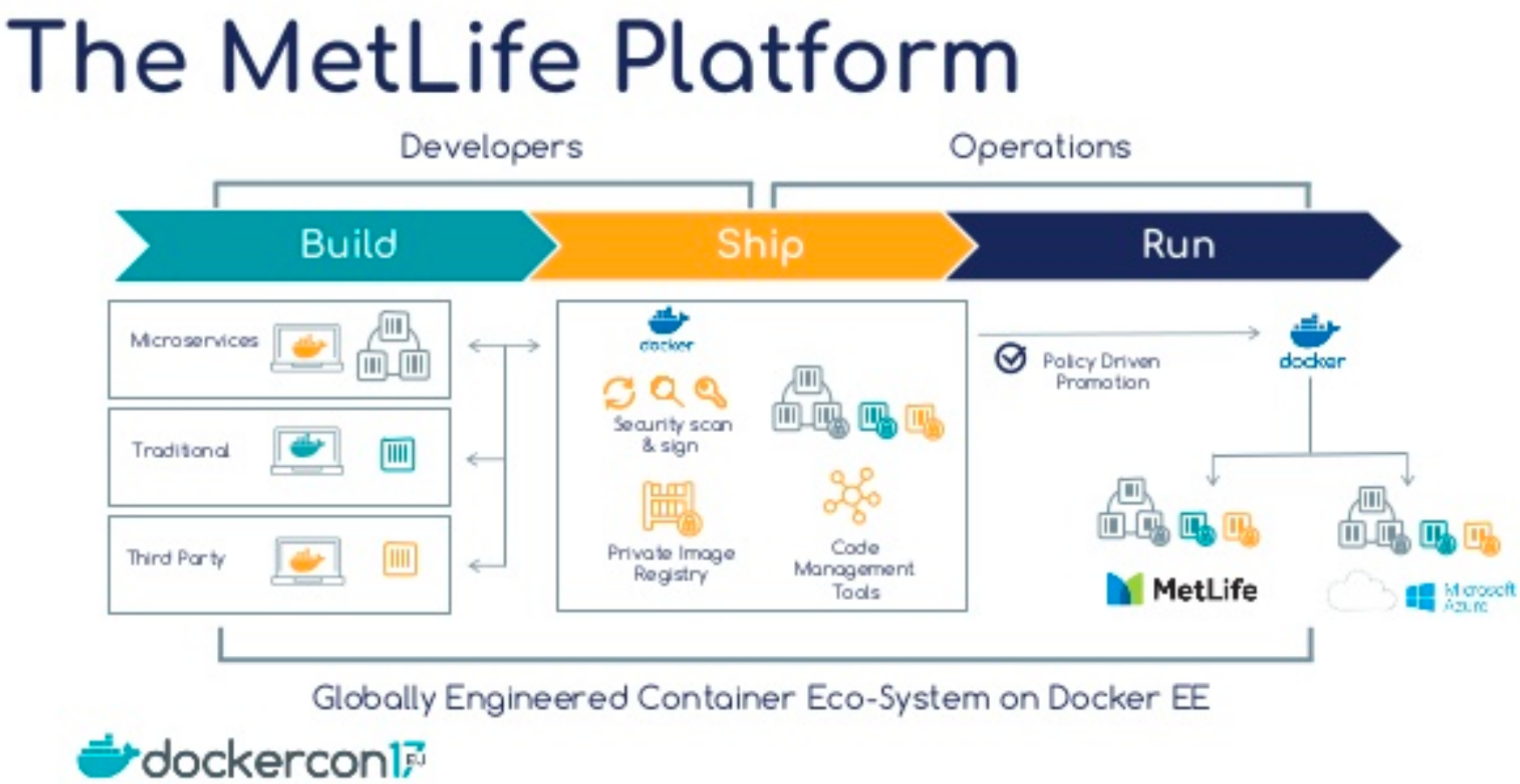
- Concept to production in 5 months
- The spark of innovation is spreading at MetLife
- Docker and DevOps change your culture
- Check out Tim Tyler's session

11:15 AM - Docker 0 to 60 in 5 Months: How a Traditional Fortune 40 Company Turns on a Dime

dockercon17

docker

Who use docker now ?



Who use docker now ?

US Infrastructure Reduction Forecast

593 Applications

10%
Of the total portfolio

-70%	+	-67%	+	10x	=	-66%
VMs		Cores		Average CPU Utilization		Cost Reduction

dockercon17 EU

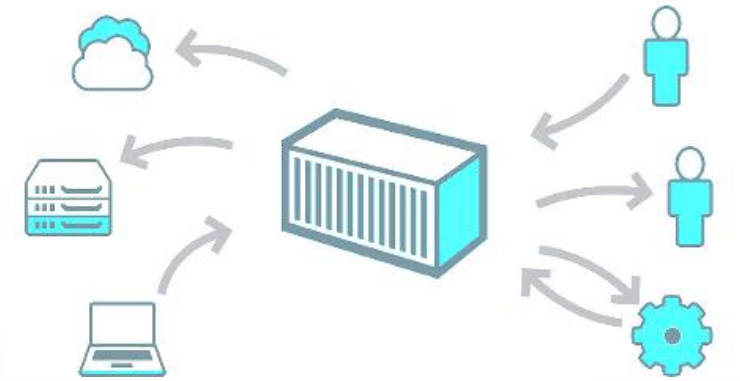
MetLife

docker

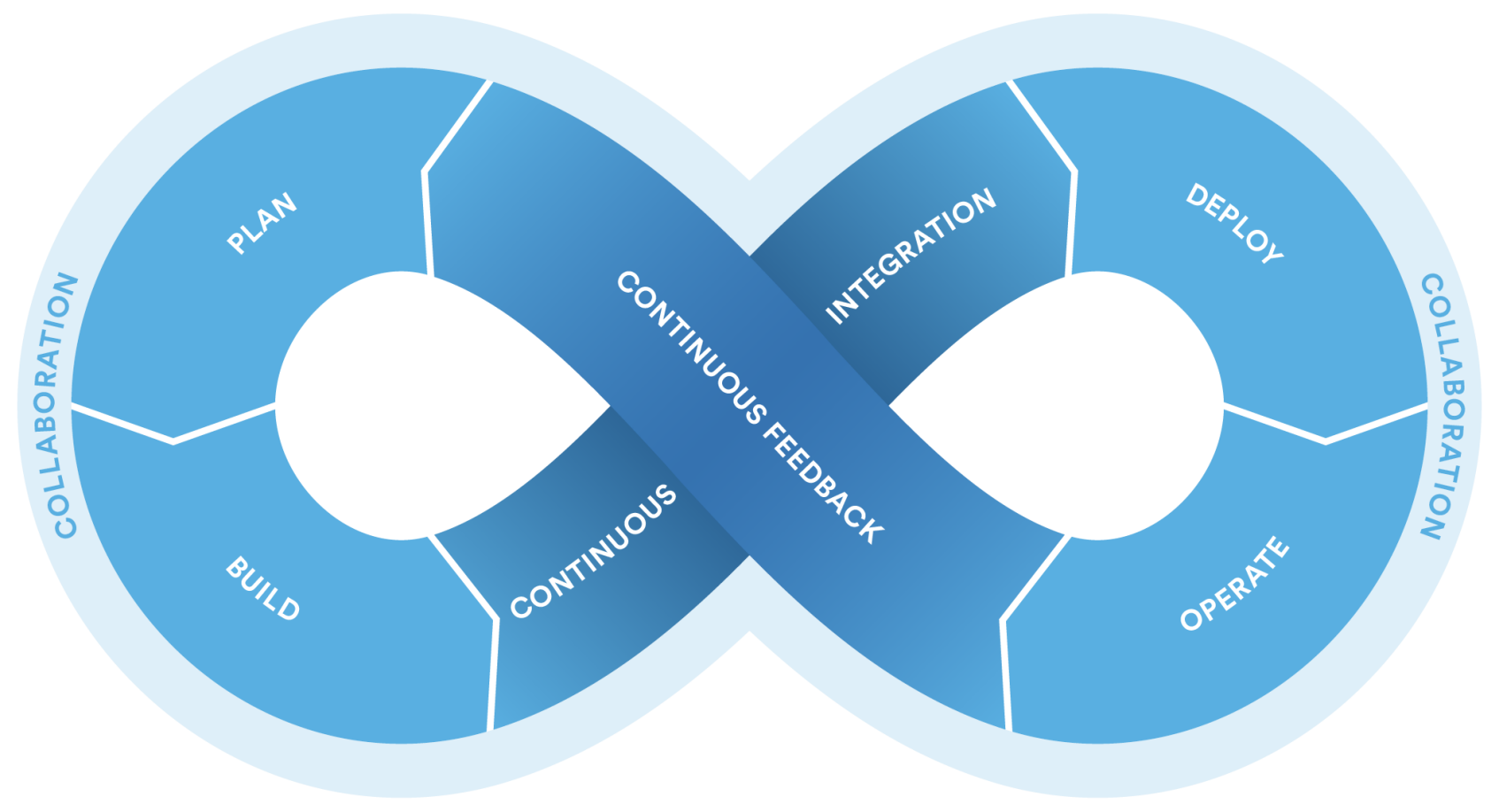
Container Life Cycle

- Developer
  - สร้าง template สำหรับโปรแกรม (build)
  - เริ่มรัน template สำหรับพัฒนาโปรแกรม (run)
  - พัฒนาเสร็จเรียบร้อย สั่ง save version เพื่อเตรียมนำขึ้นใช้งาน (commit)

- Operation
  - เริ่มรัน template ที่ได้รับจาก developer (run) บนเครื่อง production
  - หยุดการให้บริการโปรแกรม (stop, kill)
  - ลบโปรแกรมออกจากเครื่อง production (rm, rmi)

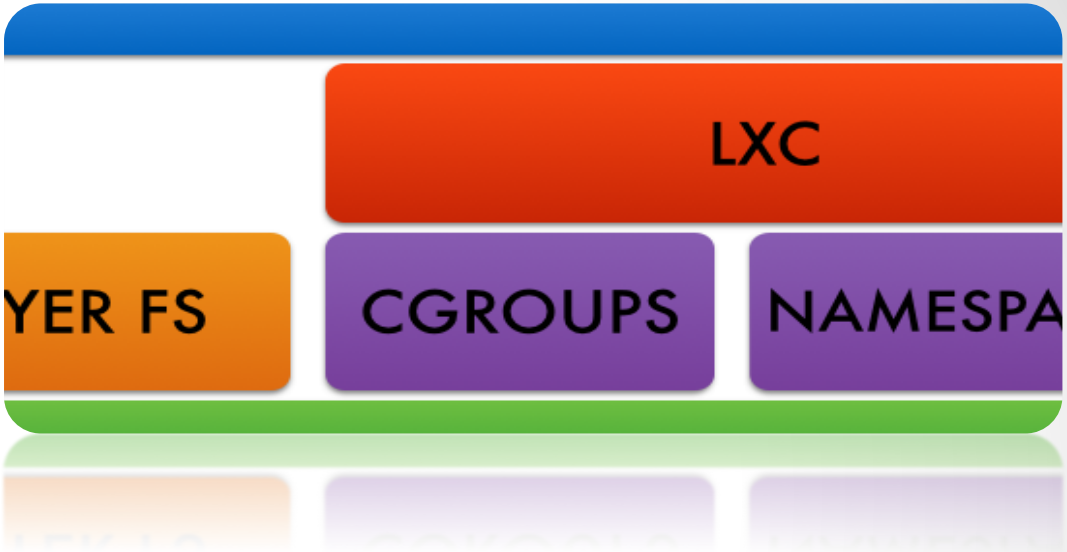


Container Life Cycle



Docker Architecture

- Docker Engine
  - Docker Client
    (CLI & GUI)
  - Docker Daemon
- Docker Hub
  - Cloud service
  - Private Registry
- Docker images
- Docker containers

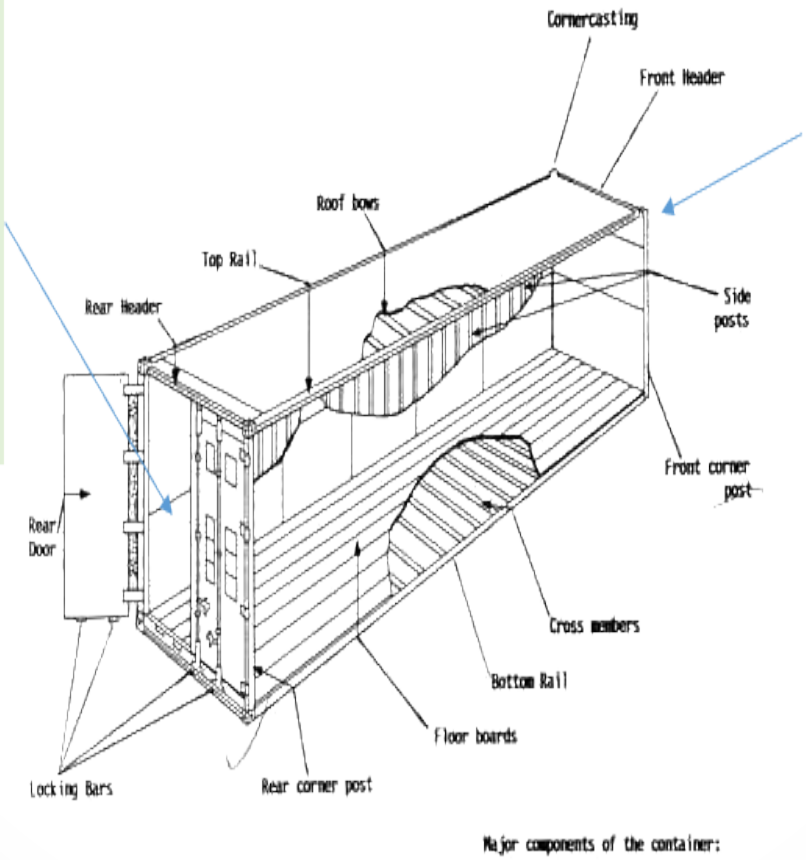


What Cool of Docker ?

- รวบรวมทุกสิ่งที่จำเป็นต้องใช้ในการรันโปรแกรมไว้ใต้ container (component, library etc)
- ขนาดไฟล์ container มีขนาดเล็กมาก (เทียบกับขนาดไฟล์ของ virtual machine หรือ os)
- มี overhead ในการรันโปรแกรมทรัพยากรต่ำ
- ลดระยะเวลาในการติดตั้งและทดสอบโปรแกรม
- ส่งมอบโปรแกรมไปทำงานบนเครื่องแม่ข่าย production ได้โดยไม่มีความจำเป็นต้องปรับแต่งระบบใหม่ (zero configure)
- สามารถรันโปรแกรมได้บนเครื่องแม่ข่ายทุกๆระบบปฏิบัติการฯ ที่ติดตั้ง docker ได้
- สามารถ scale-out ได้ง่ายในอนาคต
- World open for docker !!!

Separate of Concern

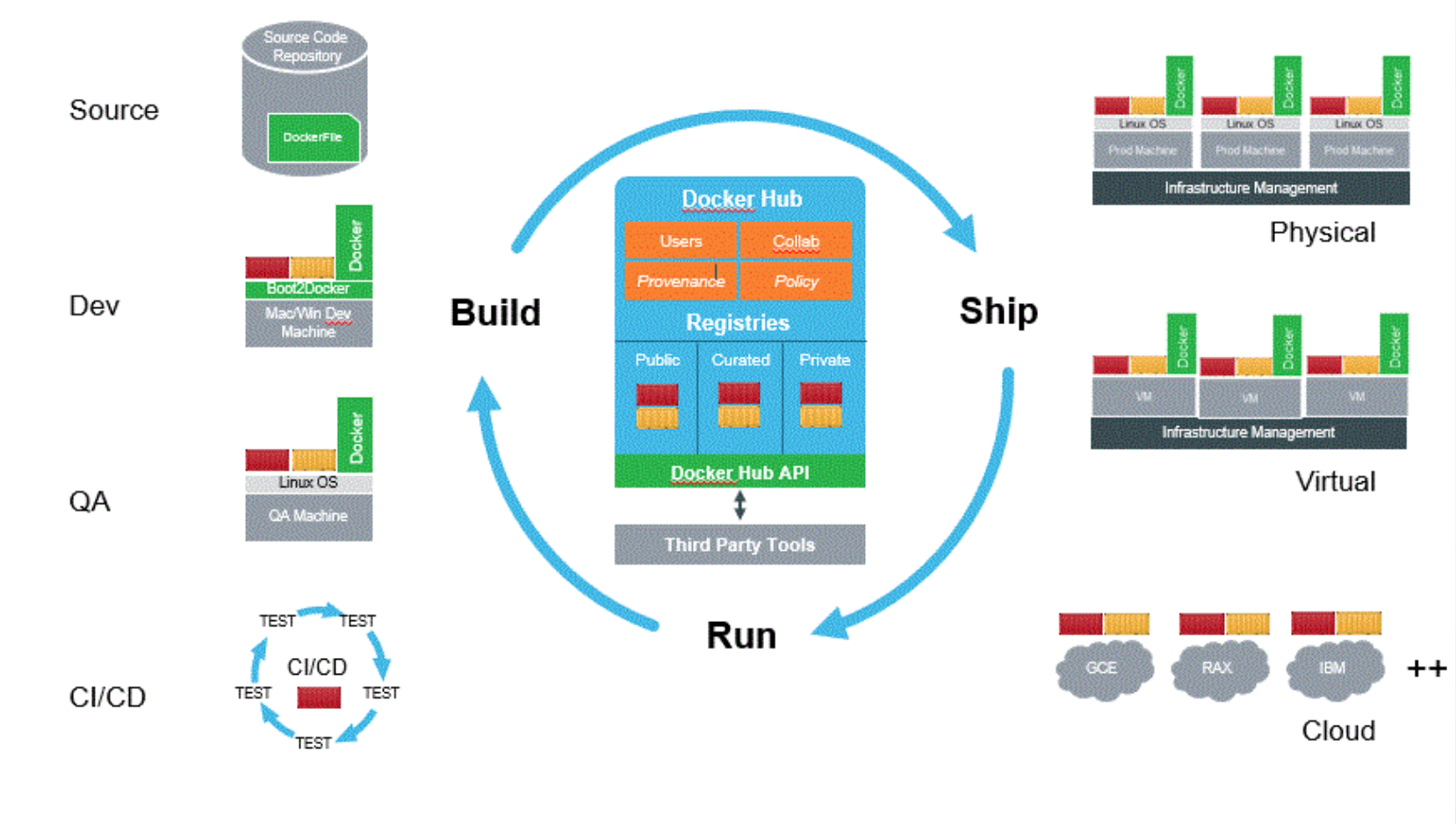
- Dan the Developer
  - Worries about what's "inside" the container
    - His code
    - His Libraries
    - His Package Manager
    - His Apps
    - His Data
  - All Linux servers look the same



- Oscar the Ops Guy
  - Worries about what's "outside" the container
    - Logging
    - Remote access
    - Monitoring
    - Network config
  - All containers start, stop, copy, attach, migrate, etc. the same way

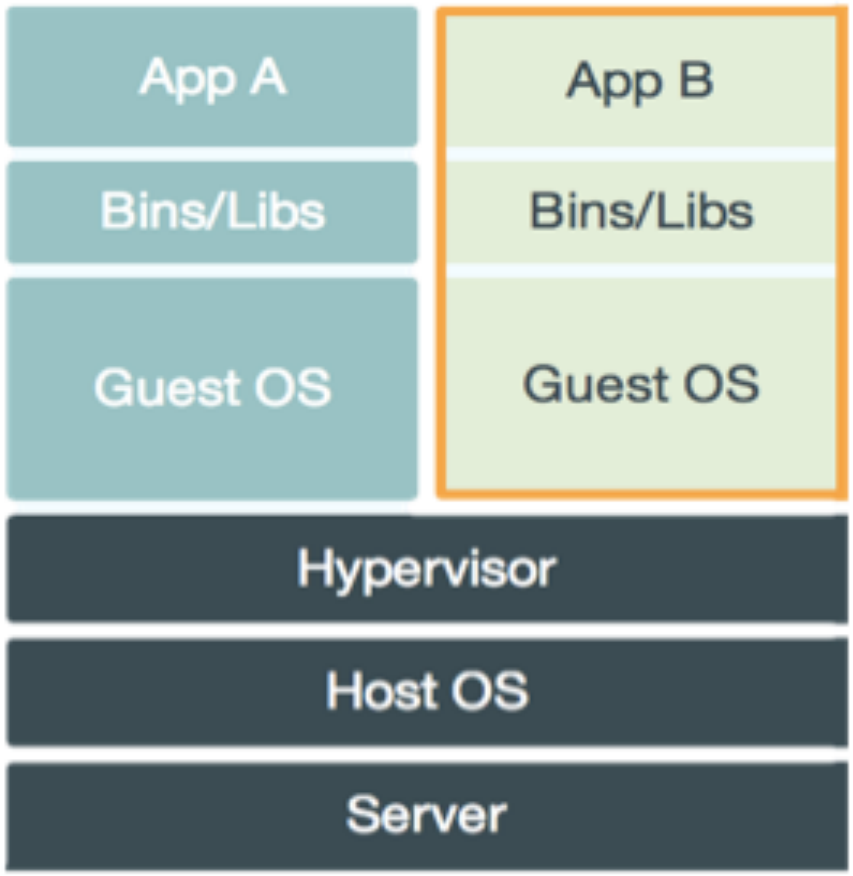
Benefit of docker for DevOps

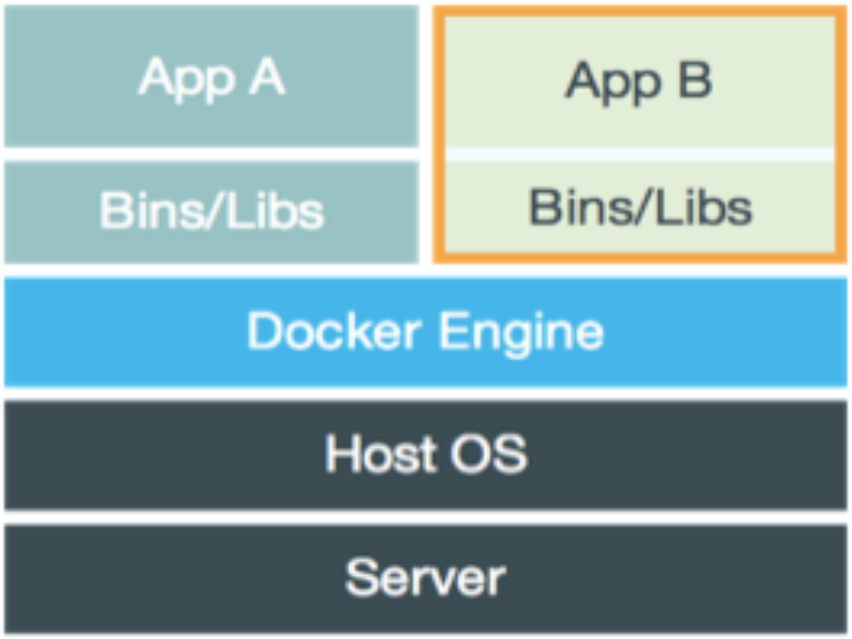
- Build-Ship-Run



Present by: Praparn L. (eva10409@gmail.com)

Docker vs VMWare





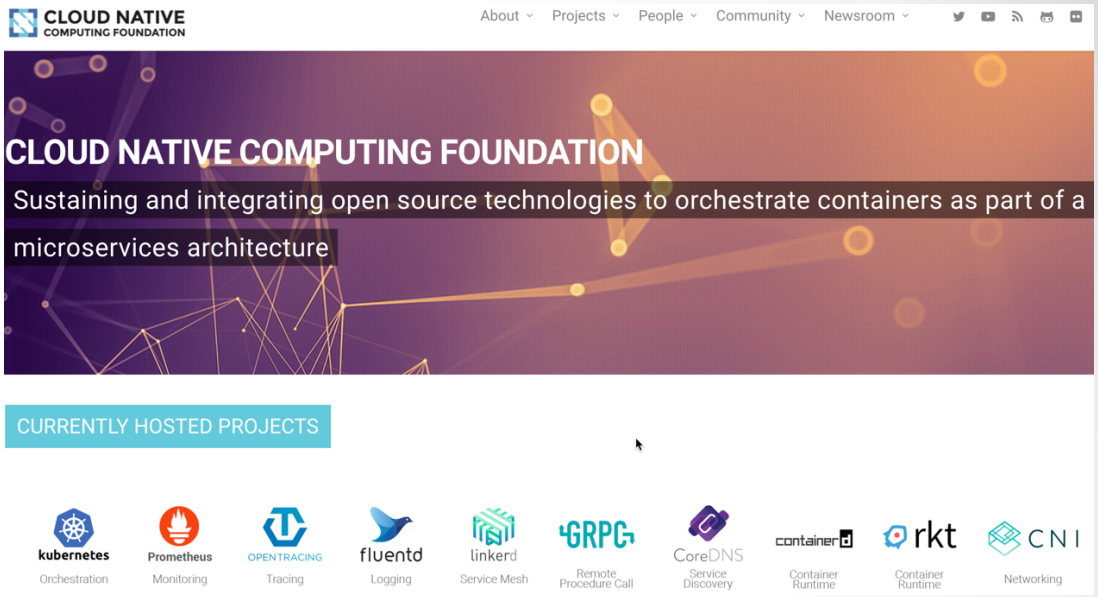
Docker vs VMWare

Docker Version

```
docker@labdocker:~$ docker version
Client:
 Version:      18.05.0-ce
 API version:  1.37
 Go version:   go1.9.2
 Git commit:   f150324
 Built:        Wed May  9 22:11:29 2018
 OS/Arch:      linux/amd64
 Experimental: false
 Orchestrator: swarm

Server:
 Engine:
  Version:      18.05.0-ce
  API version:  1.37 (minimum version 1.12)
  Go version:   go1.10.1
  Git commit:   f150324
  Built:        Wed May  9 22:20:42 2018
  OS/Arch:      linux/amd64
  Experimental: false
docker@labdocker:~$
```

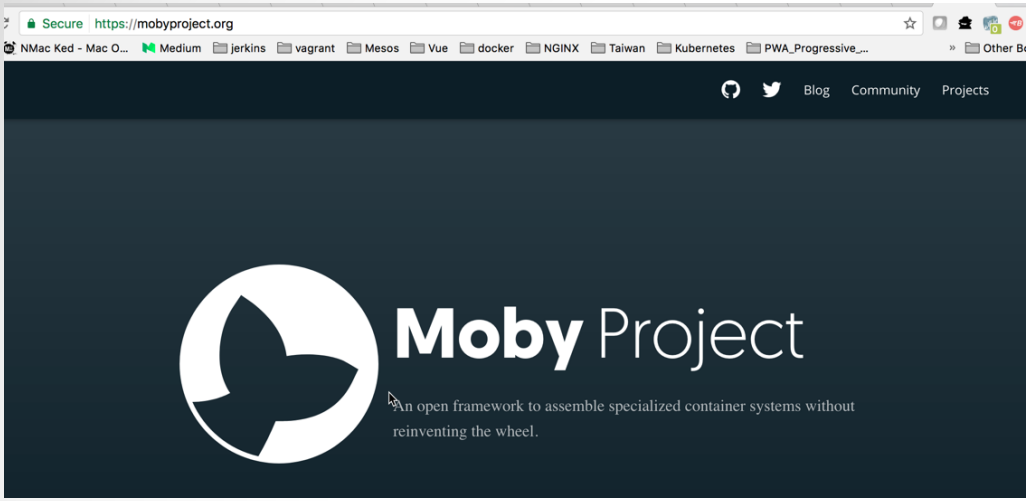
```
docker@labdocker:~$ docker system info
Containers: 1
 Running: 0
 Paused: 0
 Stopped: 1
Images: 10
Server Version: 18.05.0-ce
Storage Driver: aufs
 Root Dir: /mnt/sda1/var/lib/docker/aufs
 Backing Filesystem: extfs
 Dirs: 46
 Dirperm1 Supported: true
Logging Driver: json-file
Cgroup Driver: cgroupfs
Plugins:
 Volume: local
 Network: bridge host macvlan null overlay
 Log: awslogs fluentd gcplogs gelf journald json-file logentries splunk syslog
Swarm: inactive
Runtimes: runc
Default Runtime: runc
Init Binary: docker-init
containerd version: 773c489c9c1b21a6d78b5c538cd395416ec50f88
runc version: 4fc53a81fb7c994640722ac585fa9ca548971871
init version: 949e6fa
Security Options:
 seccomp
  Profile: default
Kernel Version: 4.9.93-boot2docker
Operating System: Boot2Docker 18.05.0-ce (TCL 8.2.1); HEAD : b5d6989 - Thu May 10 16:35:28 UTC 2018
OSType: linux
Architecture: x86_64
CPUs: 1
Total Memory: 995.6MiB
Name: labdocker
ID: Z3D3:FVYR:3335:3ZHR:AGTV:JZLH:WZ3Y:REFA:L4BY:J4Z6:NSTQ:EL6C
Docker Root Dir: /mnt/sda1/var/lib/docker
Debug Mode (client): false
Debug Mode (server): false
Registry: https://index.docker.io/v1/
Labels:
 provider=virtualbox
Experimental: false
Insecure Registries:
 127.0.0.0/8
Live Restore Enabled: false

docker@labdocker:~$
```

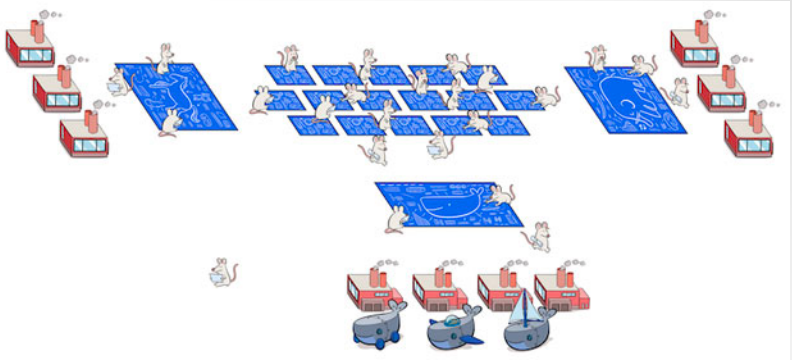
What's New

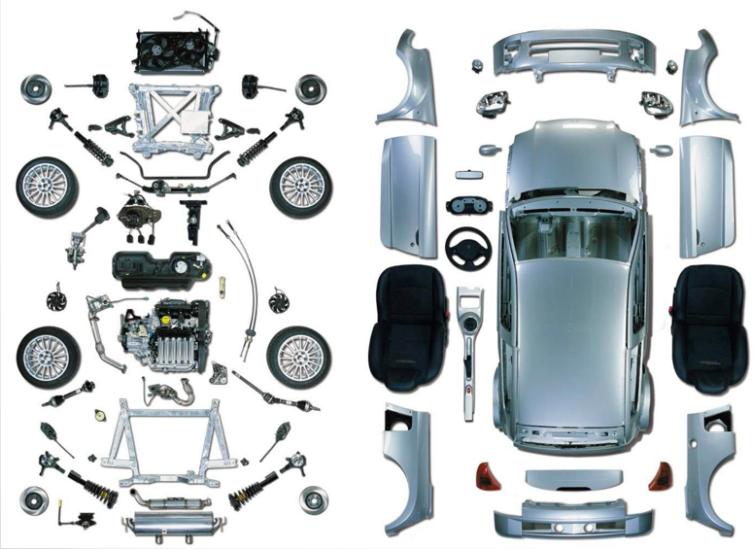


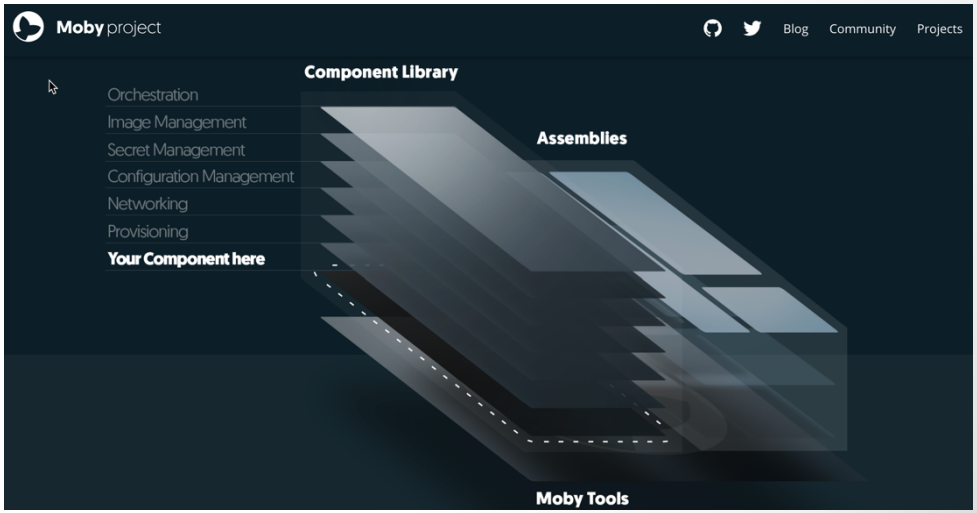
Docker: The Next-Gen of Virtualization

What's New









Docker: The Next-Gen of Virtualization

What's New

Docker Pricing Plans

	COMMUNITY EDITION	ENTERPRISE EDITION BASIC	ENTERPRISE EDITION STANDARD	ENTERPRISE EDITION ADVANCED
Container engine and built in orchestration, networking, security	✓	✓	✓	✓
Docker Certified Infrastructure, Plugins and ISV Containers		✓	✓	✓
Image Management (private registry, caching)	Cloud hosted repos		✓	✓
Docker Datacenter Integrated container app management			✓	✓
Docker Datacenter Multi-tenancy with RBAC, LDAP/AD support			✓	✓
Integrated secrets mgmt, image signing policy			✓	✓
Image security scanning	Preview			✓
Support	Community Support	Business Day or Business Critical	Business Day or Business Critical	Business Day or Business Critical

What's News

Stable releases

18.03.1-ce (2018-04-26)

Client

- Fix error with merge compose file with networks docker/cli#983
- Fix docker stack deploy re-deploying services after the service was updated with `--force` docker/cli#963
- Fix docker version output alignment docker/cli#965

Runtime

- Fix AppArmor profiles not being applied to `docker exec` processes moby/moby#36466
- Don't sort plugin mount slice moby/moby#36711
- Daemon/cluster: handle partial attachment entries during configure moby/moby#36769
- Bump Golang to 1.9.5 moby/moby#36779 docker/cli#986
- Daemon/stats: more resilient cpu sampling moby/moby#36519
- Containerd: update to 1.0.3 release moby/moby#36749
- Fix Windows layer leak when write fails moby/moby#36728
- Don't make container mount unbindable moby/moby#36768
- Fix Daemon panics on container export after a daemon restart moby/moby/36586
- Fix digest cache being removed on autherrors moby/moby#36509
- Make sure plugin container is removed on failure moby/moby#36715
- Copy: avoid using all system memory with authz plugins moby/moby#36595
- Relax some libcontainerd client locking moby/moby#36848
- Update `hcsshim` to v0.6.10 to address CVE-2018-8115

Swarm Mode

- Increase raft Election tick to 10 times Heartbeat tick moby/moby#36672

Networking

- Gracefully remove LB endpoints from services docker/libnetwork#2112
- Retry other external DNS servers on ServFail docker/libnetwork#2121
- Improve scalabiltiy of bridge network isolation rules docker/libnetwork#2117
- Allow for larger preset property values, do not override docker/libnetwork#2124
- Prevent panics on concurrent reads/writes when calling `changeNodeState` docker/libnetwork#2136

What's News

Secure https://docs.microsoft.com/en-us/sql/linux/quickstart-install-connect-docker

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  - Install & Connect - Ubuntu
  - Run & Connect - Docker
- Concepts
- Samples
- Resources

Download PDF

Run the SQL Server 2017 container image with Docker

2017-7-17 • 7 min to read • Contributors

In this quick start tutorial, you use Docker to pull and run the SQL Server 2017 RC1 container image, mssql-server-linux. Then connect with **sqlcmd** to create your first database and run queries.

This image consists of SQL Server running on Linux based on Ubuntu 16.04. It can be used with the Docker Engine 1.8+ on Linux or on Docker for Mac/Windows.

Note

This quick start specifically focuses on using the mssql-server-linux image. The Windows image is not covered, but you can learn more about it on the mssql-server-windows Docker Hub page.

Prerequisites

- Docker Engine 1.8+ on any supported Linux distribution or Docker for Mac/Windows.
- Minimum of 4 GB of disk space
- Minimum of 4 GB of RAM
- System requirements for SQL Server on Linux.

What's News

Search

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PUBLIC REPOSITORY

microsoft/mssql-server-linux

Last pushed: 21 minutes ago

Repo Info Tags

Tag Name	Compressed Size	Last Updated
rc2	482 MB	21 minutes ago
latest	482 MB	21 minutes ago
rc1	478 MB	16 days ago
ctp2-0	451 MB	2 months ago
ctp2-1	462 MB	2 months ago
ctp1-4	382 MB	5 months ago
ctp1-3	370 MB	6 months ago
ctp1-2	367 MB	6 months ago
ctp1-1	340 MB	6 months ago

What's News

Docker with Swarm and Kubernetes

1 The best enterprise container security and management

2 The best container development workflow

3 Native Kubernetes integration provides full ecosystem compatibility

4 Industry-standard container runtime

Docker Enterprise Edition

Docker Community Edition

kubernetes

SWARM

containerd

dockercon17 EU

docker

What's News

Docker Enterprise Edition

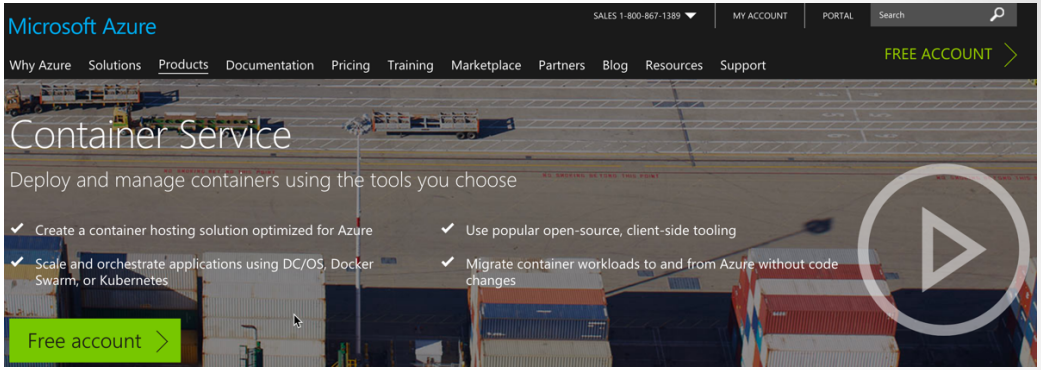
Management for Swarm and Kubernetes

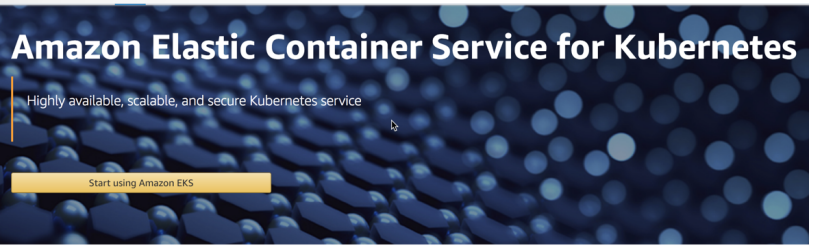
Features		Swarm Support	Kubernetes Support
100% Interoperability	- *Clean upstream integration* - *Full ecosystem compatibility*	✓	✓
Secure Cluster Lifecycle	- *Easy High Availability provisioning* - *Cryptographic node identity*	✓	✓
Secure Supply Chain	- *Registry* - *Content Trust* - *Secure Scanning*	✓	✓
Secure Multi-tenancy	- *Role Based Access Control* - *Authorization, Authentication* - *Node Segmentation*	✓	✓
Management Dashboard		✓	✓
Supported and Certified on Windows Server and Major Linux Distributions		✓	✓

Cloud Support Docker

Amazon Elastic Container Service (Amazon ECS) is a highly scalable, high-performance container orchestration service that supports Docker containers and allows you to easily run and scale containerized applications on AWS. Amazon ECS eliminates the need for you to install and operate your own container orchestration software, manage and scale a cluster of virtual machines, or schedule containers on those virtual machines.

With simple API calls, you can launch and stop Docker-enabled applications, query the complete state of your application, and access many familiar features such as IAM roles, security groups, load balancers, Amazon CloudWatch Events, AWS CloudFormation templates, and AWS CloudTrail logs.





Amazon Elastic Container Service for Kubernetes (Amazon EKS) makes it easy to deploy, manage, and scale containerized applications using Kubernetes on AWS.

Amazon EKS runs the Kubernetes management infrastructure for you across multiple AWS availability zones to eliminate a single point of failure. Amazon EKS is certified Kubernetes conformant so you can use existing tooling and plugins from partners and the Kubernetes community. Applications running on any standard Kubernetes environment are fully compatible and can be easily migrated to Amazon EKS.

Amazon EKS is generally available for all AWS customers.

amazon web services

Windows Azure

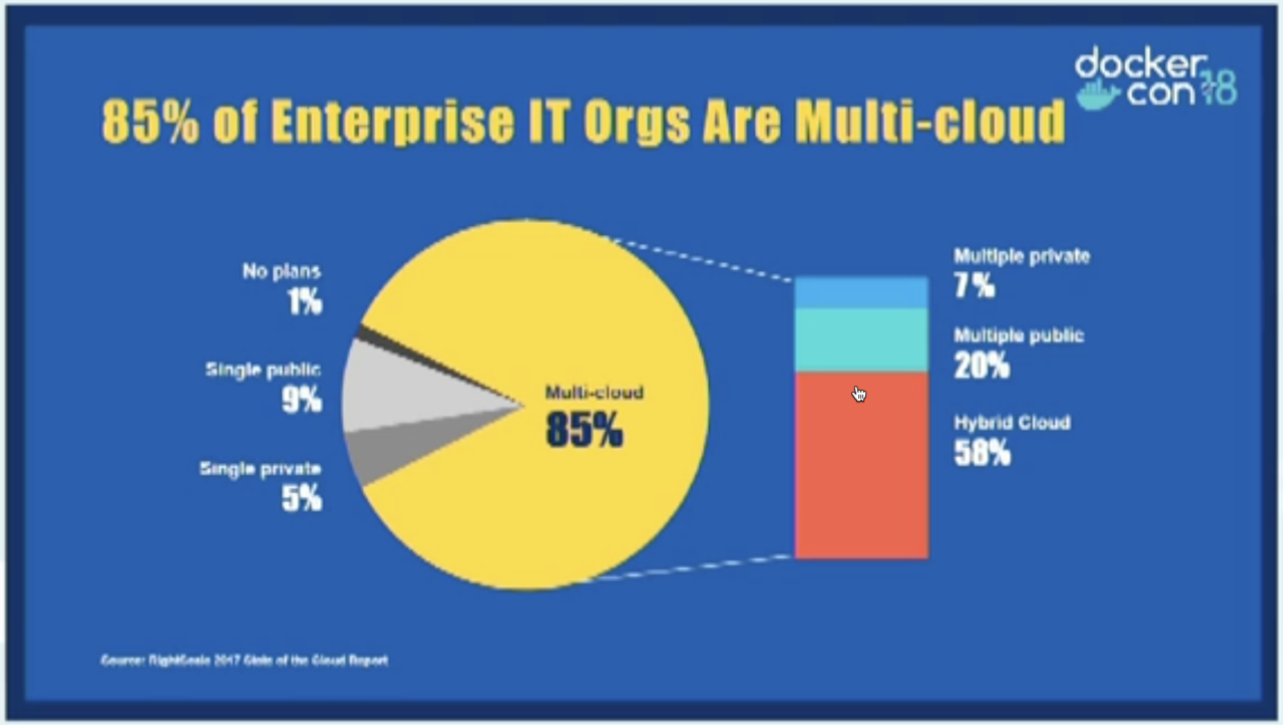
DigitalOcean

IBM SOFTLAYER

packet

docker

What's New



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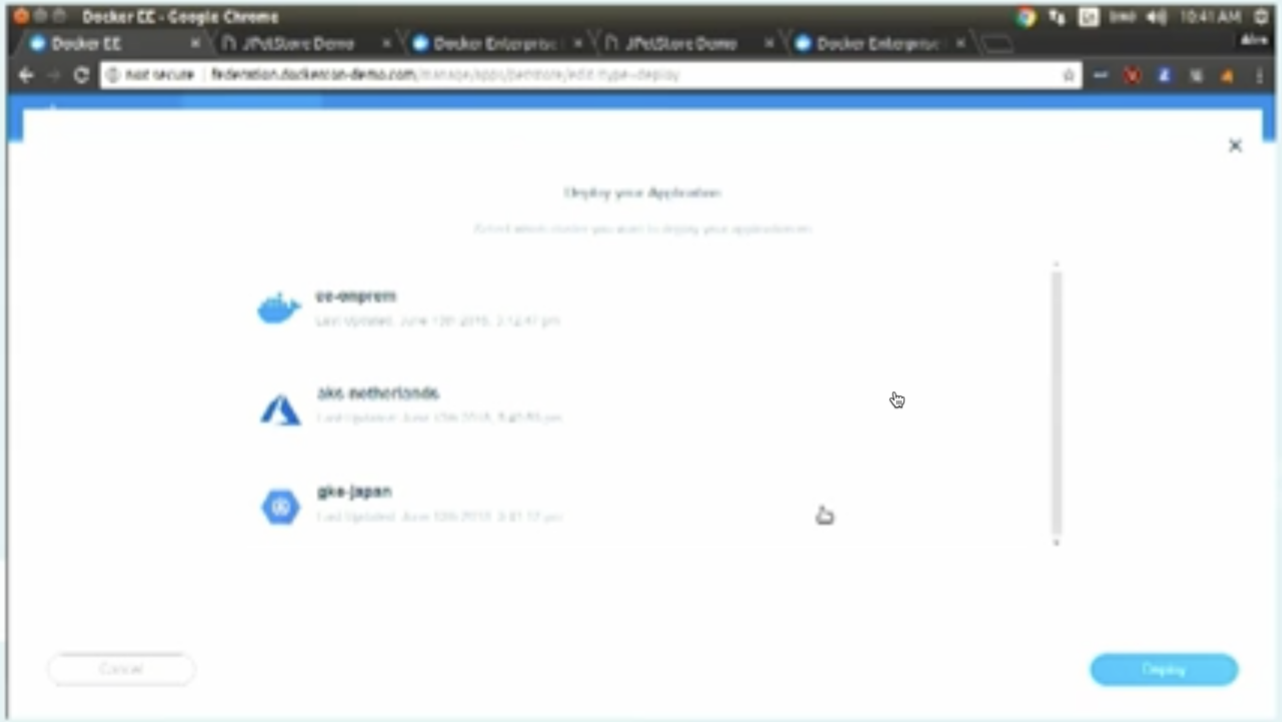
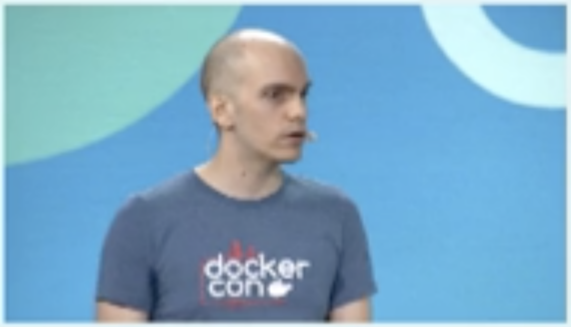
docker

What's New





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docker

Docker Machine

...

Platform of Docker

- Docker Toolbox (Legacy) for Desktop (Docker CE)
  - Install docker toolbox on machine will Create VM (Oracle VirtualBox)
  - Dockertoolbox for MAC
  - Dockertoolbox for Windows (7,8,10)

- Docker Native for Desktop (Docker CE)
  - Docker for MAC (Moby Linux (xhyve engine))
  - Docker for Windows (Moby Linux (hyper-v engine))

- Docker Native for Server (Docker CE/EE)
  - Docker for Windows 2016 (EE)
  - Docker for Ubuntu,CENTOS (CE/EE)
  - Docker for Debian (EE/ARM)
  - Docker for Red Hat Enterprise/SUSE/Oracle Linux (EE)
  - Docker for Fedora (CE)

Platform of Docker

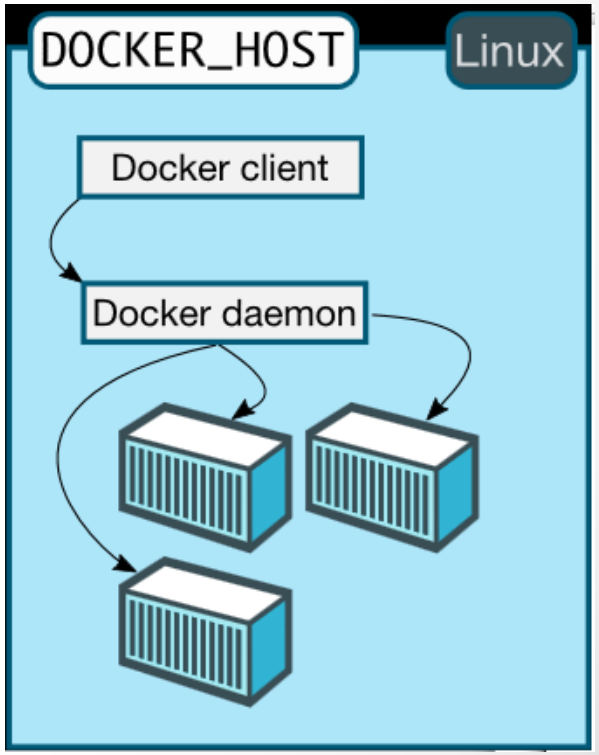
- Pros and Cons.
- Docker Toolbox
  - Pros
    - Compatible for All (Windows 7, 8, 10, MAC OS X)
    - Limit result for operate
    - Suitable for simulate multiple node or swarm
  - Cons
    - Multiple step for transfer source code and debug
    - Overhead for VirtualBox

Platform of Docker

- Pros and Cons.
- Docker for Windows or MAC
  - Pros
    - Full integrate with Machine (No need virtualbox)
      - Auto-update
      - File sharing (Host🡐 🡒 Container)
      - Http-proxy
      - Custom docker-registry
  - Cons
    - Single Node all case
    - Limit for

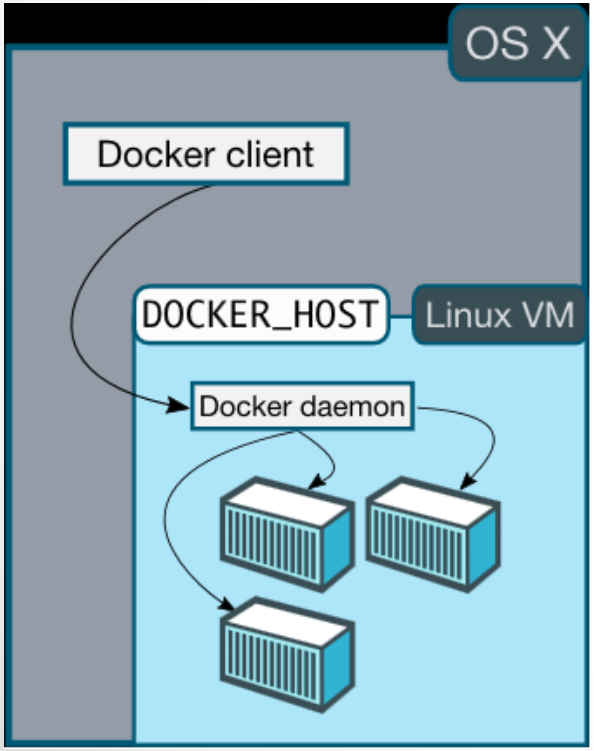
Platform of Docker

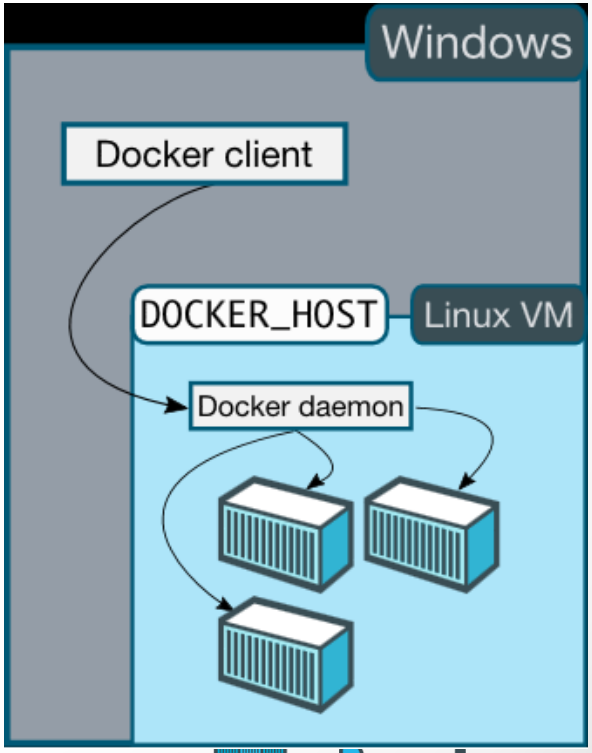
- **Docker Native for Desktop/Server**
- การติดตั้ง docker ลงบนเครื่อง linux server / windows (non-toolbox) / mac (non-toolbox) เมื่อเกิดการรัน container ขึ้น docker daemon จะให้บริการบนเครื่อง linux server ที่ทำการติดตั้งโดยตรง ซึ่งเราสามารถเรียกใช้งานโปรแกรมบนเครื่องได้ทันที



Linux vs Windows vs MAC OS

- **Docker ToolBox**
- การติดตั้ง docker ลงบนเครื่อง windows หรือ mac os จะมีการติดตั้ง virtual machine ใหม่ขึ้นบนเครื่องเพื่อให้บริการสำหรับ docker โดยเฉพาะดังนั้นเมื่อมีการสั่งรันจึงเกิดการ remote run ไปยังเครื่อง virtual machine (docker-machine)





Docker-machine CLI

- ตรวจสอบสถานะ docker-machine

```
docker-machine ls
```

- สั่งเริ่มการทำงานของ docker-machine

```
docker-machine start labdocker
```

- สั่งหยุดการทำงานของ docker-machine

```
docker-machine stop labdocker
```

- สั่งสร้าง docker-machine เครื่องใหม่

```
docker-machine create --driver virtualbox <name>
```

Workshop 1-2: Pull Image

- **เชื่อมต่อกับ** virtual machine (Boot2Docker)
  - Windows
    - Via command prompt: ➔ docker-machine ssh labdocker
    - Via SSH ➔ Connect to ip address of virtual machine
  - Mac OS
    - Via terminal : ➔ docker-machine ssh labdocker
    - Via SSH ➔ ssh docker@<ip address>

Workshop 1-2: Pull Image

ทำการ download image ubuntu ลงมาที่เครื่อง boot2docker โดยใช้คำสั่งดังนี้

```
docker image pull labdocker/alpine:latest
```

```
docker image pull labdocker/alpineweb:latest
```

```
docker image pull labdocker/cadvisor:latest
```

Compare with Ubuntu image

```
docker images/docker image ls
```

```
praparns-MacBook-Pro% docker images
REPOSITORY          TAG       IMAGE ID        CREATED          SIZE
labdocker/alpineweb latest    20f37a9ebc28    17 months ago    24.5MB
labdocker/ubuntu    latest    3876b81b5a81    18 months ago    188MB
labdocker/alpine    latest    14f89d0e6257    18 months ago    4.79MB
praparns-MacBook-Pro%
```

General Command in Docker

Command	Description
docker attach	Attach local standard input, output, and error streams to a running container
docker build	Build an image from a Dockerfile
docker checkpoint	Manage checkpoints
docker commit	Create a new image from a container's changes
docker config	Manage Docker configs
docker container	Manage containers
docker cp	Copy files/folders between a container and the local filesystem
docker create	Create a new container
docker deploy	Deploy a new stack or update an existing stack
docker diff	Inspect changes to files or directories on a container's filesystem
docker events	Get real time events from the server
docker exec	Run a command in a running container
docker export	Export a container's filesystem as a tar archive
docker history	Show the history of an image
docker image	Manage images
docker images	List images
docker import	Import the contents from a tarball to create a filesystem image
docker info	Display system-wide information
docker inspect	Return low-level information on Docker objects
docker kill	Kill one or more running containers
docker load	Load an image from a tar archive or STDIN
docker login	Log in to a Docker registry
docker logout	Log out from a Docker registry
docker logs	Fetch the logs of a container
docker network	Manage networks
docker node	Manage Swarm nodes
docker pause	Pause all processes within one or more containers
docker plugin	Manage plugins
docker port	List port mappings or a specific mapping for the container
docker ps	List containers
docker pull	Pull an image or a repository from a registry
docker push	Push an image or a repository to a registry
docker rename	Rename a container
docker restart	Restart one or more containers
docker rm	Remove one or more containers
docker rmi	Remove one or more images
docker run	Run a command in a new container
docker save	Save one or more images to a tar archive (streamed to STDOUT by default)
docker search	Search the Docker Hub for images
docker secret	Manage Docker secrets

https://docs.docker.com/engine/reference/commandline/docker/

General Command in Docker

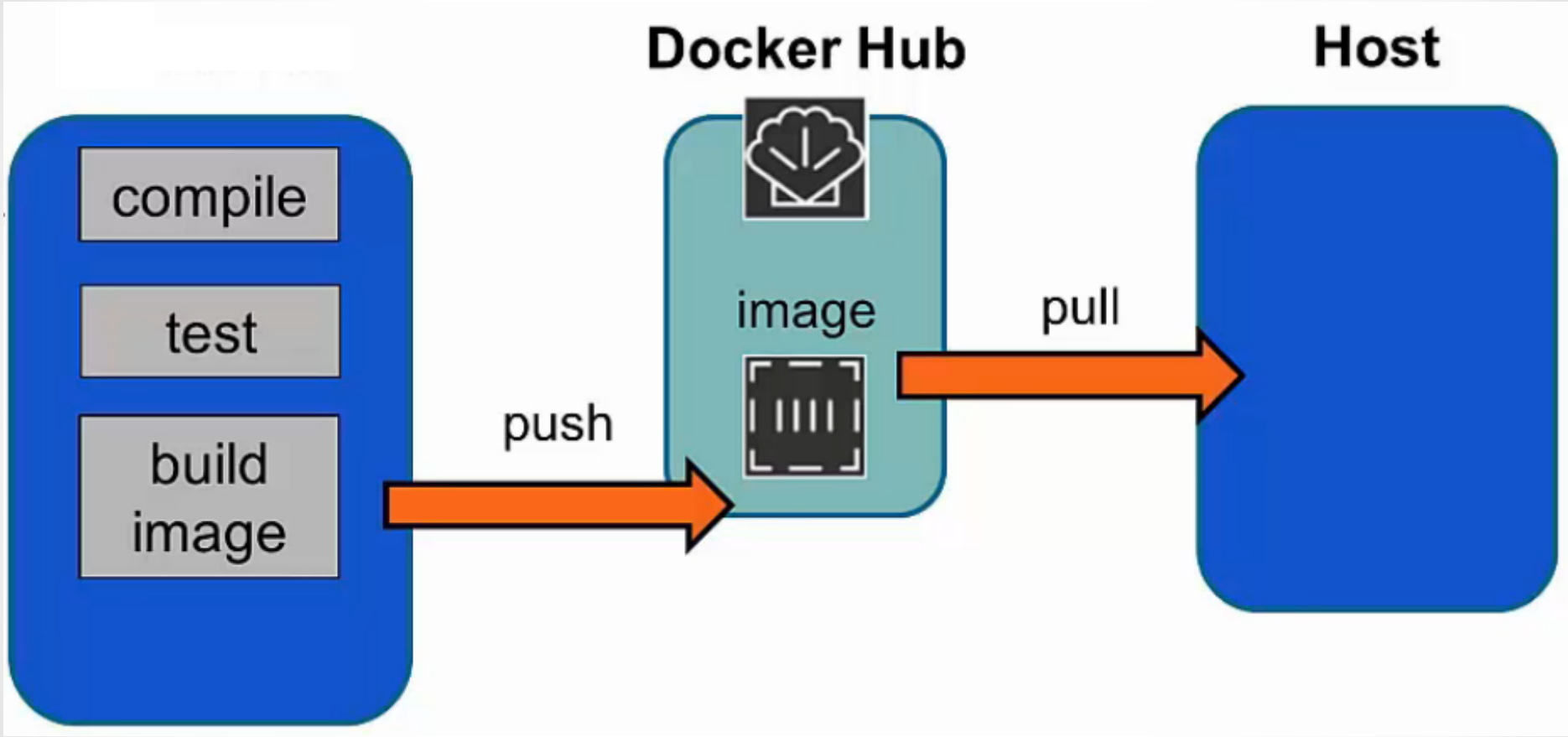
docker secret	Manage Docker secrets
docker service	Manage services
docker stack	Manage Docker stacks
docker start	Start one or more stopped containers
docker stats	Display a live stream of container(s) resource usage statistics
docker stop	Stop one or more running containers
docker swarm	Manage Swarm
docker system	Manage Docker
docker tag	Create a tag TARGET_IMAGE that refers to SOURCE_IMAGE
docker top	Display the running processes of a container
docker trust	Manage trust on Docker images (experimental)
docker unpause	Unpause all processes within one or more containers
docker update	Update configuration of one or more containers
docker version	Show the Docker version information
docker volume	Manage volumes
docker wait	Block until one or more containers stop, then print their exit codes

https://docs.docker.com/engine/reference/commandline/docker/

Image, Repository and Container

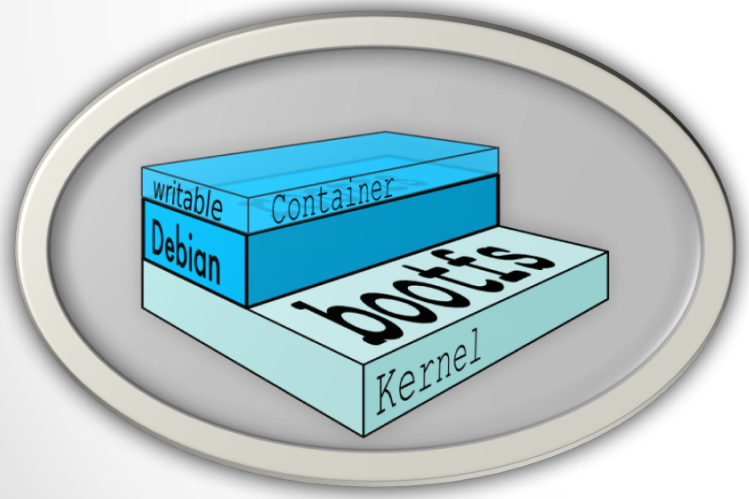
...

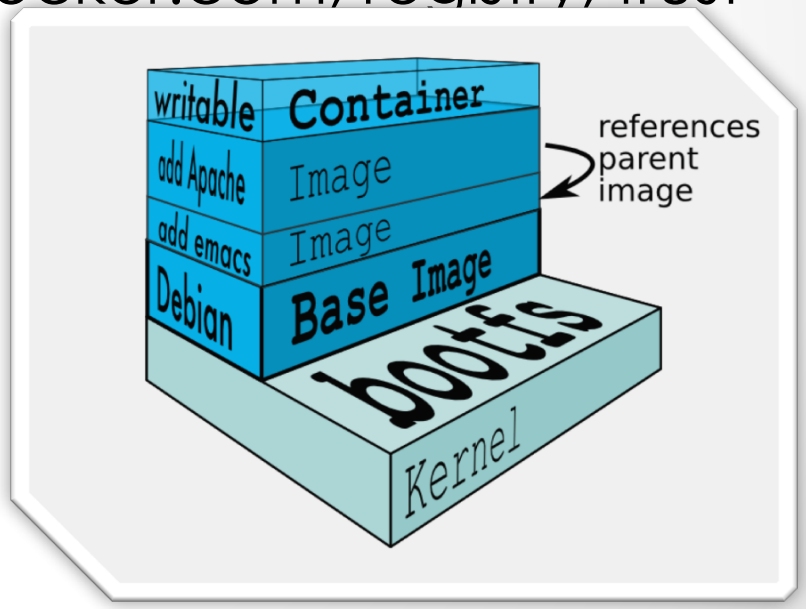
Docker Deployment



Docker Image

- Image คือtemplate ที่ถูกสร้างขึ้นเพื่อเตรียมใช้ในการรัน container
- เป็นไฟล์ที่อ่านได้อย่างเดียว
- ถูกสร้างโดยผู้ใช้งานเอง หรือผู้อื่น
- จัดเก็บไว้ใน repository (hub.docker.com, registry, trust registry)





Docker Image

- เรียกดู image ที่อยู่ภายในเครื่อง

docker images /docker image ls

192.168.99.100 - PuTTY

```
Deleted: sha256:65542ee6e3cbe2460eff25f9c3b1e24c825b8e11d6c8f052c7b469be9862c308
docker@labdocker:~/alpineweb$ docker images
REPOSITORY            TAG                 IMAGE ID            CREATED             SIZE
labdocker/alpineweb   latest              784ae16bf7c5        5 minutes ago       24.54 MB
labdocker/ubuntu      latest              3876b81b5a81        6 weeks ago         187.9 MB
labdocker/alpine      latest              14f89d0e6257        6 weeks ago         4.794 MB
docker@labdocker:~/alpineweb$
```

- tag image ใหม่เพื่อให้ตรงตามความต้องการในการใช้งาน

docker image tag <image id> <acc name/imagename: version>

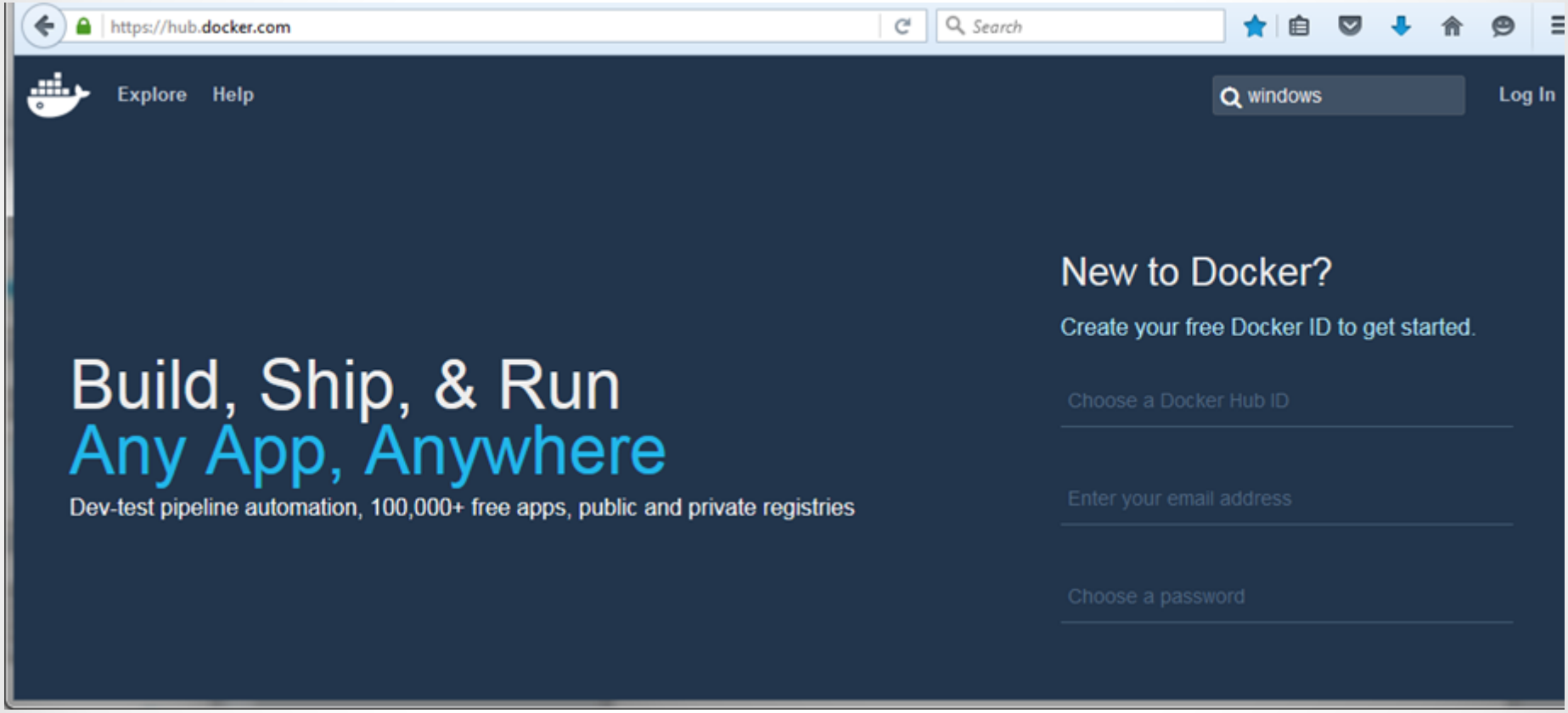
Ex: docker image tag 14f89d0e6257 labdocker/alpinelab:1.0

Repository (Registry)

- component ในการจัดเก็บ docker (image) ต่างๆรวมไปที่ศูนย์กลางเพื่อให้ docker engine บนเครื่องต่างๆมาเรียก image ไปใช้ทำงาน
- รองรับการเก็บ version ของ image อย่างเป็นระบบ
- สามารถให้ข้อมูลหรือคู่มือแนะนำการใช้งานกับผู้ download image ได้
- มี official image ที่สร้างจากผู้พัฒนาโปรแกรมเอง
- Docker มีให้บริการ repository บน cloud แก่ผู้ใช้งาน
- Url: https://hub.docker.com/
- Free registry without cost
- Private repository (registry, trust registry)

Repository (Registry)

- Hub.docker.com



Repository (Registry)

PUBLIC REPOSITORY

labdocker/cadvisor

Last pushed: 3 days ago

Repo Info | Tags | Collaborators | Webhooks | Settings

Short Description

cadvisor

Docker Pull Command

```
docker pull labdocker/cadvisor
```

Full Description

```
docker run \
--volume=/var/run:/var/run:rw \
--volume=/sys:/sys:ro \
--volume=/var/lib/docker/:/var/lib/docker:ro \
--publish=8080:8080 \
--detach=true \
--name=cadvisor \
labdocker/cadvisor:latest
```

Owner

labdocker

Repository (Registry)

- download image **ออกจาก** registry

docker image pull <account name/image name: tags>

Ex: docker image pull labdocker/alpine:latest

- Upload image **ขึ้นไปเก็บบน** registry
  - Login

docker login <url> -u <username> -p <password> -e <email>

Ex: docker login -u labdocker –p xxxxxxx –e xxxx@xxx.xxx

Ex: docker login 10.38.7.248:8080 –u labdocker

Repository (Registry)

- Push image ขึ้นไปเก็บบน registry

```
docker image push<account name/image name: tags>
```

Ex: docker image push labdocker/alpinelab:1.0

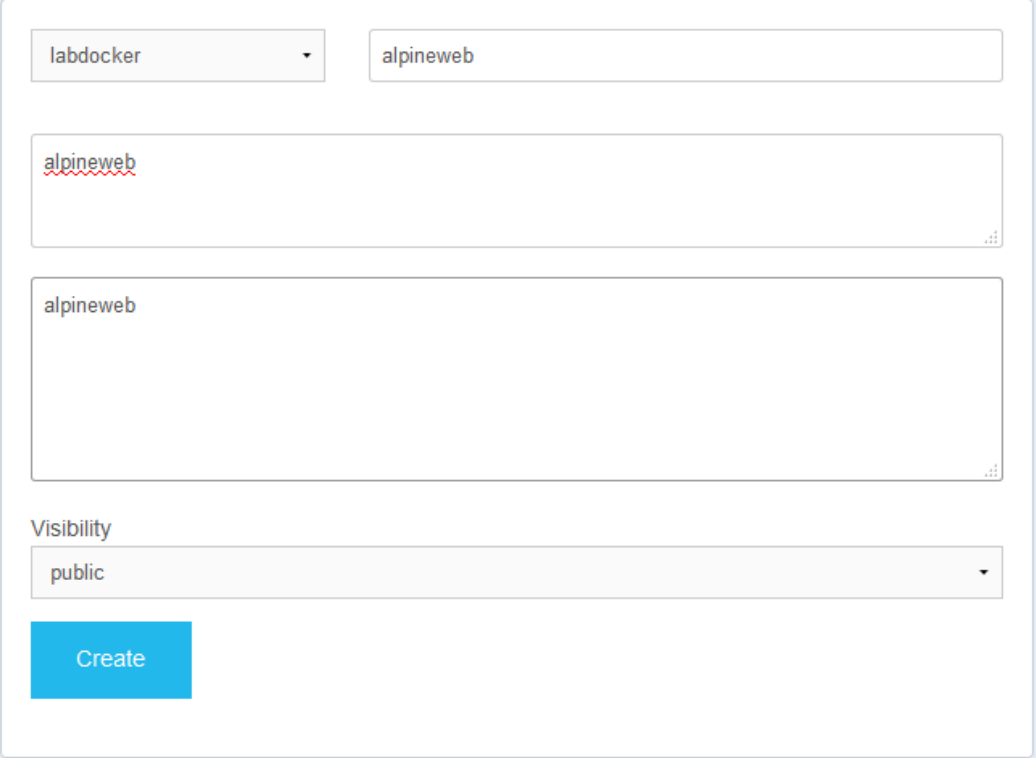
- Logoff ออกจาก Repository

```
docker logoff
```

**Docker 1.10 (upper) จะทำการ push แบบ parallel layer ทำให้สามารถ push image ได้เร็วขึ้น สามเท่าจากเดิม*

Workshop 1-3: Create & Push Image

- ใน workshop นี้สอนการสร้าง image file สำหรับใช้เป็น web server และจัดเก็บ image file ลงใน repository ส่วนตัวเพื่อเตรียมไว้ใช้งาน
- สมัครใช้งาน http://hub.docker.com และแจ้งยืนยันอีเมล์เพื่อเริ่มใช้งาน
- ทำการสร้าง repository ชื่อ alpineweb ตามตัวอย่างด้านล่าง



Workshop 1-3: Build & Push Image

- เข้าใช้งาน boot2docker และตรวจสอบ image id ด้วยคำสั่ง

```
docker image ls
```

- tag image ใหม่เป็น <accountname>/alpineweb:latest

```
docker image tag labdocker/alpineweb:latest \
<accountname>/alpineweb:latest
```

- Login เข้า hub.docker.com ด้วย username/password ที่ตั้งไว้

```
docker login –u <xxxx>
```

- Push image alpine ที่ tag ไว้ขึ้น repository

```
docker image push <accountname>/alpineweb:latest
```

Store.docker.com

docker store

Explore Publish Feedback praparn

The Docker Store

Find Trusted and Enterprise Ready Containers, Plugins, and Docker Editions

Search for great content (e.g. mysql)

Docker EE Docker CE Containers Plugins

Store.docker.com

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Explore Publish Feedback praparn

The Docker Store

Find Trusted and Enterprise Ready Containers, Plugins, and Docker Editions

Docker EE | Docker CE | Containers | Plugins

Filters (1) Clear All

TYPE

- Store
- Community (Docker Hub)

DOCKER CERTIFIED

- Docker Certified

CATEGORIES

- Analytics
- Application Frameworks
- Application Infrastructure
- Application Services

1 - 10 of 26 available images.

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Oracle
Oracle Database 12c Enterprise Edition
Databases

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Categories: Featured Images, DevOps Tools, Analytics, Monitoring

docker CERTIFIED

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$25 / mo	$38 / mo

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DESCRIPTION | REVIEWS | RESOURCES

What are your containers doing? Sysdig is the most powerful docker monitoring and troubleshooting solution. Built on ContainerVision™, Sysdig can see inside your docker containers without intrusive instrumentation. We natively integrate with the entire docker ecosystem, giving you deep visibility into your applications and microservices. Free trial at www.sysdig.com.

Please note that this container is the agent specifically for our commercial docker monitoring solution.

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- Docker Enterprise Edition for IBM Z — Server
- Docker Enterprise Edition for AWS — Cloud
- Docker Enterprise Edition for IBM Cloud (Private Beta) — Cloud
- Docker Enterprise Edition for Azure — Cloud
- Docker Enterprise Edition for CentOS — Server

Cloud.docker.com (Obsolete)

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IMPORTANT MESSAGE - Cluster Management in Docker Cloud will be discontinued on May 25. See our migration guides and view the notification.

Status.docker.com

Docker System Status

What is Docker? Product Get Docker Docs Community

Docker System Status

Current system status information.

docker

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All Systems Operational Updated a minute ago

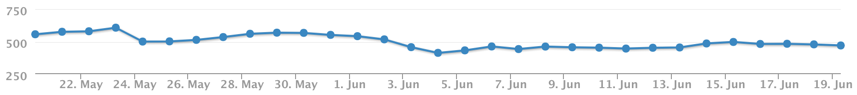
Our system status page is a real-time view of the performance and uptime of Docker products and services.

Docker Package Repositories AWS	Operational
Docker Support Site NA11	Operational
Docker Community Forums FMT2	Operational
Docker.com Web IAD3	Operational

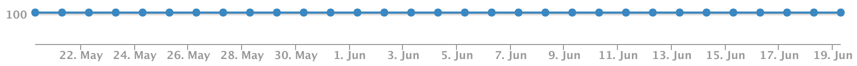
Metrics

Today Week Month

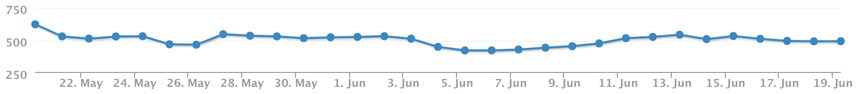
DOCKER HUB API RESPONSE TIME 500.71MS



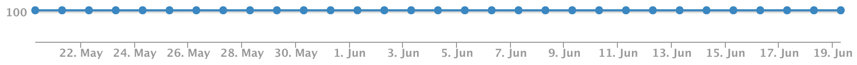
DOCKER HUB API UPTIME 100.00%



DOCKER REGISTRY HUB API RESPONSE TIME 504.03MS



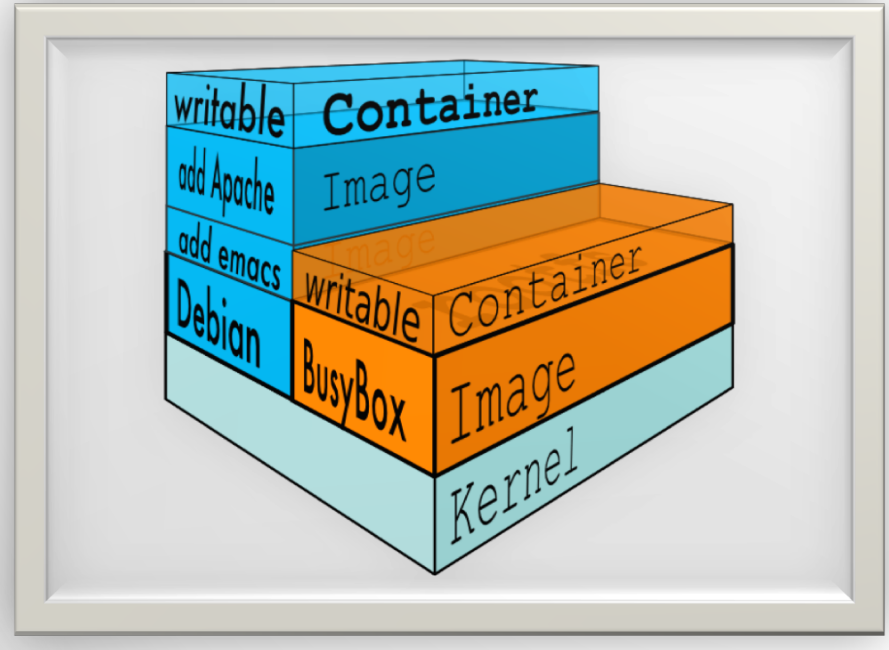
DOCKER REGISTRY HUB API UPTIME 100.00%

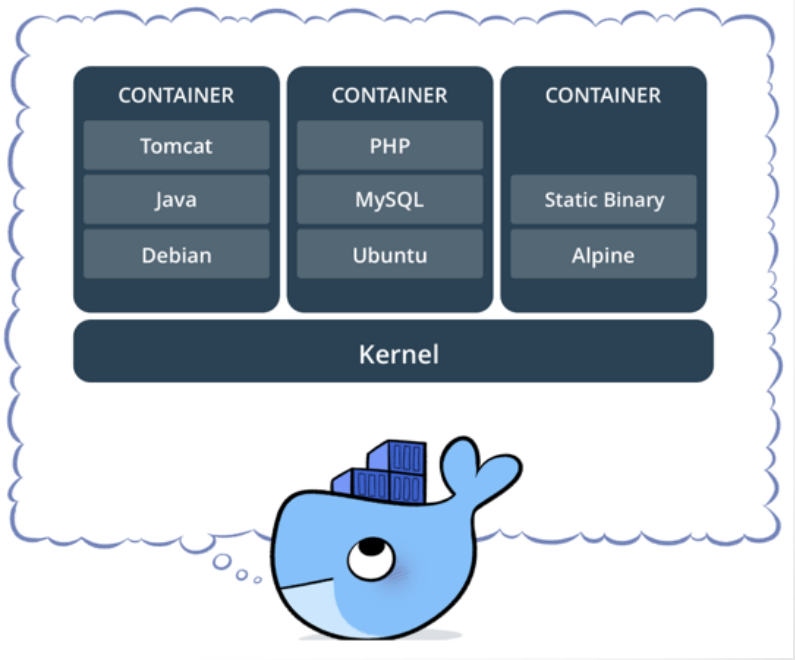


https://status.docker.com/

Docker Container

- Container คือชุดของ software layer ที่รันอิสระโดยอ้างอิงจาก image (run)
- ใช้สำหรับสร้างสภาพแวดล้อมที่จำเป็นต้องใช้ในการรันหรือพัฒนาโปรแกรม
- เมื่อพัฒนาโปรแกรมเสร็จเรียบร้อยแล้ว หรือต้องการ backup container สามารถสั่งเก็บ container ชุดปัจจุบันไปเป็น image เพื่อรอการเรียกใช้งานต่อไป (commit)





Docker: The Next-Gen of Virtualization

Docker Container

- สั่ง run docker เพื่อสร้าง container จาก image file

```
docker container run <option> <image id/name> <command>
```

```
Ex: docker container run  -i -t --rm -p 3000:3000 \
    labdocker/alpineweb:latest node hello.js
```

- สั่ง exec command ไปบน container ที่รันอยู่

```
docker container exec –it <container id/name> <command>
docker container attach <container id/name>
```

- เริ่ม/หยุด container

```
docker container <start/stop> <container id/name>
```

- ลบ container

```
docker container rm <containerid/name>
```

Workshop 1-4: Run Container

- Ex 1: Interactive NODEJS
- สั่งรัน container แบบ Interactive โดยตั้งชื่อว่า nodejs และ map network 3000:3000

```
docker container run  -i -t --rm --name nodejs -p 3000:3000 \
labdocker/alpineweb:latest node hello.js
```

- ทดสอบเปิดหน้าเว็บบน url: http://<ip address>:3000
- ตรวจสอบ container ด้วยคำสั่ง

```
docker container ps -a
```

- Exist with Ctrl+C

Workshop 1-4: Run Container

- Ex 2: DAEMON LINE BOT

ธนาคารแห่งประเทศไทย

ข้อมูลทั่วไปของ API

ประเภทของ API :	REST
ประเภทของข้อมูล :	JSON
ความปลอดภัย :	PUBLIC

ตำแหน่งที่อยู่ของ API

https://iapi.bot.or.th/Stat/Stat-ReferenceRate/DAILY_REF_RATE_V1/

พารามิเตอร์ใน Header

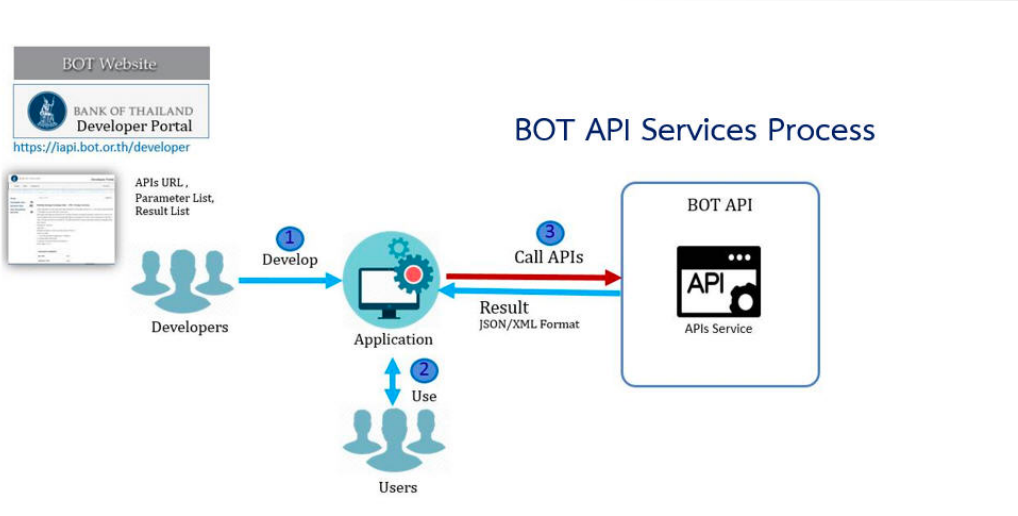
api-key : xk3h6ash-ahw5l3mch6hl3-2hhg6l4mng2346l34l6

ข้อมูลพารามิเตอร์สำหรับการใช้งาน API

ชื่อตัวแปร	ประเภท	คำอธิบาย
start_period	Datetime	วันที่เริ่มต้นงวดข้อมูล (YYYY-MM-DD) เช่น 2017-06-30
end_period	Datetime	วันที่สิ้นสุดงวดข้อมูล (YYYY-MM-DD) เช่น 2017-06-30

ข้อมูลพารามิเตอร์ที่จะได้รับ

ชื่อ	ประเภท	คำอธิบาย
report_name_eng	String	ชื่อรายงาน ภาษาอังกฤษ
rereport_name_th	String	ชื่อรายงาน ภาษาไทย
report_uoq_name_eng	String	หน่วย ภาษาอังกฤษ
report_uoq_name_th	String	หน่วย ภาษาไทย
report_source_of_data	String	แหล่งที่มาของข้อมูล
report_remark_eng	String	หมายเหตุ รายงานภาษาอังกฤษ
report_remark_th	String	หมายเหตุ รายงานภาษาไทย
last_updated	String	วันที่แก้ไขข้อมูลล่าสุด
period	String	วันที่งวดข้อมูล
rate	String	อัตรา

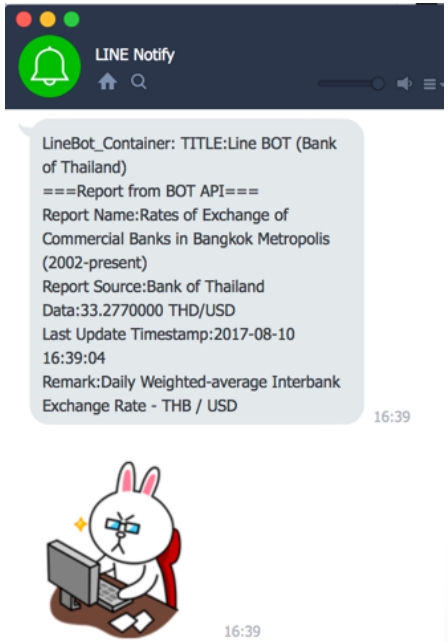


Workshop 1-4: Run Container

- Ex 2: DAEMON LINE BOT

```
docker@labdocker:~$ docker container run --rm --name linebot -e "TITLE=Line BOT (Bank of Thailand)" -e "TOKEN=EIeqyillzkzpaCo1ROrebZTcGbIyzDZHpOjcdd0t6CX" labdocker/linenotify:bot_v1
null
{"statusCode":200,"body":"{\"status\":200,\"message\":\"ok\"}","headers":{"server":"nginx","date":"Sat, 20 Jan 2018 03:12:22 GMT","content-type":"application/json;charset=UTF-8","transfer-encoding":"chunked","connection":"keep-alive","keep-alive":"timeout=3","x-ratelimit-limit":"1000","x-ratelimit-imagelimit":"50","x-ratelimit-remaining":"998","x-ratelimit-imageremaining":"50","x-ratelimit-reset":"1516421345"},"request":{"uri":{"protocol":"https:","slashes":true,"auth":null,"host":"notify-api.line.me","port":443,"hostname":"notify-api.line.me","hash":null,"search":null,"query":null,"pathname":"/api/notify","path":"/api/notify","href":"https://notify-api.line.me/api/notify"},"method":"POST","headers":{"Content-Type":"application/x-www-form-urlencoded","authorization":"Bearer EIeqyillzkzpaCo1ROrebZTcGbIyzDZHpOjcdd0t6CX","content-length":466}}}
"{\"status\":200,\"message\":\"ok\"}"
docker@labdocker:~$
```

```javascript
const request = require('request');
const qs = require('querystring');
const TITLE=process.env.TITLE;
const KEY =process.env.KEY; //Input API-KEY to Header
//const KEY="U9G1L457H6DCugT7VmBaEacbHV9RX0PyS005cYaGsm";
const URL =process.env.URL; //Input URL for Request
//const URL="https://iapi.bot.or.th/Stat/Stat-ReferenceRate/DAILY_REF_RATE_V1/?";
//const TOKEN = 'EIeqyillzkzpaCo1ROrebZTcGbIyzDZHpOjcdd0t6CX';
const TOKEN=process.env.TOKEN; //Input TOKEN LINE
//Set Date
var dateFormat = require('dateformat');
var daynow = new Date(); // Today!
daynow.setDate(daynow.getDate() - 1); // Yesterday!
var daynow=dateFormat(daynow, "yyyy-mm-dd");
var DAYSTARTPERIOD=daynow;
var DAYENDPERIOD=daynow;
//Set Date
var stickerPkg=2; //stickerPackageId
var stickerId=161; //stickerId
var Message="";
//Setup QueryString
var querystring = qs.stringify({
    start_period: DAYSTARTPERIOD,
    end_period: DAYENDPERIOD
});
//Setup QueryString
function callback(error, response, body) {
  //console.log(URL+querystring);
  //console.log('Response Code: '+ response.statusCode);
  //console.log(body)
  if (!error && response.statusCode == 200) {
    var info = JSON.parse(body);
```



Workshop 1-4: Run Container

- Ex 2: DAEMON LINE BOT
- สั่งรัน container แบบ Daemon โดยตั้งชื่อว่า linebot เพื่อทำการดึงข้อมูลจาก API ของธนาคารแห่งประเทศไทยออกมาแล้วส่ง LINE Notify ไปหา Token Key ที่กำหนด

```
docker container run -it --rm --name linebot \
-e TITLE="Line BOT (Bank of Thailand)” \
 -e "TOKEN=<LINE TOKEN>"
labdocker/linenotify:bot_v1
```

Workshop 1-4: Run Container

- Ex 3: Detach Mode NODEJS
- สั่งรัน container แบบ detach (daemon) โดยตั้งชื่อว่า nodejs และ map network 3000:3000

```
docker container run -d -t --name nodejs -p 3000:3000 \
labdocker/alpineweb:latest node hello.js
```

- ทดสอบเปิดหน้าเว็บบน url: http://<ip address>:3000
- ตรวจสอบ container ด้วยคำสั่ง

```
docker container ps -a
```

- ทดสอบ Shell เข้าสู่ container ด้วยคำสั่ง

```
docker container exec –i –t nodejs sh
```

Workshop 1-4: Run Container

- Ex 3: Detach Mode NODEJS
- สั่งหยุดเริ่ม container ด้วยคำสั่ง stop

```
docker container stop nodejs
```

```
docker container start nodejs
```

- ทำการตรวจสอบ container offline ด้วยคำสั่ง

```
docker container ps -a
```

- ทดสอบ Shell เข้าสู่ container ด้วยคำสั่ง

```
docker container exec –i –t nodejs sh
```

```
docker container attach nodejs
```

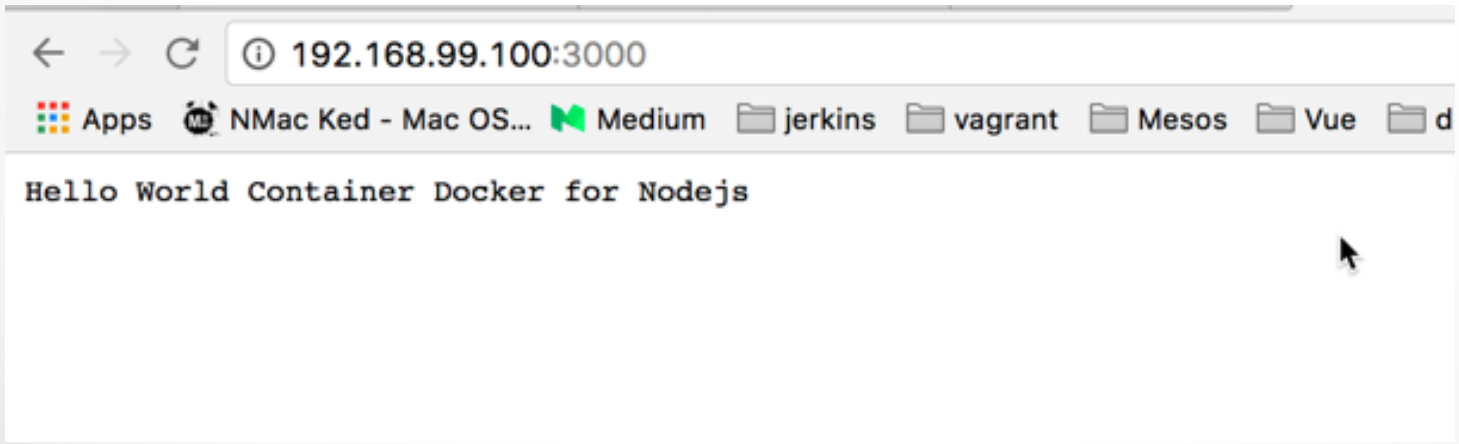
Workshop 1-4: Run Container

- Ex 3: Detach Mode NODEJS

```
var http = require('http');

http.createServer(function (req, res) {
  res.writeHead(200, {'Content-Type': 'text/plain'});
  res.end('Hello World Container Docker for Nodejs\n');
}).listen(3000, '0.0.0.0');

console.log('Server running at http://0.0.0.0:3000/');
```



Workshop 1-4: Run Container

- Ex 4: Detach Mode Python
- สั่งรัน container แบบ detach (daemon) โดยตั้งชื่อว่า pythonและ map network 5000:5000

```
docker container run -d -t --name python -p 5000:5000 \
labdocker/cluster:webservicelite
```

- ทดสอบเปิดหน้าเว็บบน url: http://<ip address>:5000
- ทดสอบ Shell เข้าสู่ container ด้วยคำสั่ง

```
docker container exec –i –t python sh
```

```
docker container attach python
```

Workshop 1-4: Run Container

- Ex 4: Detach Mode PYTHON

```python
from flask import Flask
import os
import time
app = Flask(__name__)

@app.route('/')
def hello():
    return '<H1> Welcome Page from Container Python Lab </H1>Checkpoint Date/Time: ' + time.strftime("%c") +'\n'

if __name__ == "__main__":
    app.run(host="0.0.0.0", port=5000, debug=True)
```

CPU, Memory & I/O

...

CPU

- Default container จะมองเห็น CPU resource ทั้งหมดในเครื่องระหว่าง runtime และ share เวลาการทำงานให้ทุก container เท่ากัน

- config share time ในการใช้งาน (default: 1024)

```
--cpu-shares, -c =“<0 (default): Ratio>”
```

- config share core cpu

```
--cpuset-cpus=“1, 3"
```

- กำหนด cpu quota & period (default: 100 ms)

```
--cpu-period=100000 --cpu-quota=500000
```

- NUMA (non-uniform memory access) architcture

```
--cpuset-mems=“1,3”
```

Workshop 1-5: CPU Configure

- Download cAdvisor

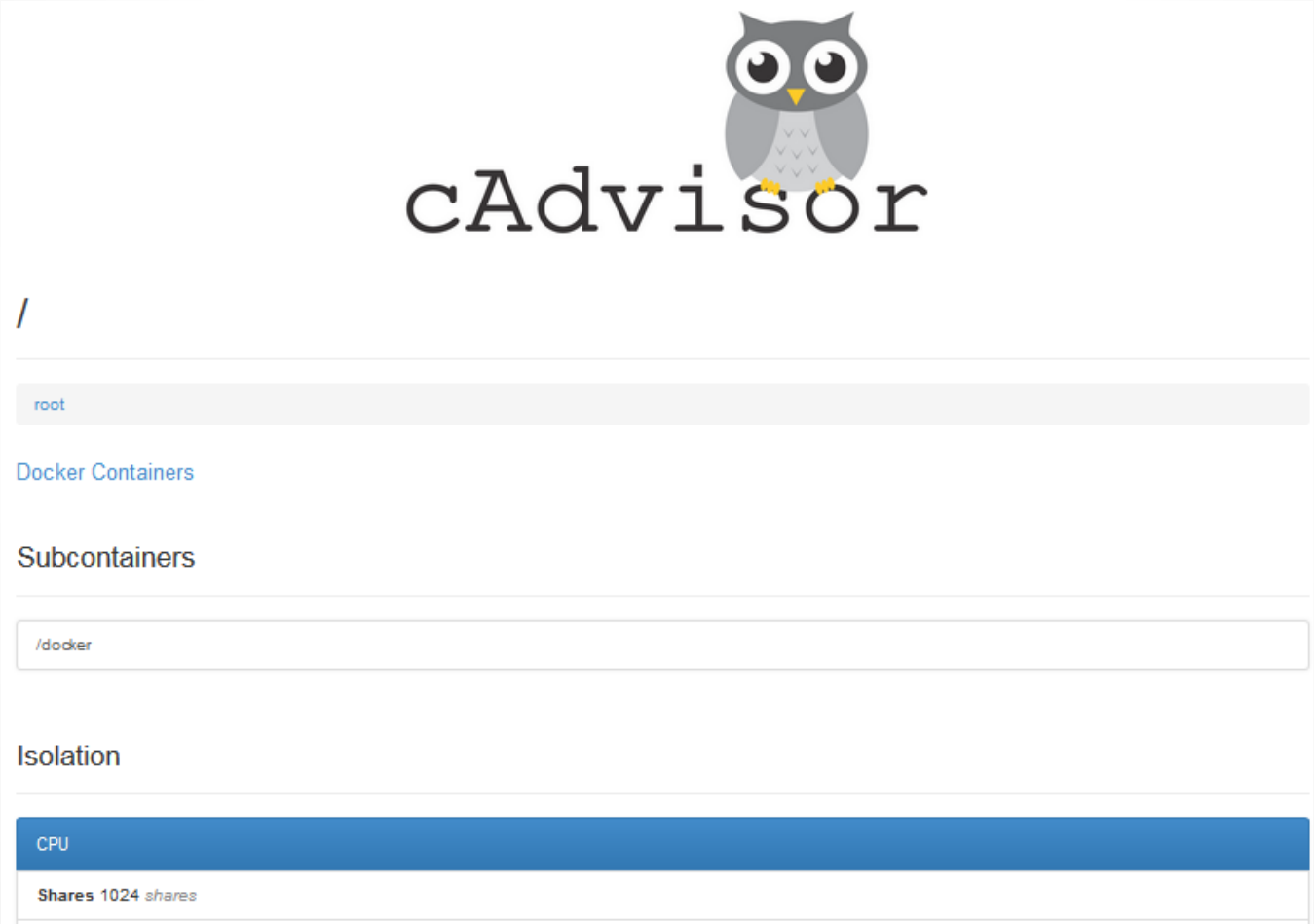
```
docker image pull labdocker/cadvisor:latest
```

- สั่งรัน cAdvisor ตาม command ดังนี้

```
docker container run \
        --mount type=bind,source=/var/run,target=/var/run \
        --mount type=bind,source=/sys,target=/sys,readonly \
        --mount
type=bind,source=/var/lib/docker,target=/var/lib/docker,readonly \
        --publish=8080:8080 \
        --detach=true \
        --name=cadvisor \
        labdocker/cadvisor:latest
```

Workshop 1-5: CPU Configure

- cAdvisor



Workshop 1-5: CPU Configure

- Download busybox เพื่อใช้ในการทดสอบ

```
docker image pull labdocker/busybox:latest
```

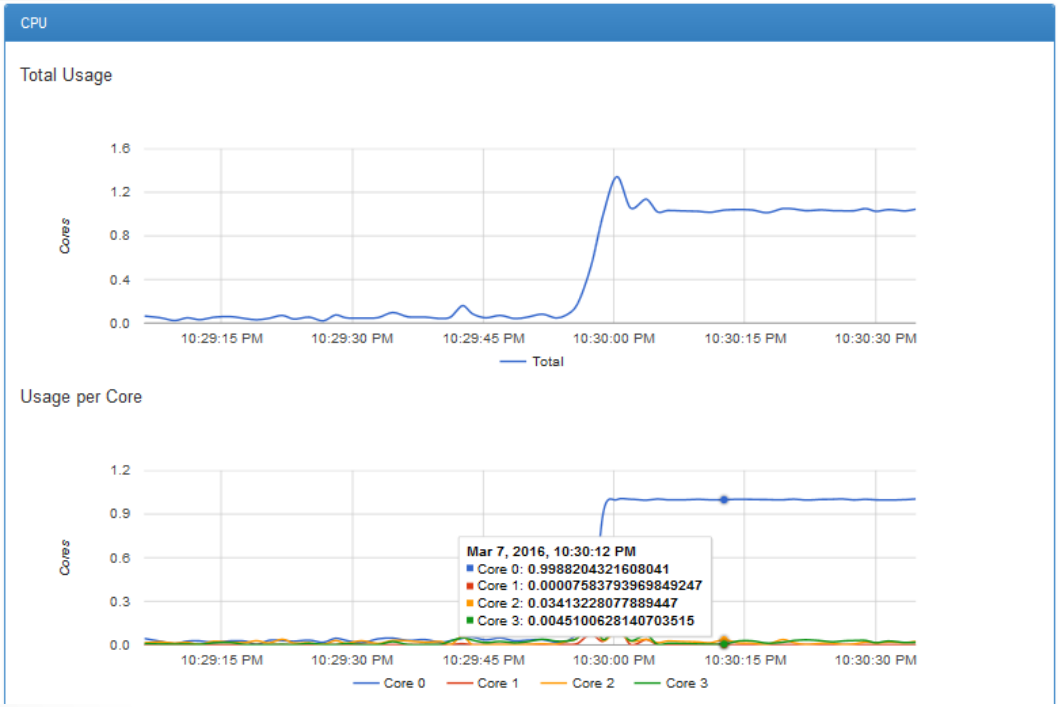
- Scenario 1 (Single CPU: 70/30)

```
docker container run -d \
--name='Share_30' \
--cpuset-cpus=0 \
--cpu-shares=30 \
labdocker/busybox:latest md5sum /dev/urandom
```

```
docker container run -d \
--name='Share_70' \
--cpuset-cpus=0 \
--cpu-shares=70 \
labdocker/busybox:latest md5sum /dev/urandom
```

Workshop 1-5: CPU Configure

- Result




```
CONTAINER           CPU %               MEM USAGE / LIMIT     MEM %               NET I/O             BLOCK I/O           PIDS
01109e1c7b0f        70.65%              76KiB / 995.4MiB      0.01%               648B / 0B           0B / 0B             1
909882f27a59        30.26%              40KiB / 995.4MiB      0.00%               648B / 0B           0B / 0B             1
e247e2e8240a        0.05%               16.86MiB / 995.4MiB   1.69%               718kB / 39.4MB      17.6MB / 0B         11
^C
docker@labdocker:~$ docker ps
CONTAINER ID        IMAGE                       COMMAND                  CREATED             STATUS              PORTS
           NAMES
01109e1c7b0f        labdocker/busybox:latest    "md5sum /dev/urandom"    2 minutes ago       Up 2 minutes
           Share_70
909882f27a59        labdocker/busybox:latest    "md5sum /dev/urandom"    3 minutes ago       Up 3 minutes
           Share_30
e247e2e8240a        labdocker/cadvisor:latest   "/usr/bin/cadvisor..."   4 minutes ago       Up 4 minutes        0.0.0.0:8080->
8080/tcp   cadvisor
docker@labdocker:~$
```

Workshop 1-5: CPU Configure

- Download busybox เพื่อใช้ในการทดสอบ

```
docker image pull labdocker/busybox:latest
```

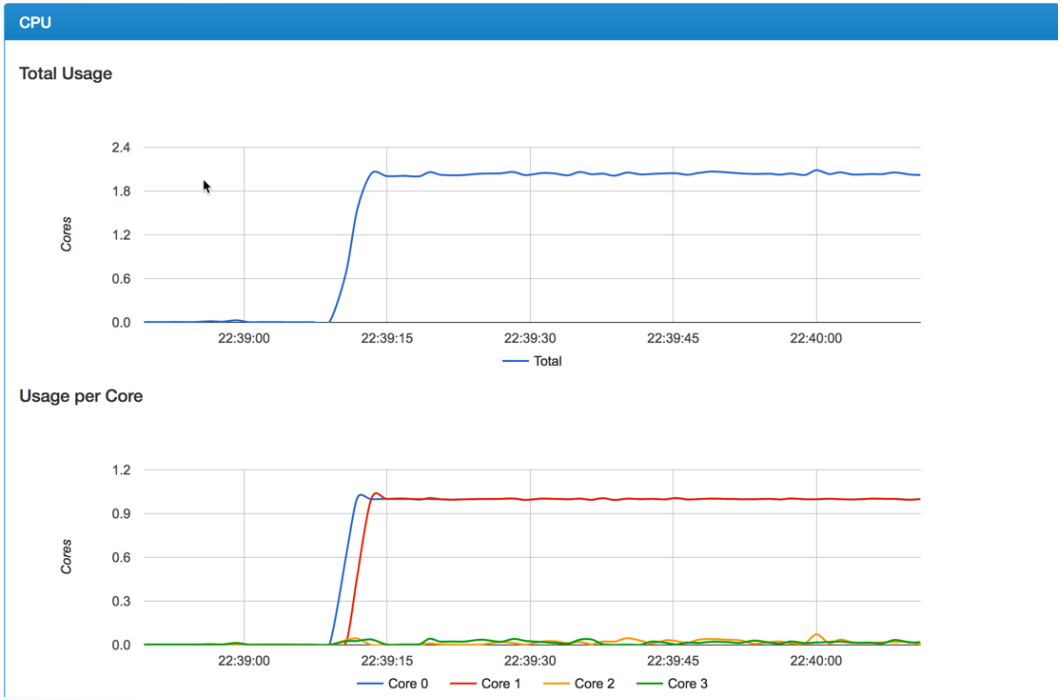
- Scenario 2 (Multiple CPU: 70/30)

```
docker container run -d \
--name='Share_30' \
--cpuset-cpus=0 \
--cpu-shares=30 \
labdocker/busybox:latest md5sum /dev/urandom
```

```
docker container run -d \
--name='Share_70' \
--cpuset-cpus=1 \
--cpu-shares=70 \
labdocker/busybox:latest md5sum /dev/urandom
```

Workshop 1-5: CPU Configure

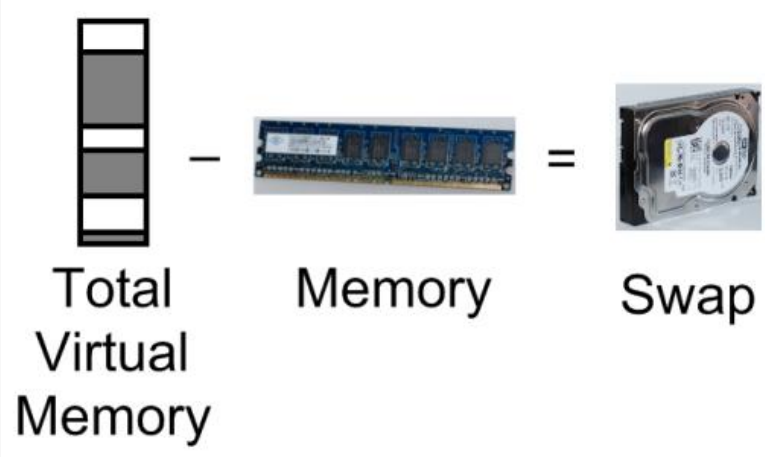
- Result

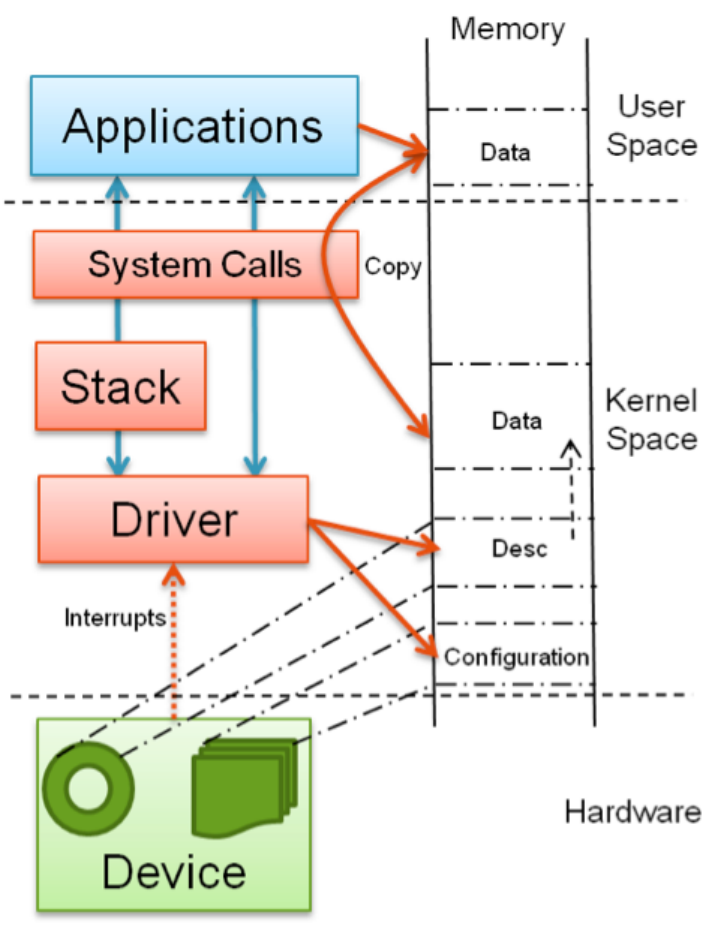



```
CONTAINER           CPU %               MEM USAGE / LIMIT     MEM %               NET I/O             BLOCK I/O           PIDS
02d0b2973cff        99.93%              88KiB / 995.4MiB      0.01%               648B / 0B           0B / 0B             1
b1aebf2a3d71        99.88%              84KiB / 995.4MiB      0.01%               648B / 0B           0B / 0B             1
e247e2e8240a        2.02%               19.34MiB / 995.4MiB   1.94%               1.07MB / 66.7MB     17.6MB / 0B         11
^C
docker@labdocker:~$ docker ps
CONTAINER ID        IMAGE                       COMMAND                  CREATED             STATUS              PORTS
            NAMES
02d0b2973cff        labdocker/busybox:latest    "md5sum /dev/urandom"    41 seconds ago      Up 40 seconds
            Share_70
b1aebf2a3d71        labdocker/busybox:latest    "md5sum /dev/urandom"    42 seconds ago      Up 42 seconds
            Share_30
e247e2e8240a        labdocker/cadvisor:latest   "/usr/bin/cadvisor..."   6 minutes ago       Up 6 minutes        0.0.0.0:8080->
8080/tcp    cadvisor
docker@labdocker:~$
```

Memory

- Default container จะมองเห็น memory resource ทั้งหมดในเครื่องระหว่าง runtime และสามารถใช้งาน memory resource ทั้งหมดเท่าที่ต้องการ





Memory

- การคอนฟิก memory บน container สามารถกำหนดได้ดังนี้
- memory limit and reservation (default: unlimit) (B:byte, K:kilobyte, M:megabyte, G:gigabyte)

```
--memory, -m =10G --memory-reservation= 1G
```

- memory swap (default: unlimit)

```
-- memory-swap= -1
```

- kernel memory

```
-- kernel-memory= 500M
```

- memory swappiness (kernel)(0=no swap)

```
-- memory-swappiness =0
```

Memory

- memory ใน production system
- กำหนด memory-swappiness = 0 (no swappiness for kernel memory)
- กำหนด memory swap (--memory-swap) เป็น 2 เท่าของ memory (Limit)
- monitor footprint ในการใช้งาน memory ของ application system แล้วกำหนดเป็น “--memory-reservation”
- ทำ capacity testing เพื่อกำหนด maximum memory ที่ต้องการในการใช้งาน (+30%) แล้วกำหนด “--memory“ (Limit)
- สำหรับ critical system ให้กำหนด “--memory-reservation” เท่ากับ “--memory“ (Limit)
- Memory Priority ? (Still waiting)

I/O

- โดย default ทุก container จะมีโอกาสใช้ I/O เท่าๆกัน (500 weight)

- กำหนดค่า weight ในการใช้งาน I/O (สำหรับ Direct IO เท่านั้น)

--blkio-weight 300, --blkio-weight-device “/s01/tdb:500”

- จำกัดการอ่านข้อมูล เป็น bps (kb: kilobyte, mb: megabyte, gb: gigabyte) / iops

--device-read-bps /s01/tdb:1mb

--device-read-iops /s01/tdb:20000

- จำกัดการเขียนข้อมูล เป็น bps , iops

--device-write-bps /s01/tdb:1mb

--device-write-iops /s01/tdb:20000

I/O

- I/O configure in production system
- weight I/O **ควรกำหนดเฉพาะในกรณีที** application **ต้องทำงานกับ** direct i/o (slow than cache)
- Monitor **การใช้งาน** I/O **ของ** container (IOSTAT –xtc) **และปรับแต่ง**

```
$ iostat -xtc
                    extended device statistics                          tty          cpu
device       r/s    w/s   kr/s   kw/s wait actv  svc_t  %w  %b  tin tout  us sy wt id
fd0          0.0    0.0    0.0    0.0  0.0  0.0    0.0   0   0    0    0   0  0  0 100
sd0          0.0    0.0    0.4    0.4  0.0  0.0   49.5   0   0
sd6          0.0    0.0    0.0    0.0  0.0  0.0    0.0   0   0
nfs1         0.0    0.0    0.0    0.0  0.0  0.0    0.0   0   0
nfs49        0.0    0.0    0.0    0.0  0.0  0.0   15.1   0   0
nfs53        0.0    0.0    0.4    0.0  0.0  0.0   24.5   0   0
nfs54        0.0    0.0    0.0    0.0  0.0  0.0    6.3   0   0
nfs55        0.0    0.0    0.0    0.0  0.0  0.0    4.9   0   0
```

- Web server / Application server ➔ IOPS **สูง** / Transfer **ต่ำ**
- Database server ➔ IOPS **ต่ำ** / Transfer **สูง**
- **คำนึงถึง** physical storage performance

I/O

- Normal disk iops

Disk Speed	IOPS
15,000	175
10,000	125
7200	75
5400	50

RAID	Write Penalty
0	1
1	2
5	4
6	6
DP	2
10	2

- Raw disk performance: disk iops x unit of disk
  - **Ex:** SAS 128GB (15K) x 6 units => 175 x 6 = 1060 iops

- Raid disk performance:
  - ((raw iops x %write)/penalty)+(raw x %read)
  - Normal situation (write 30%, read 70%)
  - **Ex:** Raid 5 ((1060 x .3)/4)+(1060x.7) ➔ 821.6 iops
  - **Ex**: Raid 1 ((1060 x .3)/2)+(1060x.7) ➔ 901 iops

Network

...

Network

- Software define network by design (virtual switch)
- default docker จะจัดเตรียม network มาให้สามรูปแบบ

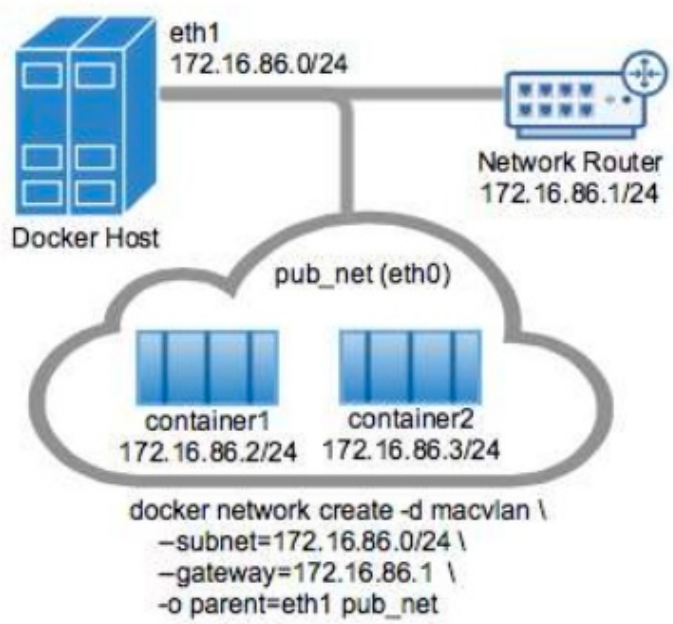
```
docker@labdocker:~$ docker network ls
NETWORK ID          NAME                DRIVER              SCOPE
0dc1bbf00498        bridge              bridge              local
91d6dd4056a9        host                host                local
fa786a00adda        none                null                local
docker@labdocker:~$
```

- **bridge** คือ default network สำหรับให้ container เชื่อมต่อออกสู่โลกภายนอกผ่าน virtual switch “docker0” โดยใช้ network stack ของ container เองในการเชื่อมต่อ (route mode)
- **none** คือ network loopback (127.0.0.1) สำหรับ container ที่ไม่มีการเชื่อมต่อออกไปด้านนอก
- **host** คือ network host ที่ container ใช้งาน host network stack ในการทำงาน

  (ใช้ในกรณี ต้องการ network performance สูงสุด) (security concern)

Network

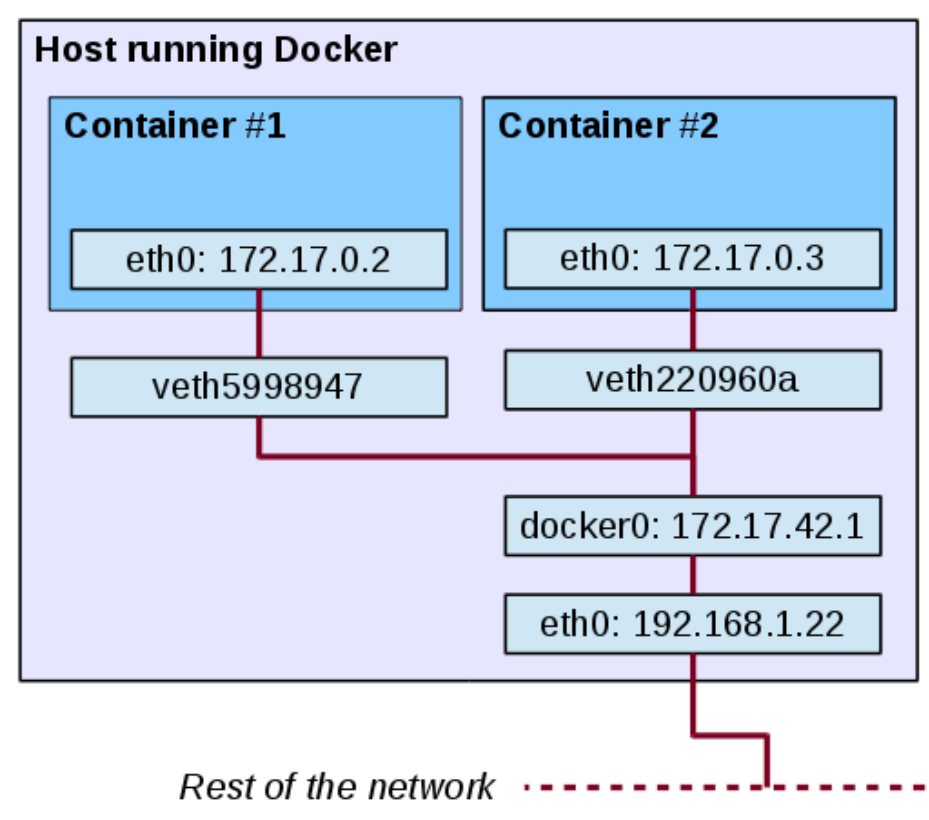
- Additional network type
- **MACVLAN**



- **Overlay (Swarm Mode)**
- **3rd Party Network Plugin (Swarm Mode)**

Network

- bridge (default) เมื่อสั่งรัน container ในระบบโดยไม่ได้ระบุ network ใดๆ container จะถูกเพิ่ม ipaddress, subnet เข้าสู่ bridge network โดยอัตโนมัต



Network

- docker network inspect bridge

192.168.99.100 - PuTTY

```
docker@labdocker:~$ docker network inspect bridge
[
    {
        "Name": "bridge",
        "Id": "5c03ed5297b82ab55b592d36324be256190b48267780a12bb603da9fd0c13887",
        "Scope": "local",
        "Driver": "bridge",
        "IPAM": {
            "Driver": "default",
            "Options": null,
            "Config": [
                {
                    "Subnet": "172.17.0.0/16"
                }
            ]
        },
        "Containers": {
            "303c0f349f5ae46873f0dfb1440cae34a30d7e58e187c448f95842c475fb770f": {
                "Name": "cadvisor",
                "EndpointID": "5aa767acbcaa4d64095778b1daca4823b92dd497fa6f4aaa436b
9032e475fcc2",
                "MacAddress": "02:42:ac:11:00:02",
                "IPv4Address": "172.17.0.2/16",
                "IPv6Address": ""
            }
        },
        "Options": {
            "com.docker.network.bridge.default_bridge": "true",
            "com.docker.network.bridge.enable_icc": "true",
            "com.docker.network.bridge.enable_ip_masquerade": "true",
            "com.docker.network.bridge.host_binding_ipv4": "0.0.0.0",
            "com.docker.network.bridge.name": "docker0",
            "com.docker.network.driver.mtu": "1500"
        }
    }
]
docker@labdocker:~$
```

Network

- Option เกี่ยวกับ network สำหรับสั่ง run container

--dns= x.x.x.x (Default --name,--net-alias,--link also dns internal docker)
--net="<bridge/none/host/custom>"
--net-alias = "xxxx"
--add-host="xxxx"
--mac-address="xx:xx:xx:xx"
--ip="x.x.x.x"
--ipv6="xx:xx:xx:xx" <new in 1.11>
-p, --publish = 9999:9999
-P, --publish-all ➔ Auto map network

```
docker container run  -i -t --rm --name nodejs -p 3000:3000 \
        labdocker/alpineweb:latest node nodejs/hello.js
```

Network

- สร้าง custom virtual switch เพื่อจัดระเบียบและแบ่งแยก network ของ application ออกจากกัน (Recommend for Production)

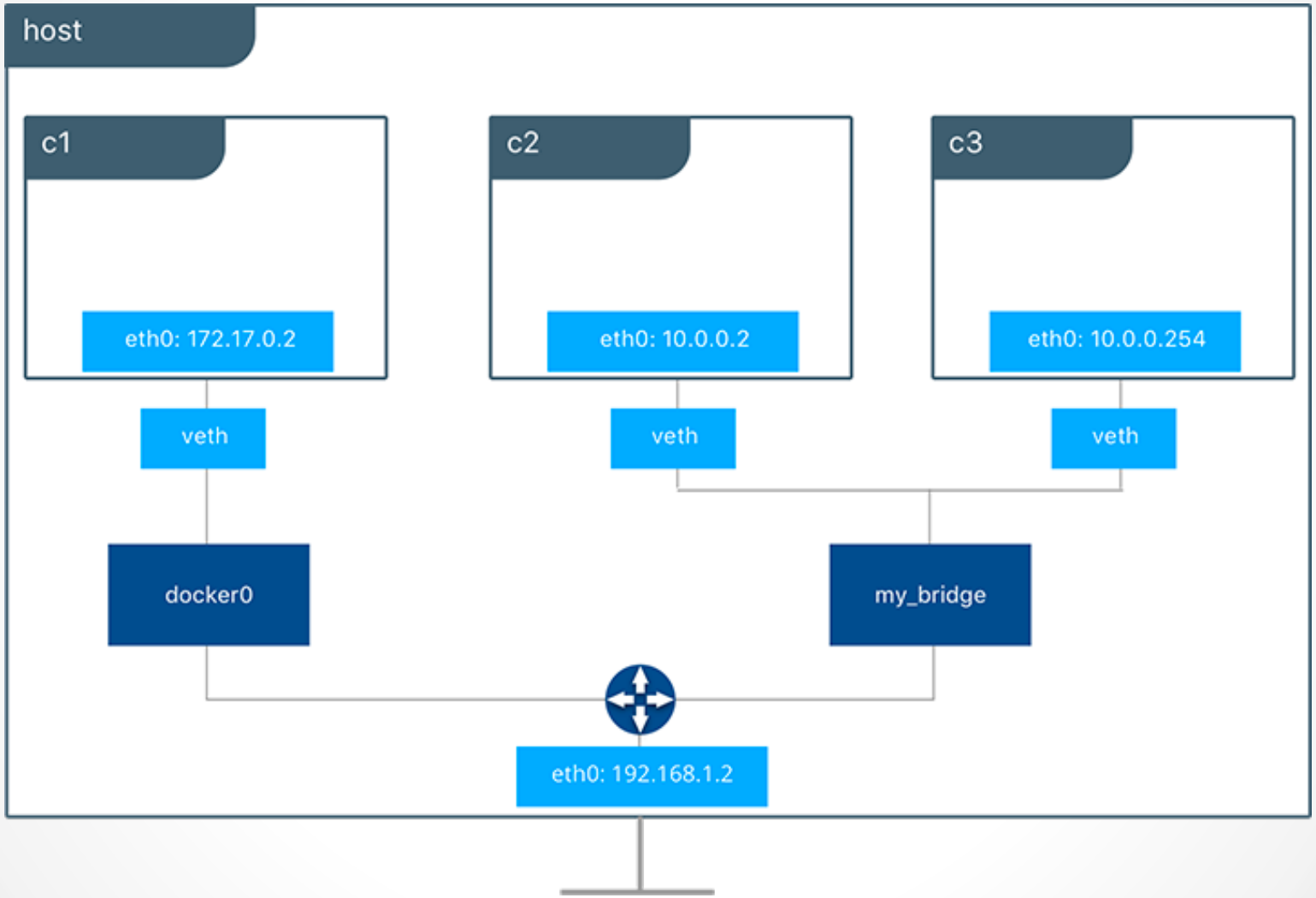
docker network create --driver <default/null/host> name

Ex: docker network create --driver default netweb

Ex: docker network rm netweb

- สามารถเพิ่มเติม option ในการสร้าง virtual switch เพิ่มเติม
  - -d macvlan -o parent = กำหนด vlan tagging
  - --subnet = xx (ระบุ ip address ของ virtual switch (Ex: 192.168.100.0/24))
  - --ip-range = xx (ระบุ ip address ที่จะส่งให้ container ทำงาน) (Ex: 192.168.100.128/25)
  - --gateway = xx (ระบุ ip address gateway) (Ex: 192.168.100.5)
  - --opt = custom option
    - --opt="com.docker.network.mtu"="1500"
    - --opt="com.docker.network.bridge.host_binding_ipv4"=x.x.x.x

Network


host
c1
eth0: 172.17.0.2
c2
eth0: 10.0.0.2
c3
eth0: 10.0.0.254
veth
veth
veth
docker0
my_bridge
eth0: 192.168.1.2

Network

- การเพิ่ม network ใน container

```
docker network connect <network > <container >
```

```
Ex: docker network connect webnet web1
```

- การลด network ใน container

```
docker network disconnect <network > <container >
```

```
Ex: docker network disconnect webnet web1
```

Network

- Link container (add on /etc/hosts) (Legacy)

```
docker –dt --name web1 labdocker/alpineweb sh
```

```
docker –dt --name web2 --link web1:webmaster \
labdocker/alpineweb sh
```

Legacy container links

Estimated reading time: 14 minutes

> Warning: The `--link` flag is a legacy feature of Docker. It may eventually be removed. Unless you absolutely need to continue using it, we recommend that you use user-defined networks to facilitate communication between two containers instead of using `--link`. One feature that user-defined networks do not support that you can do with `--link` is sharing environmental variables between containers. However, you can use other mechanisms such as volumes to share environment variables between containers in a more controlled way.

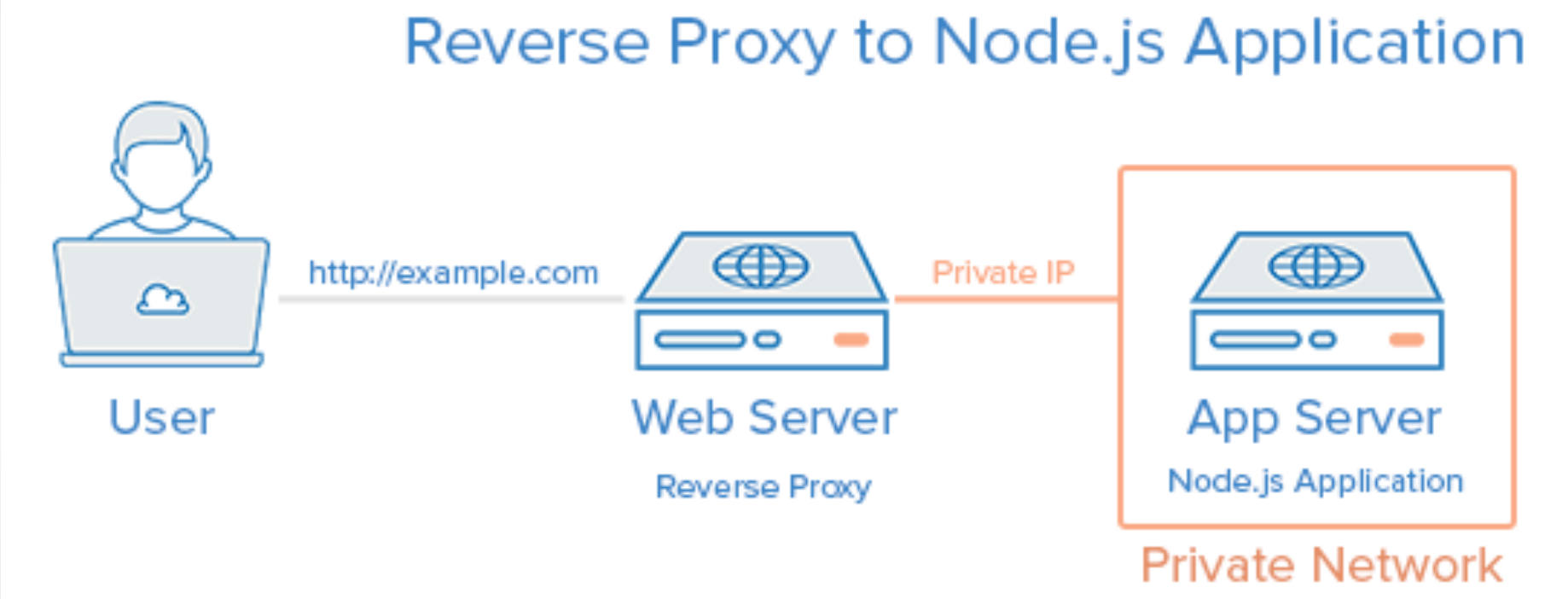
- DNS resolve on docker network (Recommend for Production)

Workshop 1-6: Network Configure

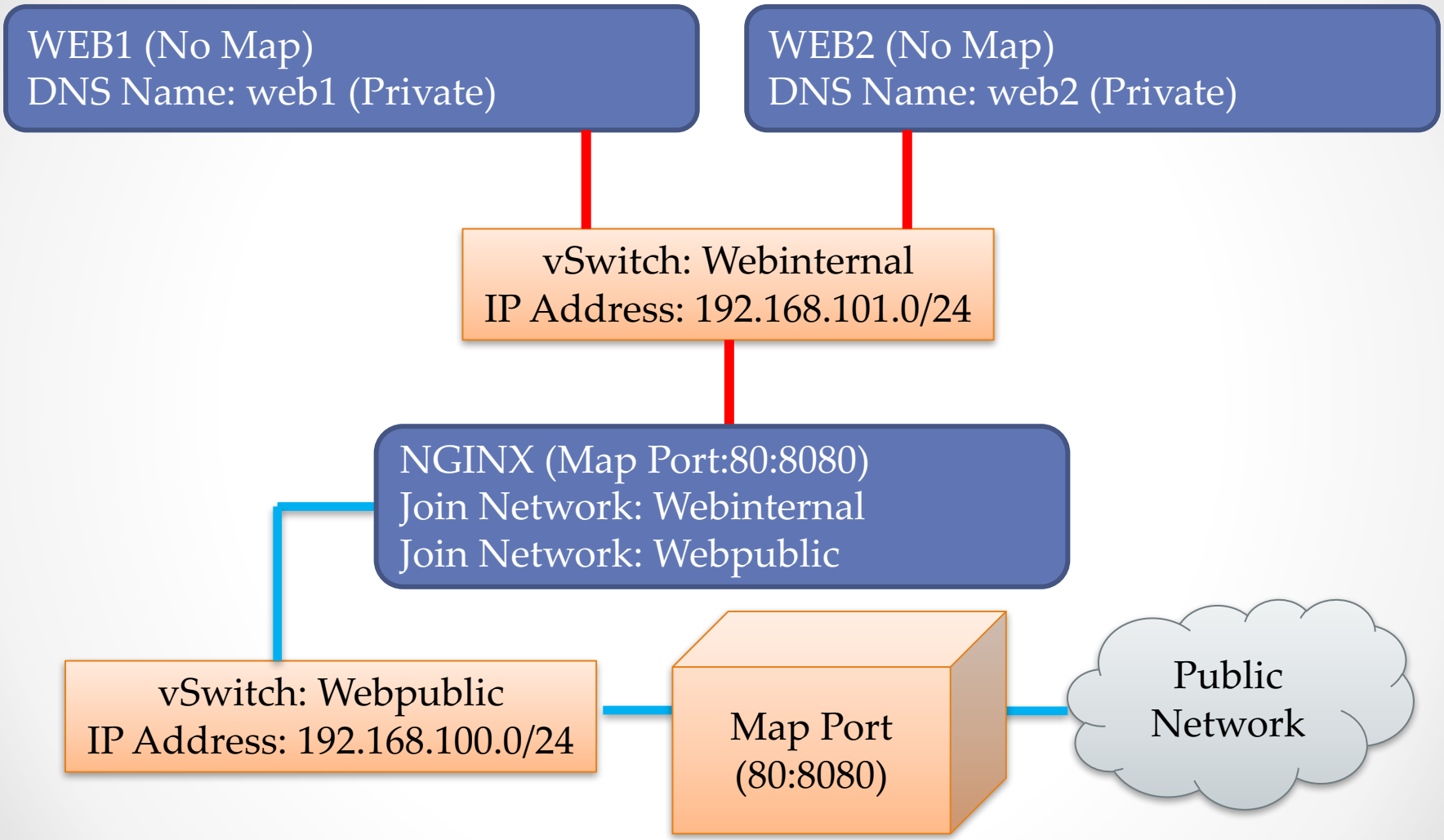
- <u>Part 1: Reverse Proxy Network (DNS)</u>
- Purpose: **ทำการ** Deploy nodejs webserver **ด้วย** solution proxy **ของ** nginx (load balance / reverse proxy)

- **public network** เพื่อให้บุคคลภายนอกเข้าใช้งานผ่าน nginx server (reverse proxy)
  - IP Address: 192.168.100.0/24
  - Range Address: 192.168.100.128 – 192.168.100.256
  - MTU: 1500
- **private network** เพื่อให้ nginx server **เข้าเรียกใช้งาน** nodejs web server
  - IP Address: 192.168.101.0/24
  - Range Address: 192.168.101.128 – 192.168.101.256
  - MTU: 9000

Workshop 1-6: Network Configure



Workshop 1-6: Network Configure



Workshop 1-6: Network Configure

- ทำการสร้าง Switch สำหรับเชื่อมต่อ Private / Public Network
  - docker network create --driver bridge \
    --subnet=192.168.100.0/24 --ip-range=192.168.100.128/25 \
    --gateway=192.168.100.5 --opt="com.docker.network.mtu"="1500" webpublic

  - docker network create --driver bridge \
    --subnet=192.168.101.0/24 --ip-range=192.168.101.128/25 \
    --gateway=192.168.101.5 --opt="com.docker.network.mtu"="9000" webinternalCreate Server

Workshop 1-6: Network Configure

- **สร้างเครื่อง** Webserver (nodejs) **และ** Nginx
  - **Web1**
  - docker run -dt --name web1 --net webinternal \
  --net-alias web1 labdocker/alpineweb:web1 node hello.js

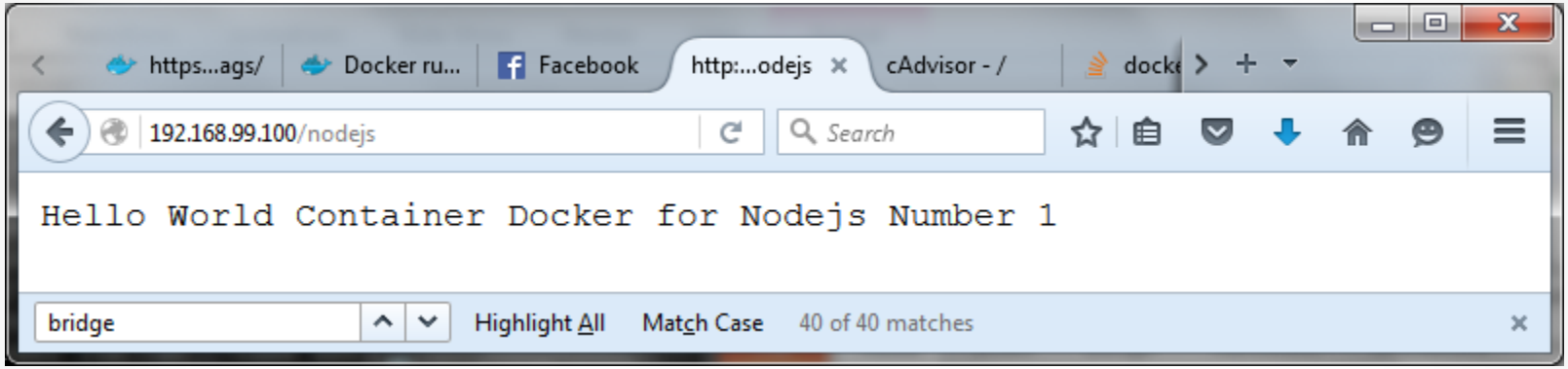
  - **Web2**
  - docker run -dt --name web2 --net webinternal \
  --net-alias web2 labdocker/alpineweb:web2 node hello.js

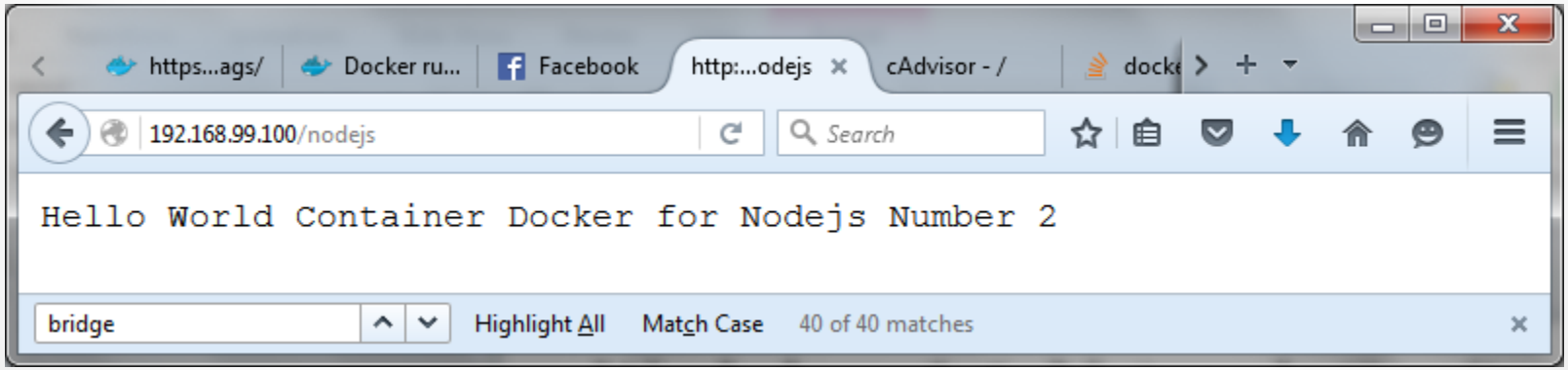
  - **NGINX**
  - docker run -dt --name nginx --net webinternal \
  -p 80:8080 labdocker/nginx:lab

  docker network connect webpublic nginx

Workshop 1-6: Network Configure

- url: http://<ip address of docker-machine/nodejs





Workshop 1-6: Network Configure

- curl result:

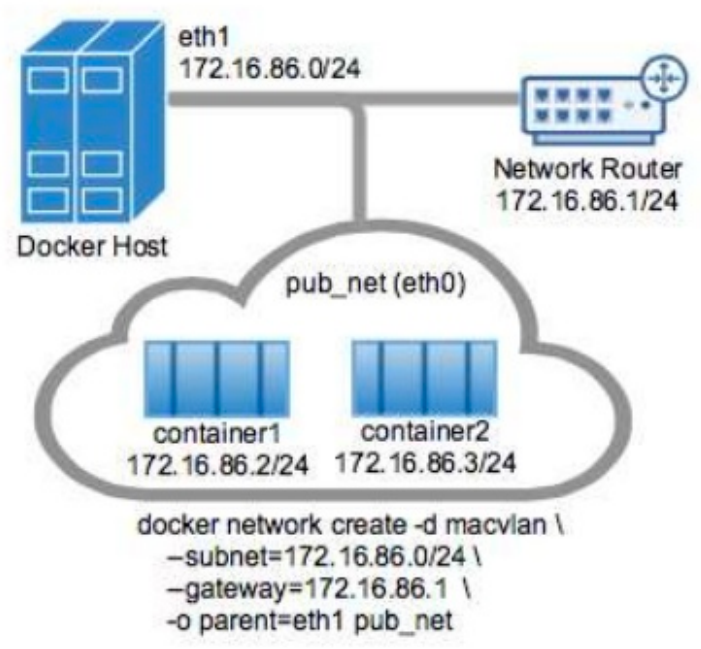
```
/usr/sbin # curl http://web1:3000
Hello World Container Docker for Nodejs Number 1
/usr/sbin # curl http://web2:3000
Hello World Container Docker for Nodejs Number 2
/usr/sbin #
```

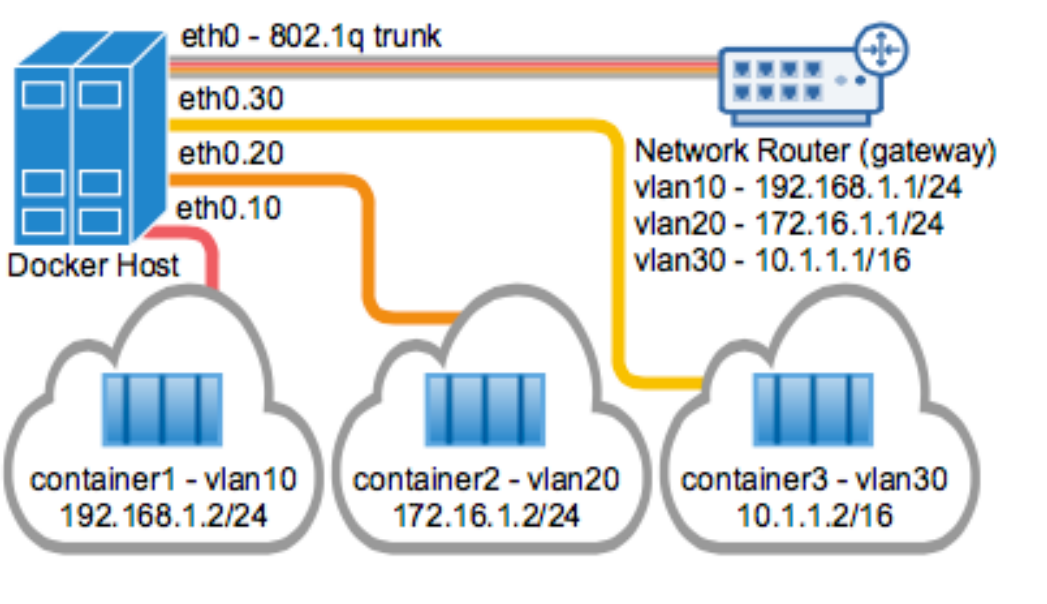
- nginx.conf

```
upstream nodejs_web {
    server web1:3000;
    server web2:3000;
}
server {
        listen 8080;
        location /nodejs{
        proxy_pass http://nodejs_web;
        proxy_http_version 1.1;
        proxy_set_header Upgrade $http_upgrade;
        proxy_set_header Connection 'upgrade';
        proxy_set_header Host $host;
        proxy_cache_bypass $http_upgrade;
        }
}
```

Network

- 802.1q Tagging (MACVLAN)





Workshop 1-6: Network Configure

- Part 2: Reverse Proxy Network (MACVLAN)
- Purpose: ทำการ Deploy nodejs webserver ด้วย solution proxy ของ nginx ผ่าน Macvlan

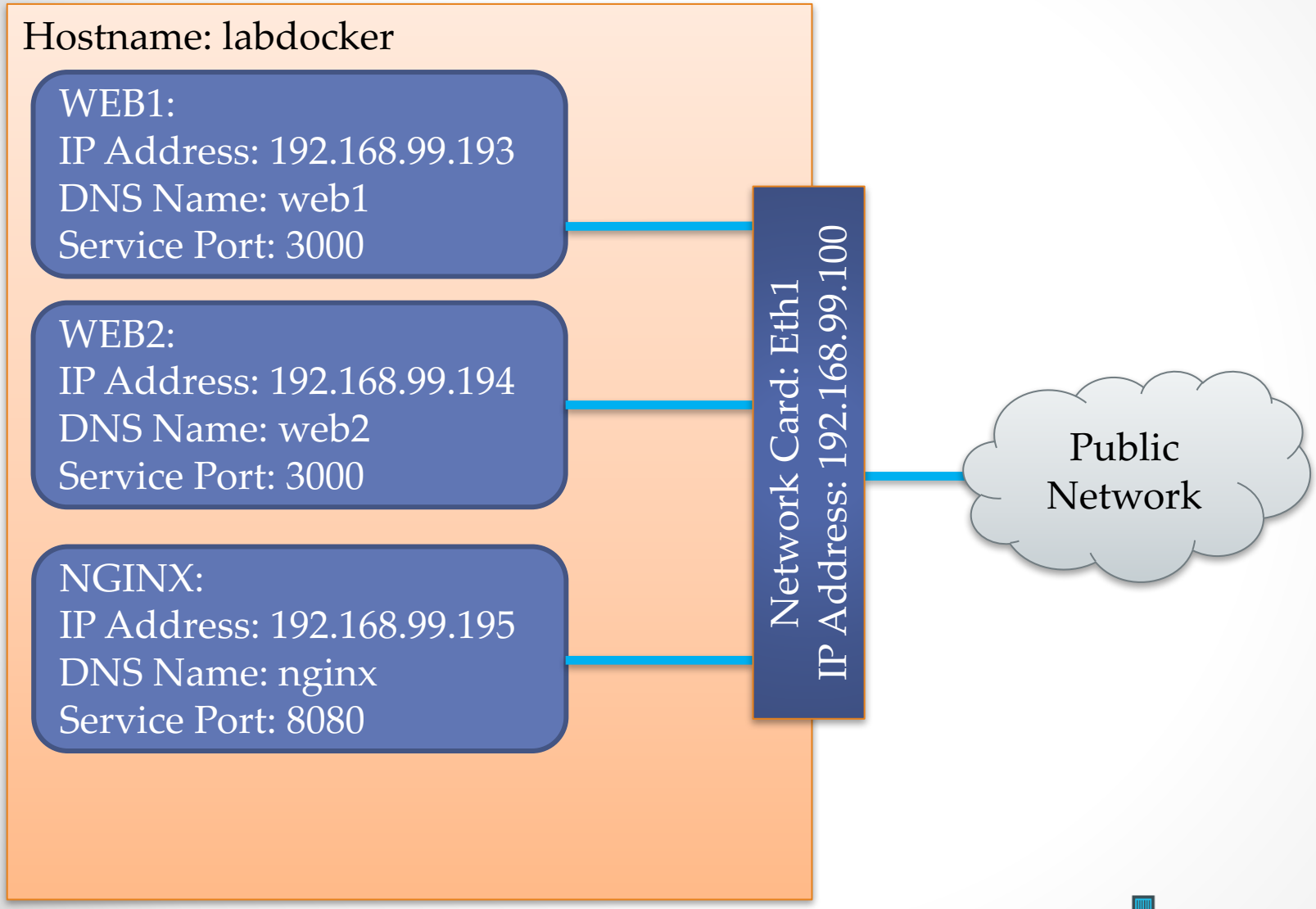
- **Macvlan:**
  - Interface: eth1
  - IP Address: 192.168.99.0/24
  - Gateway: 192.168.99.1 ➔ Your Machine
  - Labdocker: 192.168.99.100 ➔ Default
  - Range Address: 192.168.99.192/28
    - 192.168.99.193 – 192.168.99.206

https://github.com/docker/libnetwork/blob/master/docs/macvlan.md

Medium | jerkins | vagrant | Mesos | Vue | docker | NGINX | Taiwan | Kubernetes | PWA_Progressive_W... | MYSQL_Cluster | GeneralKB | Nod

- **Note:** Linux Macvlan interface types are not able to ping or communicate with the default namespace IP address. For example, if you create a container and try to ping the Docker host's `eth0` it will **not** work. That traffic is explicitly filtered by the kernel to offer additional provider isolation and security. This is a common gotcha when a user first uses those Linux interface types since it is natural to ping local addresses when testing.

Workshop 1-6: Network Configure



Workshop 1-6: Network Configure

- ทำการสร้าง Switch สำหรับเชื่อมต่อ Macvlan
  - docker network create -d macvlan \
    --subnet=192.168.99.0/24 \
    --ip-range=192.168.99.192/28 \
    --gateway=192.168.99.1 \
    -o parent=eth1 macvlanlab

- ในกรณีต้องการทำ Tag VLAN (802.1q) จาก Switch/Router เข้าสู่ Docker Host และทำการสร้าง Sub Interface สามารถทำได้ดังนี้
  - docker network create -d macvlan \
    --subnet=192.168.99.0/24 \
    --ip-range=192.168.99.192/28 \
    --gateway=192.168.99.1 \
    -o parent=eth1.<vlan id> macvlanlab

Workshop 1-6: Network Configure

- **สร้างเครื่อง** Webserver (nodejs) **และ** Nginx
  - **Web1**
  - docker run -dt --name web1 --net macvlanlab \
  --net-alias web1 labdocker/alpineweb:web1 node hello.js

  - **Web2**
  - docker run -dt --name web2 --net macvlanlab \
  --net-alias web2 labdocker/alpineweb:web2 node hello.js

  - **NGINX**
  - docker run -dt --name nginx --net macvlanlab \
  labdocker/nginx:lab

Workshop 1-6: Network Configure

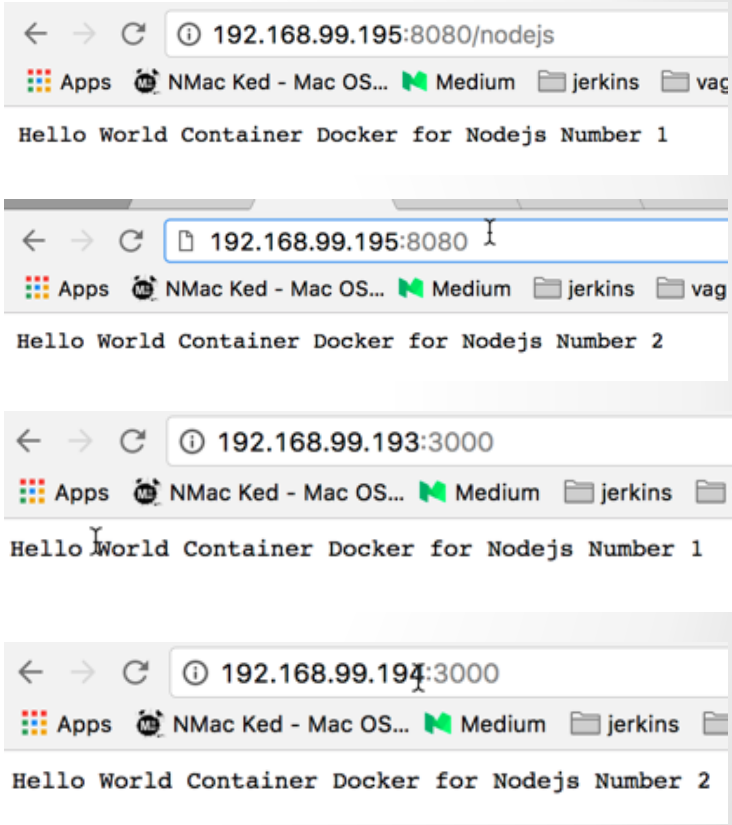
- Internal test:

```
docker@labdocker:~$ docker exec -it nginx curl http://web1:3000
Hello World Container Docker for Nodejs Number 1
docker@labdocker:~$ docker exec -it nginx curl http://web2:3000
Hello World Container Docker for Nodejs Number 2
docker@labdocker:~$ docker exec -it ping web1
Error: No such container: ping
docker@labdocker:~$ docker exec -it nginx ping web1
PING web1 (192.168.99.193): 56 data bytes
64 bytes from 192.168.99.193: seq=0 ttl=64 time=0.253 ms
64 bytes from 192.168.99.193: seq=1 ttl=64 time=0.405 ms
^C
--- web1 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 0.253/0.329/0.405 ms
docker@labdocker:~$ docker exec -it nginx ping web2
PING web2 (192.168.99.194): 56 data bytes
64 bytes from 192.168.99.194: seq=0 ttl=64 time=0.256 ms
^C
--- web2 ping statistics ---
1 packets transmitted, 1 packets received, 0% packet loss
round-trip min/avg/max = 0.256/0.256/0.256 ms
```

Workshop 1-6: Network Configure

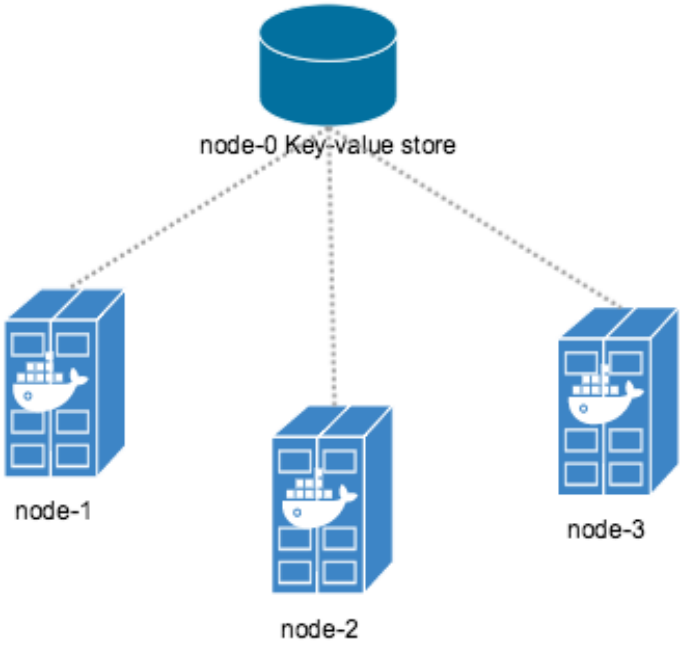
- External Test:

```
praparns-MacBook-Pro:~ praparn$ curl http://192.168.99.195:8080/nodejs
Hello World Container Docker for Nodejs Number 1
praparns-MacBook-Pro:~ praparn$ curl http://192.168.99.195:8080/nodejs
Hello World Container Docker for Nodejs Number 2
praparns-MacBook-Pro:~ praparn$ curl http://192.168.99.194:3000
Hello World Container Docker for Nodejs Number 2
praparns-MacBook-Pro:~ praparn$ curl http://192.168.99.193:3000
Hello World Container Docker for Nodejs Number 1
praparns-MacBook-Pro:~ praparn$ ping 192.168.99.195
PING 192.168.99.195 (192.168.99.195): 56 data bytes
64 bytes from 192.168.99.195: icmp_seq=0 ttl=64 time=0.471 ms
^C
--- 192.168.99.195 ping statistics ---
1 packets transmitted, 1 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 0.471/0.471/0.471/0.000 ms
praparns-MacBook-Pro:~ praparn$ ping 192.168.99.194
PING 192.168.99.194 (192.168.99.194): 56 data bytes
64 bytes from 192.168.99.194: icmp_seq=0 ttl=64 time=0.392 ms
^C
--- 192.168.99.194 ping statistics ---
1 packets transmitted, 1 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 0.392/0.392/0.392/0.000 ms
praparns-MacBook-Pro:~ praparn$ ping 192.168.99.193
PING 192.168.99.193 (192.168.99.193): 56 data bytes
64 bytes from 192.168.99.193: icmp_seq=0 ttl=64 time=0.495 ms
^C
--- 192.168.99.193 ping statistics ---
1 packets transmitted, 1 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 0.495/0.495/0.495/0.000 ms
praparns-MacBook-Pro:~ praparn$
```



Network

- Network across host (Overlay Network)



Network

- 3rd Party Network Plugin

Driver	Description
contiv	An open source network plugin led by Cisco Systems to provide infrastructure and security policies for multi-tenant microservices deployments. Contiv also provides integration for non-container workloads and with physical networks, such as ACI. Contiv implements remote network and IPAM drivers.
weave	A network plugin that creates a virtual network that connects Docker containers across multiple hosts or clouds. Weave provides automatic discovery of applications, can operate on partially connected networks, does not require an external cluster store, and is operations friendly.
calico	An open source solution for virtual networking in cloud datacenters. It targets datacenters where most of the workloads (VMs, containers, or bare metal servers) only require IP connectivity. Calico provides this connectivity using standard IP routing. Isolation between workloads — whether according to tenant ownership or any finer grained policy — is achieved via iptables programming on the servers hosting the source and destination workloads.
kuryr	A network plugin developed as part of the OpenStack Kuryr project. It implements the Docker networking (libnetwork) remote driver API by utilizing Neutron, the OpenStack networking service. Kuryr includes an IPAM driver as well.

Docker Remote IPAM Drivers

Community and vendor created IPAM drivers can also be used to provide integrations with existing systems or special capabilities.

Driver	Description
infoblox	An open source IPAM plugin that provides integration with existing Infoblox tools.

Volume

...

Volume

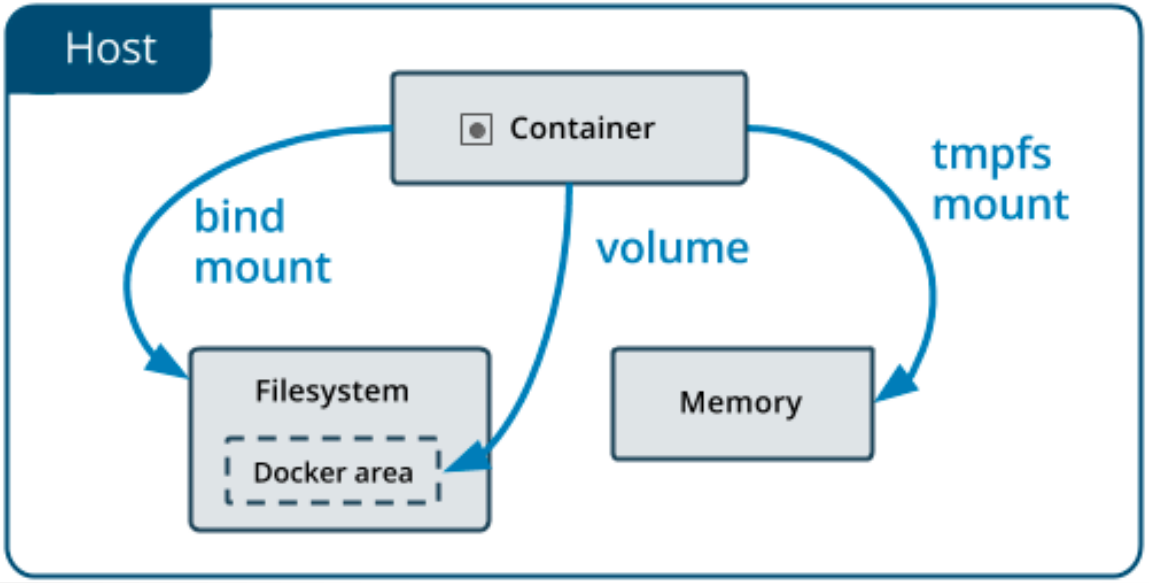
- ตามปกติแล้ว docker จะเก็บข้อมูลทุกอย่างเอาไว้ภายใน container
  - /var/log
  - /sys/data
  - /etc/nagios/
  - /etc/mysql
  - Etc.

- สำหรับการใช้งาน container ใน production environment docker ได้สร้าง tool สำหรับอำนวยความสะดวกในการใช้งานข้อมูลร่วมกันในหลายๆกรณี อาทิเช่น
  - การ share ข้อมูลร่วมกันระหว่าง container
  - การ share ข้อมูลร่วมกันระหว่าง container / host
  - จัดเก็บ configuration / log / data ของทุกๆ container ไว้ที่ศูนย์กลาง
  - data migration
  - backup / restore

Volume

- รูปแบบการใช้งาน Volume บน Docker
  - Bind Mount (Map path with Host Directly)
  - Volumes Mount(Local, Special Driver)
  - Tmpfs Mount (Memory Only)

- พารามิเตอร์ในการใช้งาน (--mount), (-v (Obsolete))



Volume

- 1. Bind Mount: map volume ระหว่าง host directory และ container directory

```
-v /volume-host:/volume-container:(ro/rw)
```

```
--mount type=bind,source=/volume-host
,target=/volume-container, (readonly)
```

Ex: docker container run –dt -v /etc/nginx.conf:/etc/nginx.conf:ro

Ex:docker container run -dt --mount type=bind,\
source=/etc/nginx.conf,target=/etc/nginx.conf,readonly

- ตรวจสอบการคอนฟิกบน container (inspect)

```
"HostConfig": {
        "Binds": [
          "/var/log:/var/log:ro"],
```

Volume

- 2. Volumes สร้าง volume กลางเพื่อใช้ในการจัดเก็บข้อมูล หรือ share volume ระหว่าง host/container/container (local: /var/lib/docker/volumes,driver: 3rd Party)
  - สร้าง Volume สำหรับใช้เก็บข้อมูล

```
docker volume create --driver <xxx> --opt <xxx> <name>
```

Ex: docker volume create --driver local datavol

```
Ex: docker volume create --driver local \
    --opt type=nfs --opt o=addr=192.168.99.100,rw \
    --opt device=:/nfs_share datavol
```

Volume

- การใช้ Volumes (-v option is not allow for service level (Swarm/Compose))

Ex: docker volume create --driver local datavol

Ex: docker container run –dt --name web1 \
-v datavol:/data labdocker/alpine sh

Ex: docker container run –dt --name web2 \
-v datavol:/data labdocker/alpine sh

Ex: docker container run –dt --name web1 \
--mount source=datavol,target=/data labdocker/alpine sh

Ex: docker container run –dt --name web2 \
--mount source=datavol,target=/data labdocker/alpine sh

Volume

- การลบ volume ทิ้งจาก container ให้ใช้คำสั่ง docker volume rm เพื่อลบ volume

```
docker volume rm <volume name>
```

- Third Party Volume Plugin (Since 1.8)

```
docker volume create --driver=<third party> <volume name>
```

```
Ex: docker volume create --driver=gce --name gce-disk \
 -o SizeGb=90
```

```
Ex: docker run –dt -v gce-disk:/store/database alpine sh
```

Volume

Iugin	Description
Azure File Storage plugin	Lets you mount Microsoft Azure File Storage shares to Docker containers as volumes using the SMB 3.0 protocol. Learn more.
BeeGFS Volume Plugin	An open source volume plugin to create persistent volumes in a BeeGFS parallel file system.
Blockbridge plugin	A volume plugin that provides access to an extensible set of container-based persistent storage options. It supports single and multi-host Docker environments with features that include tenant isolation, automated provisioning, encryption, secure deletion, snapshots and QoS.
Contiv Volume Plugin	An open source volume plugin that provides multi-tenant, persistent, distributed storage with intent based consumption. It has support for Ceph and NFS.
Convoy plugin	A volume plugin for a variety of storage back-ends including device mapper and NFS. It's a simple standalone executable written in Go and provides the framework to support vendor-specific extensions such as snapshots, backups and restore.
DigitalOcean Block Storage plugin	Integrates DigitalOcean's block storage solution into the Docker ecosystem by automatically attaching a given block storage volume to a DigitalOcean droplet and making the contents of the volume available to Docker containers running on that droplet.
DRBD plugin	A volume plugin that provides highly available storage replicated by DRBD. Data written to the docker volume is replicated in a cluster of DRBD nodes.
Flocker plugin	A volume plugin that provides multi-host portable volumes for Docker, enabling you to run databases and other stateful containers and move them around across a cluster of machines.
Fuxi Volume Plugin	A volume plugin that is developed as part of the OpenStack Kuryr project and implements the Docker volume plugin API by utilizing Cinder, the OpenStack block storage service.
gce-docker plugin	A volume plugin able to attach, format and mount Google Compute persistent-disks.
GlusterFS plugin	A volume plugin that provides multi-host volumes management for Docker using GlusterFS.
Horcrux Volume Plugin	A volume plugin that allows on-demand, version controlled access to your data. Horcrux is an open-source plugin, written in Go, and supports SCP, Minio and Amazon S3.
HPE 3Par Volume Plugin	A volume plugin that supports HPE 3Par and StoreVirtual iSCSI storage arrays.
IPFS Volume Plugin	An open source volume plugin that allows using an ipfs filesystem as a volume.
Keywhiz plugin	A plugin that provides credentials and secret management using Keywhiz as a central repository.
Local Persist Plugin	A volume plugin that extends the default local driver's functionality by allowing you specify a mountpoint anywhere on the host, which enables the files to *always persist*, even if the volume is removed via docker volume rm.
NetApp Plugin(nDVP)	A volume plugin that provides direct integration with the Docker ecosystem for the NetApp storage portfolio. The nDVP package supports the provisioning and management of storage resources from the storage platform to Docker hosts, with a robust framework for adding additional platforms in the future.
Netshare plugin	A volume plugin that provides volume management for NFS 3/4, AWS EFS and CIFS file systems.
Nimble Storage Volume Plugin	A volume plug-in that integrates with Nimble Storage Unified Flash Fabric arrays. The plug-in abstracts array volume capabilities to the Docker administrator to allow self-provisioning of secure multi-tenant volumes and clones.
OpenStorage Plugin	A cluster-aware volume plugin that provides volume management for file and block storage solutions. It implements a vendor neutral specification for implementing extensions such as CoS, encryption, and snapshots. It has example drivers based on FUSE, NFS, NBD and EBS to name a few.
Portworx Volume Plugin	A volume plugin that turns any server into a scale-out converged compute/storage node, providing container granular storage and highly available volumes across any node, using a shared-nothing storage backend that works with any docker scheduler.
Quobyte Volume Plugin	A volume plugin that connects Docker to Quobyte's data center file system, a general-purpose scalable and fault-tolerant storage platform.
REX-Ray plugin	A volume plugin which is written in Go and provides advanced storage functionality for many platforms including VirtualBox, EC2, Google Compute Engine, OpenStack, and EMC.
Virtuozzo Storage and Ploop plugin	A volume plugin with support for Virtuozzo Storage distributed cloud file system as well as ploop devices.
VMware vSphere Storage Plugin	Docker Volume Driver for vSphere enables customers to address persistent storage requirements for Docker containers in vSphere environmen

Volume

- การ backup volume จาก container

Ex:

```
docker container run -it --rm --mount source=datavol,target=/data\
--mount type=bind,source=$(pwd) ,target=/backup \
tar cvf /backup/vol001.tar /data
```

- การ restore volume จาก container

Ex:

```
docker container run  -it --rm --mount source=datavol,target=/data\
--mount type=bind,source=$(pwd) ,target=/backup \
bash -c "cd /data && tar xvf /backup/vol001.tar --strip 1"
```

Volume

- 3. tmpfs mount ใช้เพื่อจัดเก็บข้อมูลใน memory ไว้บน non-persistency space โดย tmpfs ไม่สามารถ Share ระหว่าง container และไม่สามารถใช้งานบน Windows ได้

```
docker volume create --driver <xxx> --opt <xxx> <name>
```

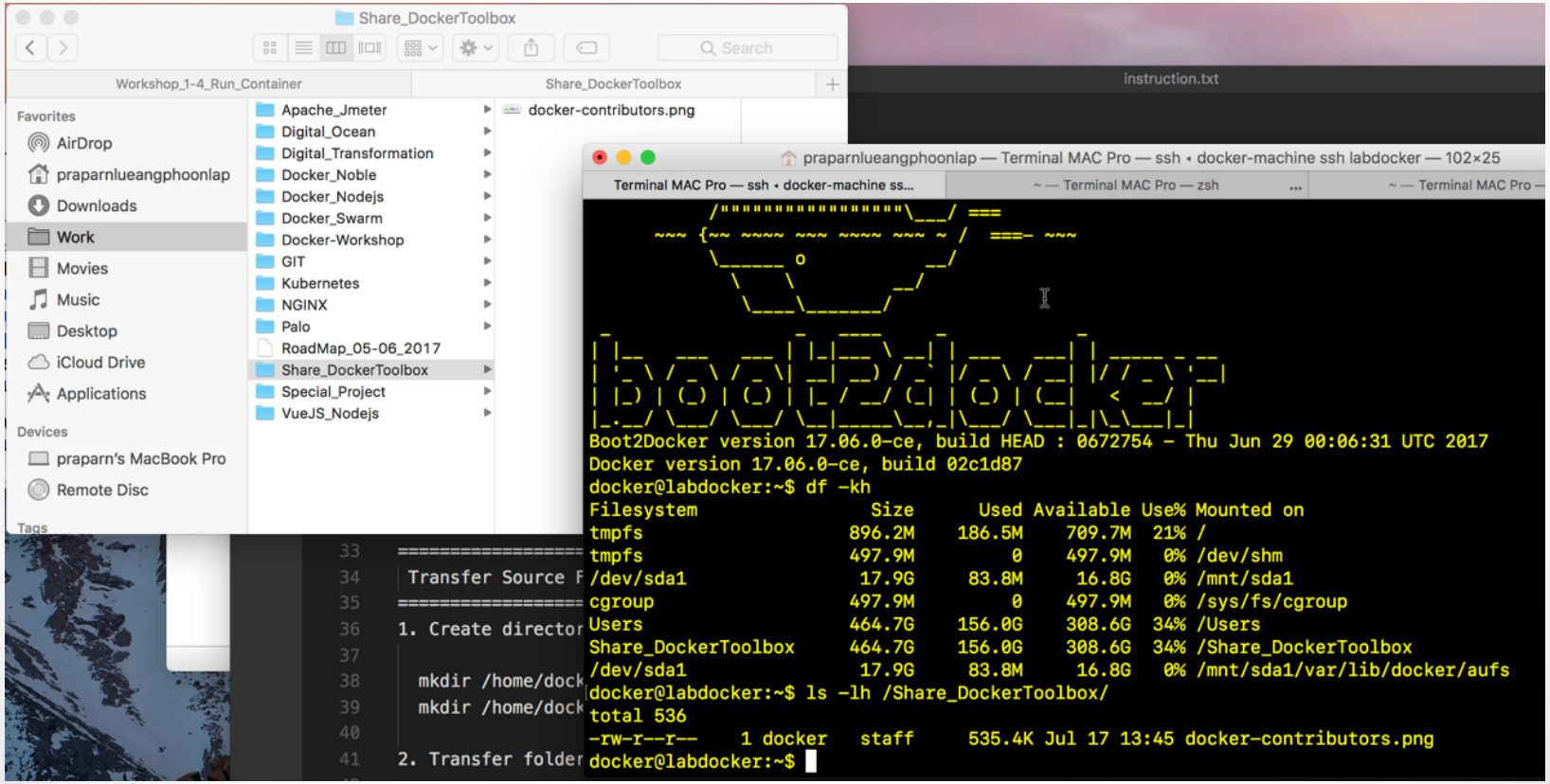
Ex: docker volume create --driver local --opt type=tmpfs \ --opt device=tmpfs --opt o=size=100m,uid=1000 tmptest

Ex: docker container run -dt --name tmptest –mount type=tmpfs,destination=/app nginx:latest

Ex: docker container run -dt --name tmptest --tmpfs /app \ nginx:latest

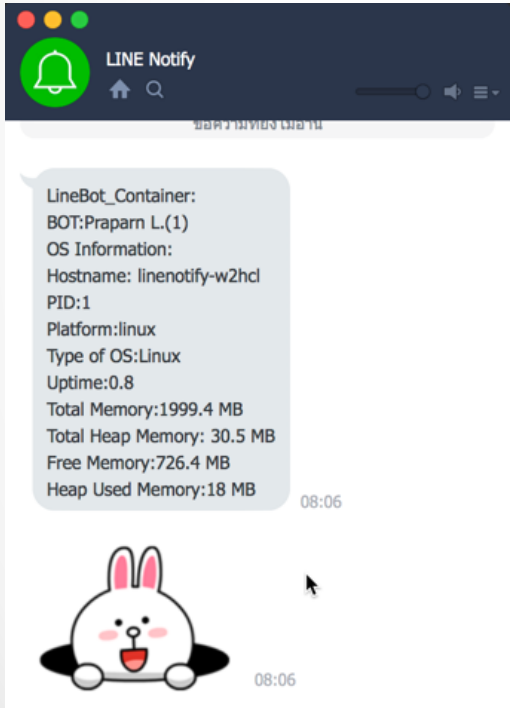
Workshop 1-7: Share Volume

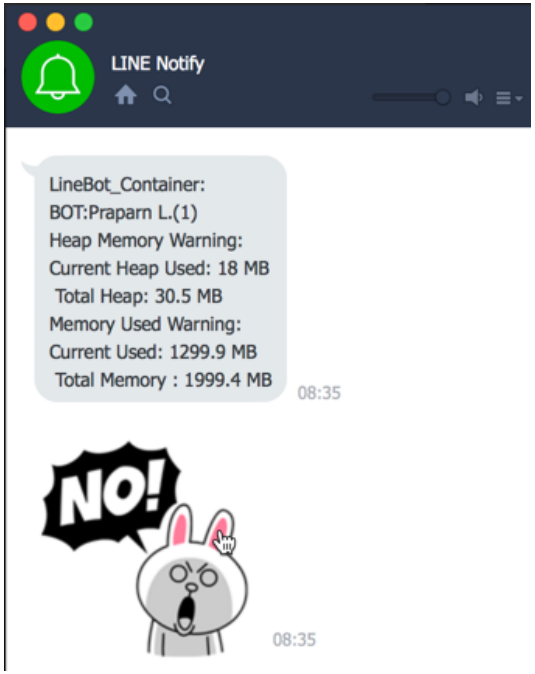
- <u>Before Workshop</u>
- Following manual "create sharefile for dockertoolbox" to initial share volume



Workshop 1-7: Share Volume

- <u>Part 1: Host Path debug program</u>
- Purpose: ทำการ Map volume เพื่อนำ source code เข้าไปทำการ debug/run บน container
- Example on WorkShop: "Monitor and LINE notify container"



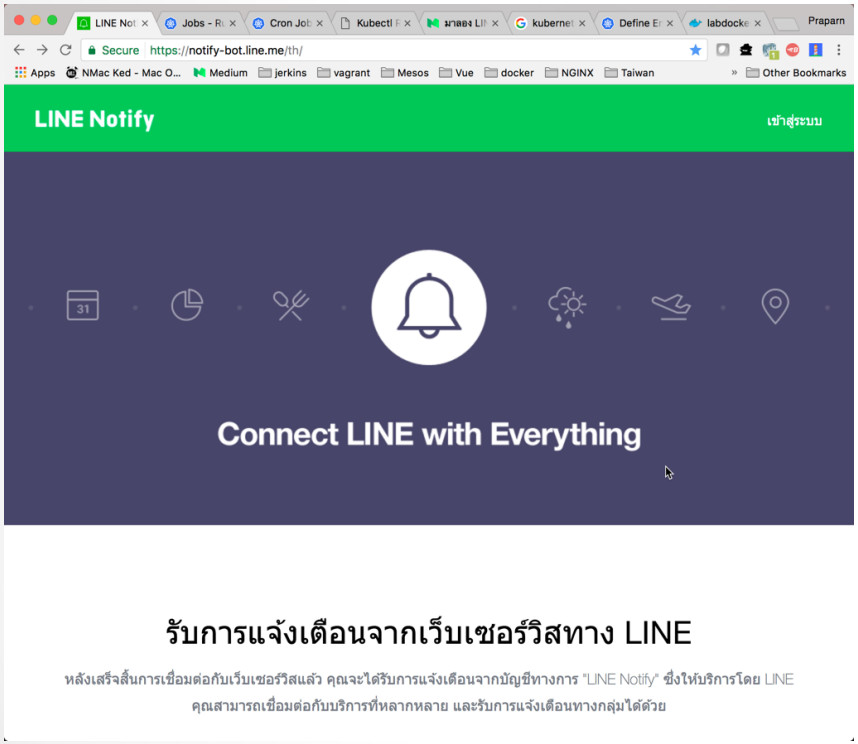


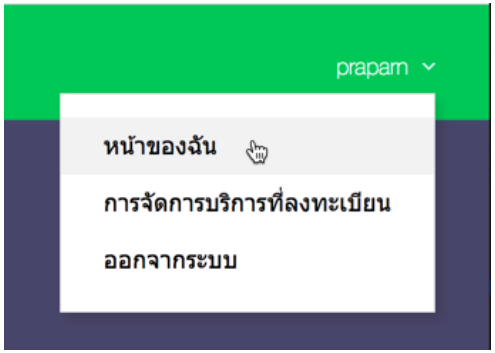
LINE

docker

Workshop 1-7: Share Volume

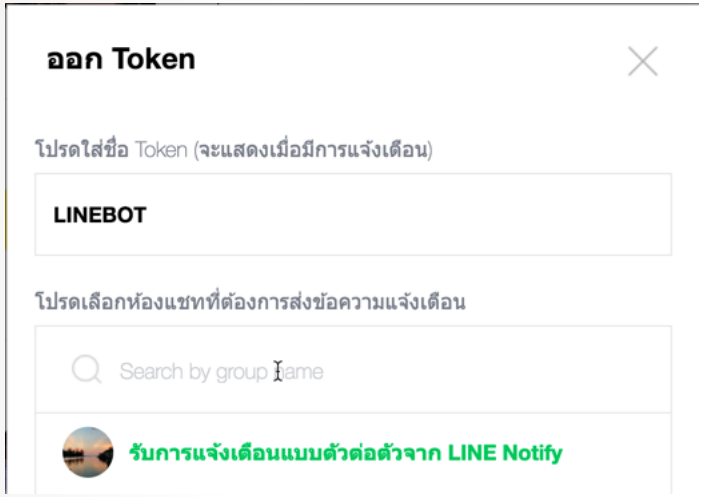
- <u>Generate LINE Token</u>
  - https://notify-bot.line.me

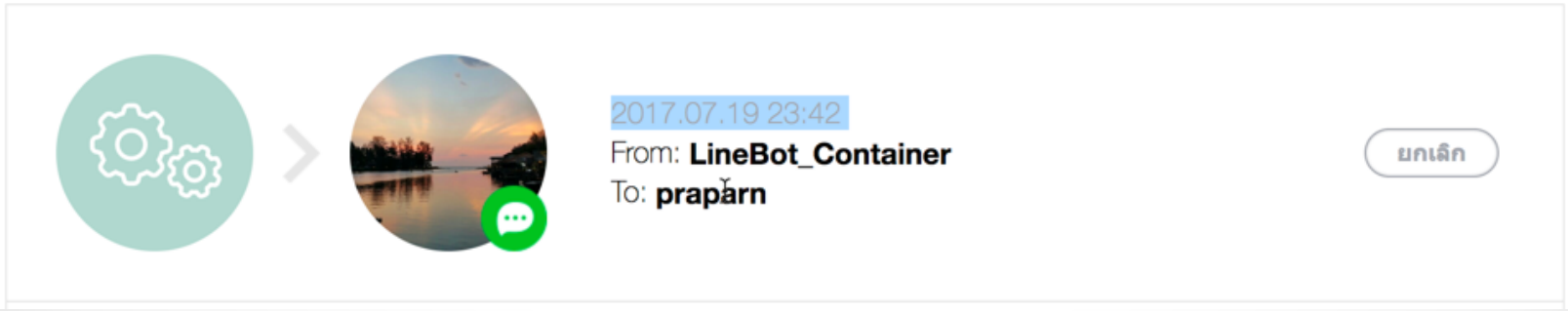




Workshop 1-7: Share Volume

- Generate LINE Token
  - https://notify-bot.line.me





Workshop 1-7: Share Volume

```
1   const Monitor = require('monitor');
2   const request = require('request');
3   const TITLE=process.env.TITLE;
4   const INTERVAL=process.env.INTERVAL;
5   const HEAP_HIGH =process.env.HEAP_HIGH;
6   const MEM_HIGH =process.env.MEM_HIGH;
7   const SH_OS =process.env.SH_OS;
8   const TOKEN = process.env.TOKEN;
9   const critical_StickerPkg = 2;
10  const critical_StickerId = 39;
11  const information_StickerPkg = 2;
12  const information_StickerId = 34;
13  var options = {
14    probeClass: 'Process',
15    initParams: {
16      pollInterval: INTERVAL
17    }
18  }
19  var processMonitor = new Monitor(options);
20  var stickerPkg=0; //stickerPackageId
21  var stickerId=0; //stickerId
22  processMonitor.on('change', () => {
23    var sendNotify="N" //final decision to send notify
24    var heapWarning="N" //flag for heap memory warning
25    var memoryWarning="N" //flag for memory warning
```

```
19  var processMonitor = new Monitor(options);
20  var stickerPkg=0; //stickerPackageId
21  var stickerId=0; //stickerId
22  processMonitor.on('change', () => {
23    var sendNotify="N" //final decision to send notify
24    var heapWarning="N" //flag for heap memory warning
25    var memoryWarning="N" //flag for memory warning
26    //collect OS information
27    var hostName = processMonitor.get('hostname');
28    var pID = processMonitor.get('pid');
29    var platForm = processMonitor.get('platform');
30    var upTime = processMonitor.get('uptime');
31    var type = processMonitor.get('type');
32    var totalMem = processMonitor.get('totalmem');
33    totalMem=Number(((totalMem/1024)/1024).toFixed(1)); //Convert to MB
34    var heapTotal = processMonitor.get('heapTotal');
35    heapTotal=Number(((heapTotal/1024)/1024).toFixed(1)); //Convert to MB
36    var titleMSG="\n"+TITLE+"("+pID+")"
37    var osMSG="";
38    var warnMSG="";
39    //collect OS information
40    //collect memory information
41    var heapUsed = processMonitor.get('heapUsed');
42    heapUsed=Number(((heapUsed/1024)/1024).toFixed(1)); //Convert to MB
43    if(HEAP_HIGH<((heapUsed/heapTotal)*100)){heapWarning="Y";}
44    var freeMem = processMonitor.get('freemem');
45    freeMem=Number(((freeMem/1024)/1024).toFixed(1));
46    var usedMem = totalMem-freeMem;
47    usedMem=Number(usedMem.toFixed(1)); //Convert to MB
48    if(MEM_HIGH<((usedMem/totalMem)*100)){memoryWarning="Y";}
49    //collect memory information
```

Workshop 1-7: Share Volume

praparnlueangphoonlap — Terminal MAC Pro — ssh ◂ docker-machine ssh labdocker — 102×25

Terminal MAC Pro — ssh ◂ docker-machine ss... | ~ — Terminal MAC Pro — zsh | ~ — Terminal MAC Pro — -bash

```
mit":"50","x-ratelimit-remaining":"997","x-ratelimit-imageremaining":"50","x-ratelimit-reset":"1501996
936"},"request":{"uri":{"protocol":"https:","slashes":true,"auth":null,"host":"notify-api.line.me","po
rt":443,"hostname":"notify-api.line.me","hash":null,"search":null,"query":null,"pathname":"/api/notify
","path":"/api/notify","href":"https://notify-api.line.me/api/notify"},"method":"POST","headers":{"Con
tent-Type":"application/x-www-form-urlencoded","authorization":"Bearer EIeqyillzkzpaCo1ROrebZTcGbIyzDZ
HpOjcdd0t6CX","content-length":343}}}
"{\"status\":200,\"message\":\"ok\"}"
^C
/nodejs # export HEAP_HIGH=20
/nodejs # export MEM_HIGH=20
/nodejs # export SH_OS=N
/nodejs # node index.js
null
{"statusCode":200,"body":"{\"status\":200,\"message\":\"ok\"}","headers":{"server":"nginx","date":"Sun
, 06 Aug 2017 04:30:41 GMT","content-type":"application/json;charset=UTF-8","transfer-encoding":"chunk
ed","connection":"keep-alive","keep-alive":"timeout=3","x-ratelimit-limit":"1000","x-ratelimit-imageli
mit":"50","x-ratelimit-remaining":"996","x-ratelimit-imageremaining":"50","x-ratelimit-reset":"1501996
936"},"request":{"uri":{"protocol":"https:","slashes":true,"auth":null,"host":"notify-api.line.me","po
rt":443,"hostname":"notify-api.line.me","hash":null,"search":null,"query":null,"pathname":"/api/notify
","path":"/api/notify","href":"https://notify-api.line.me/api/notify"},"method":"POST","headers":{"Con
tent-Type":"application/x-www-form-urlencoded","authorization":"Bearer EIeqyillzkzpaCo1ROrebZTcGbIyzDZ
HpOjcdd0t6CX","content-length":290}}}
"{\"status\":200,\"message\":\"ok\"}"
^C
/nodejs #
```

LINE Notify

ข้อความที่ยังไม่อ่าน

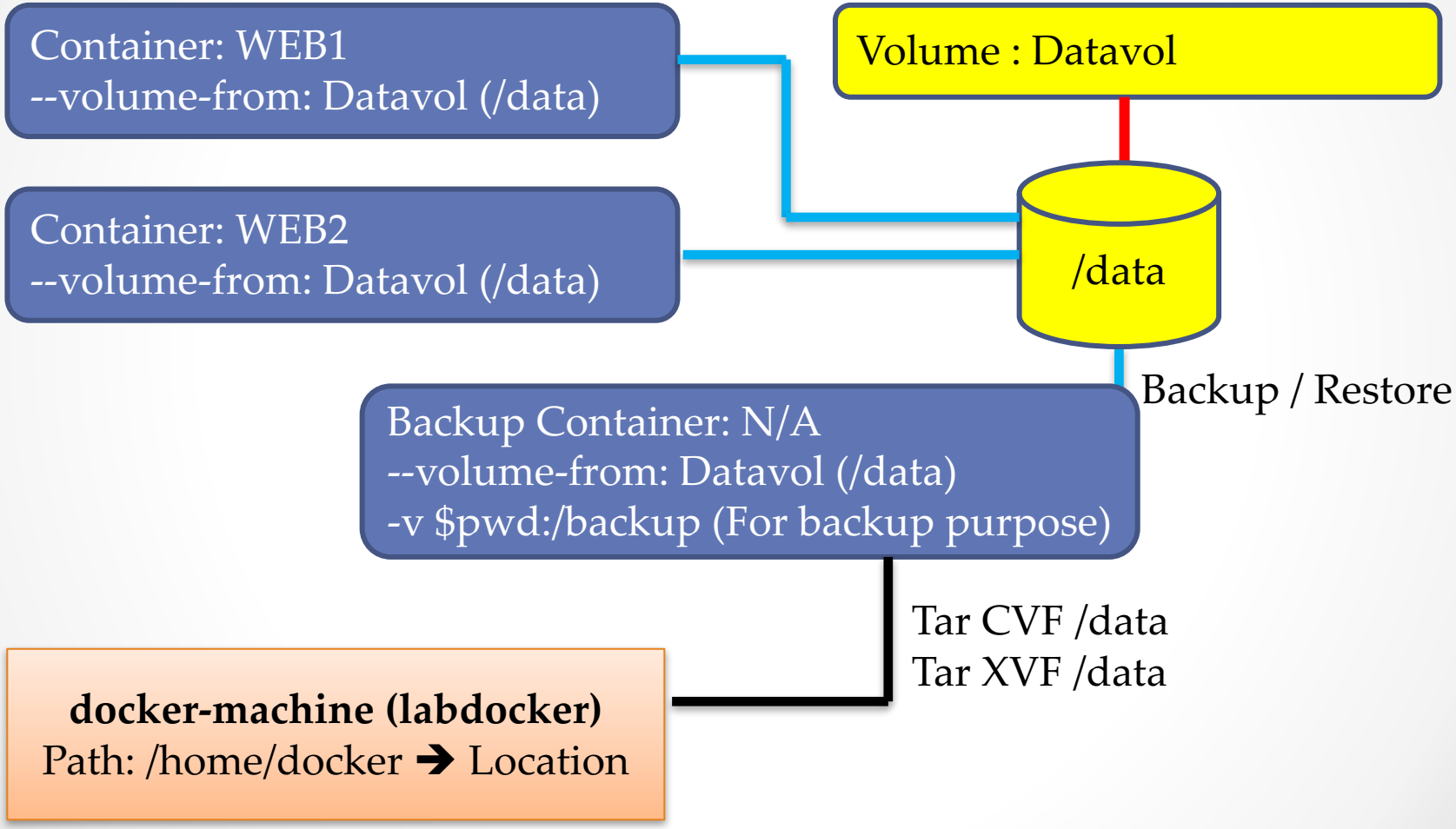
LineBot_Container:
NODEJS_BOT_NOTIFY(67 Edit LINENOTIFY)
Heap Memory Warning:
Current Heap Used: 18.2 MB
Total Heap: 30.5 MB
Memory Used Warning:
Current Used: 477.6 MB
Total Memory : 995.8 MB

11:30

11:30

Workshop 1-7: Share Volume

- Part 2: Container Volume



Log and Inspect

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Log

- เพื่อตรวจสอบ log การทำงานบน container อย่างต่อเนื่อง docker ได้เตรียม tool ในการตรวจสอบ log การทำงาน

docker container logs <options> <container name>

- options ในการดูล็อกไฟล์
  - -f, --follow เพื่อตรวจสอบล็อกไฟล์ใหม่ตลอดเวลา
  - -t,--timestamps กำหนดให้ใส่วันและเวลาในล็อกไฟล์
  - --since= <unix timestamps> กำหนดเวลาเริ่มตรวจสอบล็อกไฟล์ หรือ กำหนด yyyy-mm-dd
  - --tail = "all" / number of line
  - --until แสดง log ก่อนเวลาที่กำหนด (Ex: 20180619220001) หรือ Relative (Ex: 42m = 42 minute before)
  - --details แสดงรายละเอียดเพิ่มเติมของล็อกเช่น Env variable, labels โดยจะเป็นรายละเอียดเพิ่มเติมจากการใส่ option --log-opt ตอนสร้าง container

Inspect

- การตรวจสอบค่าคอนฟิกของ container / network / volume etc

```
docker inspect <container >
```

```
docker network inspect
```

```
docker volume inspect
```

Workshop 1-8: Log & Inspect

- ทดสอบสร้าง container nginx และ map port 80 ดังนี้

```
docker container run -dt –name nginx \
–p 80:8080 labdocker/nginx: badversion
```

- ตรวจสอบค่าคอนฟิกภายใน container ด้วยคำสั่ง inspect

```
docker container inspect nginx
```

- ตรวจสอบล็อกการทำงานภายใน container ด้วยคำสั่ง logs

```
docker container logs nginx
```

Commit

...

Commit

- เมื่อต้องการเก็บ container ที่ทำการรันเรียบร้อยเป็น snap image เป็น generation สามารถทำได้ผ่านคำสั่ง “commit”

```
docker container commit  <options>  <container> <image name:tag>
```

- options
  - -a, --author=“ “ ระบุผู้จัดทำ image
  - -c, --change = [ ] เพิ่มเติม command พิเศษที่จะจัดเก็บภายใน image
  - -m, --message = “ “ ระบุ comment ใน image ที่จัดเก็บ
  - -p, --pause=true กำหนดให้หยุดการใช้งาน container ชั่วคราวในระหว่างทำการ commit

Docker Security

...

Docker Security

- เพื่อให้การรันงานบน docker container มีความปลอดภัยสูง docker มีการพิจารณาเรื่อง security ในการทำงานแบ่งออกได้ดังนี้

- Control Group (CG Group) / Name Space
  - Docker container run in separate namespace (Process independence, Not release / touch with other container)
  - Separate network stack
  - CG group will create for separate resource (CPU, Memory, I/O) and limit for protect single container run process and make host fail (denied-of-service)

- Docker daemon operation (root privilege)
  - Beaware for allow user who operate with docker daemon
  - Some operation quite risk for security (docker pull, docker run –v with share host path etc)
  - Docker API should be aware for RESTFUL connection with secure method

Docker Security

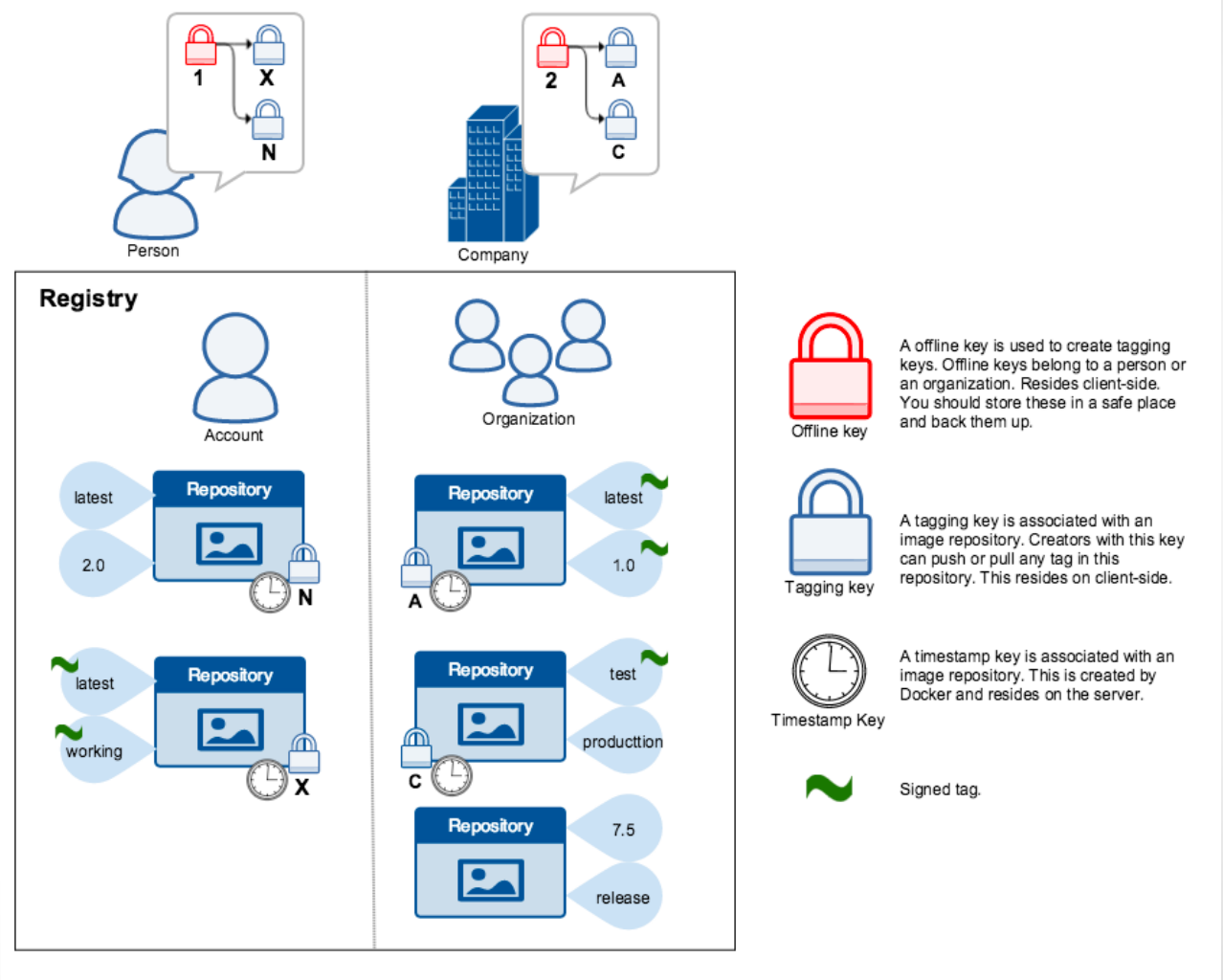
- Secure enhancement by limit capability of container inside
  - Normally user will be “root” inside container
  - Almost container job (web server, restful server, database server) don’t need high privilege as “root” for operate
  - Some activity should be prohibit on container
    - Mount disk operation
    - Access system path (/bin, /usr/bin, /proc etc)
    - Create network socket
    - Execute shell
    - etc

Docker Security

- Recommendation for enhance docker security
  - ระวังการจัดการ user ที่มีหน้าที่ทำงานกับ docker daemon และ privilege คำสั่งบน docker command
  - ใช้ non-root user ในการจัดการ docker daemon operation (docker run etc)
  - จัดการ Image Content Trust (Sign Image) ในการสั่ง pull/push image
  - เปลี่ยนการจัดการ docker daemon socket เป็น HTTP socket (with TLS verify and authentication)
  - จำกัดสิทธิและขอบเขตการทำงานของ user บน container (Secure compute mode (seccomp)

Docker Security

- Image Content Trust



Workshop 1-9: Docker Security

- Content Trust
- Purpose: ทำการ enable feature "DOCKER_CONTENT_TRUST" และใช้งาน image แบบ sign/unsign

```
root@labdocker:~# docker push praparn/alpine:sign
The push refers to a repository [docker.io/praparn/alpine]
6102f0d2ad33: Layer already exists
sign: digest: sha256:65242e8220a341cec40628caaea77eb4acd2fc252329aa853526fde15a4a1d85 size: 528
Signing and pushing trust metadata
You are about to create a new root signing key passphrase. This passphrase
will be used to protect the most sensitive key in your signing system. Please
choose a long, complex passphrase and be careful to keep the password and the
key file itself secure and backed up. It is highly recommended that you use a
password manager to generate the passphrase and keep it safe. There will be no
way to recover this key. You can find the key in your config directory.
Enter passphrase for new root key with ID ca6ab4b:
Repeat passphrase for new root key with ID ca6ab4b:
Enter passphrase for new repository key with ID 68d88cd (docker.io/praparn/alpine):
Repeat passphrase for new repository key with ID 68d88cd (docker.io/praparn/alpine):
```

Kitematic

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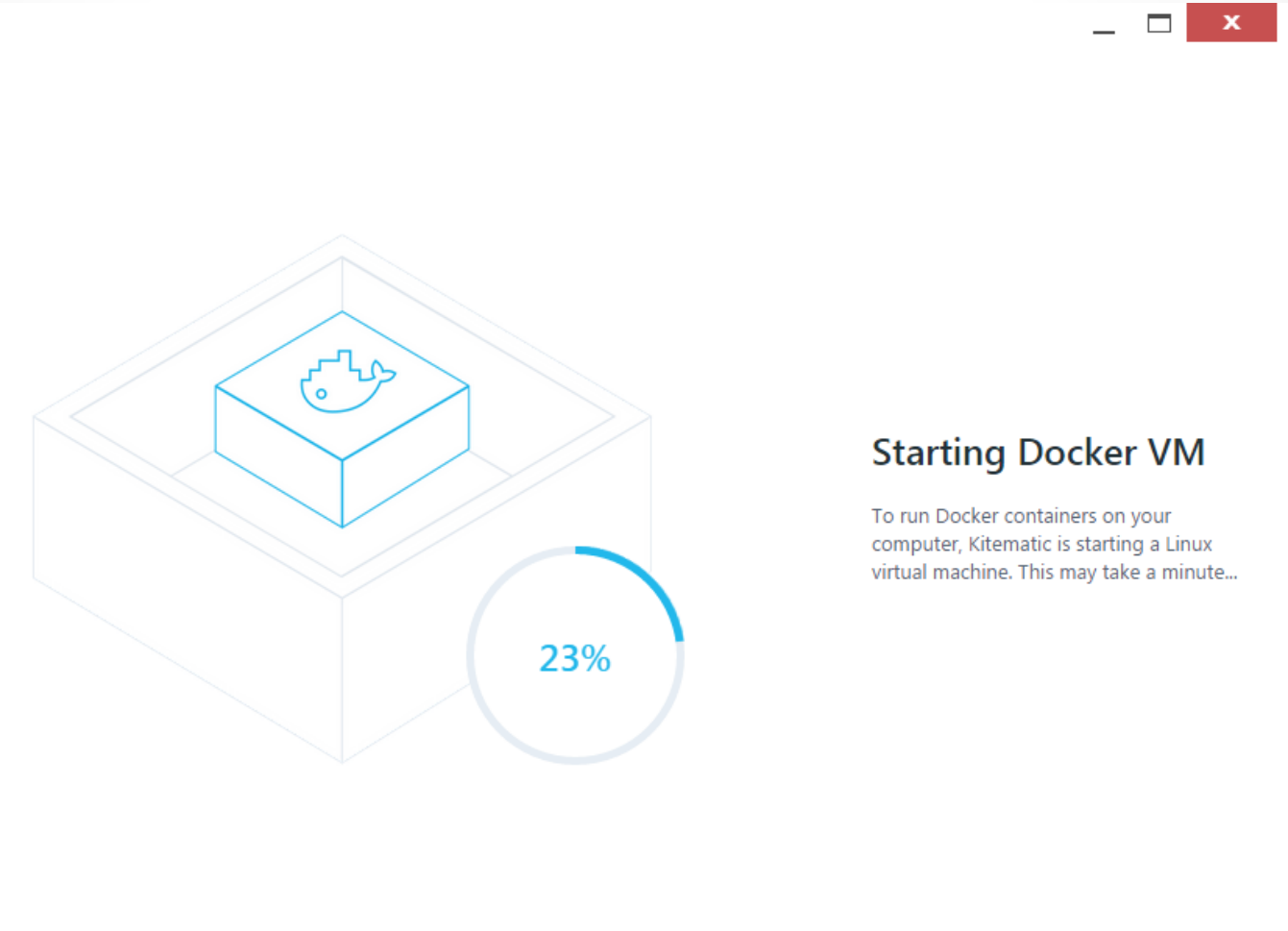
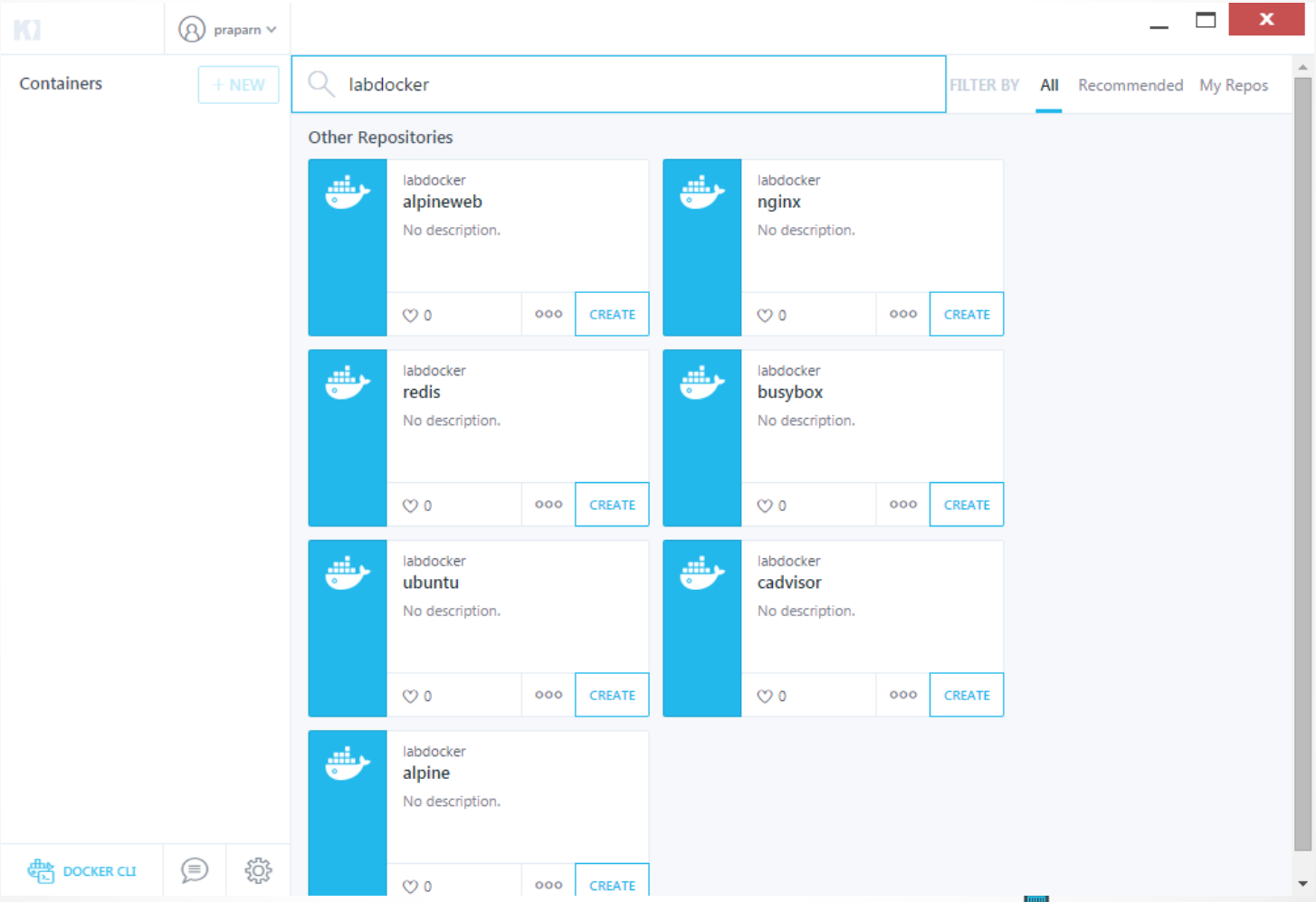
Kitematic

- GUI tool for operate docker



Kitematic

- GUI tool for operate docker



Recapture for Day 1

- Docker principle
- Docker machine
- Image, Repository & Tag, container
- CPU, Memory and I/O
- Network
- Volume
- Inspect and Log
- Commit
- Docker Security
- Kitematic

Q&A for Day 1

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Docker:Zero to Hero (Day 2)

By Praparn Luengphoonlap
Email: eva10409@gmail.com

Outline Day 2

- Dockerfile and Build
- Compose
- Registry
- Swarm Mode
  - Conceptual of Swarm
  - Swarm Mode Architecture
  - Swarm init/join cluster system
  - Swarm service
  - Orchestrator Assignment
  - Config and Secret
  - Network Overlay and Ingress
  - HA Manager Role
  - Docker Stack Deploy (Compose Swarm Mode)
- Portainer for Docker
- Q&A

Dockerfile and Build

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Dockerfile

- docker file คือการคำสั่งที่ใช้สร้าง image ขึ้นเพื่อใช้งานโดยเฉพาะ และสามารถกำหนดเป็นมาตรฐานสำหรับการทำงานในองค์กรโดยสร้าง text file ตาม syntax ที่ทาง docker กำหนดไว้
  - FROM
  - MAINTAINER
  - RUN (shell), [“exec”, “parameter1”,”parameter2”,”etc”]
  - CMD (shell),[“exec”,”parameter1”,”parameter2”,”etc”]
  - EXPOSE
  - ARGS
  - ENV
  - COPY /ADD (source) (Destination), [(source) (destination)]
  - ENTRYPOINT
  - WORKDIR
  - Etc(https://docs.docker.com/engine/reference/builder)
- เมื่อสร้าง dockerfile เสร็จแล้วสามารถสั่ง image ผ่านคำสั่ง build

docker build <option> <path of dockerfile>

Dockerfile

- **Best practice ในการสร้าง dockerfile**
- simple is the best
- 1 container / 1 service
- เลือก source image จาก official owner
- สร้าง dockerfile โดยพยายามให้มี footprint ต่ำที่สุด
  - สร้าง dockerfile บน path ที่สร้างขึ้นเฉพาะงาน
  - วางเฉพาะไฟล์ที่จำเป็นต้องใช้งานบน path
  - install component เท่าที่จำเป็นต้องใช้งานบน container
- คำสั่ง run เพื่อติดตั้ง software รวบยอดใน 1 ชุดคำสั่ง
- ควรมีการลบ temp ที่เกิดขึ้นจากการติดตั้ง software เพื่อลดขนาดของ image
- จัดเรียง dockerfile ให้อ่านง่าย
  - apt-update && apt-install –y \
  - curl \
  - automake \
- ควรระบุ EXPOSE port ที่ออกแบบให้ใช้งานไว้ในทุกๆครั้ง

Dockerfile

```
RUN apt-get update && apt-get install -y \
    aufs-tools \
    automake \
    build-essential \
    curl \
    dpkg-sig \
    libcap-dev \
    libsqlite3-dev \
    mercurial \
    reprepro \
    ruby1.9.1 \
    ruby1.9.1-dev \
    s3cmd=1.1.* \
 && rm -rf /var/lib/apt/lists/*
```

Dockerfile

```
FROM php:5.6-apache
MAINTAINER Volker Wiegand <volker.wiegand@cvw.de>

RUN a2enmod rewrite

RUN apt-get update && apt-get install -y \
        libpng12-dev \
        libjpeg-dev \
        libpq-dev \
        libxml2-dev \
        vim-tiny \
        && docker-php-ext-configure gd --with-png-dir=/usr --with-jpeg
        && docker-php-ext-install gd mbstring mysql mysqli pgsql soap
        && rm -rf /var/lib/apt/lists/* /var/www/html/index.html

ENV MANTIS_VER 1.3.2
ENV MANTIS_MD5 f30acb6d41ba757b7c09f922a0f68b06
ENV MANTIS_URL https://sourceforge.net/projects/mantisbt/files/mantis-
ENV MANTIS_FILE mantisbt.tar.gz

RUN mkdir -p /var/lib/mantisbt && cd /var/lib/mantisbt \
        && curl -fSL ${MANTIS_URL} -o ${MANTIS_FILE} \
        && echo "${MANTIS_MD5}  ${MANTIS_FILE}" | md5sum -c \
        && tar -xz --strip-components=1 -f ${MANTIS_FILE} \
        && rm ${MANTIS_FILE} \
        && chown -R www-data:www-data .
```

Dockerfile

- ควรระบุ WORKDIR เพื่อกำหนด path เริ่มต้นในการทำงานทุกครั้ง (before ENTRYPOINT, RUN, CMD, COPY etc)

- ADD/COPY operation
  - COPY เป็น basic transfer simple file
  - ADD ใช้ในกรณี remote file URL, self extract (.tar) (Not recommend)

- ENV PATH ควรระบุ path ของ executable ที่จำเป็นต้องใช้งาน

- พิจารณาการใช้ cache ของ image layer โดยเราสามารถ ignore cache ด้วย option "--no-cache=true"
  - ตามปกติ docker จะเปรียบเทียบ instruction ที่กำหนดไว้กับ image layer ที่
  - Consider: instruction, base image

How can check dockerfile ?

Praparn

Secure https://www.fromlatest.io/#/

Apps | NMac Ked - Mac O... | Medium | Infra | NOVA | jerkins | vagrant | Mesos | Vue | docker | NGINX | Taiwan | Kubernetes | Other Bookmarks

FROM:latest

Analyze | About | Contribute

```
1  FROM labdocker/alpine:latest
2  MAINTAINER Praparn Lueangphoonlap (eva10409@gmail.com)
3  LABEL Description="NodeJS/NGINX Build Container" Version="1.0"
4  ENV NODE_VERSION=v4.3.0 NPM_VERSION=2.14.12
5  RUN apk update && \
6      apk add nginx
7  COPY nginx.conf /etc/nginx/nginx.conf
8  WORKDIR /usr/sbin
9  ENTRYPOINT ["nginx","-c","/etc/nginx/nginx.conf"]
10 EXPOSE 8080
```

Line 5: Consider `–no-cache or –update with rm -rf /var/cache/apk/*` (Optimization)

Line 1: Base Image Latest Tag (Clarity)

2 issues found

Made by REPLICATED

Instruction_Kubernet....txt | Instruction_Kubernet....txt | Show All

Docker: The Next-Gen of Virtualization

docker

Workshop 2-1: DockerFile

- Part1: NGINX/NODEJS

Container Name: NODEJS
IP Address: X.X.X.X (Port: 3000:3000)

Container Name: NGINX
IP Address: X.X.X.X (Port: 8080:80)

Docker-machine: labdocker
Path: /Share_DockerToolbox

/nodejs

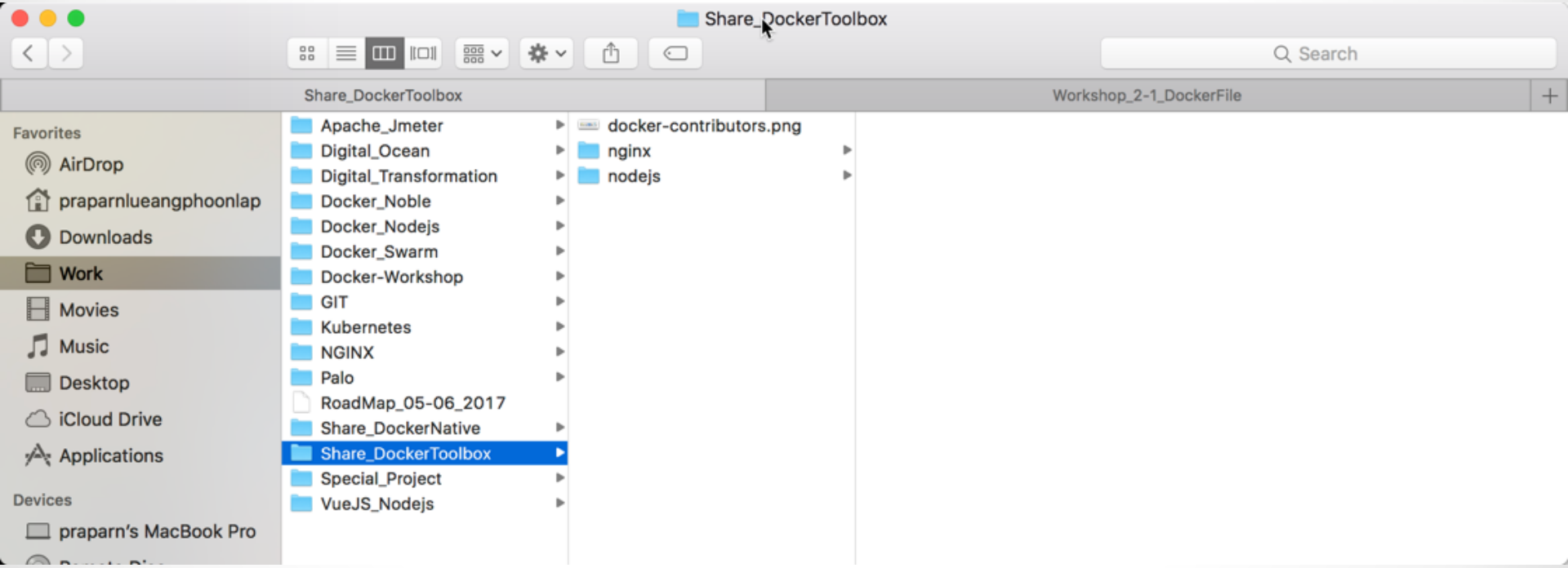
dockerfile

/nginx

dockerfile

Workshop 2-1: DockerFile

- **NODEJS container**
- copy folder “nodejs”,”nginx” ไปวางไว้ที่ /Share_DockerToolbox



Workshop 2-1: DockerFile

- ตรวจสอบ dockerfile ตามตัวอย่างด้านล่าง

```
FROM labdocker/alpine:latest
MAINTAINER Praparn Lueangphoonlap (eva10409@gmail.com)
LABEL Description="NodeJS/NGINX Build Container" Version="1.0"
ENV NODE_VERSION=v4.3.0 NPM_VERSION=2.14.12
RUN apk update && \
    apk add nodejs
RUN mkdir /nodejs
COPY hello.js /nodejs/
WORKDIR /nodejs
ENTRYPOINT ["node","hello.js"]
EXPOSE 3000
```

```
docker image build -t labdocker/node:1.0 /Share_DockerToolbox/nodejs
```

Workshop 2.1: DockerFile

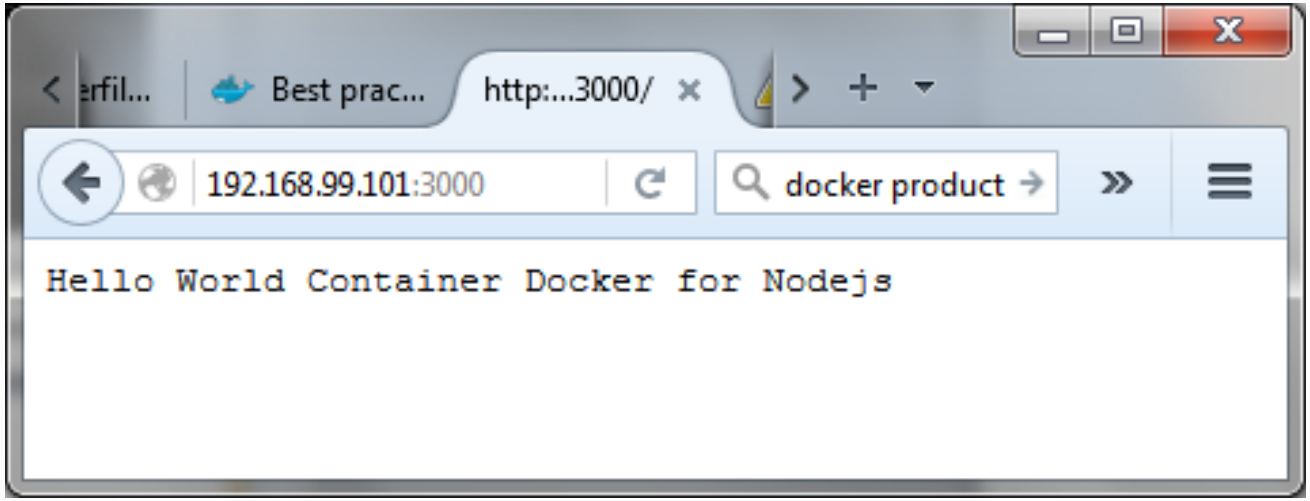
- Output

```
Sending build context to Docker daemon 3.072 kB
Step 1 : FROM labdocker/alpine:latest
 ---> 14f89d0e6257
Step 2 : MAINTAINER Praparn Lueangphoonlap (eva10409@gmail.com)
 ---> Using cache
 ---> 10f80fb4997d
Step 3 : LABEL Description "NodeJS/NGINX Build Container" Version "1.0"
 ---> Using cache
 ---> 59bc5a927e19
Step 4 : ENV NODE_VERSION v4.3.0 NPM_VERSION 2.14.12
 ---> Using cache
 ---> ce23d23959b7
Step 5 : RUN apk update &&     apk add nodejs
 ---> Running in b12c752ef6a0
fetch http://dl-4.alpinelinux.org/alpine/v3.3/main/x86_64/APKINDEX.tar.gz
fetch http://dl-4.alpinelinux.org/alpine/v3.3/community/x86_64/APKINDEX.tar.gz
v3.3.1-99-gc7d905f [http://dl-4.alpinelinux.org/alpine/v3.3/main]
v3.3.1-59-g48b0368 [http://dl-4.alpinelinux.org/alpine/v3.3/community]
OK: 5857 distinct packages available
(1/4) Installing libgcc (5.3.0-r0)
(2/4) Installing libstdc++ (5.3.0-r0)
(3/4) Installing libuv (1.7.5-r0)
(4/4) Installing nodejs (4.3.0-r0)
Executing busybox-1.24.1-r7.trigger
OK: 29 MiB in 15 packages
 ---> 8f2bf208ab86
Removing intermediate container b12c752ef6a0
Step 6 : RUN mkdir /nodejs
 ---> Running in 2ee51d1af642
 ---> d3edf2c2f511
Removing intermediate container 2ee51d1af642
Step 7 : COPY hello.js /nodejs/
 ---> f703ccbc7dd4
Removing intermediate container 952935d69cce
Step 8 : CMD nginx -c /etc/nginx/nginx.conf
 ---> Running in 67940385f5ac
 ---> edfba609e20a
```

Workshop 2-1: DockerFile

- Test run

```
docker container run -dt --name NODEJS \
-p 3000:3000 labdocker/node:1.0
```



Workshop 2-1: DockerFile

- **NGINX container**
- แก้ไข configure nginx.conf เพื่อใช้ทำ reverse proxy

```
upstream nodejs_web {
    server 192.168.99.131:3000;
}
server {
        listen 8080;
        location /nodejs{
        proxy_pass http://nodejs_web;
        proxy_http_version 1.1;
        proxy_set_header Upgrade $http_upgrade;
        proxy_set_header Connection 'upgrade';
        proxy_set_header Host $host;
        proxy_cache_bypass $http_upgrade;
        }
```

Workshop 2-1: DockerFile

- ตรวจสอบ dockerfile ตามตัวอย่างด้านล่าง

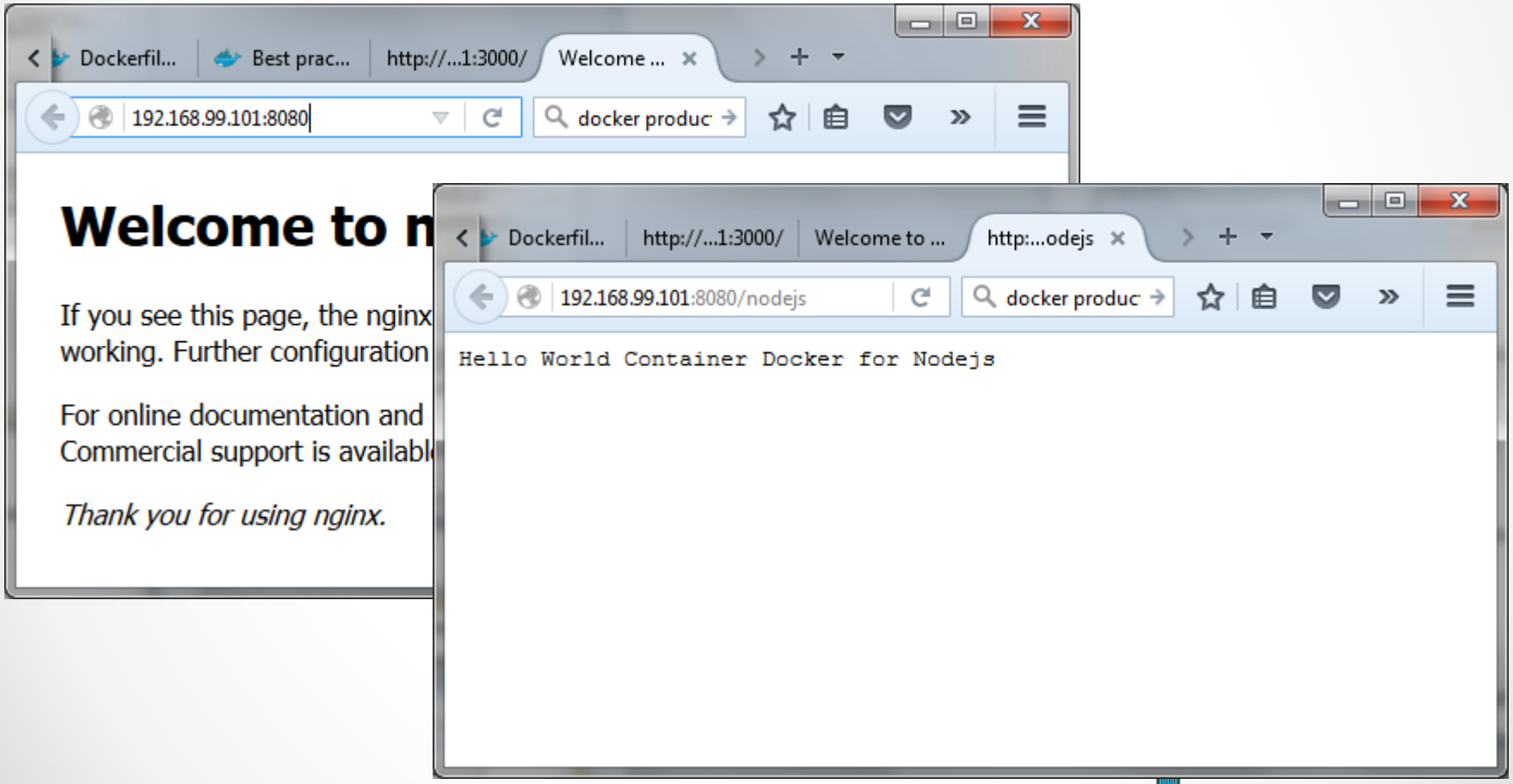
```
FROM labdocker/alpine:latest
MAINTAINER Praparn Lueangphoonlap (eva10409@gmail.com)
LABEL Description="NodeJS/NGINX Build Container" Version="1.0"
RUN apk update && \
   apk add nginx
COPY nginx.conf /etc/nginx/nginx.conf
WORKDIR /usr/sbin
ENTRYPOINT ["nginx","-c","/etc/nginx/nginx.conf"]
EXPOSE 8080
```

```
docker build -t labdocker/web:1.0 /Share_DockerToolbox/nginx
```

Workshop 2-1: DockerFile

- Test run

```
docker container run -dt --name NGINX -p 8080:8080 labdocker/web:1.0
```

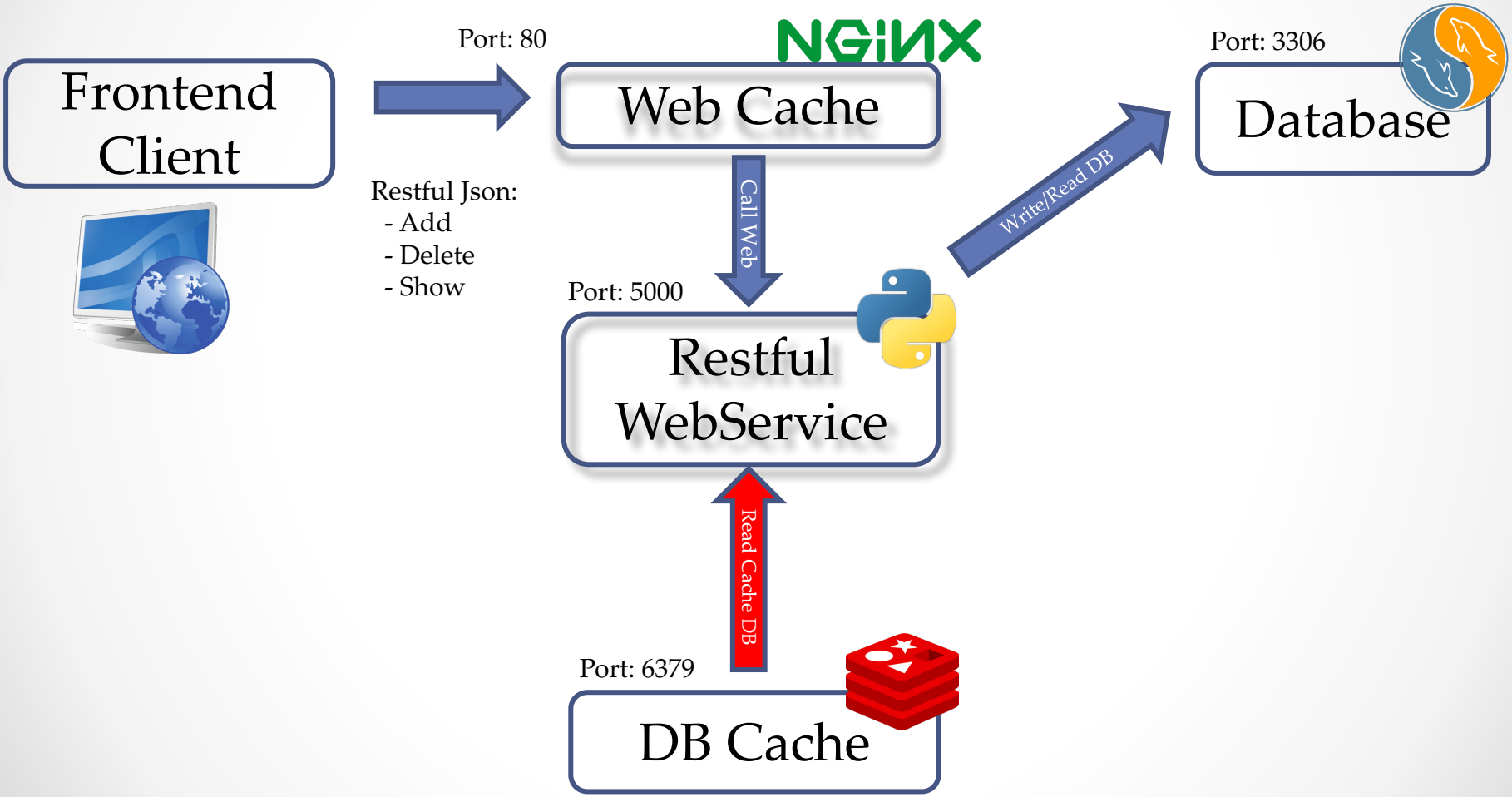


Workshop 2-1: DockerFile

- Part2: Python RESTFUL
- Basic Component

Workshop 2-1: DockerFile

- Optimize for WorkLoad



Workshop 2-1: DockerFile

- Restful WebService
  - /init

```
@app.route('/init')
def init():
    MAIN_DB.execute("DROP DATABASE IF EXISTS ACCTABLE")
    MAIN_DB.execute("CREATE DATABASE ACCTABLE")
    MAIN_DB.execute("USE ACCTABLE")
    sql = """CREATE TABLE users (
         ID int,
         USER char(30),
         DESCRIPE char(250)
     )"""
    MAIN_DB.execute(sql)
    db.commit()
    return "###########   Database Create New Account Table Done  ###########"
```

  - /insertuser

```
@app.route("/users/insertuser", methods=['POST'])
def add_users():
    req_json = request.get_json()
    MAIN_DB.execute("INSERT INTO ACCTABLE.users (ID, USER, DESCRIPE) VALUES (%s,%s,%s)", (req_json['uid'], req_json['user'], req_json['descripe']))
    #curl -i -H "Content-Type: application/json" -X POST -d '{"uid": "1", "user":"Praparn Luangphoonlap", "descripe":"System Engineer"}' http://<IP
    db.commit()
    return Response("########### Record was added ###########", status=200, mimetype='application/json')
```

Workshop 2-1: DockerFile

- Restful WebService
  - /removeuser/<uid>

```
@app.route('/users/removeuser/<uid>')
def remove_users(uid):
    hash = hashlib.sha224(str(uid)).hexdigest()
    key = "sql_cache:" + hash
    MAIN_DB.execute("DELETE FROM ACCTABLE.users WHERE ID =" + str(uid))
    db.commit()
    #curl http://<IP Host>:<Port>/users/removeuser/<uid>
    if (CACHE_DB.get(key)):
        CACHE_DB.delete(key)
        return Response("########### Record was deleted (Both Database Cache) ###########", status=200, mimetype='application/json')
    else:
        return Response("########### Record was deleted ###########", status=200, mimetype='application/json')
```

Workshop 2-1: DockerFile

- Restful WebService
  - /users/<uid>

```
@app.route('/users/<uid>')
def get_users(uid):
    hash = hashlib.sha224(str(uid)).hexdigest()
    key = "sql_cache:" + hash
    #curl http://<IP Host>:<Port>/users/<uid>
    if (CACHE_DB.get(key)):
        return CACHE_DB.get(key) + "(Database Cache)"
    else:
        MAIN_DB.execute("select USER from ACCTABLE.users where ID=" + str(uid))
        data = MAIN_DB.fetchone()
        if data:
            CACHE_DB.set(key,data[0])
            CACHE_DB.expire(key, 36);
            return CACHE_DB.get(key)
        else:
            return "########### Record not found ###########"
```

Workshop 2-1: DockerFile

- Web Cache (NGINX)

```
http {
    client_max_body_size 500M;
    client_body_timeout 3000s;
    include /etc/nginx/mime.types;
    default_type application/octet-stream;
    log_format main '$remote_addr - $remote_user [$time_local] "$request" '
    '$status $body_bytes_sent "$http_referer" '
    '"$http_user_agent" "$http_x_forwarded_for"';

    access_log /var/log/nginx/access.log main;
    tcp_nopush on;

    keepalive_timeout 65;

    gzip on;

    include /etc/nginx/conf.d/*.conf;
server {
        listen 80;
        client_body_buffer_size 50M;
        index index.html        index.htm;
        location / {
        proxy_pass http://webservice:5000;
        proxy_next_upstream error timeout invalid_header http_500 http_502 http_503 http_504;
        proxy_redirect off;
        proxy_buffering off;
        proxy_set_header        Host            $host;
        proxy_set_header        X-Real-IP       $remote_addr;
        proxy_set_header        X-Forwarded-For $proxy_add_x_forwarded_for;
        }
        }
```

Workshop 2-1: DockerFile

- Database / Database Cache

```
maindb:
  image: labdocker/mysql:latest
  container_name: maindb
  environment:
      MYSQL_ROOT_PASSWORD: password

cachedb:
  image: labdocker/redis:latest
  container_name: cachedb

webservice:
  build: .
  dockerfile: dockerfile_python
  container_name: webservice
  ports:
   - "5000:5000"
  links:
   - cachedb:cachedb
   - maindb:maindb

webcache:
  build: .
  dockerfile: dockerfile_nginx
  container_name: webcache
  ports:
   - "80:80"
  links:
   - webservice:webservice
```

Mysql Database

Redis Key-Value Database

Workshop 2-1: DockerFile

- Dockerfile: WebService

```
FROM labdocker/alpinepython:2.7-onbuild
MAINTAINER Praparn Lueangphoonlap (eva10409@gmail.com)
LABEL Description="Python Special Build for Alpine (On Build)" Version="1.0"
EXPOSE 5000
CMD [ "python", "main.py" ]
```

```
docker build -t labdocker/webservice:1.0 \
-f dockerfile_python \ /Share_DockerToolbox/python_restfulset/
```

Workshop 2-1: DockerFile

- Dockerfile: Webcache

```
FROM labdocker/alpine:latest
MAINTAINER Praparn Lueangphoonlap (eva10409@gmail.com)
LABEL Description="NGINX Build Container" Version="1.0"
RUN apk update && \
apk add nginx
COPY nginx.conf /etc/nginx/nginx.conf
WORKDIR /usr/sbin
ENTRYPOINT ["nginx","-c","/etc/nginx/nginx.conf"]
EXPOSE 80
```

```
docker build -t labdocker/webcache:1.0 \
-f dockerfile_nginx /Share_DockerToolbox/python_restfulset/
```

Workshop 2-1: DockerFile

- Test run container

~ — Terminal MAC Pro — ssh ◂ docker-machine ssh labdocker | ~ — Terminal MAC Pro — zsh | ~ — Terminal MAC Pro — -bash

```
docker@labdocker:~$ docker ps
CONTAINER ID        IMAGE                     COMMAND                  CREATED             STATUS              PORTS                    NAMES
13f776fdf3c0        labdocker/webcache:1.0    "nginx -c /etc/ngi..."   21 seconds ago      Up 21 seconds       0.0.0.0:80->80/tcp       webcache
42e238466523        labdocker/webservice:1.0  "python main.py"         26 seconds ago      Up 26 seconds       0.0.0.0:5000->5000/tcp   webservice
5781e3b3da50        labdocker/redis:latest    "docker-entrypoint..."   36 seconds ago      Up 35 seconds       6379/tcp                 cachedb
0258e5719d3f        labdocker/mysql:latest    "docker-entrypoint..."   About a minute ago  Up About a minute   3306/tcp                 maindb
docker@labdocker:~$
```

praparnlueangphoonlap — Terminal MAC Pro — zsh — 148×24

~ — Terminal MAC Pro — ssh ◂ docker-machine ssh labdocker | ~ — Terminal MAC Pro — zsh

```
praparns-MacBook-Pro% export Server_IP=192.168.99.100
praparns-MacBook-Pro% export Server_Port=80
praparns-MacBook-Pro% curl http://$Server_IP:$Server_Port/
<H1> Welcome Page from Container Python Lab </H1>Checkpoint Date/Time: Sun Aug  6 16:04:37 2017
praparns-MacBook-Pro%
```

192.168.99.100

Apps | NMac Ked - Mac OS... | Medium | jerkins | vagrant | Mesos | Vue | docker | NGINX | Taiwan | Kubernetes

Welcome Page from Container Python Lab

Checkpoint Date/Time: Sun Aug 6 16:05:01 2017

Workshop 2-1: DockerFile

- Init / Insert Data

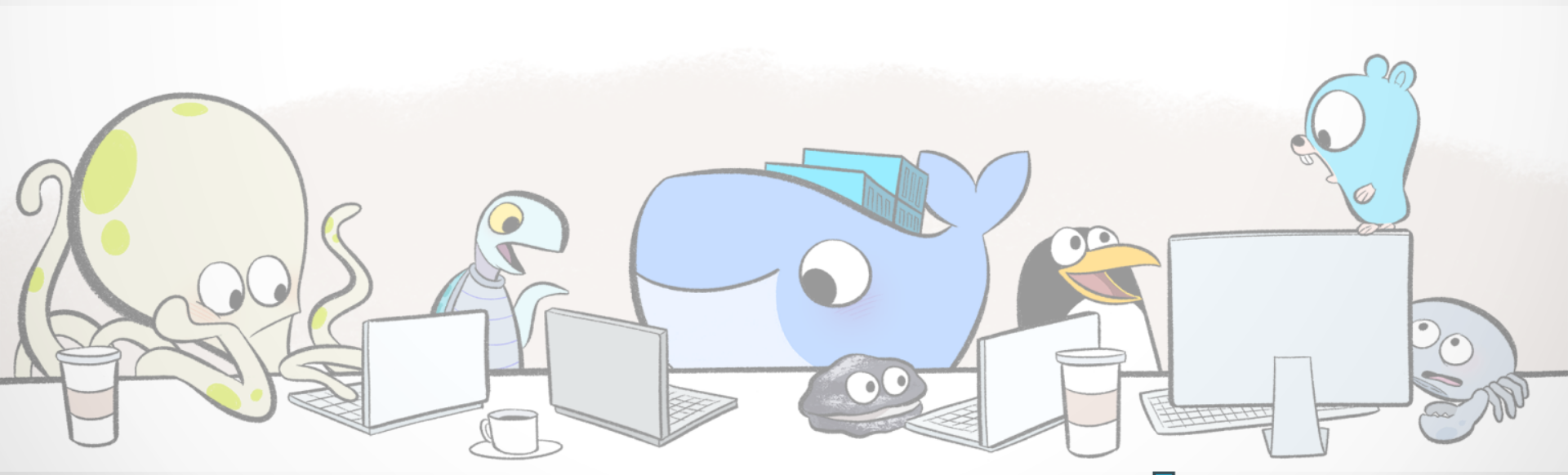
```
praparns-MacBook-Pro% curl http://$Server_IP:$Server_Port/init
###########   Database Create New Account Table Done  ###########
praparns-MacBook-Pro% curl -i -H "Content-Type: application/json" -X POST -d '{"uid": "1", "user":"Praparn Luangphoonlap", "descripe":"Slave"}' http://$Server_IP:$Server_Port/users/inse
rtuser
      curl -i -H "Content-Type: application/json" -X POST -d '{"uid": "2", "user":"Somchai Sunsukwan", "descripe":"Security Guard"}' http://$Server_IP:$Server_Port/users/insertuser
      curl -i -H "Content-Type: application/json" -X POST -d '{"uid": "3", "user":"Sanyachan Panrudee", "descripe":"House Keeping"}' http://$Server_IP:$Server_Port/users/insertuser
      curl -i -H "Content-Type: application/json" -X POST -d '{"uid": "4", "user":"Sakkan Yanyicharoen", "descripe":"Messenger"}' http://$Server_IP:$Server_Port/users/insertuser
      curl -i -H "Content-Type: application/json" -X POST -d '{"uid": "5", "user":"Chatchai Moungang", "descripe":"Programmer"}' http://$Server_IP:$Server_Port/users/insertuser
      curl -i -H "Content-Type: application/json" -X POST -d '{"uid": "6", "user":"Anusit Kannaphat", "descripe":"DevOps Manager"}' http://$Server_IP:$Server_Port/users/insertuser
      curl -i -H "Content-Type: application/json" -X POST -d '{"uid": "7", "user":"Meelarp Maisanuk", "descripe":"System Engineer"}' http://$Server_IP:$Server_Port/users/insertuser
      curl -i -H "Content-Type: application/json" -X POST -d '{"uid": "8", "user":"Pansa Bunsong", "descripe":"Secuirty Guard"}' http://$Server_IP:$Server_Port/users/insertuser
      curl -i -H "Content-Type: application/json" -X POST -d '{"uid": "9", "user":"Wiphanee Wongsaisawan", "descripe":"Administrator"}' http://$Server_IP:$Server_Port/users/insertuser

HTTP/1.1 200 OK
Server: nginx/1.8.1
Date: Sun, 06 Aug 2017 16:06:09 GMT
Content-Type: application/json
Content-Length: 41
Connection: keep-alive

########### Record was added ###########
HTTP/1.1 200 OK
Server: nginx/1.8.1
Date: Sun, 06 Aug 2017 16:06:09 GMT
Content-Type: application/json
Content-Length: 41
Connection: keep-alive

########### Record was added ###########
HTTP/1.1 200 OK
Server: nginx/1.8.1
Date: Sun, 06 Aug 2017 16:06:09 GMT
Content-Type: application/json
Content-Length: 41
Connection: keep-alive

########### Record was added ###########
HTTP/1.1 200 OK
Server: nginx/1.8.1
Date: Sun, 06 Aug 2017 16:06:09 GMT
Content-Type: application/json
Content-Length: 41
Connection: keep-alive
```

Workshop 2-1: DockerFile

- Get Data (Direct/Cache) and Delete Data

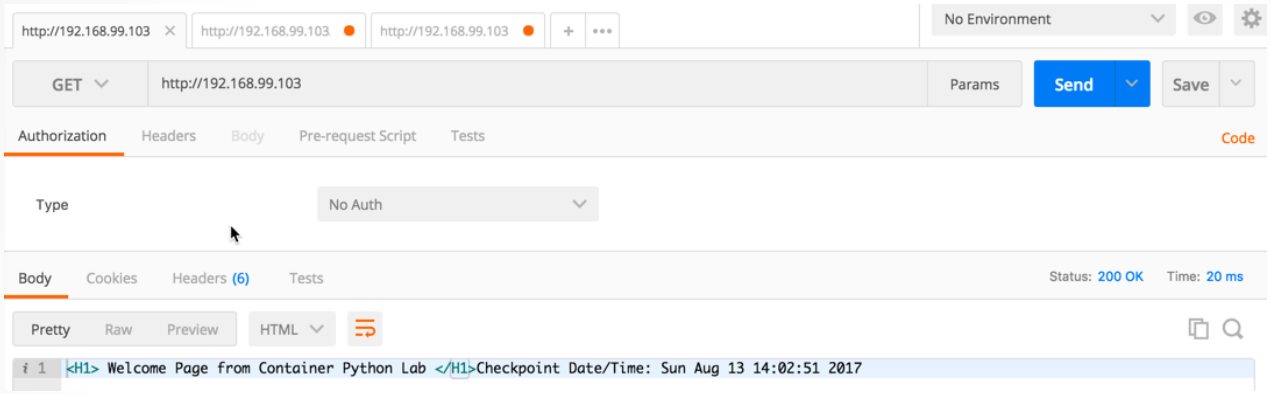
~ — Terminal MAC Pro — ssh • docker-machine ssh labdocker | ~ — Terminal MAC Pro — zsh | ~ — Terminal MAC Pro — -bash

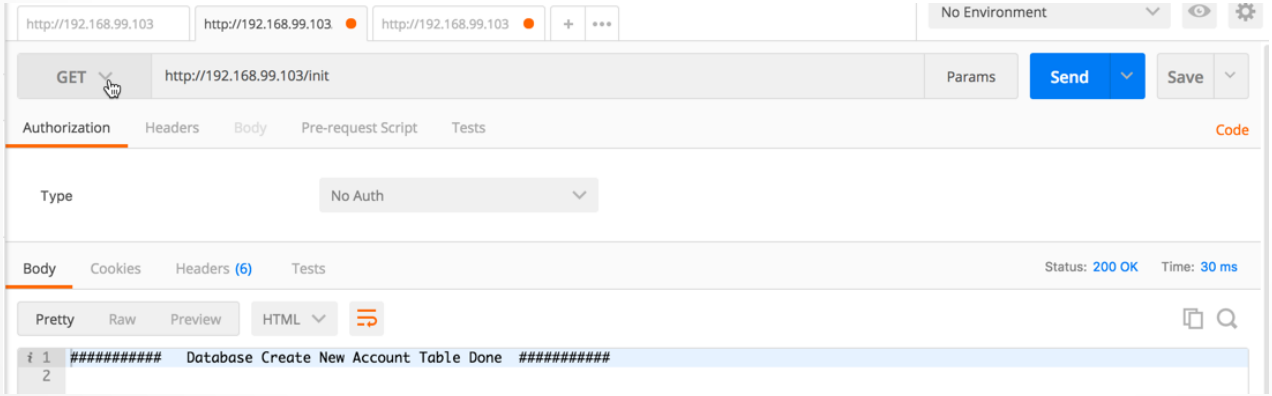
```
praparns-MacBook-Pro% curl http://$Server_IP:$Server_Port/users/1
Praparn Luangphoonlap(Database Direct)
praparns-MacBook-Pro% curl http://$Server_IP:$Server_Port/users/1
Praparn Luangphoonlap(Database Cache)
praparns-MacBook-Pro% curl http://$Server_IP:$Server_Port/users/4
Sakkan Yanyicharoen(Database Direct)
praparns-MacBook-Pro% curl http://$Server_IP:$Server_Port/users/4
Sakkan Yanyicharoen(Database Cache)
praparns-MacBook-Pro% curl http://$Server_IP:$Server_Port/users/removeuser/1
########### Record was deleted (Both Database Cache) ###########
praparns-MacBook-Pro% curl http://$Server_IP:$Server_Port/users/removeuser/2
########### Record was deleted ###########
praparns-MacBook-Pro% curl http://$Server_IP:$Server_Port/users/removeuser/3
########### Record was deleted ###########
praparns-MacBook-Pro% curl http://$Server_IP:$Server_Port/users/removeuser/4
########### Record was deleted (Both Database Cache) ###########
praparns-MacBook-Pro%
```



Workshop 2-1: DockerFile

- Case for POSTMAN





Workshop 2-1: DockerFile

- Case for POSTMAN

http://192.168.99.103 | http://192.168.99.103 | http://192.168.99.103 | No Environment

POST http://192.168.99.103/users/insertuser Params Send Save

Authorization Headers (1) Body Pre-request Script Tests Code

form-data x-www-form-urlencoded raw binary JSON (application/json)

```
1 {"uid": "1", "user":"Praparn Luangphoonlap", "descripe":"Slave"}
2
```

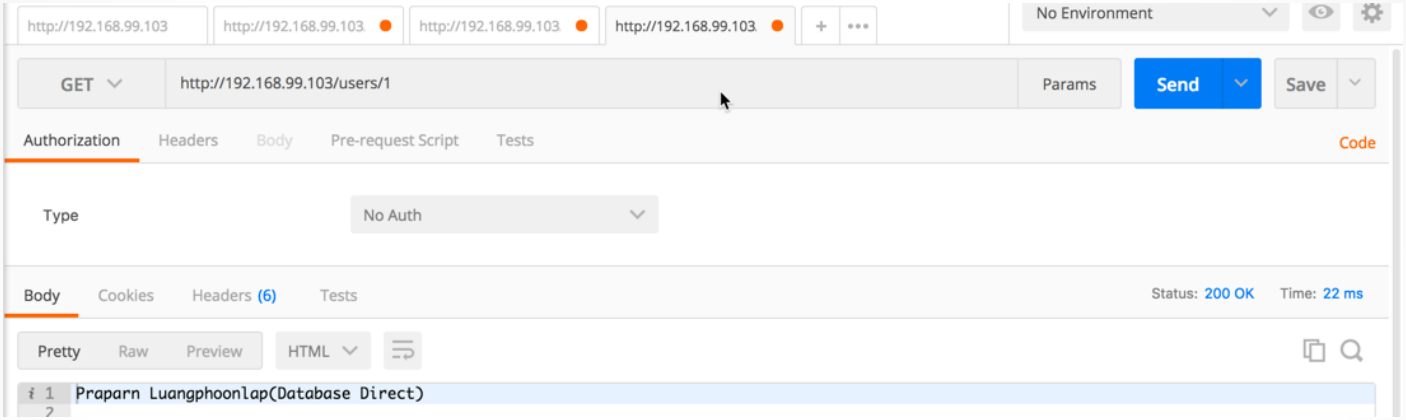
Body Cookies Headers (5) Tests Status: 200 OK Time: 25 ms

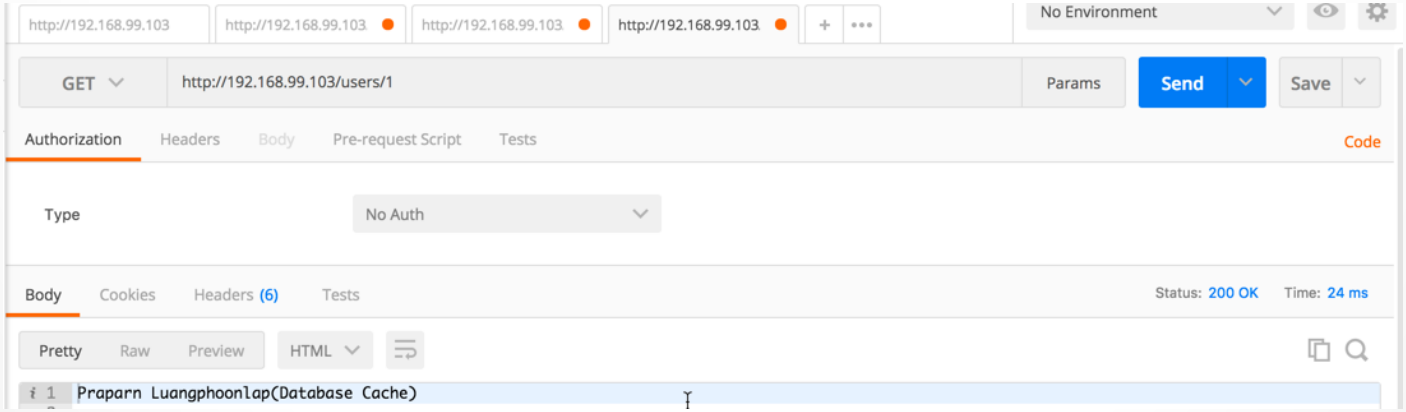
Pretty Raw Preview HTML

```
1 ########### Record was added ###########
2
```

Workshop 2-1: DockerFile

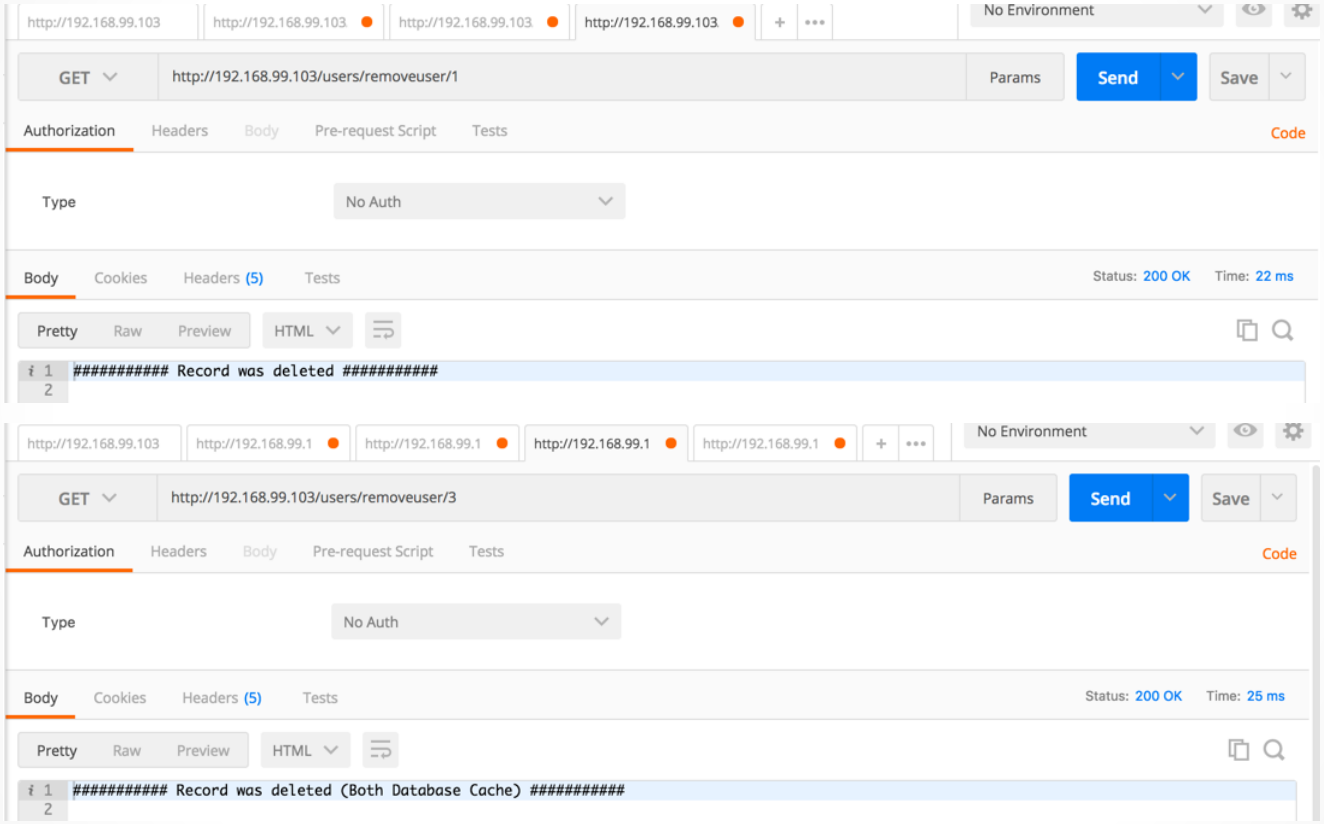
- Case for POSTMAN





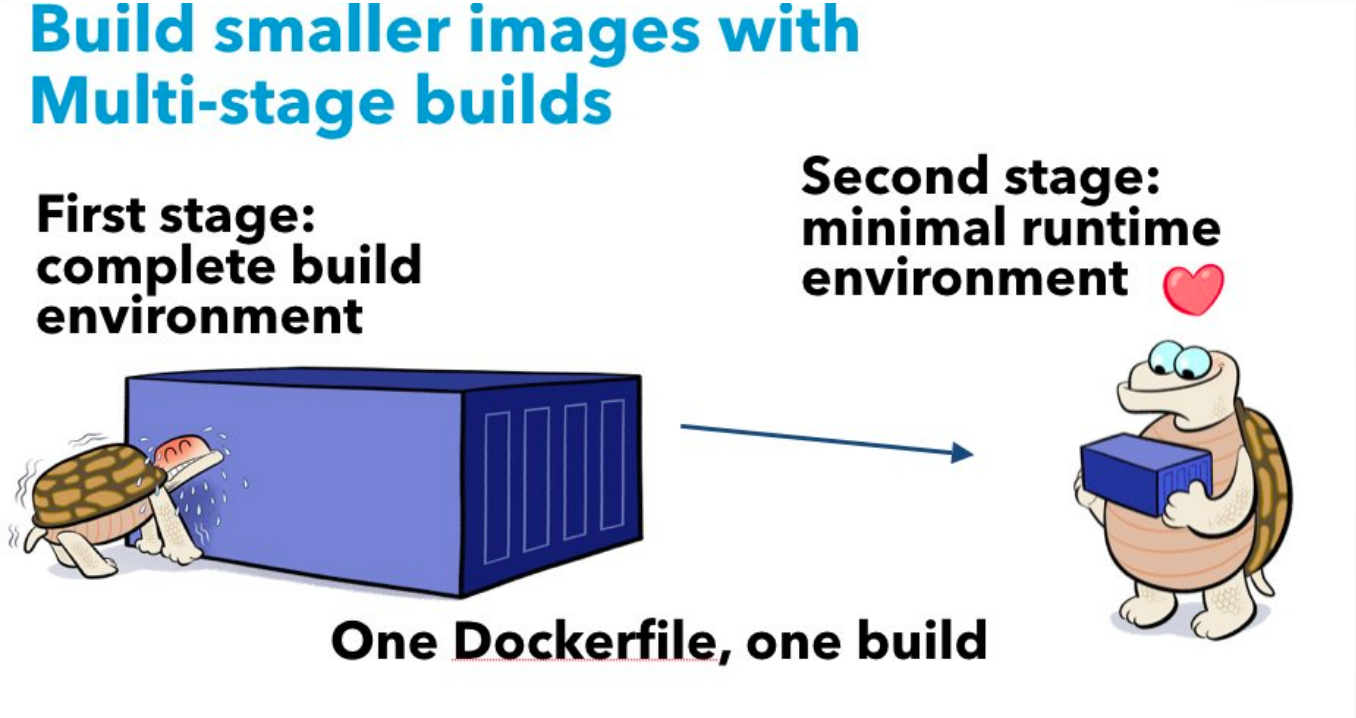
Workshop 2-1: DockerFile

- Case for POSTMAN



Dockerfile

- Multi-State was introduced on April 2017(Since 17.06)
- Write multiple "FROM" on same dockerfile
- Reduce duplicate workload by copy "intermediate state" during build to new image



Dockerfile

Dockerfile1:

```
FROM golang:1.7.3
WORKDIR /go/src/github.com/alexellis/href-counter/
RUN go get -d -v golang.org/x/net/html
COPY app.go .
RUN go get -d -v golang.org/x/net/html \
&& CGO_ENABLED=0 GOOS=linux go build -a -installsuffix cgo -o app .
```

Output: image 1 unit

Dockerfile2:

```
FROM alpine:latest
RUN apk --no-cache add ca-certificates
WORKDIR /root/
COPY app .
CMD ["./app"]
```

Output: image final unit

Dockerfile

Multi-state dockerfile:

```
FROM golang:1.7.3 as builder
WORKDIR /go/src/github.com/alexellis/href-counter/
RUN go get -d -v golang.org/x/net/html
COPY app.go    .
RUN CGO_ENABLED=0 GOOS=linux go build -a -installsuffix cgo -o app .

FROM alpine:latest
RUN apk --no-cache add ca-certificates
WORKDIR /root/
COPY --from=builder /go/src/github.com/alexellis/href-counter/app .
CMD ["./app"]
```

Output: Final Image 1 Unit

Compose

...

Compose

- Compose เป็นเครื่องมือที่ใช้ในการสร้าง system service ที่จะใช้ในการรันระบบงานทั้งระบบ ซึ่งตามปกติจะประกอบไปด้วยหลาย component อาทิเช่น
  - Web component service
  - Application component service
  - Database component service
  - Load balance component service
  - etc

- compose สามารถควบคุมการ start / stop / monitor การทำงานของ service ทั้งระบบเป็น single point

- เหมาะสำหรับการสร้าง development environment / test environment / automatic deploy to production (docker-machine / swam) (build one ➔ ship to everywhere)
- *No Support --ip now

Compose

- ขั้นตอนในการสร้าง compose
  - สร้าง docker file สำหรับแต่ละ component
  - กำหนดค่า running parameter ใน .yml/.yaml file ของ compose ซึ่งจะอ้างอิงถึง docker file แต่ละตัว
  - docker-compose up

docker file (Webserver)

docker file (Database)

docker file (…..)

Compose .yml file

```
build:
  context: /web
  dockerfile: xxxx

build:
  context: /db
  dockerfile: xxxx
```

"docker-compose build"
"docker-compose up"
"docker-compose down"
"docker stack deploy"

Compose

Compose file format	Docker Engine release
3.6	18.02.0+
3.5	17.12.0+
3.4	17.09.0+
3.3	17.06.0+
3.2	17.04.0+
3.1	1.13.1+
3.0	1.13.0+
2.4	17.12.0+
2.3	17.06.0+
2.2	1.13.0+
2.1	1.12.0+
2.0	1.10.0+
1.0	1.9.1.+

Version 3.3

An upgrade of version 3 that introduces new parameters only available with Docker Engine version **17.06.0+**, and higher.

Introduces the following additional parameters:

- build `labels`
- `credential_spec`
- `configs`
- deploy `endpoint_mode`

Version 3.4

An upgrade of version 3 that introduces new parameters. It is only available with Docker Engine version **17.09.0** and higher.

Introduces the following additional parameters:

- `target` and `network` in build configurations
- `start_period` for `healthchecks`
- `order` for update configurations
- `name` for volumes

Version 3.5

An upgrade of version 3 that introduces new parameters. It is only available with Docker Engine version **17.12.0** and higher.

Introduces the following additional parameters:

- `isolation` in service definitions
- `name` for networks, secrets and configs
- `shm_size` in build configurations

Version 3.6

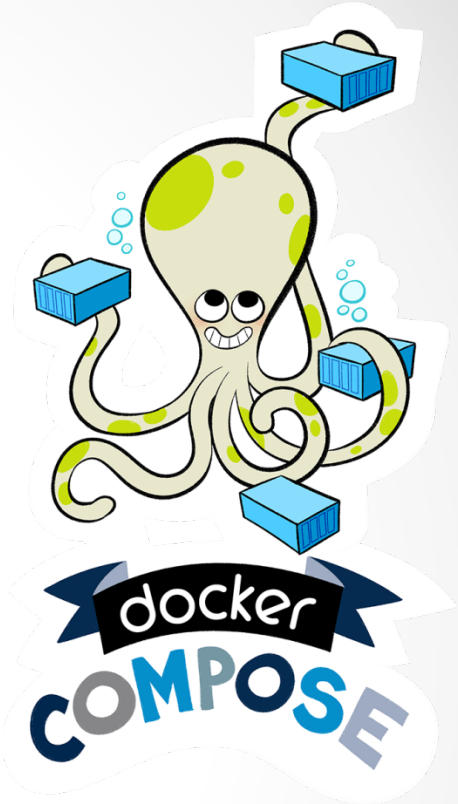
An upgrade of version 3 that introduces new parameters. It is only available with Docker Engine version **18.02.0** and higher.

Introduces the following additional parameters:

- `tmpfs` size for `tmpfs` -type mounts

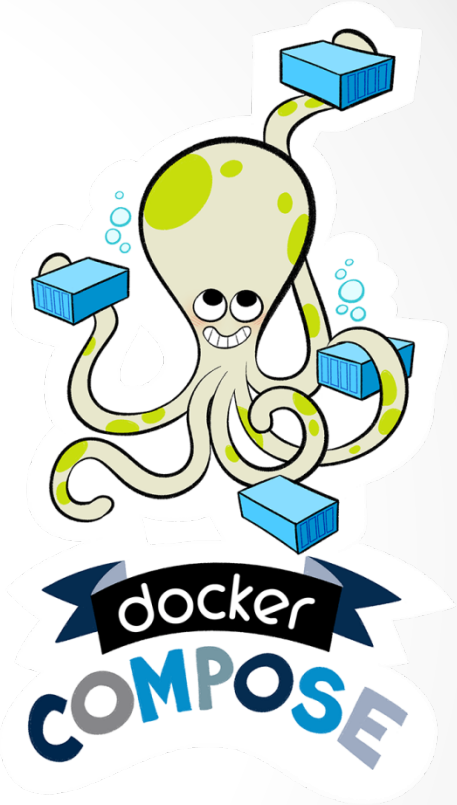
Compose

- Compose syntax: (docker compose up/down/run)
  - version: x.x (Current Version 3.4)
  - services:
    - XXX (service name):
      - image: <image name>
      - build:
        - target: /xxxx (New on Version 3.4)
        - cache_from: (New on Version 3.2)
          - <image name>
        - labels: (New on Version 3.3)
          - <label>: <value>
        - context: ./<path>
        - dockerfile: <file>
      - container_name: <name>
      - args:
        - <xxxx>:<value>
      - dns: x.x.x.x
      - dns_search: xxx.com
      - entrypoint: ["nginx","-c","/etc/nginx/nginx.conf"]
      - env_file: xxxx.xxx (VAR=VAL)
      - Environment:
        - TOKEN: XXXX
      - ports:
        - - "9999:9999"
      - Link:
        - xx:<alias>
      - healthcheck:
        - test: ["CMD-SHELL", "pg_isready"]
        - interval: 30s
        - timeout: 30s
        - retries: 3
        - start_period: 100s (New on Version 3.4)



Compose

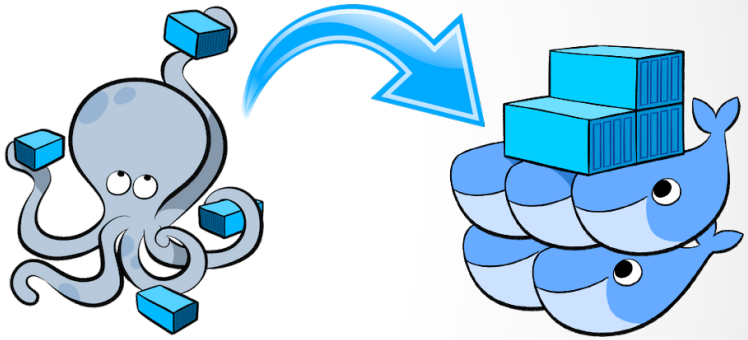
- Compose syntax:
  - XXX (service name):
    - depends_on:
      - XXXX
      - XXXX
    - networks:
      - XXXX1
      - XXXX2



Ref:https://docs.docker.com/compose/compose-file/#command

Compose

- Compose syntax: (docker stack deploy)
  - services:
    - XXX (service name): (Current Version 3.4)
      - image: <image name>
      - **deploy: <SWARM>**
        - mode:
          - global
          - replicated
        - resource:
          - limits:
            - cpus: '0.5'
            - memory: 100M
          - reservations:
            - cpus: '0.1'
            - memory: 20M
        - restart_policy:
          - condition: on-failure
          - delay: 5s
          - max_attempts: 3
        - update_config:
          - parallelism: 2
          - delay: 10s
          - failure_action: 10ms
          - max_failure_ratio: X
          - order: (stop-first,start-first) <New on Version 3.4>



Compose

- DOCKER STACK DEPLOY
  - Not Supported
    - build
    - cgroup_parent
    - container_name
    - devices
    - dns
    - dns_search
    - external_links
    - links
    - network_mode
    - security_opt
    - stop_signal
    - sysctls
    - userns_mode

Workshop 2-2: Compose

- Install compose (Boot2docker)

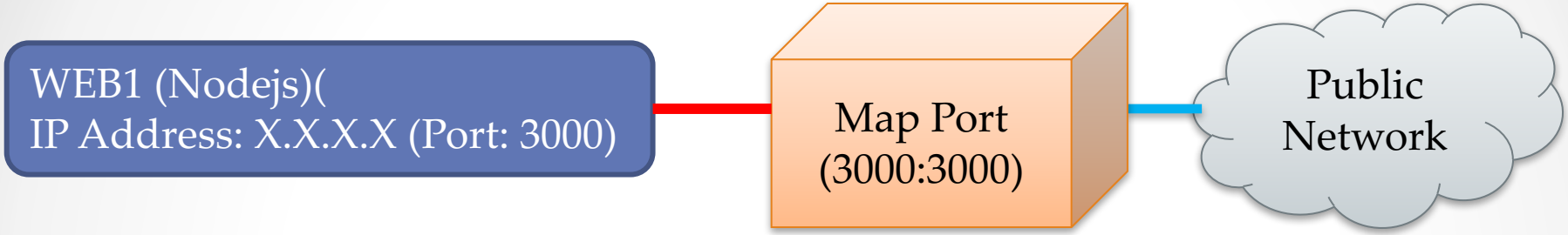
```
curl -L https://github.com/docker/compose/releases/download/1.21.2/docker-compose-`uname -s`-`uname -m` > /home/docker/docker-compose

sudo cp /home/docker/docker-compose /usr/local/bin/docker-compose

sudo chmod +x /usr/local/bin/docker-compose
```

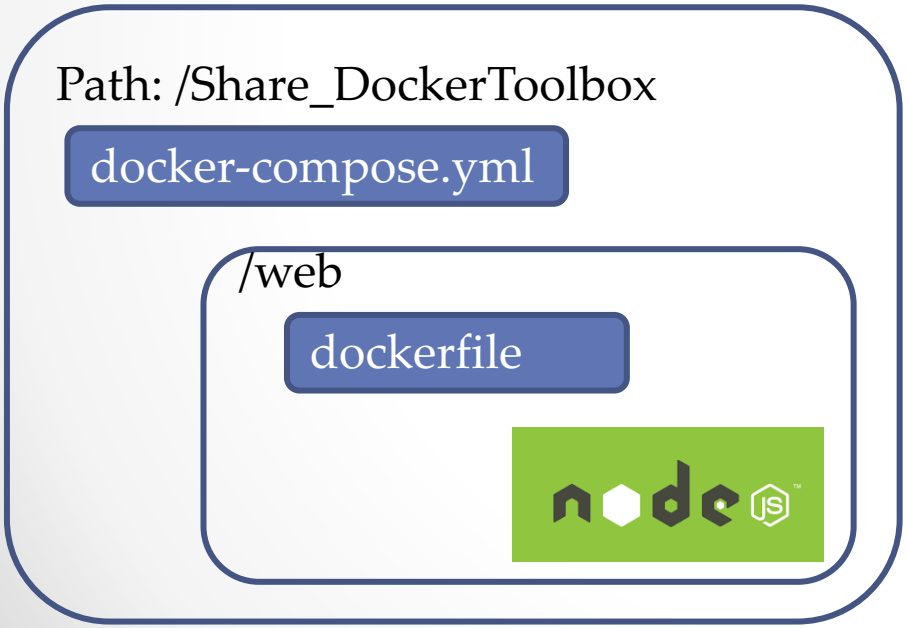
- Install ubuntu & redhat

```
curl -L https://github.com/docker/compose/releases/download/1.21.2/docker-compose-`uname -s`-`uname -m` > /usr/local/bin/docker-compose

sudo chmod +x /usr/local/bin/docker-compose
```

Workshop 2-2: Compose

- Part1: composenodejs





Workshop 2-2: Compose

- dockerfile

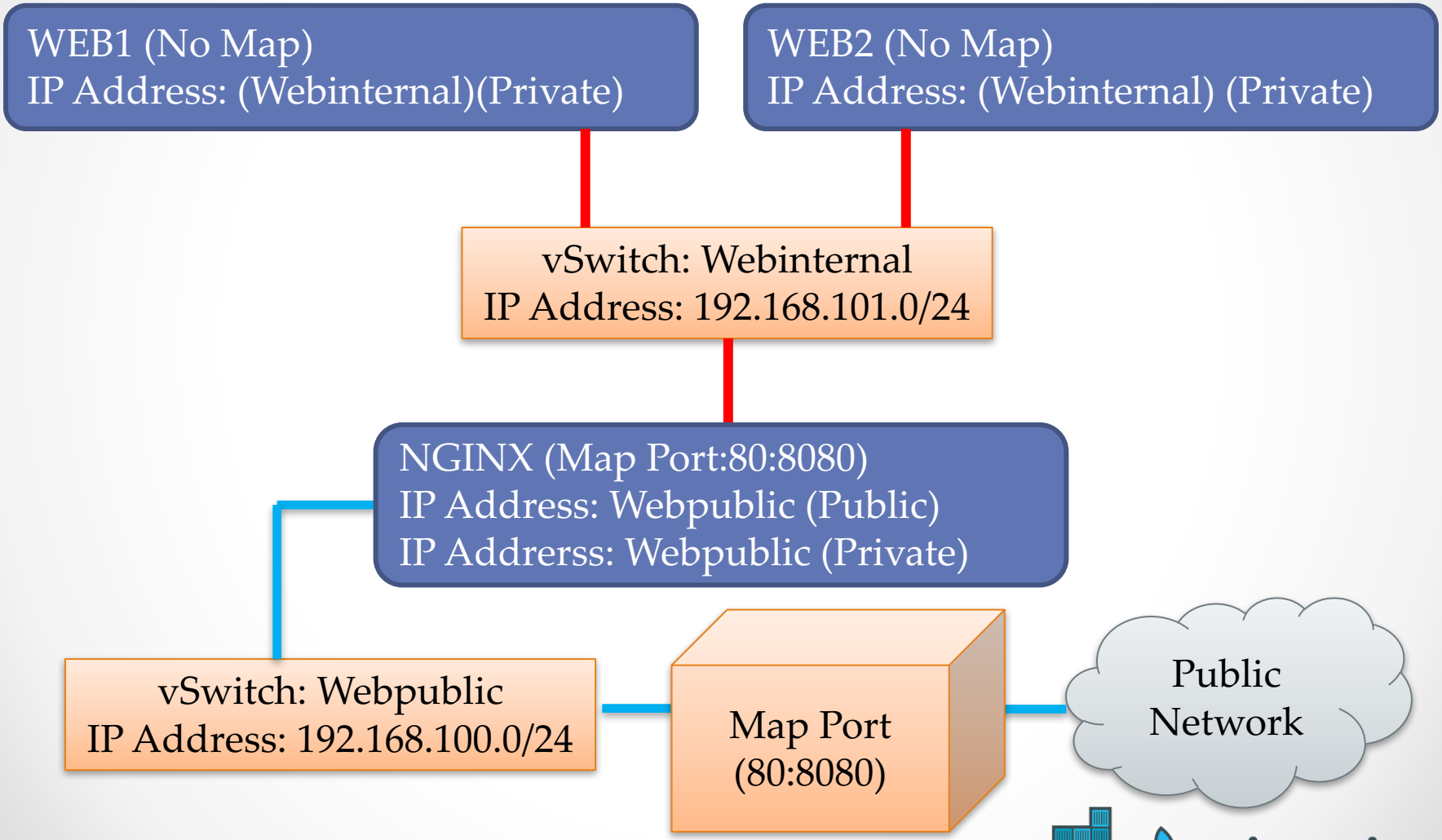
```
FROM labdocker/alpine:latest
MAINTAINER Praparn Lueangphoonlap (eva10409@gmail.com)
LABEL Description="NodeJS/NGINX Build Container" Version="1.0"
ENV NODE_VERSION=v4.3.0 NPM_VERSION=2.14.12
RUN apk update && \
   apk add nodejs
RUN mkdir /nodejs
COPY hello.js /nodejs/
WORKDIR /nodejs
ENTRYPOINT ["node","hello.js"]
EXPOSE 3000
```

- docker-compose.yml

```
version: "3.4"
services:
  web:
     build:
        context: ./web
        dockerfile: dockerfile                    # optional for specific dockerfile
    container_name: nodejs                        # optional for specific container name
    command: ["node","hello.js"]                  # optional for override command on dockerfile
    ports:
       - 3000:3000
```

Workshop 2-2: Compose

- Part 2: composemultinodejs



Workshop 2-2: Compose

- Use case: multinodejs with nginx

Path: /Share_DockerToolbox

docker-compose.yml

/nginx

dockerfile
(webinternal)
(webpublic)

nginx.conf
load balance:
web1
web2

/web1

dockerfile (webinternal)

/web2

dockerfile (webinternal)

Workshop 2-2: Compose

- nginx: dockerfile

```
FROM labdocker/alpine:latest
MAINTAINER Praparn Lueangphoonlap (eva10409@gmail.com)
LABEL Description="NodeJS/NGINX Build Container" Version="1.0"
RUN apk update && \
   apk add nginx
COPY nginx.conf /etc/nginx/nginx.conf
WORKDIR /usr/sbin
ENTRYPOINT ["nginx","-c","/etc/nginx/nginx.conf"]
EXPOSE 8080
```

- Web1 & Web 2: dockerfile

```
FROM labdocker/alpine:latest
MAINTAINER Praparn Lueangphoonlap (eva10409@gmail.com)
LABEL Description="NodeJS/NGINX Build Container" Version="1.0"
ENV NODE_VERSION=v4.3.0 NPM_VERSION=2.14.12
RUN apk update && \
   apk add nodejs
RUN mkdir /nodejs
COPY hello.js /nodejs/
WORKDIR /nodejs
ENTRYPOINT ["node","hello.js"]
EXPOSE 3000
```

Workshop 2-2: Compose

- Web1: Hello.js

```
var http = require('http');
http.createServer(function (req, res)
{res.writeHead(200, {'Content-Type': 'text/plain'});
res.end('Hello World Container Docker for Nodejs Node 1\n');}).listen(3000,
'0.0.0.0');
console.log('Server running at http://0.0.0.0:3000/');
```

- Web2: Hello.js

```
var http = require('http');
http.createServer(function (req, res)
{res.writeHead(200, {'Content-Type': 'text/plain'});
res.end('Hello World Container Docker for Nodejs Node 2\n');}).listen(3000,
'0.0.0.0');
console.log('Server running at http://0.0.0.0:3000/');
```

Workshop 2-2: Compose

- docker-compose.yml

```yaml
version: '3.4'
services:
  nginx:
    build:
      context: ./nginx
      dockerfile: dockerfile          # optional for specific dockerfile
      cache_from:
        - alpine:latest
    container_name: nginx
    depends_on:
      - web1
      - web2
    healthcheck:
      test: ["CMD", "curl", "-f", "http://localhost:80"]  # option for health check and send curl for check http://localhost:3000
      interval: 30s                                         # interval health check
      timeout: 10s                                          # timeout for check
      retries: 3                                            # maximum retries
      start_period: 30s                                     # start period <news on 3.4>
    networks:
      webpublic:
        aliases:
        - nginx
      webinternal:
        aliases:
        - nginx
    ports:
      - "80:8080"
```

Workshop 2-2: Compose

- docker-compose.yml

```yaml
  web1:
    build:
      context: ./web1
      dockerfile: dockerfile          # optional for specific dockerfile
      cache_from:
        - labdocker/alpineweb:latest
    container_name: web1
    healthcheck:
      test: ["CMD", "curl", "-f", "http://localhost:3000"]  # option for health check and send curl for check http://localhost:3000
      interval: 30s                                         # interval health check
      timeout: 10s                                          # timeout for check
      retries: 3                                            # maximum retries
      start_period: 30s                                     # start period <news on 3.4>
    networks:
      webinternal:
        aliases:
        - web1

  web2:
    build:
      context: ./web2
      dockerfile: dockerfile          # optional for specific dockerfile
      cache_from:
        - labdocker/alpineweb:latest
    container_name: web2
    healthcheck:
      test: ["CMD", "curl", "-f", "http://localhost:3000"]  # option for health check and send curl for check http://localhost:3000
      interval: 30s                                         # interval health check
      timeout: 10s                                          # timeout for check
      retries: 3                                            # maximum retries
      start_period: 30s                                     # start period <news on 3.4>
    networks:
      webinternal:
        aliases:
        - web2
```

Workshop 2-2: Compose

- docker-compose.yml

```yaml
networks:
  webpublic:
    driver: bridge
    ipam:
      driver: default
      config:
      - subnet: 192.168.100.0/24
  webinternal:
    driver: bridge
    ipam:
      driver: default
      config:
      - subnet: 192.168.101.0/24
```

Registry

...

Registry

- Registry เป็น container แบบหนึ่งที่ใช้สำหรับจัดเก็บ image ที่สร้างขึ้นไว้บน private server โดยไม่จำเป็นต้องผ่าน public internet (hub.docker.com) ทำให้สามารถจัดเก็บ image ภายในองค์กรได้อย่างปลอดภัย

- Registry เป็นพื้นที่สำหรับจัดเก็บ image ที่ถูกสร้างขึ้นโดยแบ่งออกตาม image name และ tag version ที่กำหนดไว้

Ex: labdocker/alpineweb:latest

- กรณีการใช้งาน registry ระหว่าง Server ด้วยกันสามารถกำหนด TLS security ระหว่างกันได้

- สามารถเลือก storage backend อื่นๆในการจัดเก็บ image ได้เช่น
- Etc: s3 (aws), azure, gcs (google cloud) etc
- มี option gc (garbage collect) ด้วย option
- “bin/registry garbage-collect [--dry-run] config.yml”

Workshop 2-3: Registry

- Part1:Registry on single docker-machine
- เริ่มใช้งาน registry โดย download image registry ตามตัวอย่าง

```
docker image pull registry:2.6.2 (registry version 2.0)
```

- Start container เพื่อเริ่มใช้งาน

```
docker container run -d -p 5000:5000 \
--restart=always --name registry \
 -e REGISTRY_STORAGE_DELETE_ENABLED=true \
--mount type=bind,source=/home/docker,target=/var/lib/registry \
registry:2.5.2
```

- ดำเนินการ tag image และทดสอบ push image docker เข้า registry

```
docker image tag labdocker/alpine:latest \
localhost:5000/alpine:latest
```

```
docker push localhost:5000/alpine:latest
```

- *ต้องบันทึก digest image ไว้เพื่อใช้อ้างอิงภายหลัง

Workshop 2-3: Registry

- ในการตรวจสอบ registry image file เพื่อให้เกิดความง่ายต่อการใช้งาน docker ได้จัดเตรียม HTTP API สำหรับการเรียกใช้งานบน registry ผ่าน curl/customize application ซึ่งรองรับการใช้งาน อาทิเช่น
- การ List รายการ image ที่จัดเก็บไว้บน

```
curl -X GET http://localhost:5000/v2/_catalog
```

- ตรวจสอบ revision image tag ที่จัดเก็บไว้ในแต่ละ image

```
curl -X GET http://localhost:5000/v2/<name>/tags/list
```

```
curl -X GET http://localhost:5000/v2/alpine/tags/list
```

- สามารถทำการลบ image ที่จัดเก็บไว้โดยอ้างอิงจาก digest

```
curl -X DELETE
http://localhost:5000/v2/alpine/manifests/<digest>
```

Workshop 2-3: Registry

- ตรวจสอบ image ทาง physical file จาก docker-machine

```
cd /home/docker
cd /docker/registry/v2
```

- ลบ image file ออกจาก docker-machine

```
docker image rm localhost:5000/alpine:latest
```

- ทำการดึง image ใหม่มาจาก registry

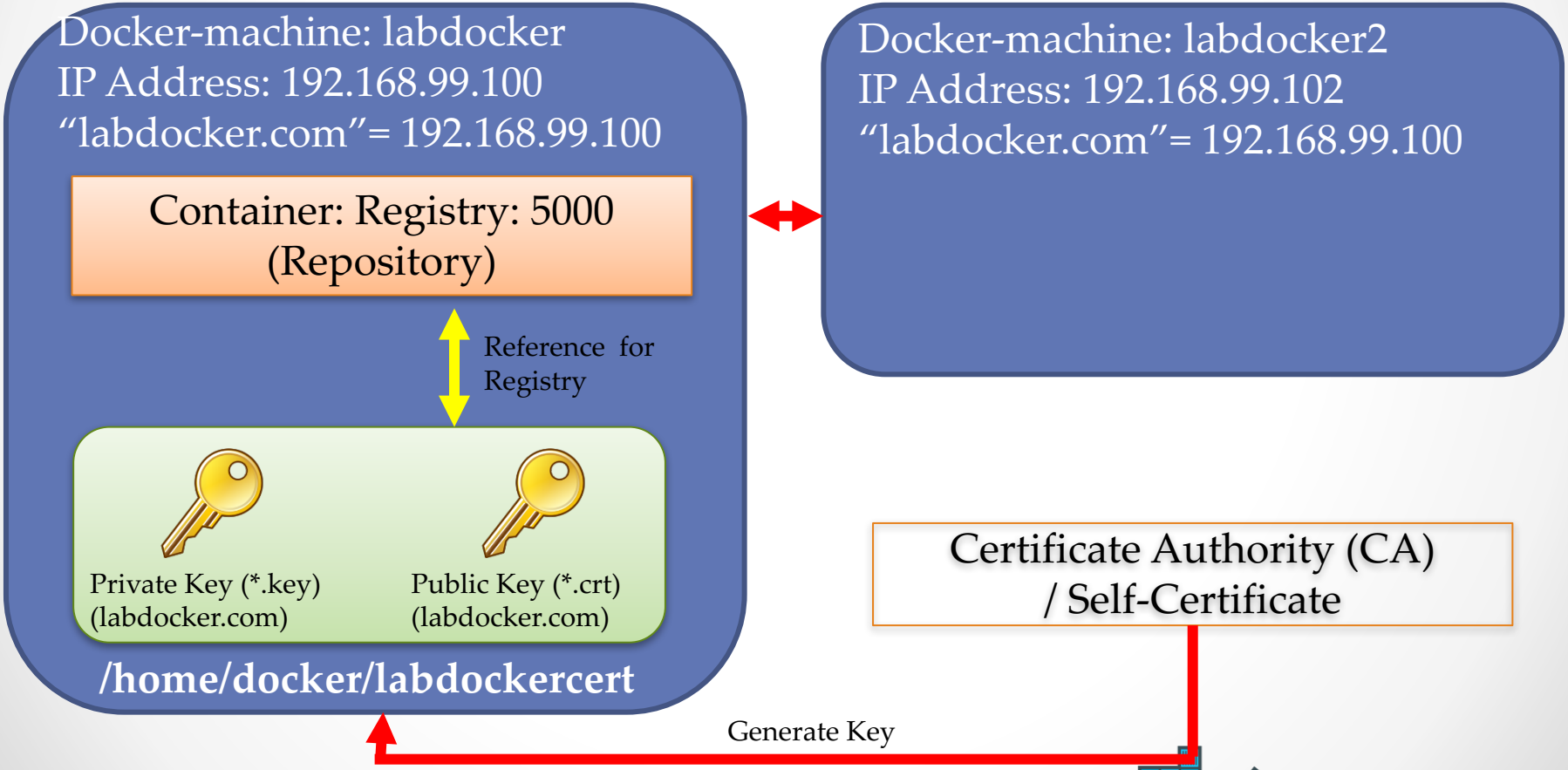
```
docker image pull localhost:5000/alpine:latest
```

- ทำการลบ container registry เพื่อยกเลิกการใช้งาน

```
docker container stop registry
docker container rm registry
```

Workshop 2-3: Registry

- Part2: Registry on multiple docker-machine
- กรณีที่ต้องใช้งาน registry จาก docker server มากกว่า 1 เครื่อง เราสามารถดึงต้องสร้าง TLS certificate (next generate of SSL) เพื่อ trust



Workshop 2-3: Registry

- การสร้าง certificate จาก CA / Self-Signed

www.selfsignedcertificate.com

Search

Self-Signed Certificate Generator | Development Tips | About

Self-Signed Certificate Generator

Self-signed ssl certificates can be used to set up temporary ssl servers. You can use it for test and development servers where security is not a big concern. Use the form below to generate a self-signed ssl certificate and key.

Server name: www.example.com Generate »

sslstore
AFFORDABLE SSL CERTIFICATES
ISSUED IN MINUTES*

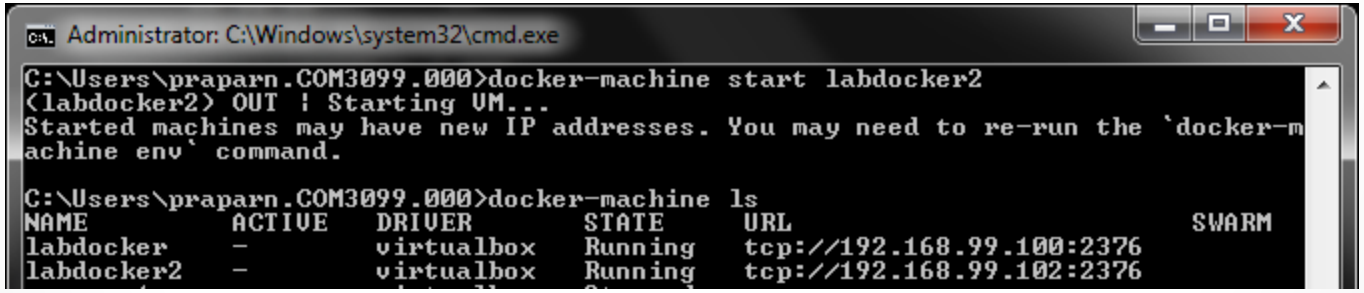
Workshop 2-3: Registry

- สร้าง docker-machine ใหม่อีกหนึ่งเครื่องชื่อ “labdocker2”

```
docker-machine  create --driver  virtualbox
labdocker2
```

- ตรวจสอบ IP Address และ ssh เข้าสู่ docker-machine “labdocker2”

```
docker-machine ls
```



Workshop 2-3: Registry

- เพิ่ม domain “labdocker.com” ลงใน /etc/hosts (labdocker, labdocker2)

192.168.99.100 - PuTTY

```
# The following lines are desirable for IPv6 capable hosts
# (added automatically by netbase upgrade)

::1     ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
ff02::3 ip6-allhosts
192.168.99.100 labdocker.com
I /etc/hosts 12/12 100%
```

192.168.99.100 - PuTTY

```
docker@labdocker:~$ sudo vi /etc/hosts
docker@labdocker:~$ ping labdocker.com
PING labdocker.com (192.168.99.100): 56 data bytes
64 bytes from 192.168.99.100: seq=0 ttl=64 time=0.110 ms
64 bytes from 192.168.99.100: seq=1 ttl=64 time=0.108 ms
64 bytes from 192.168.99.100: seq=2 ttl=64 time=0.105 ms
^C
--- labdocker.com ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.105/0.107/0.110 ms
docker@labdocker:~$
```

Workshop 2-3: Registry

- ในกรณี self-certificate เครื่อง docker-machine จำเป็นต้อง trust root ca โดย copy *.crt ไว้ในพาธ /etc/docker/certs.d/<domain name>

```
sudo mkdir /etc/docker/certs.d
sudo mkdir /etc/docker/certs.d/labdocker.com:5000
sudo cp /Share_DockerToolbox/labdocker.com.crt
/etc/docker/certs.d/labdocker.com:5000
```

- สำหรับกรณีเครื่อง ubuntu ทั่วไปที่ใช้งาน self-certificate ให้ทำการ trust root ca ดังนี้

```
sudo cp /Share_DockerToolbox/labdocker.com.cert  /usr/local/share/ca-certificates
sudo update-ca-certificates
sudo service docker restart
```

Workshop 2-3: Registry

- เริ่มใช้งาน registry โดย start container ดังนี้ (labdocker)

```
docker container run -d -p 5000:5000 \
        --restart=always --name registrylab \
        --mount type=bind,source=/home/docker,target=/var/lib/registry \
        --mount type=bind,source=/Share_DockerToolbox,target=/certs  \
        --mount type=bind,source=/Share_DockerToolbox,target=/auth\
        -e "REGISTRY_AUTH=htpasswd" \
        -e "REGISTRY_AUTH_HTPASSWD_REALM=Registry Realm" \
        -e REGISTRY_AUTH_HTPASSWD_PATH=/auth/htpasswd \
        -e REGISTRY_STORAGE_DELETE_ENABLED=true \
        -e REGISTRY_HTTP_TLS_CERTIFICATE=/certs/labdocker.com.crt \
        -e REGISTRY_HTTP_TLS_KEY=/certs/labdocker.com.key \
        registry:2.6.2
```

- ดำเนินการ tag image,login และทดสอบ push image docker เข้า registry

```
docker image tag labdocker/alpine:latest labdocker.com:5000/alpine:1.0
docker login -u <username> -p <password>
docker image push labdocker.com:5000/alpine:1.0
```

Workshop 2-3: Registry

- ในการตรวจสอบ registry image file สำหรับ registry ที่มีการ enable TLS เรียบบร้อยแล้วต้องเพิ่มพารามิเตอร์ "--cacert " เพื่อระบุ certificate สำหรับการใช้งานและเปลี่ยน protocol เป็น https

- การ List รายการ image ที่จัดเก็บไว้บน

```
curl –u <username:password> --cacert /Share_DockerToolbox/labdocker.com.crt  -X
GET https://labdocker.com:5000/v2/_catalog
```

- ตรวจสอบ revision image tag ที่จัดเก็บไว้ในแต่ละ image

```
curl –u <username:password> --cacert /home/docker/labdockercert/labdocker.com.crt  -
X GET https://labdocker.com:5000/v2/alpine/tags/list
```

- สามารถทำการลบ image ที่จัดเก็บไว้โดยอ้างอิงจาก digest

```
curl –u <username:password> --cacert /home/docker/labdockercert/labdocker.com.crt
-X DELETE https://labdocker.com:5000/v2/alpine/manifests
```

Workshop 2-3: Registry

- ดึง image ผ่าน labdocker 2

```
docker image pull labdocker.com:5000/alpine:1.0
```

- Optional: สำหรับเพิ่มรันเว็บเพื่อตรวจสอบ Container

```
-v `pwd`/auth:/auth \
 -e "REGISTRY_AUTH=htpasswd" \
 -e "REGISTRY_AUTH_HTPASSWD_REALM=Registry
Realm" \
```

- ทำการลบ container registry เพื่อยกเลิกการใช้งาน

```
docker container stop registry
docker container rm -v registry
```

Ref: https://docs.docker.com/registry/deploying/

Workshop 2-3: Registry

- ดึง image ผ่าน labdocker 2

```
docker image pull labdocker.com:5000/alpine:1.0
```

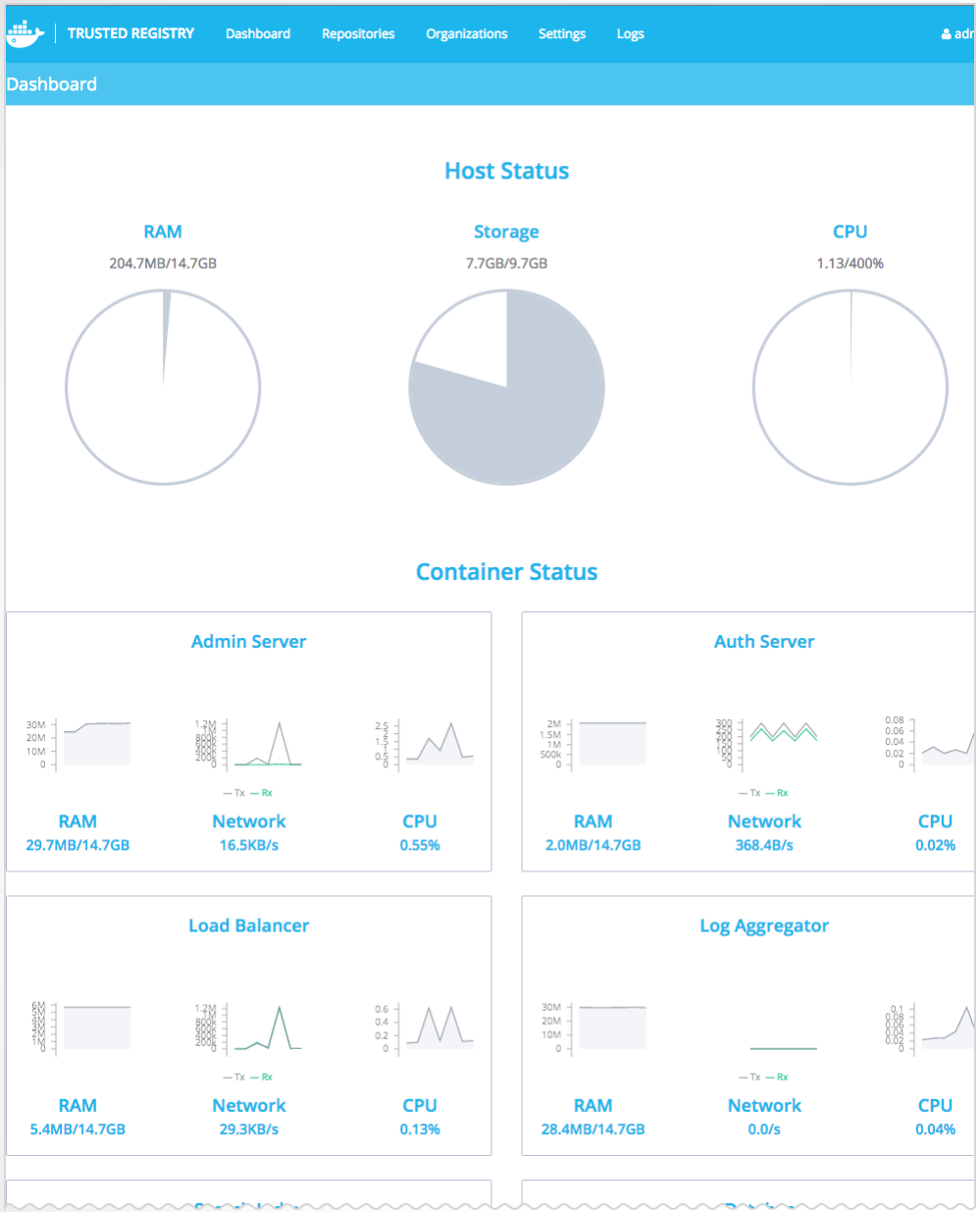
- ทำการลบ container registry เพื่อยกเลิกการใช้งาน

```
docker container stop registry
docker container rm -v registry
```

- Optional: สำหรับเพิ่มการ authenticate login ก่อนทำการ push registry

```
-v `pwd`/auth:/auth \
 -e "REGISTRY_AUTH=htpasswd" \
 -e "REGISTRY_AUTH_HTPASSWD_REALM=Registry
Realm" \
```

Ref: https://docs.docker.com/registry/deploying/



Trust Registry

- Commercial support
- GUI for manage everything
- Integrated LDAP authentication
- GC schedule available

Open Source Registry (Experiment)

- http://port.us.org

Portus

flavio

Dashboard

Images

flavio/busybox

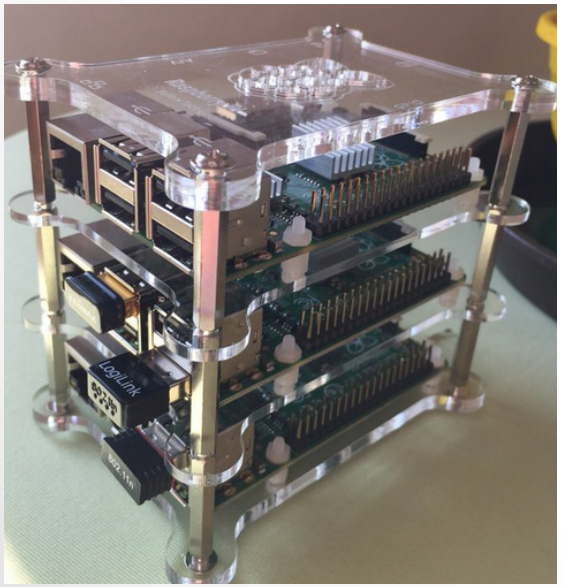
Repository	Tag	Pushed at
flavio/busybox	1.0.0	2015-04-22 14:50:08 UTC
flavio/busybox	2.0.0	2015-04-24 14:12:17 UTC
flavio/busybox	latest	2015-04-24 14:15:34 UTC

Swarm

...

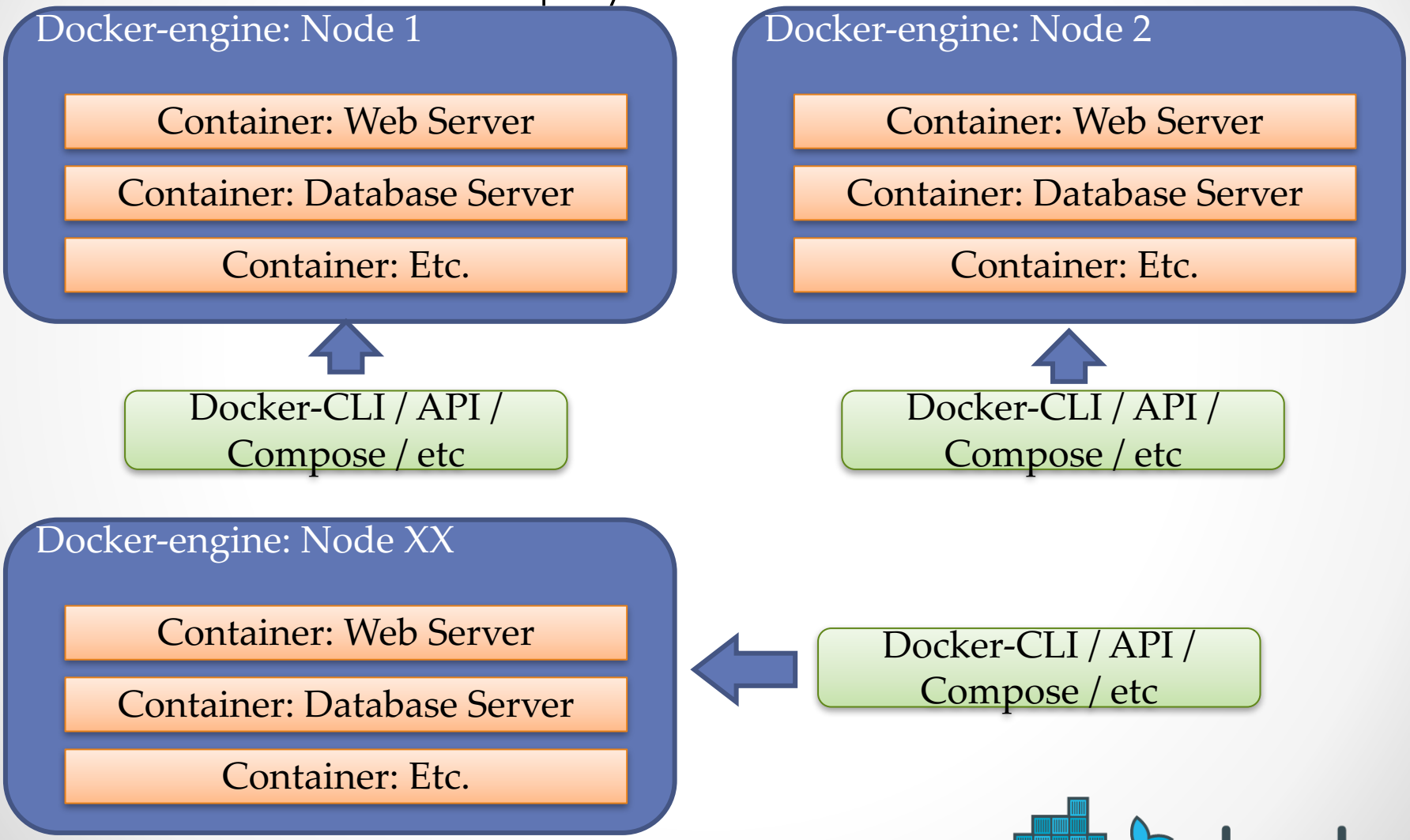
Swarm: Conceptual

- Swarm ถือเป็น native tool ในการจัดการ docker-engine หลายๆเครื่อง ให้รวมเป็น resource pool เดียวกัน เพื่อให้ง่ายต่อการบริหารจัดการ
- เพิ่มขีดความสามารถในการทำงานร่วมกันของ docker-engine
- Hybrid Swan Cluster (Windows / Linux)
- Fail Over / High Availability (HA)
- Micro Service



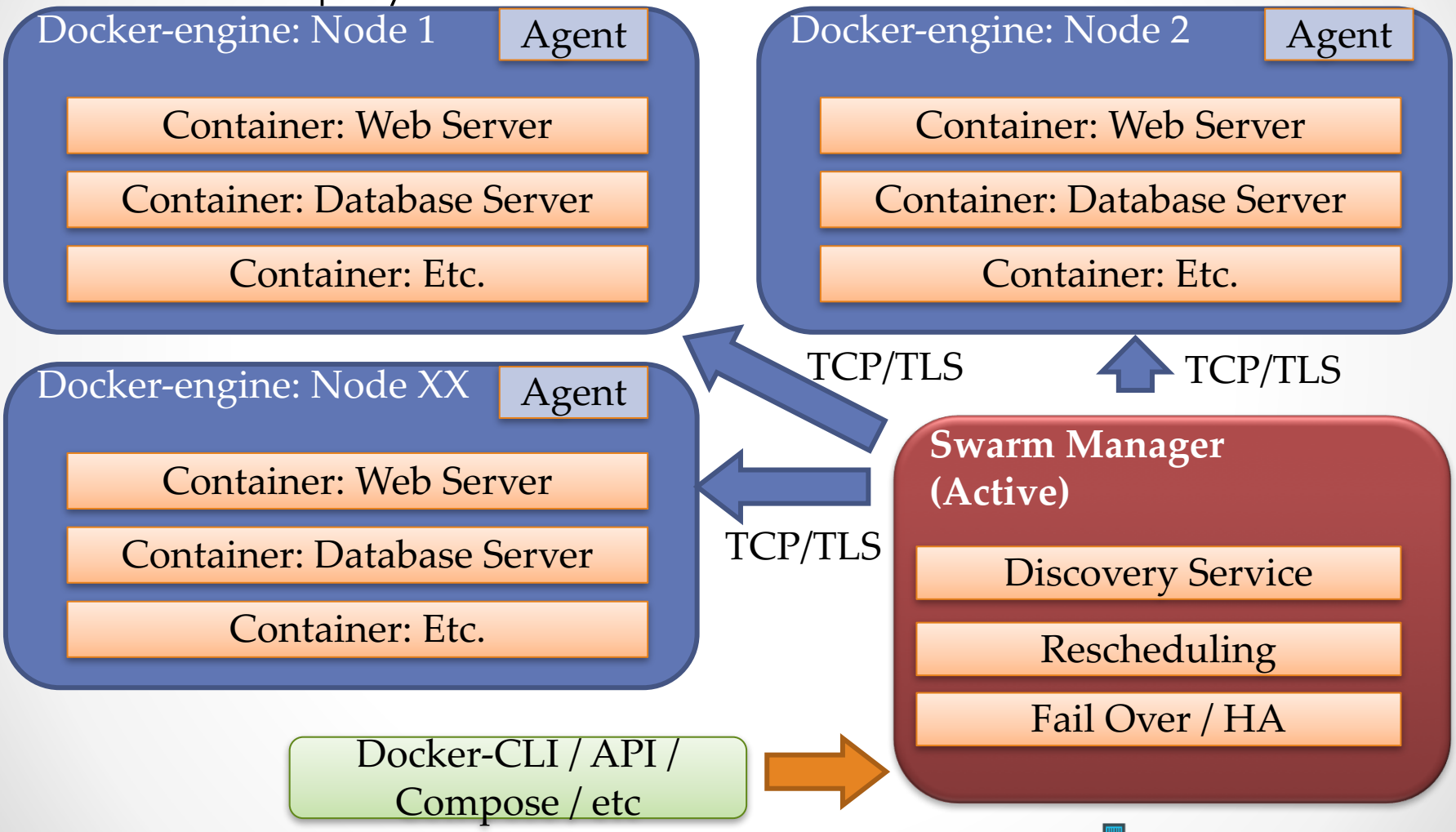
Swarm: Conceptual

- Traditional Docker Deployment



Swarm: Conceptual

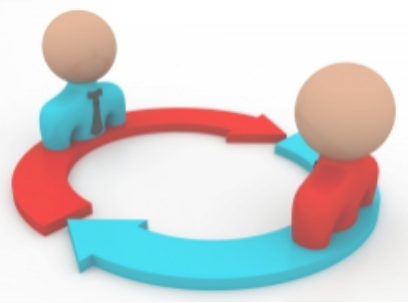
- Swarm Deployment

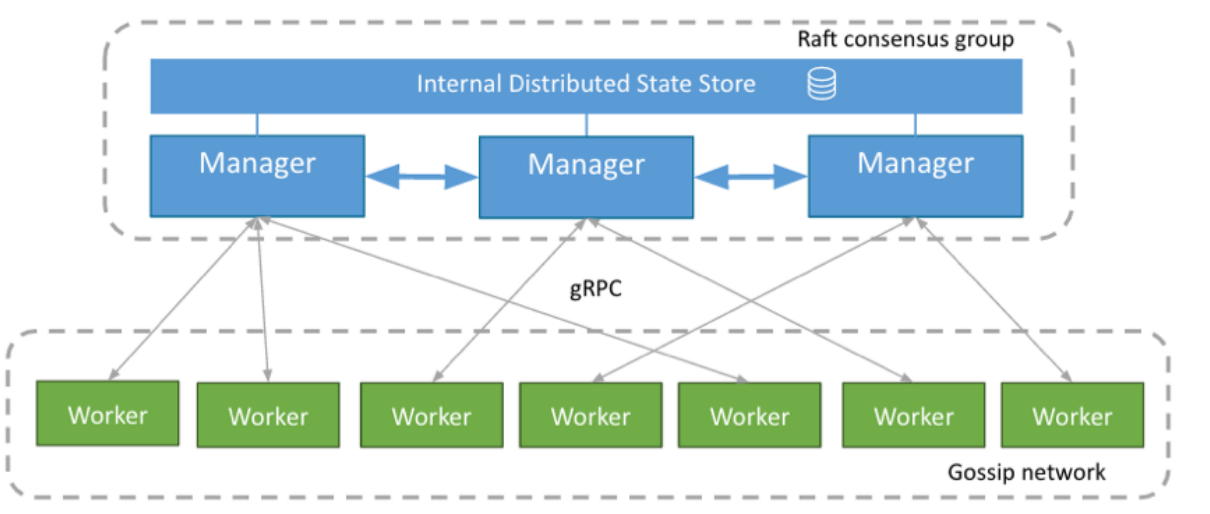


Swarm Mode Architecture

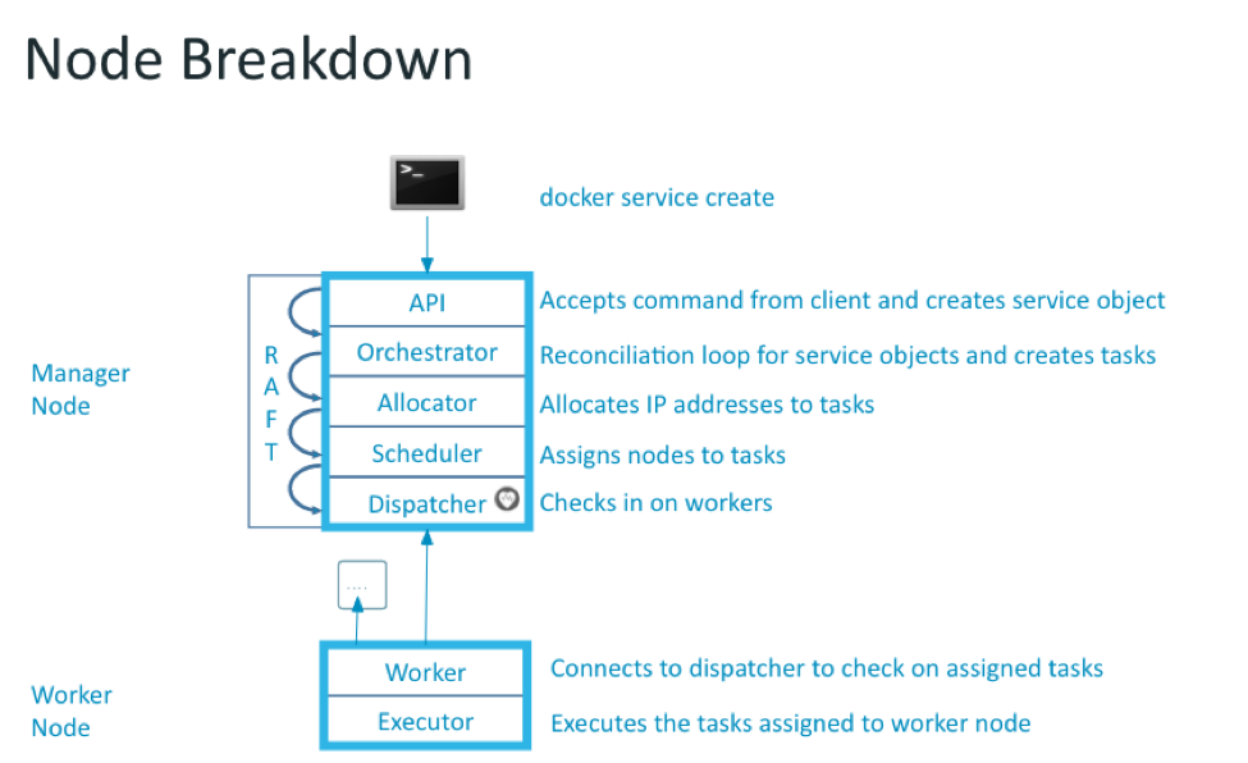
- Swarm Mode (build-in swarm) เป็นฟังก์ชั่นที่มาพร้อมdocker-engine ตั้งแต่แรก และสามารถบริหารจัดการ swarm ได้ด้วยตัวเองรวมถึง build-in TLS certificate เพื่อใช้ทำงานระหว่าง node ทันที (Security On the Box)

- Swarm Role
  - Manager Node
  - Worker Node

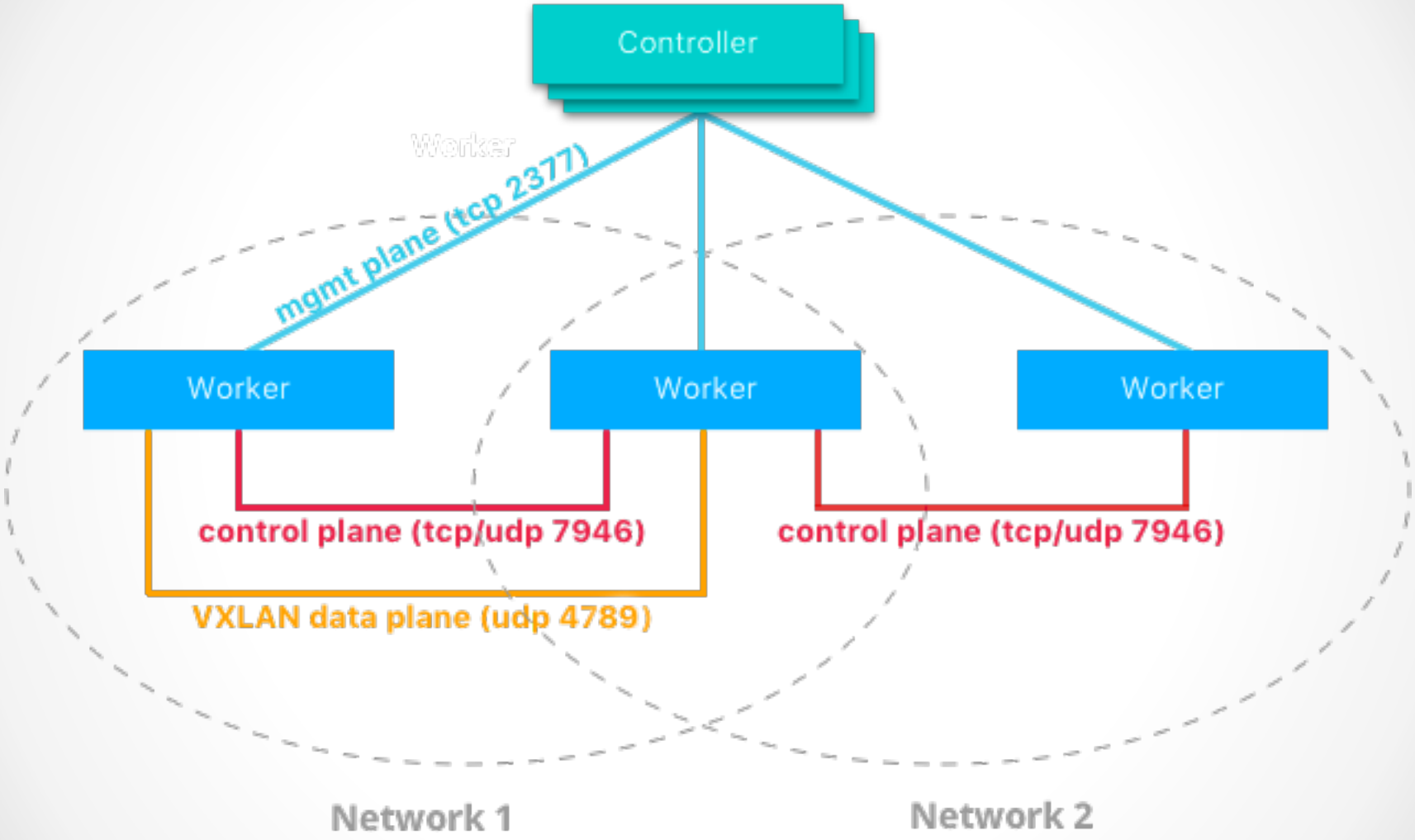




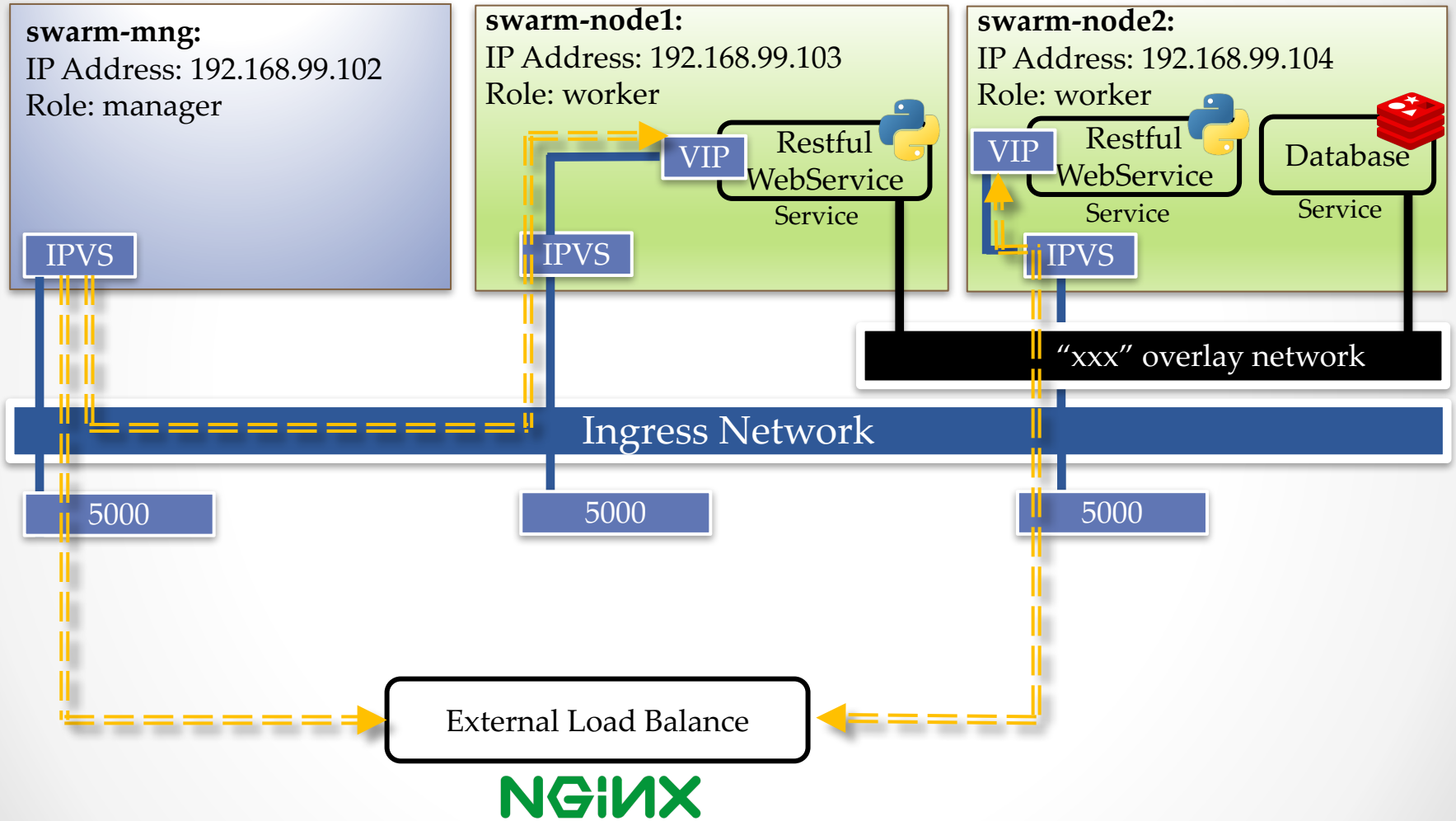
Swarm Mode Architecture



Swarm Mode Architecture



Swarm Mode Architecture



Swarm Mode Architecture

https://blog.docker.com/2016/07/docker-built-in-orchestration-ready-for-production-docker-1-12-goes-ga/

All
Engineering
Curated
Docker Weekly

The core team also wanted to give a special thanks to one of our external maintainers and Docker Captain, Chanwit Kaewkasi, who through his own undertaking, drove the amazing DockerSwarm2000 initiative which rallied the entire community around scaling an RC of 1.12 with swarm mode to nearly 2.4K nodes and just under 100K containers. This was achieved through our global community, who donated access to their machines in all shapes and sizes from bare metal, to Raspberry Pis, to various clouds to VMs from x86 architectures to ARM-based systems. Through this evaluation using live data, we identified that built-in orchestration in Docker has already–in its first release–doubled Docker's orchestration scale in just a half a year. While this validates the scalability of the architecture, there is still headroom for greater performance optimization in the future.

Swarm Mode Architecture

swarmzilla / swarm3k

Watch 11 | Star 21 | Fork 21

Code | Issues 0 | Pull requests 0 | Projects 0 | Pulse | Graphs

SwarmZilla 3000 Collaborative Project

112 commits | 1 branch | 0 releases | 21 contributors

Branch: master | New pull request | Find file | Clone or download

chanwit committed on GitHub got 3185 nodes — Latest commit 7630dad a day ago

README.md	got 3185 nodes	a day ago
dashboard2.png	Add files via upload	26 days ago
events.png	Add files via upload	26 days ago
monitoring.md	Update monitoring.md	2 days ago

README.md

Swarm3k - Friday, 28th October 2016 3.00PM UTC

SwarmZilla 3000 Collaborative Project

Swarm Mode Architecture

Name	Company	Number of Nodes Expected to Contribute
@chanwit	Suranaree University	100
@FlorianHeigl	my own boss	10
@jmaitrehenry	PetalMD	50
@everett_toews	Rackspace	100
@InetCloudArch	Internet Thailand	500
@squeaky_pl	n/a	10
@neverlock	Neverlock	10
@demonware	Demonware	1000
@sujaypillai	Jabil	50
@pilgrimstack	OVH	500
@ajeetsraina	Collabnix	10
@AorJoa	Aiyara Cluster	10
@f_soppelsa	Personal	20
@GroupSprint3r	SPRINT3r	630
@toughIQ	Personal	30
@mrnonaki	N/A	10
@zinuzoid	HotelQuickly	200
@_EthanHunt_	N/A	25
@packethost	Packet	100
@ContainerizeT	ContainerizeThis: The Conference	10
@_pascalandy	FirePress	10
@lucjuggery	TRAXxs	10
@alexellisuk	Personal	10
@svega	Huli	10
@BretFisher	Myself :)	20
@voodootikigod	Emerging Technology Advisors	100
@AlexPostID	Personal	20
@gianarb	ThumpFlow	50
@Rucknar	Personal	10
@lherrerabenitez	Personal	10
@abhisak	Nipa Technology	100
@djalal	NexwayGroup	30

Docker: The Next-Gen of Virtualization

K8S vs Docker what is the difference ?

Topic	K8S	Docker/Swarm
Architecture	Open-system (Base on cluster manager "Borg" for support complex workload)	**Swarm**: Proprietary of Docker product, "Easy to use", "Extend capability of Docker in cluster"
Operation command	Almost operate by "YMAL" file (Declarative Command)	Almost operate by "command" (Imperative Command)
Unit of Work	Pods (Pods >= Container)	Container
How to Identify Work	"Label operation"	**Docker**: By container name **Swarm**: By service/stack name
Level of workload management	Service Level: (Simple) Replication Level: (Auto healing) Deployment Level: (Auto healing + Roll Update)	**Docker**: N/A **Swarm**: Service Level (Snag with service/stack)
Auto scaling	HPA (Horizontal Pods Scaling) base on CPU	No
Health check	Liveness & Readiness (Multi option to check application health)	Service health only

Swarm Init/Join

- เริ่มการสร้าง swarm ด้วยคำสั่ง docker swarm init [OPTIONS] เพื่อให้ docker เริ่มทำงานใน swarm mode

docker swarm init --listen-addr <ip address>:<port>

docker swarm init --advertise-addr 192.168.99.102:2377

```
docker@swarm-mng:~$ docker swarm init --advertise-addr 192.168.99.102:2377
Swarm initialized: current node (j65b873flobaqui845vq40m6e) is now a manager.

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

    docker swarm join --token SWMTKN-1-36b4m3gpm3rd7szs82p6hsyg4cml5cq86vc3l4sfzezei1iz6m-5makre25xpxb8y8i85vyedjnj 192.168.99.102:2377

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

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

    docker swarm join --token SWMTKN-1-36b4m3gpm3rd7szs82p6hsyg4cml5cq86vc3l4sfzezei1iz6m-bzcryc1kj16ftmttkxoppodjz 192.168.99.102:2377
```

Swarm Init/Join

- Option:
  - --cert-expiry duration: **กำหนดระยะเวลาในการ** expire certificate (default: 2160 hours = 90 Days)
  - --dispatcher-heartbeat duration: **กำหนดช่วงเวลาในการ** check heartbeat **ภายใน** swarm (Default: 5 seconds)
  - --external-ca value: **กำหนดให้ใช้งาน** CA certificate **ภายนอกเพื่อทำ** trust node **ภายใน** swarm
  - --force-new-cluster: **บังคับการสร้าง** swarm cluster **ใหม่**
  - --advertise-addr value: **ระบุ** ip address **ที่ใช้คุยระหว่าง** swarm node (default: 0.0.0.0:2377)
  - --task-history-limit <int>: **กำหนดการจัดเก็บ** history task **ย้อนหลังบน** swarm (default: 10)
  - --availability: <"active"/"pause"/"drain">
  - Etc.

Swarm Init/Join

- ทำการ join node เข้าไปยัง swarm cluster ด้วยคำสั่ง

```
docker swarm join --token <token> <ip of swarm manager: port>
```

```
Boot2Docker version 17.06.0-ce, build HEAD : 0672754 - Thu Jun 29 00:06:31 UTC 2017
Docker version 17.06.0-ce, build 02c1d87
docker@swarm-node1:~$ docker swarm join \
> --token SWMTKN-1-36b4m3gpm3rd7szs82p6hsyg4cml5cq86vc3l4sfzezei1iz6m-5makre25xpxb8y8i85vyedjnj \
> 192.168.99.102:2377
This node joined a swarm as a worker.
docker@swarm-node1:~$
```

```
Boot2Docker version 17.06.0-ce, build HEAD : 0672754 - Thu Jun 29 00:06:31 UTC 2017
Docker version 17.06.0-ce, build 02c1d87
docker@swarm-node2:~$ docker swarm join \
> --token SWMTKN-1-36b4m3gpm3rd7szs82p6hsyg4cml5cq86vc3l4sfzezei1iz6m-5makre25xpxb8y8i85vyedjnj \
> 192.168.99.102:2377
This node joined a swarm as a worker.
docker@swarm-node2:~$
```

Swarm Init/Join

- Option:
  - --token <value>: กำหนด token เพื่อใช้ในการ trust swarm cluster ร่วมกัน
  - --listen-addr value: ระบุ ip address ที่ใช้คุยระหว่าง swarm node (default: 0.0.0.0:2377)
  - --advertise-addr value: ระบุ ip address ที่ประกาศให้ผู้อื่นมาคุยในกรณีเป็น swarm-manager
  - --availability: <“active”/”pause”/”drain”>
  - Etc.

Swarm Init/Join

- ตรวจสอบ Token ที่ใช้ในการ Join Swarm (Worker/Manager)

```
docker swarm join-token <option> <worker/manager>
```

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

    docker swarm join --token SWMTKN-1-36b4m3gpm3rd7szs82p6hsyg4cml5cq86vc3l4sfzezei1iz6m-5makre25xpxb8y8i85vyedjnj 192.168.99.102:2377

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

    docker swarm join --token SWMTKN-1-36b4m3gpm3rd7szs82p6hsyg4cml5cq86vc3l4sfzezei1iz6m-bzcryc1kj16ftmttkxoppodjz 192.168.99.102:2377

docker@swarm-mng:~$
```

- Option:
  - -q, --q : แสดงเฉพาะ token เท่านั้น
  - --rotate: ทำการเปลี่ยน token ใหม่

Swarm Init/Join

- ตรวจสอบ node ที่ทำงานภายใต้ swarm cluster ด้วยคำสั่ง docker node ls

```
docker node ls
```

```
docker@swarm-mng:~$ docker node ls
ID                            HOSTNAME     STATUS  AVAILABILITY  MANAGER STATUS
9d691mgn29newn26phadsavny     swarm-node1  Ready   Active
d4495w8xwhtjrdmadm05dip6x *   swarm-mng    Ready   Active        Leader
embruwpko1py52hfceovy37cl     swarm-node2  Ready   Active        Reachable
docker@swarm-mng:~$
```

Swarm Init/Join

- Option:
  - promote <ID>: ทำการ promote node จาก worker กลายเป็น manager
  - demote <ID>: ทำการ demote node จาก manager กลายเป็น worker ปกติ
  - Inspect <ID>: ตรวจสอบค่าคอนฟิกกูเรชั่นของ node
  - ls: แสดง node ทั้งหมดภายใต้ docker swarm cluster
  - ps <ID>: แสดงงานทั้งหมดที่รันอยู่ภายใต้ node
  - rm <ID>: ลบ node ออกจาก swarm cluster
  - update <ID>: ทำการ update node information
    - --availability <status>: อัพเดตสถานะของ node (active/pause/drain)
    - --label-add <value>: สร้าง custom label เพื่อใช้อ้างอิงให้กับ node สำหรับการรัน service
    - --label-remove <value>: ลบ custom label
    - --role <role>: role of node (worker/manager)

Workshop 2-4: Swarm Mode

- ทำการสร้าง docker-engine ขึ้นมาใหม่เพื่อรองรับการสร้าง swarm ดังนี้

```
docker-machine create --driver=virtualbox swarm-mng

docker-machine create --driver=virtualbox swarm-node1

docker-machine create --driver=virtualbox swarm-node2
```

- ตรวจสอบและบันทึก IP Address ของ docker-engine แต่ละเครื่องที่สร้างขึ้น

```
docker-machine ls
```

- เริ่ม initial swarm ที่เครื่อง swarm-mng

```
docker swarm init --secret labdocker --listen-addr
192.168.99.101:2377
```

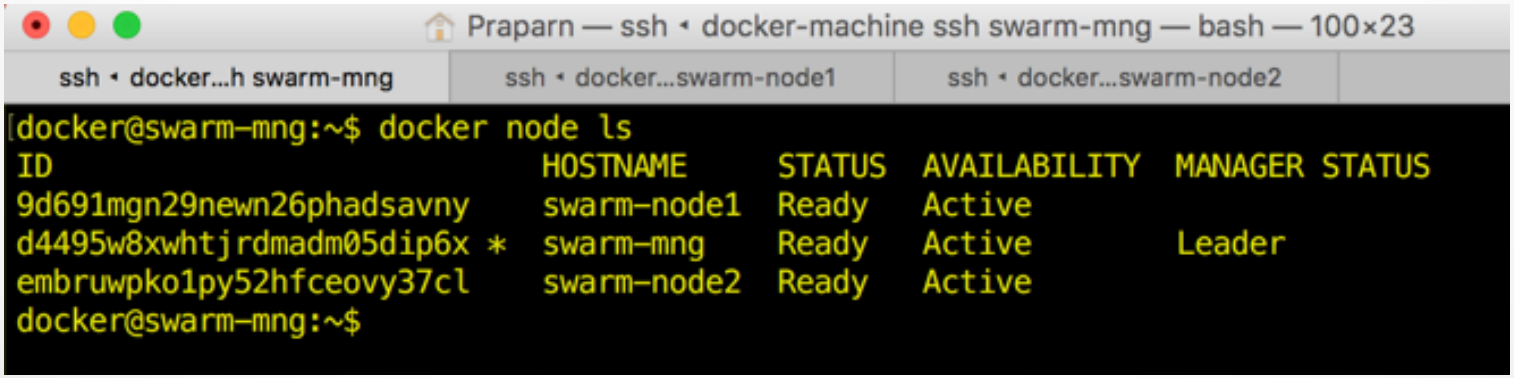
Workshop 2-4: Swarm Mode

- ทำการ Join swarm-node1, swarm-node2 เข้าสู่ swarm cluster

```
docker swarm join \
--token SWMTKN-1-
316tn4xze2w2zi7jpukxjdyoniu18k0onh5ywrxinzmau8t71f-
4750wvm6fqxi8lbd3trlw7pk4 \
   192.168.99.102:2377
```

- ตรวจสอบสถานะของ swarm หลังจาก join node เข้าไปเรียบร้อยแล้ว

```
docker node ls
```

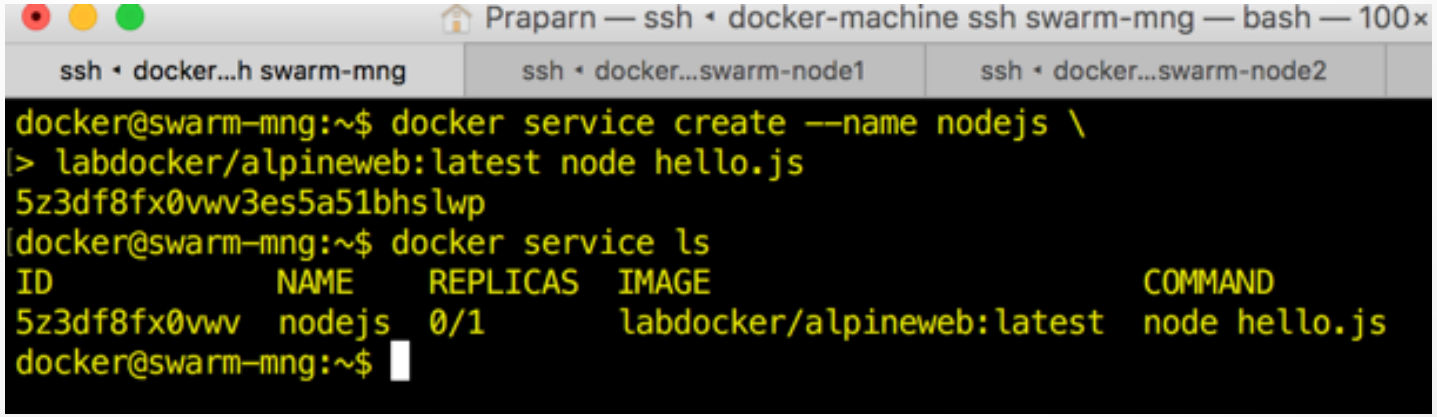


Swarm Service

- สำหรับการสั่งรัน container บน swarm ได้มีการเปลี่ยนแปลงรูปแบบใหม่เช่นกัน โดยกำหนดการรัน container ถูกนิยามใหม่ในรูปแบบของคำสั่ง "docker service" เพื่อนิยามแทนการรันกลุ่มของ container แทนคำสั่ง "docker run" โดยเราสามารถกำหนดค่าพารามิเตอร์ได้เช่นกัน

docker service <action> (create/inspect/tasks/scale/ls/rm/update)

Ex: docker service create -dt --name nodejs \
labdocker/alpineweb:latest node hello.js



Swarm Service

```
Options:
      --config config                    Specify configurations to expose to the service
      --constraint list                  Placement constraints
      --container-label list             Container labels
      --credential-spec credential-spec  Credential spec for managed service account (Windows only)
  -d, --detach                           Exit immediately instead of waiting for the service to converge (default true)
      --dns list                         Set custom DNS servers
      --dns-option list                  Set DNS options
      --dns-search list                  Set custom DNS search domains
      --endpoint-mode string             Endpoint mode (vip or dnsrr) (default "vip")
      --entrypoint command               Overwrite the default ENTRYPOINT of the image
  -e, --env list                         Set environment variables
      --env-file list                    Read in a file of environment variables
      --group list                       Set one or more supplementary user groups for the container
      --health-cmd string                Command to run to check health
      --health-interval duration         Time between running the check (ms|s|m|h)
      --health-retries int               Consecutive failures needed to report unhealthy
      --health-start-period duration     Start period for the container to initialize before counting retries towards unstable (ms|s|m|h)
      --health-timeout duration          Maximum time to allow one check to run (ms|s|m|h)
      --help                             Print usage
      --host list                        Set one or more custom host-to-IP mappings (host:ip)
      --hostname string                  Container hostname
  -l, --label list                       Service labels
      --limit-cpu decimal                Limit CPUs
      --limit-memory bytes               Limit Memory
      --log-driver string                Logging driver for service
      --log-opt list                     Logging driver options
      --mode string                      Service mode (replicated or global) (default "replicated")
      --mount mount                      Attach a filesystem mount to the service
      --name string                      Service name
```

- Reference: https://docs.docker.com/engine/reference/commandline/service_create/

Swarm Service

```
      --name string                        Service name
      --network network                    Network attachments
      --no-healthcheck                     Disable any container-specified HEALTHCHECK
      --no-resolve-image                   Do not query the registry to resolve image digest and supported platforms
      --placement-pref pref                Add a placement preference
  -p, --publish port                       Publish a port as a node port
  -q, --quiet                              Suppress progress output
      --read-only                          Mount the container's root filesystem as read only
      --replicas uint                      Number of tasks
      --reserve-cpu decimal                Reserve CPUs
      --reserve-memory bytes               Reserve Memory
      --restart-condition string           Restart when condition is met ("none"|"on-failure"|"any") (default "any")
      --restart-delay duration             Delay between restart attempts (ns|us|ms|s|m|h) (default 5s)
      --restart-max-attempts uint          Maximum number of restarts before giving up
      --restart-window duration            Window used to evaluate the restart policy (ns|us|ms|s|m|h)
      --rollback-delay duration            Delay between task rollbacks (ns|us|ms|s|m|h) (default 0s)
      --rollback-failure-action string     Action on rollback failure ("pause"|"continue") (default "pause")
      --rollback-max-failure-ratio float   Failure rate to tolerate during a rollback (default 0)
      --rollback-monitor duration          Duration after each task rollback to monitor for failure (ns|us|ms|s|m|h) (default 5s)
      --rollback-order string              Rollback order ("start-first"|"stop-first") (default "stop-first")
      --rollback-parallelism uint          Maximum number of tasks rolled back simultaneously (0 to roll back all at once) (default 1)
      --secret secret                      Specify secrets to expose to the service
      --stop-grace-period duration         Time to wait before force killing a container (ns|us|ms|s|m|h) (default 10s)
      --stop-signal string                 Signal to stop the container
  -t, --tty                                Allocate a pseudo-TTY
      --update-delay duration              Delay between updates (ns|us|ms|s|m|h) (default 0s)
      --update-failure-action string       Action on update failure ("pause"|"continue"|"rollback") (default "pause")
      --update-max-failure-ratio float     Failure rate to tolerate during an update (default 0)
      --update-monitor duration            Duration after each task update to monitor for failure (ns|us|ms|s|m|h) (default 5s)
      --update-order string                Update order ("start-first"|"stop-first") (default "stop-first")
      --update-parallelism uint            Maximum number of tasks updated simultaneously (0 to update all at once) (default 1)
  -u, --user string                        Username or UID (format: <name|uid>[:<group|gid>])
      --with-registry-auth                 Send registry authentication details to swarm agents
  -w, --workdir string                     Working directory inside the container
docker@swarm-mng:~$
```

- Reference: https://docs.docker.com/engine/reference/commandline/service_create/

Swarm Service

docker service scale nodejs=5

praparnlueangphoonlap — Terminal MAC Pro — ssh ‹ docker-machine ssh swarm-mng — 147×30

~ — Terminal MAC Pro — ssh ‹ docker-machine ssh labdocker | ~ — Terminal MAC Pro — -bash | ~ — Terminal MAC Pro — ssh ‹ docker-machine ssh swarm-mng

```
docker@swarm-mng:~$ docker service create --name nodejs -dt \
>    labdocker/alpineweb:latest node hello.js
n96f925q4yq9vi94zdpmjff34
docker@swarm-mng:~$ docker service ls
ID                  NAME                MODE                REPLICAS            IMAGE                          PORTS
n96f925q4yq9        nodejs              replicated          1/1                 labdocker/alpineweb:latest
docker@swarm-mng:~$ docker service ps nodejs
ID                  NAME                IMAGE                          NODE                DESIRED STATE       CURRENT STATE           ERROR
       PORTS
9lrwdm68zgq4        nodejs.1            labdocker/alpineweb:latest     swarm-mng           Running             Running 5 minutes ago

docker@swarm-mng:~$ docker service scale nodejs=5
nodejs scaled to 5
docker@swarm-mng:~$ docker service ls
ID                  NAME                MODE                REPLICAS            IMAGE                          PORTS
n96f925q4yq9        nodejs              replicated          5/5                 labdocker/alpineweb:latest
docker@swarm-mng:~$ docker service ps nodejs
ID                  NAME                IMAGE                          NODE                DESIRED STATE       CURRENT STATE           ERROR
       PORTS
9lrwdm68zgq4        nodejs.1            labdocker/alpineweb:latest     swarm-mng           Running             Running 6 minutes ago

jmo3g3rfzfxi        nodejs.2            labdocker/alpineweb:latest     swarm-mng           Running             Running 26 seconds ago

zxjo6psq6hnh        nodejs.3            labdocker/alpineweb:latest     swarm-node2         Running             Running 15 seconds ago

tmdlb2878g9j        nodejs.4            labdocker/alpineweb:latest     swarm-node1         Running             Running 26 seconds ago

f6xe6zbprlyt        nodejs.5            labdocker/alpineweb:latest     swarm-node1         Running             Running 26 seconds ago

docker@swarm-mng:~$
```

Swarm Service

```
docker service update -dt --reserve-cpu 1 --limit-cpu 1 nodejs
```

```
docker service inspect nodejs | more
```

```
docker@swarm-mng:~$ docker service inspect nodejs | more
[
    {
        "ID": "n96f925q4yq9vi94zdpmjff34",
        "Version": {
            "Index": 174
        },
        "CreatedAt": "2017-08-10T15:19:01.295998146Z",
        "UpdatedAt": "2017-08-10T15:28:15.828876222Z",
        "Spec": {
            "Name": "nodejs",
            "Labels": {},
            "TaskTemplate": {
                "ContainerSpec": {
                    "Image": "labdocker/alpineweb:latest@sha256:e14b3ab7fd7378177cd790d887656a6623b75bff183df7e2b1b2592691e419d3",
                    "Args": [
                        "node",
                        "hello.js"
                    ],
                    "TTY": true,
                    "StopGracePeriod": 10000000000,
                    "DNSConfig": {}
```

```
        "UpdateStatus": {
            "State": "completed",
            "StartedAt": "2017-08-10T15:27:59.279202178Z",
            "CompletedAt": "2017-08-10T15:28:15.82885596Z",
            "Message": "update completed"
        }
    }
```

Swarm Service

docker service ps nodejs

```
docker@swarm-mng:~$ docker service ps nodejs
ID                  NAME                IMAGE                          NODE                DESIRED STATE       CURRENT STATE           ERROR
       PORTS
bgelggjkcfbt        nodejs.1            labdocker/alpineweb:latest     swarm-mng           Running             Running 2 minutes ago

9lrwdm68zgq4         \_ nodejs.1        labdocker/alpineweb:latest     swarm-mng           Shutdown            Shutdown 2 minutes ago
```

docker rm nodejs

```
docker@swarm-mng:~$ docker service rm nodejs
nodejs
docker@swarm-mng:~$ docker service ls
ID                  NAME                MODE                REPLICAS            IMAGE               PORTS
```

Swarm Service

```
docker@swarm-mng:~$ docker service update --help

Usage:  docker service update [OPTIONS] SERVICE

Update a service

Options:
      --args command                     Service command args
      --config-add config                Add or update a config file on a service
      --config-rm list                   Remove a configuration file
      --constraint-add list              Add or update a placement constraint
      --constraint-rm list               Remove a constraint
      --container-label-add list         Add or update a container label
      --container-label-rm list          Remove a container label by its key
      --credential-spec credential-spec  Credential spec for managed service account (Windows only)
  -d, --detach                           Exit immediately instead of waiting for the service to converge (default true)
      --dns-add list                     Add or update a custom DNS server
      --dns-option-add list              Add or update a DNS option
      --dns-option-rm list               Remove a DNS option
      --dns-rm list                      Remove a custom DNS server
      --dns-search-add list              Add or update a custom DNS search domain
      --dns-search-rm list               Remove a DNS search domain
      --endpoint-mode string             Endpoint mode (vip or dnsrr)
      --entrypoint command               Overwrite the default ENTRYPOINT of the image
      --env-add list                     Add or update an environment variable
      --env-rm list                      Remove an environment variable
      --force                            Force update even if no changes require it
      --group-add list                   Add an additional supplementary user group to the container
      --group-rm list                    Remove a previously added supplementary user group from the container
      --health-cmd string                Command to run to check health
```

- Reference: https://docs.docker.com/engine/reference/commandline/service_update/

Swarm Service

```
      --health-interval duration          Time between running the check (ms|s|m|h)
      --health-retries int                Consecutive failures needed to report unhealthy
      --health-start-period duration      Start period for the container to initialize before counting retries towards unstable (ms|s|m|h)
      --health-timeout duration           Maximum time to allow one check to run (ms|s|m|h)
      --help                              Print usage
      --host-add list                     Add or update a custom host-to-IP mapping (host:ip)
      --host-rm list                      Remove a custom host-to-IP mapping (host:ip)
      --hostname string                   Container hostname
      --image string                      Service image tag
      --label-add list                    Add or update a service label
      --label-rm list                     Remove a label by its key
      --limit-cpu decimal                 Limit CPUs
      --limit-memory bytes                Limit Memory
      --log-driver string                 Logging driver for service
      --log-opt list                      Logging driver options
      --mount-add mount                   Add or update a mount on a service
      --mount-rm list                     Remove a mount by its target path
      --network-add network               Add a network
      --network-rm list                   Remove a network
      --no-healthcheck                    Disable any container-specified HEALTHCHECK
      --no-resolve-image                  Do not query the registry to resolve image digest and supported platforms
      --placement-pref-add pref           Add a placement preference
      --placement-pref-rm pref            Remove a placement preference
      --publish-add port                  Add or update a published port
      --publish-rm port                   Remove a published port by its target port
  -q, --quiet                             Suppress progress output
      --read-only                         Mount the container's root filesystem as read only
      --replicas uint                     Number of tasks
      --reserve-cpu decimal               Reserve CPUs
      --reserve-memory bytes              Reserve Memory
```

- Reference: https://docs.docker.com/engine/reference/commandline/service_update/

Swarm Service

```
      --read-only                        Mount the container's root filesystem as read only
      --replicas uint                    Number of tasks
      --reserve-cpu decimal              Reserve CPUs
      --reserve-memory bytes             Reserve Memory
      --restart-condition string         Restart when condition is met ("none"|"on-failure"|"any")
      --restart-delay duration           Delay between restart attempts (ns|us|ms|s|m|h)
      --restart-max-attempts uint        Maximum number of restarts before giving up
      --restart-window duration          Window used to evaluate the restart policy (ns|us|ms|s|m|h)
      --rollback                         Rollback to previous specification
      --rollback-delay duration          Delay between task rollbacks (ns|us|ms|s|m|h)
      --rollback-failure-action string   Action on rollback failure ("pause"|"continue")
      --rollback-max-failure-ratio float Failure rate to tolerate during a rollback
      --rollback-monitor duration        Duration after each task rollback to monitor for failure (ns|us|ms|s|m|h)
      --rollback-order string            Rollback order ("start-first"|"stop-first")
      --rollback-parallelism uint        Maximum number of tasks rolled back simultaneously (0 to roll back all at once)
      --secret-add secret                Add or update a secret on a service
      --secret-rm list                   Remove a secret
      --stop-grace-period duration       Time to wait before force killing a container (ns|us|ms|s|m|h)
      --stop-signal string               Signal to stop the container
  -t, --tty                              Allocate a pseudo-TTY
      --update-delay duration            Delay between updates (ns|us|ms|s|m|h)
      --update-failure-action string     Action on update failure ("pause"|"continue"|"rollback")
      --update-max-failure-ratio float   Failure rate to tolerate during an update
      --update-monitor duration          Duration after each task update to monitor for failure (ns|us|ms|s|m|h)
      --update-order string              Update order ("start-first"|"stop-first")
      --update-parallelism uint          Maximum number of tasks updated simultaneously (0 to update all at once)
  -u, --user string                      Username or UID (format: <name|uid>[:<group|gid>])
      --with-registry-auth               Send registry authentication details to swarm agents
  -w, --workdir string                   Working directory inside the container
docker@swarm-mng:~$
```

- Reference: https://docs.docker.com/engine/reference/commandline/service_update/

Workshop 2-4-1: Swarm Service

- สร้าง service nodejs เพื่อเริ่มทำงานบน swarm

```
docker service create -dt --name nodejs \
labdocker/alpineweb:latest node hello.js
```

- ตรวจสอบสถานะของ service หลังจากการสร้าง

```
docker service ls
docker service ps nodejs
```

```
docker@swarm-mng:~$ docker service create --name nodejs -dt \
>    labdocker/alpineweb:latest node hello.js
n96f925q4yq9vi94zdpmjff34
docker@swarm-mng:~$ docker service ls
ID                  NAME                MODE                REPLICAS            IMAGE                          PORTS
n96f925q4yq9        nodejs              replicated          1/1                 labdocker/alpineweb:latest
```

Orchestrator Assignment

- Swarm สามารถควบคุมการจ่ายงานให้จาก manager ไปยัง workerได้หลากหลายเทคนิค เพื่อตอบสนองความต้องการของผู้ใช้งาน
- Docker stack deploy (Compose version 3.3)
  - Replicated (Specific number of container by manual)
  - Global (1 container per node in swarm)
- Assign by default node constrain (--constrain)
  - node.id
  - node.hostname
  - node.role
  - node.labels (user define label)
  - engine.labels
- Assign by service placement preference (--placement-pref)
  - Spread on node.label (user define label)

Orchestrator Assignment

- node constrain
  - Running with constrain with node
  - node.id

```
docker@swarm-mng:~$ docker service inspect nodejs|grep update
docker@swarm-mng:~$ docker node ls
ID                            HOSTNAME            STATUS              AVAILABILITY        MANAGER STATUS
6bei4mbj5pd7yduyhp375b7z4 *   swarm-mng           Ready               Active              Leader
u2eju1jxy5k8qd30ucrhuhjfs     swarm-node1         Ready               Active
ywy7pfddcumccm2uojesnjy9v     swarm-node2         Ready               Active
docker@swarm-mng:~$ docker service create -dt --constraint 'node.id==6bei4mbj5pd7yduyhp375b7z4' --na
me nodejs --replicas=5 labdocker/alpineweb:latest node hello.js
w87s7jaz5i8l944yq1t8v2eo6
docker@swarm-mng:~$ docker service ps nodejs
ID                  NAME                IMAGE                          NODE                DESIRED STATE       CURRENT STATE           ERR
OR                  PORTS
u8p7dnw2wta8        nodejs.1            labdocker/alpineweb:latest     swarm-mng           Running             Running 6 seconds ago
w3bm3p92kmdq        nodejs.2            labdocker/alpineweb:latest     swarm-mng           Running             Running 6 seconds ago
7pkkpmt4ew2l        nodejs.3            labdocker/alpineweb:latest     swarm-mng           Running             Running 6 seconds ago
2m8dmrzxotwr        nodejs.4            labdocker/alpineweb:latest     swarm-mng           Running             Running 6 seconds ago
vwbxkhpftup7        nodejs.5            labdocker/alpineweb:latest     swarm-mng           Running             Running 6 seconds ago
docker@swarm-mng:~$
```

Orchestrator Assignment

- Remove constrain/Add constrain
  - node.hostname

```
docker@swarm-mng:~$ docker service update -dt --constraint-rm 'node.id==6bei4mbj5pd7yduyhp375b7z4' --constraint-add 'node.hostname!=swar
m-mng' nodejs
nodejs
docker@swarm-mng:~$ docker service inspect nodejs|grep update
            "Message": "update in progress"
docker@swarm-mng:~$ docker service inspect nodejs|grep update
            "Message": "update completed"
docker@swarm-mng:~$ docker service ps nodejs
ID                  NAME                IMAGE                     NODE                DESIRED STATE       CURRENT STATE
   ERROR               PORTS
pahz73v2ma9l        nodejs.1            labdocker/alpineweb:latest   swarm-node1         Running             Running about a minute ago

u8p7dnw2wta8         \_ nodejs.1        labdocker/alpineweb:latest   swarm-mng           Shutdown            Shutdown about a minute ago

oj1koyxqgl55        nodejs.2            labdocker/alpineweb:latest   swarm-node1         Running             Running about a minute ago

w3bm3p92kmdq         \_ nodejs.2        labdocker/alpineweb:latest   swarm-mng           Shutdown            Shutdown about a minute ago

1k57ahejx8pv        nodejs.3            labdocker/alpineweb:latest   swarm-node2         Running             Running about a minute ago

7pkkpmt4ew2l         \_ nodejs.3        labdocker/alpineweb:latest   swarm-mng           Shutdown            Shutdown about a minute ago

l11o7jo0xdy6        nodejs.4            labdocker/alpineweb:latest   swarm-node1         Running             Running about a minute ago

2m8dmrzxotwr         \_ nodejs.4        labdocker/alpineweb:latest   swarm-mng           Shutdown            Shutdown about a minute ago

dg4x1dac3jyb        nodejs.5            labdocker/alpineweb:latest   swarm-node2         Running             Running about a minute ago

vwbxkhpftup7         \_ nodejs.5        labdocker/alpineweb:latest   swarm-mng           Shutdown            Shutdown about a minute ago

docker@swarm-mng:~$
```

Workshop 2-4: node constrain

- สร้าง service nodejs เพื่อเริ่มทำงานบน swarm

```
docker service create -dt --constraint
'node.id==6bei4mbj5pd7yduyhp375b7z4' --name nodejs --
replicas=5 labdocker/alpineweb:latest node hello.js
```

```
docker@swarm-mng:~$ docker service inspect nodejs|grep update
docker@swarm-mng:~$ docker node ls
ID                            HOSTNAME            STATUS              AVAILABILITY        MANAGER STATUS
6bei4mbj5pd7yduyhp375b7z4 *   swarm-mng           Ready               Active              Leader
u2eju1jxy5k8qd30ucrhuhjfs     swarm-node1         Ready               Active
ywy7pfddcumccm2uojesnjy9v     swarm-node2         Ready               Active
docker@swarm-mng:~$ docker service create -dt --constraint 'node.id==6bei4mbj5pd7yduyhp375b7z4' --na
me nodejs --replicas=5 labdocker/alpineweb:latest node hello.js
w87s7jaz5i8l944yq1t8v2eo6
docker@swarm-mng:~$ docker service ps nodejs
ID                  NAME                IMAGE                          NODE                DESIRED STATE       CURRENT STATE           ERR
OR                  PORTS
u8p7dnw2wta8        nodejs.1            labdocker/alpineweb:latest     swarm-mng           Running             Running 6 seconds ago
w3bm3p92kmdq        nodejs.2            labdocker/alpineweb:latest     swarm-mng           Running             Running 6 seconds ago
7pkkpmt4ew2l        nodejs.3            labdocker/alpineweb:latest     swarm-mng           Running             Running 6 seconds ago
2m8dmrzxotwr        nodejs.4            labdocker/alpineweb:latest     swarm-mng           Running             Running 6 seconds ago
vwbxkhpftup7        nodejs.5            labdocker/alpineweb:latest     swarm-mng           Running             Running 6 seconds ago
docker@swarm-mng:~$
```

Orchestrator Assignment

- node constrain (custom label)

```
docker node update --label-add 'storage=sas' swarm-mng
docker node update --label-add 'storage=nvdimm' swarm-node1
docker node update --label-add 'storage=sata' swarm-node2
```

```
docker node inspect swarm-mng|grep storage
docker node inspect swarm-node1|grep storage
docker node inspect swarm-node2|grep storage
```

```
docker@swarm-mng:~$ docker service rm nodejs
nodejs
docker@swarm-mng:~$ docker node update --label-add 'storage=sas' swarm-mng
swarm-mng
docker@swarm-mng:~$ docker node update --label-add 'storage=nvdimm' swarm-node1
swarm-node1
docker@swarm-mng:~$ docker node update --label-add 'storage=sata' swarm-node2
swarm-node2
docker@swarm-mng:~$ docker node inspect swarm-mng|grep storage
                "storage": "sas"
docker@swarm-mng:~$
docker@swarm-mng:~$ docker node inspect swarm-node1|grep storage
                "storage": "nvdimm"
docker@swarm-mng:~$ docker node inspect swarm-node2|grep storage
                "storage": "sata"
docker@swarm-mng:~$
```

Orchestrator Assignment

- custom label

```
docker service create --name xxx --add-label 'xxx=xxx'
```

```
docker service create -dt  --constraint 'node.labels.storage==sas' --name nodejs --replicas=5 labdocker/alpineweb:latest node hello.js
```

```
docker@swarm-mng:~$ docker service create -dt  --constraint 'node.labels.storage==sas' --name nodejs --replicas=5 labdocker/alpineweb:la
test node hello.js
qhfydixi6h5f0ral5jr4c7trc
docker@swarm-mng:~$ docker service ps nodejs
ID                  NAME                IMAGE                     NODE                DESIRED STATE       CURRENT STATE           ERR
OR                PORTS
w6bbu30v6m2x        nodejs.1            labdocker/alpineweb:latest   swarm-mng           Running             Running 3 seconds ago

9xpnnj3zqxig        nodejs.2            labdocker/alpineweb:latest   swarm-mng           Running             Running 2 seconds ago

nwuzbcuj912r        nodejs.3            labdocker/alpineweb:latest   swarm-mng           Running             Running 2 seconds ago

m9dwd8bhbjve        nodejs.4            labdocker/alpineweb:latest   swarm-mng           Running             Running 2 seconds ago

rvkv00o4n5yq        nodejs.5            labdocker/alpineweb:latest   swarm-mng           Running             Running 2 seconds ago

docker@swarm-mng:~$
```

Workshop 2-4: custom label

- สร้าง docker service โดยระบุ constrain จาก custom label ที่สร้างขึ้น

```
docker service create -dt  --constraint
'node.labels.storage==sas' --name nodejs --replicas=5
labdocker/alpineweb:latest node hello.js
```

```
docker@swarm-mng:~$ docker service create -dt  --constraint 'node.labels.storage==sas' --name nodejs --replicas=5 labdocker/alpineweb:la
test node hello.js
qhfydixi6h5f0ral5jr4c7trc
docker@swarm-mng:~$ docker service ps nodejs
ID                  NAME                IMAGE                     NODE                DESIRED STATE       CURRENT STATE           ERR
OR                PORTS
w6bbu30v6m2x        nodejs.1            labdocker/alpineweb:latest   swarm-mng           Running             Running 3 seconds ago

9xpnnj3zqxig        nodejs.2            labdocker/alpineweb:latest   swarm-mng           Running             Running 2 seconds ago

nwuzbcuj912r        nodejs.3            labdocker/alpineweb:latest   swarm-mng           Running             Running 2 seconds ago

m9dwd8bhbjve        nodejs.4            labdocker/alpineweb:latest   swarm-mng           Running             Running 2 seconds ago

rvkv00o4n5yq        nodejs.5            labdocker/alpineweb:latest   swarm-mng           Running             Running 2 seconds ago

docker@swarm-mng:~$
```

Orchestrator Assignment

- service placement preference (--placement-pref)

```
docker node update --label-add 'physical=DELLPE820' swarm-mng
docker node update --label-add 'physical=DELLPE820' swarm-node1
docker node update --label-add 'physical=HP' swarm-node2
```

```
docker node inspect swarm-mng|grep physical
docker node inspect swarm-node1|grep physical
docker node inspect swarm-node2|grep physical
```

```
docker@swarm-mng:~$ docker node update --label-add 'physical=DELLPE820' swarm-mng
swarm-mng
docker@swarm-mng:~$
docker@swarm-mng:~$ docker node update --label-add 'physical=DELLPE820' swarm-node1
swarm-node1
docker@swarm-mng:~$
docker@swarm-mng:~$ docker node update --label-add 'physical=HP' swarm-node2
swarm-node2
docker@swarm-mng:~$ docker node inspect swarm-mng|grep physical
                "physical": "DELLPE820",
docker@swarm-mng:~$
docker@swarm-mng:~$ docker node inspect swarm-node1|grep physical
                "physical": "DELLPE820",
docker@swarm-mng:~$
docker@swarm-mng:~$ docker node inspect swarm-node2|grep physical
                "physical": "HP",
docker@swarm-mng:~$
```

Orchestrator Assignment

- service placement preference

```
docker service create -dt  --placement-pref 'spread=node.labels.physical' \
--name nodejs --replicas=10 labdocker/alpineweb:latest node hello.js
```

```
docker@swarm-mng:~$ docker service create -dt  --placement-pref 'spread=node.labels.physical' \
> --name nodejs --replicas=10 labdocker/alpineweb:latest node hello.js
s74pj8exuh8skxtuxeebllvel
docker@swarm-mng:~$ docker service ps nodejs
ID                  NAME                IMAGE                     NODE                DESIRED STATE       CURRENT STATE           ERRO
R                PORTS
p84dv19t4kaq        nodejs.1            labdocker/alpineweb:latest   swarm-node2         Running             Running 1 second ago

pw15nk81ujcf        nodejs.2            labdocker/alpineweb:latest   swarm-mng           Running             Running 1 second ago

tjz75m4as403        nodejs.3            labdocker/alpineweb:latest   swarm-node2         Running             Running 1 second ago

wdrh5phg4xwp        nodejs.4            labdocker/alpineweb:latest   swarm-mng           Running             Running 1 second ago

mfri64z507tm        nodejs.5            labdocker/alpineweb:latest   swarm-node2         Running             Running 1 second ago

totevs2q6dus        nodejs.6            labdocker/alpineweb:latest   swarm-node2         Running             Running 1 second ago

valrbfn79ofi        nodejs.7            labdocker/alpineweb:latest   swarm-mng           Running             Running 1 second ago

m6rxlxh3amq2        nodejs.8            labdocker/alpineweb:latest   swarm-node1         Running             Running 1 second ago

nn1st3cou81j        nodejs.9            labdocker/alpineweb:latest   swarm-node2         Running             Running 1 second ago

mdxigzfaygc0        nodejs.10           labdocker/alpineweb:latest   swarm-node1         Running             Running 1 second ago

docker@swarm-mng:~$
```

Workshop 2-4: Orchestrator

- สร้าง docker service โดยระบุใน swarm กระจายภายใต้ label

```
docker service create -dt  --placement-pref
'spread=node.labels.physical' \
--name nodejs --replicas=10 labdocker/alpineweb:latest node hello.js
```

```
docker@swarm-mng:~$ docker service create -dt  --placement-pref 'spread=node.labels.physical' \
> --name nodejs --replicas=10 labdocker/alpineweb:latest node hello.js
s74pj8exuh8skxtuxeebllvel
docker@swarm-mng:~$ docker service ps nodejs
ID                  NAME                IMAGE                     NODE                DESIRED STATE       CURRENT STATE           ERRO
R                PORTS
p84dv19t4kaq        nodejs.1            labdocker/alpineweb:latest   swarm-node2         Running             Running 1 second ago

pw15nk81ujcf        nodejs.2            labdocker/alpineweb:latest   swarm-mng           Running             Running 1 second ago

tjz75m4as403        nodejs.3            labdocker/alpineweb:latest   swarm-node2         Running             Running 1 second ago

wdrh5phg4xwp        nodejs.4            labdocker/alpineweb:latest   swarm-mng           Running             Running 1 second ago

mfri64z507tm        nodejs.5            labdocker/alpineweb:latest   swarm-node2         Running             Running 1 second ago

totevs2q6dus        nodejs.6            labdocker/alpineweb:latest   swarm-node2         Running             Running 1 second ago

valrbfn79ofi        nodejs.7            labdocker/alpineweb:latest   swarm-mng           Running             Running 1 second ago

m6rxlxh3amq2        nodejs.8            labdocker/alpineweb:latest   swarm-node1         Running             Running 1 second ago

nn1st3cou81j        nodejs.9            labdocker/alpineweb:latest   swarm-node2         Running             Running 1 second ago

mdxigzfaygc0        nodejs.10           labdocker/alpineweb:latest   swarm-node1         Running             Running 1 second ago

docker@swarm-mng:~$
```

Config and Secret

- Make secret data and configuration great again !
- การทำงานของ microservice ที่รวมกันเป็น application stack จะมีส่วนของข้อมูลคอนฟิกต่างๆที่จำเป็นต้องใช้งานในระบบ เช่น
  - Root password of database
  - Environment variable
  - Custom variable
  - Path of mount volume data
  - Etc
- docker config จะใช้เพื่อจัดเก็บข้อมูลคอนฟิกต่างๆของ container
- docker secret ใช้จัดเก็บข้อมูลที่เป็นความลับโดยการเข้ารหัสข้อมูล

Config and Secret

- config can add/update with service anytime
  - Linux container: /<config name>
  - Windows container: c:\<config name>

```
echo "config value" | docker config create <config name> -
```

```
docker config create <config name> <config file>
```

```
docker config rm <config name>
```

- Apply config to service

```
docker service <create/update> \
--config source=<config name>,target=<path to map config>
```

```
docker service <create/update> \
--config-rm <config name>
```

Config and Secret

- secret is all same as configure except that secret is encrypt all data (encode base64)
  - Linux container: /run/secrets/<secret name>
  - Windows container: c:\ProgramData\Docker\Secret

```
echo "config value" | docker secret create <secret name> -
```

```
docker secret create <secret name> <secret file>
```

```
docker secret rm <secret name>
```

- Apply config to service

```
docker service <create/update> --secret <secret name>
```

```
docker service <create/update> \
 --secret source=<secret name>,target=<target path>
```

Workshop 2-4: Config and Secret

- สร้าง nginx service เพื่อรองรับการให้บริการ https (TLS 1.2) ผ่าน config and secret

```
docker config create nginx.conf /Share_DockerToolbox/nginx.conf
```

```
docker secret create labdocker.com.crt \
/Share_DockerToolbox/labdocker.com.crt

docker secret create labdocker.com.key \
/Share_DockerToolbox/labdocker.com.key
```

```
docker@swarm-mng:~$ docker config create nginx.conf /Share_DockerToolbox/nginx.conf
xw9bzcm6agbv67x01jkkch1oc
docker@swarm-mng:~$ docker config ls
ID                          NAME                CREATED             UPDATED
xw9bzcm6agbv67x01jkkch1oc   nginx.conf          4 seconds ago       4 seconds ago
docker@swarm-mng:~$ docker secret create labdocker.com.crt /Share_DockerToolbox/labdocker.com.crt
esxxlhdvd6jbtnjkey17xrmwa
docker@swarm-mng:~$ docker secret create labdocker.com.key /Share_DockerToolbox/labdocker.com.key
ony89eke7ifm203kta21jcn7z
docker@swarm-mng:~$ docker secret ls
ID                          NAME                CREATED             UPDATED
esxxlhdvd6jbtnjkey17xrmwa   labdocker.com.crt   6 seconds ago       6 seconds ago
ony89eke7ifm203kta21jcn7z   labdocker.com.key   5 seconds ago       5 seconds ago
```

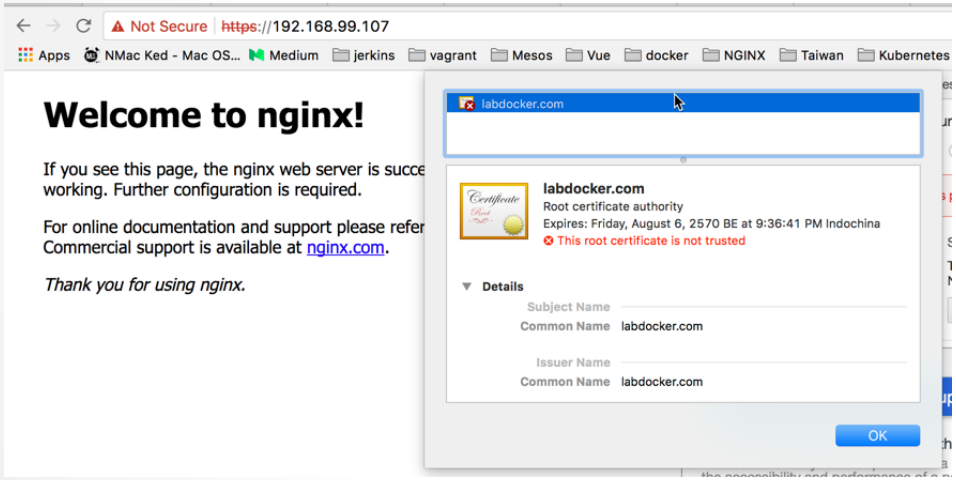
Workshop 2-4: Config and Secret

- nginx.conf

```
server {
listen 443 ssl;
server_name localhost;
ssl_certificate            /run/secrets/labdocker.com.crt;
ssl_certificate_key        /run/secrets/labdocker.com.key;
location / {
root /usr/share/nginx/html;
index index.html index.htm;
}
```

Workshop 2-4: Config and Secret

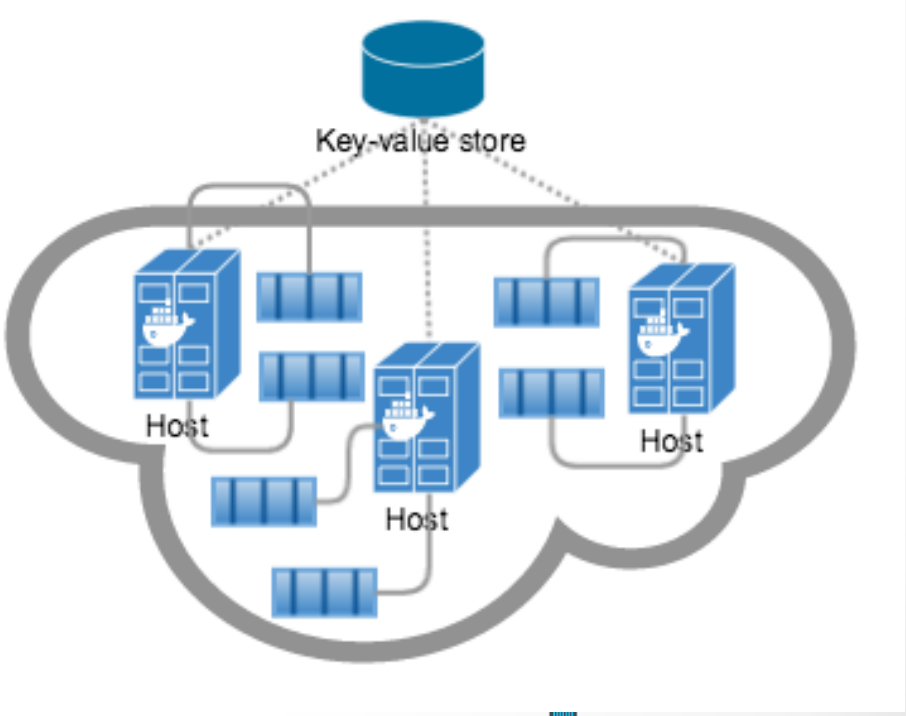
```
docker service -dt create \
--name nginx \
--secret labdocker.com.key \
--secret labdocker.com.crt \
--config source=nginx.conf,target=/etc/nginx/nginx.conf \
-p 443:443 labdocker/nginx:latest
```



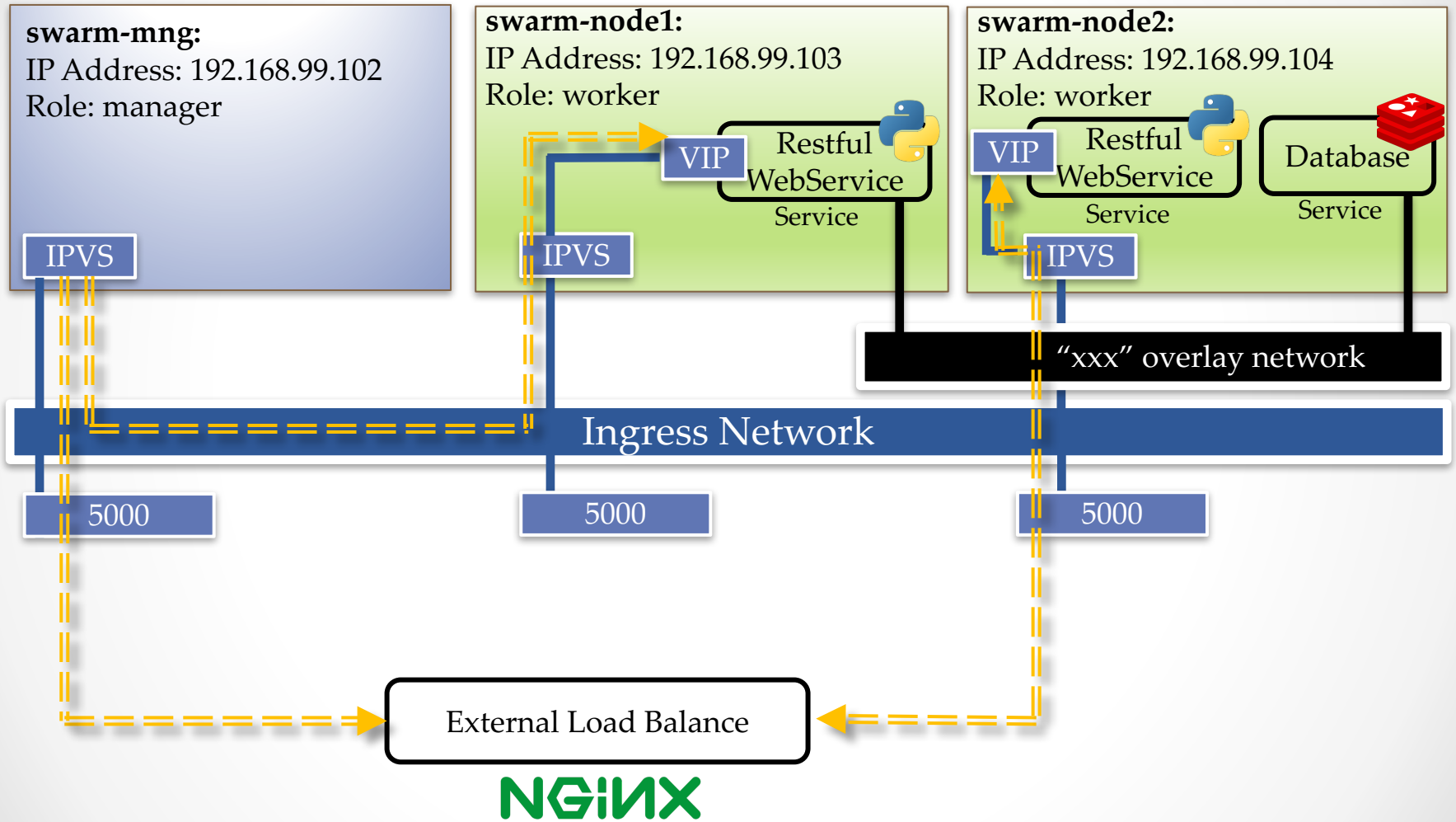

```
praparns-MacBook-Pro% curl https://192.168.99.107 -k
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
    body {
        width: 35em;
        margin: 0 auto;
        font-family: Tahoma, Verdana, Arial, sans-serif;
    }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If 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>
praparns-MacBook-Pro%
```

Overlay and Ingress Network

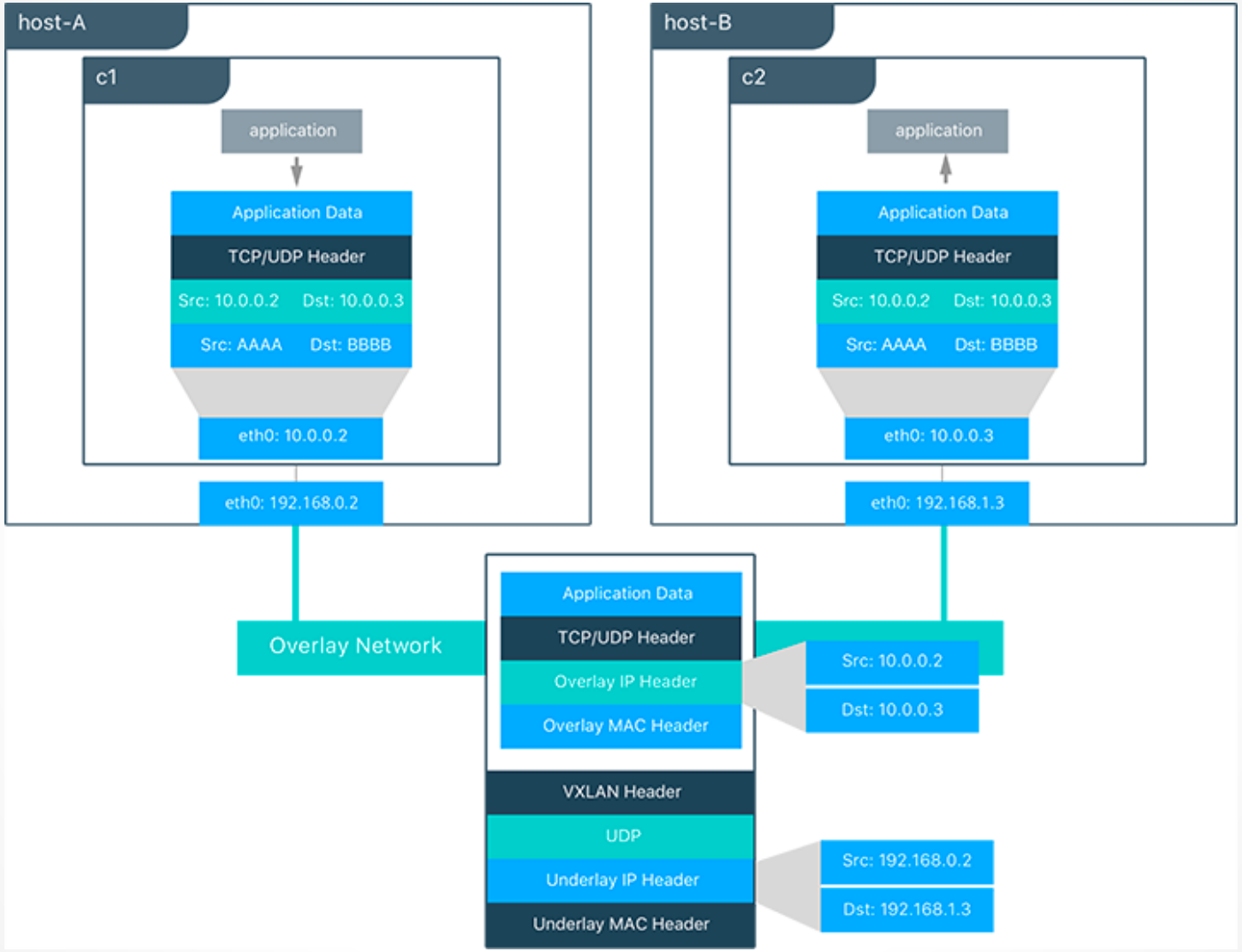
- เพื่อให้ทุกๆ node ภายใต้ swarm cluster สามารถมองเห็นกันได้ docker ได้เตรียมระบบ network แบบ overlay
- การทำงานของ overlay จะอาศัยกลไกของ key value store เป็นหลักในการตรวจสอบ (Discovery / Network status / IP Address etc)
- Default swarm จะสร้าง overlay network ชื่อ “ingress” เพื่อรองรับการใช้งาน service



Overlay and Ingress Network



Overlay and Ingress Network



Workshop 2-4: Overlay and Ingress

- สร้าง overlay network บน swarm manager

```
docker network create --driver overlay --subnet=192.168.100.0/24 swarmnet
```

```
docker@swarm-mng:~$ docker network create --driver overlay --subnet=192.168.100.0/24 swarmnet
43mgygbg4wd15zw8ebxls8qs2
docker@swarm-mng:~$ docker network ls
NETWORK ID          NAME                DRIVER              SCOPE
1e00be7da218        bridge              bridge              local
22a6b95d749b        docker_gwbridge     bridge              local
951ca42f37e7        host                host                local
gqga8p8t4tf3        ingress             overlay             swarm
4c38e2fa3110        none                null                local
43mgygbg4wd1        swarmnet            overlay             swarm
docker@swarm-mng:~$
```

Workshop 2-4: Overlay and Ingress

- สร้าง new service เพื่อใช้งาน swarm network

```
docker service -dt create --name nodejs --replicas=2 --
network-add swarmnet -p 3000:3000
labdocker/alpineweb:latest node hello.js
```

```
docker@swarm-mng:~$ docker service create -dt --name nodejs \
> --replicas=2 --network swarmnet -p 3000:3000 \
> labdocker/alpineweb:latest node hello.js
m6t4ea8vlnzufy97cg3tr6grt
docker@swarm-mng:~$ docker service ps nodejs
ID                  NAME                IMAGE                       NODE                DESIRED STATE       CURRENT STATE           ERROR               PORTS
ejng79ettt6f        nodejs.1            labdocker/alpineweb:latest  swarm-mng           Running             Running 3 seconds ago
7xmhszizxqhn        nodejs.2            labdocker/alpineweb:latest  swarm-node2         Running             Running 5 seconds ago
docker@swarm-mng:~$
```

```
docker@swarm-mng:~$ docker ps
CONTAINER ID        IMAGE                       COMMAND             CREATED             STATUS              PORTS               NAMES
47f421456edb        labdocker/alpineweb:latest  "node hello.js"     2 minutes ago       Up 2 minutes        3000/tcp            nodejs.1.ejng79ettt6fzf3n0o5vp2
519
docker@swarm-mng:~$ docker inspect 47f421456edb|grep IPAddress
            "SecondaryIPAddresses": null,
            "IPAddress": "",
                    "IPAddress": "10.255.0.6",
                    "IPAddress": "192.168.100.3",
docker@swarm-mng:~$
```

```
docker@swarm-node2:~$ docker ps
CONTAINER ID        IMAGE                       COMMAND             CREATED             STATUS              PORTS               NAMES
bf10e17d890b        labdocker/alpineweb:latest  "node hello.js"     3 minutes ago       Up 3 minutes        3000/tcp            nodejs.2.7xmhszizxqhn7d8xjsfjt4
111
docker@swarm-node2:~$ docker inspect bf10e17d890b|grep IPAddress
            "SecondaryIPAddresses": null,
            "IPAddress": "",
                    "IPAddress": "10.255.0.7",
                    "IPAddress": "192.168.100.4",
docker@swarm-node2:~$
```

Workshop 2-4: Overlay and Ingress

- ตรวจสอบ IP Address ของ servcice และทดสอบ Ping ข้าม node

```
docker service inspect nodejs|more
```

```
docker@swarm-mng:~$ docker service inspect nodejs|more
[
    {
        "ID": "m6t4ea8vlnzufy97cg3tr6grt",
        "Version": {
            "Index": 24
        },
        "CreatedAt": "2017-08-13T11:49:49.472002608Z",
        "UpdatedAt": "2017-08-13T11:49:49.472588284Z",
        "Spec": {
            "Name": "nodejs",
            "Labels": {},
            "TaskTemplate": {
            "Ports": [
                {
                    "Protocol": "tcp",
                    "TargetPort": 3000,
                    "PublishedPort": 3000,
                    "PublishMode": "ingress"
                }
            ],
            "VirtualIPs": [
                {
                    "NetworkID": "gqga8p8t4tf3gcxmb3dm04kx7",
                    "Addr": "10.255.0.5/16"
                },
                {
                    "NetworkID": "43mgygbg4wd15zw8ebxls8qs2",
                    "Addr": "192.168.100.2/24"
                }
            ]
        }
    }
]
```

Workshop 2-4: Overlay and Ingress

- ตรวจสอบ IP Address ของ servcice และทดสอบ Ping ข้าม node

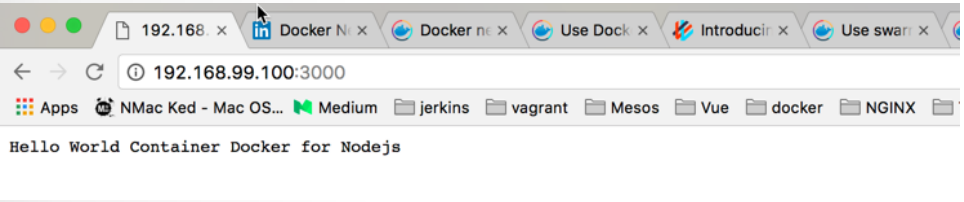
```
docker@swarm-mng:~$ docker ps
CONTAINER ID        IMAGE                       COMMAND             CREATED             STATUS              PORTS               NAMES
47f421456edb        labdocker/alpineweb:latest  "node hello.js"     11 minutes ago      Up 11 minutes       3000/tcp            nodejs.1.ejng79ettt6fzf3n0o5vp2
519
docker@swarm-mng:~$ docker exec -it nodejs.1.ejng79ettt6fzf3n0o5vp2519 ping 192.168.100.4
PING 192.168.100.4 (192.168.100.4): 56 data bytes
64 bytes from 192.168.100.4: seq=0 ttl=64 time=0.768 ms
^C
--- 192.168.100.4 ping statistics ---
1 packets transmitted, 1 packets received, 0% packet loss
round-trip min/avg/max = 0.768/0.768/0.768 ms
docker@swarm-mng:~$ docker exec -it nodejs.1.ejng79ettt6fzf3n0o5vp2519 ping 192.168.100.2
PING 192.168.100.2 (192.168.100.2): 56 data bytes
64 bytes from 192.168.100.2: seq=0 ttl=64 time=0.061 ms
^C
--- 192.168.100.2 ping statistics ---
1 packets transmitted, 1 packets received, 0% packet loss
round-trip min/avg/max = 0.061/0.061/0.061 ms
docker@swarm-mng:~$
```

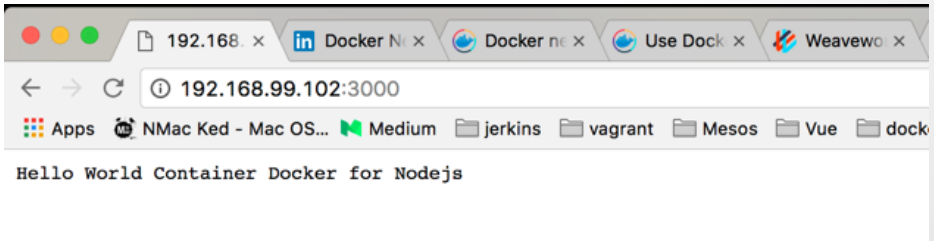
```
docker@swarm-node2:~$ docker ps
CONTAINER ID        IMAGE                       COMMAND             CREATED             STATUS              PORTS               NAMES
bf10e17d890b        labdocker/alpineweb:latest  "node hello.js"     12 minutes ago      Up 12 minutes       3000/tcp            nodejs.2.7xmhszizxqhn7d8xjsfjt4
1ll
docker@swarm-node2:~$ docker exec -it nodejs.2.7xmhszizxqhn7d8xjsfjt41ll ping 192.168.100.3
PING 192.168.100.3 (192.168.100.3): 56 data bytes
64 bytes from 192.168.100.3: seq=0 ttl=64 time=0.525 ms
64 bytes from 192.168.100.3: seq=1 ttl=64 time=0.576 ms
^C
--- 192.168.100.3 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 0.525/0.550/0.576 ms
docker@swarm-node2:~$ docker exec -it nodejs.2.7xmhszizxqhn7d8xjsfjt41ll ping 192.168.100.2
PING 192.168.100.2 (192.168.100.2): 56 data bytes
64 bytes from 192.168.100.2: seq=0 ttl=64 time=0.055 ms
64 bytes from 192.168.100.2: seq=1 ttl=64 time=0.090 ms
^C
--- 192.168.100.2 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 0.055/0.072/0.090 ms
docker@swarm-node2:~$
```

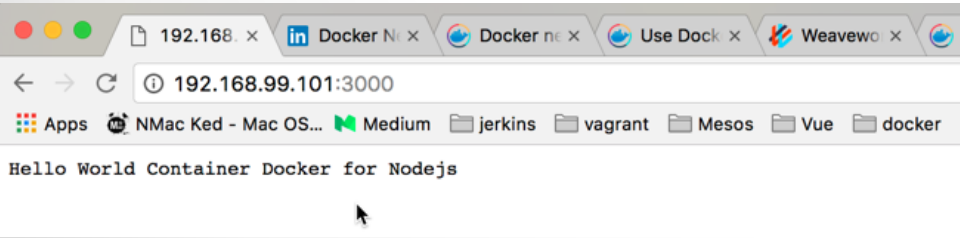
Workshop 2-4: Overlay and Ingress

- เรียกใช้บริการผ่าน http port ด้วย browser/curl

```
praparns-MacBook-Pro:~ praparn$ docker-machine ls
NAME          ACTIVE   DRIVER       STATE     URL                         SWARM   DOCKER        ERRORS
labdocker     -        virtualbox   Stopped                                       Unknown
swarm-mng     -        virtualbox   Running   tcp://192.168.99.100:2376           v17.06.0-ce
swarm-node1   -        virtualbox   Running   tcp://192.168.99.101:2376           v17.06.0-ce
swarm-node2   -        virtualbox   Running   tcp://192.168.99.102:2376           v17.06.0-ce
praparns-MacBook-Pro:~ praparn$ curl http://192.168.99.100:3000
Hello World Container Docker for Nodejs
praparns-MacBook-Pro:~ praparn$ curl http://192.168.99.101:3000
Hello World Container Docker for Nodejs
praparns-MacBook-Pro:~ praparn$ curl http://192.168.99.102:3000
Hello World Container Docker for Nodejs
praparns-MacBook-Pro:~ praparn$
```







HA Manager Role

- Add redundancy swarm manager in swarm cluster
  - ทำการ join node เข้าไปเป็น manager swarm cluster ด้วยคำสั่ง

```
docker swarm join --ca-hash <hash> <ip of swarm manager:port>
```

```
docker@labdocker:~$ docker swarm join \
> --token SWMTKN-1-398w160nl4ed4od3yiq168yvzbg2g7z32nmxvzxq47ubqh6sz6-bv4zdksviq68gqh4emh098xnl \
> 192.168.99.100:2377
This node joined a swarm as a manager.
docker@labdocker:~$ docker node ls
ID                            HOSTNAME            STATUS              AVAILABILITY        MANAGER STATUS
izywb24ghey4v6fpp7fv60l9h *   labdocker           Ready               Active              Reachable
u45isavg9pv02xq2894nqlojs     swarm-mng           Ready               Active              Leader
ujb06wblj9sw9e463fky4bnju     swarm-node1         Ready               Active
wdqwo14hlam1tp6cqauzwxumj     swarm-node2         Ready               Active
docker@labdocker:~$
```

  - ตรวจสอบค่า token เพื่อ join swarm

```
docker@labdocker:~$ docker swarm join-token -q manager
SWMTKN-1-398w160nl4ed4od3yiq168yvzbg2g7z32nmxvzxq47ubqh6sz6-bv4zdksviq68gqh4emh098xnl
docker@labdocker:~$ docker swarm join-token -q worker
SWMTKN-1-398w160nl4ed4od3yiq168yvzbg2g7z32nmxvzxq47ubqh6sz6-db21ae2ieqyl5gi25nc6izm6x
docker@labdocker:~$
```

HA Manager Role

- Add redundancy swarm manager in swarm cluster
  - ทำการ change role node จาก worker ➔ manager

```
docker node update --role manager <node id>
```

```
docker@labdocker:~$ docker node update --role manager swarm-node1
swarm-node1
```

```
docker@labdocker:~$ docker node ls
ID                            HOSTNAME        STATUS    AVAILABILITY    MANAGER STATUS
izywb24ghey4v6fpp7fv6019h *   labdocker       Ready     Active          Reachable
u45isavg9pv02xq2894nqlojs     swarm-mng       Ready     Active          Leader
ujb06wblj9sw9e463fky4bnju     swarm-node1     Ready     Active          Reachable
wdqwo14hlam1tp6cqauzwxumj     swarm-node2     Ready     Active
docker@labdocker:~$
```

HA Manager Role

- Add redundancy swarm manager in swarm cluster
  - Shutting down major manager

```
docker@swarm-mng:~$ docker node ls
ID                           HOSTNAME            STATUS              AVAILABILITY        MANAGER STATUS
izywb24ghey4v6fpp7fv60l9h    labdocker           Ready               Active              Reachable
u45isavg9pv02xq2894nqlojs *  swarm-mng           Ready               Active              Leader
ujb06wblj9sw9e463fky4bnju    swarm-node1         Ready               Active              Reachable
wdqwo14hlam1tp6cqauzwxumj    swarm-node2         Ready               Active
docker@swarm-mng:~$ sudo shutdown -h now
docker@swarm-mng:~$ Connection to 127.0.0.1 closed by remote host.
exit status 255
praparns-MacBook-Pro:~ praparn$
```

  - Other will take role for manager within 5 min.

```
docker@labdocker:~$ docker node ls
ID                           HOSTNAME            STATUS              AVAILABILITY        MANAGER STATUS
izywb24ghey4v6fpp7fv60l9h *  labdocker           Ready               Active              Reachable
u45isavg9pv02xq2894nqlojs    swarm-mng           Ready               Active              Leader
ujb06wblj9sw9e463fky4bnju    swarm-node1         Ready               Active              Reachable
wdqwo14hlam1tp6cqauzwxumj    swarm-node2         Ready               Active
docker@labdocker:~$ docker node ls
ID                           HOSTNAME            STATUS              AVAILABILITY        MANAGER STATUS
izywb24ghey4v6fpp7fv60l9h *  labdocker           Ready               Active              Reachable
u45isavg9pv02xq2894nqlojs    swarm-mng           Down                Active              Unreachable
ujb06wblj9sw9e463fky4bnju    swarm-node1         Ready               Active              Leader
wdqwo14hlam1tp6cqauzwxumj    swarm-node2         Ready               Active
docker@labdocker:~$
```

HA Manager Role

- Add redundancy swarm manager in swarm cluster
  - When old swarm-mng is back to online. It will back to “Reachable state”

```
praparns-MacBook-Pro:~ praparn$ docker-machine start swarm-mng
Starting "swarm-mng"...
(swarm-mng) Check network to re-create if needed...
(swarm-mng) Waiting for an IP...
Machine "swarm-mng" was started.
Waiting for SSH to be available...
Detecting the provisioner...
Started machines may have new IP addresses. You may need to re-run the `docker-machine env` command.
praparns-MacBook-Pro:~ praparn$ docker-machine ssh swarm-mng
                        ##         .
                  ## ## ##        ==
               ## ## ## ## ##    ===
           /"""""""""""""""""\___/ ===
      ~~~ {~~ ~~~~ ~~~ ~~~~ ~~~ ~ /  ===- ~~~
           \_____ o           __/
             \    \         __/
              \____\_______/
 _                 _   ____     _            _
| |__   ___   ___ | |_|___ \ __| | ___   ___| | _____ _ __
| '_ \ / _ \ / _ \| __| __) / _` |/ _ \ / __| |/ / _ \ '__|
| |_) | (_) | (_) | |_ / __/ (_| | (_) | (__|   <  __/ |
|_.__/ \___/ \___/ \__|_____\__,_|\___/ \___|_|\_\___|_|
Boot2Docker version 17.06.0-ce, build HEAD : 0672754 - Thu Jun 29 00:06:31 UTC 2017
Docker version 17.06.0-ce, build 02c1d87
docker@swarm-mng:~$ docker node ls
ID                            HOSTNAME            STATUS              AVAILABILITY        MANAGER STATUS
izywb24ghey4v6fpp7fv6019h     labdocker           Ready               Active              Reachable
u45isavg9pv02xq2894nqlojs *   swarm-mng           Ready               Active              Reachable
ujb06wblj9sw9e463fky4bnju     swarm-node1         Ready               Active              Leader
wdqwo14hlam1tp6cqauzwxumj     swarm-node2         Ready               Active
docker@swarm-mng:~$
```

HA Manager Role

- Remove
  - Update node to worker and set "Drain" to node

```
docker@swarm-mng:~$ docker node ls
ID                           HOSTNAME            STATUS              AVAILABILITY        MANAGER STATUS
izywb24ghey4v6fpp7fv60l9h    labdocker           Ready               Active              Reachable
u45isavg9pv02xq2894nqlojs *  swarm-mng           Ready               Active              Reachable
ujb06wblj9sw9e463fky4bnju    swarm-node1         Ready               Active              Leader
wdqwo14hlam1tp6cqauzwxumj    swarm-node2         Ready               Active
docker@swarm-mng:~$ docker node update --role worker labdocker
labdocker
docker@swarm-mng:~$ docker node update --availability drain labdocker
labdocker
docker@swarm-mng:~$ docker node ls
ID                           HOSTNAME            STATUS              AVAILABILITY        MANAGER STATUS
izywb24ghey4v6fpp7fv60l9h    labdocker           Ready               Drain
u45isavg9pv02xq2894nqlojs *  swarm-mng           Ready               Active              Reachable
ujb06wblj9sw9e463fky4bnju    swarm-node1         Ready               Active              Leader
wdqwo14hlam1tp6cqauzwxumj    swarm-node2         Ready               Active
docker@swarm-mng:~$
```

  - Leave swarm on node "labdocker"

```
docker@labdocker:~$ docker swarm leave
Node left the swarm.
docker@labdocker:~$
```

```
docker@swarm-mng:~$ docker node ls
ID                           HOSTNAME            STATUS              AVAILABILITY        MANAGER STATUS
izywb24ghey4v6fpp7fv60l9h    labdocker           Down                Drain
u45isavg9pv02xq2894nqlojs *  swarm-mng           Ready               Active              Reachable
ujb06wblj9sw9e463fky4bnju    swarm-node1         Ready               Active              Leader
wdqwo14hlam1tp6cqauzwxumj    swarm-node2         Ready               Active
docker@swarm-mng:~$ docker node rm labdocker
labdocker
docker@swarm-mng:~$ docker node ls
ID                           HOSTNAME            STATUS              AVAILABILITY        MANAGER STATUS
u45isavg9pv02xq2894nqlojs *  swarm-mng           Ready               Active              Reachable
ujb06wblj9sw9e463fky4bnju    swarm-node1         Ready               Active              Leader
wdqwo14hlam1tp6cqauzwxumj    swarm-node2         Ready               Active
docker@swarm-mng:~$
```

Workshop 2-4: HA Manager Role

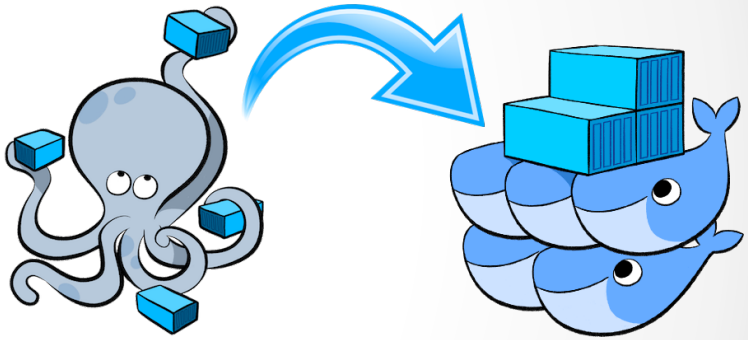
- ทำการ join new manager เข้าสู่ swarm cluster/update/drain

```
docker@labdocker:~$ docker node ls
ID                            HOSTNAME          STATUS    AVAILABILITY    MANAGER STATUS
izywb24ghey4v6fpp7fv6019h *   labdocker         Ready     Active          Reachable
u45isavg9pv02xq2894nqlojs     swarm-mng         Ready     Active          Leader
ujb06wblj9sw9e463fky4bnju     swarm-node1       Ready     Active          Reachable
wdqwo14hlam1tp6cqauzwxumj     swarm-node2       Ready     Active
docker@labdocker:~$
```

```
docker@swarm-mng:~$ docker node ls
ID                            HOSTNAME          STATUS    AVAILABILITY    MANAGER STATUS
izywb24ghey4v6fpp7fv6019h     labdocker         Ready     Active          Reachable
u45isavg9pv02xq2894nqlojs *   swarm-mng         Ready     Active          Reachable
ujb06wblj9sw9e463fky4bnju     swarm-node1       Ready     Active          Leader
wdqwo14hlam1tp6cqauzwxumj     swarm-node2       Ready     Active
docker@swarm-mng:~$ docker node update --role worker labdocker
labdocker
docker@swarm-mng:~$ docker node update --availability drain labdocker
labdocker
docker@swarm-mng:~$ docker node ls
ID                            HOSTNAME          STATUS    AVAILABILITY    MANAGER STATUS
izywb24ghey4v6fpp7fv6019h     labdocker         Ready     Drain
u45isavg9pv02xq2894nqlojs *   swarm-mng         Ready     Active          Reachable
ujb06wblj9sw9e463fky4bnju     swarm-node1       Ready     Active          Leader
wdqwo14hlam1tp6cqauzwxumj     swarm-node2       Ready     Active
docker@swarm-mng:~$
```

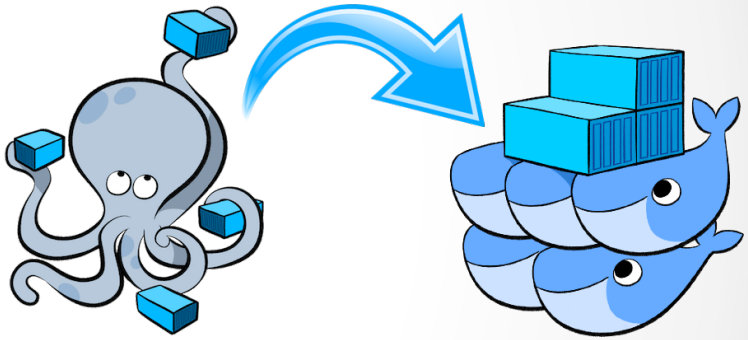
Docker Stack Deploy (Compose)

- Compose syntax: (docker stack deploy)
  - services:
    - XXX (service name): (Current Version 3.3)
      - image: <image name>
      - **deploy: <SWARM>**
        - mode
          - global
          - replicated
        - resource:
          - limits:
            - cpus: 'X.X'
            - memory: XXXM
          - reservations:
            - cpus: 'X.X'
            - memory: 2=XXM
        - restart_policy:
          - condition: on-failure/any
          - delay: XXs
          - max_attempts: X
          - windows: XXs
        - update_config:
          - parallelism: X
          - delay: XXs
          - failure_action: Xms
          - max_failure_ratio: X



Docker Stack Deploy (Compose)

- Not support for docker stack deploy
  - build
  - cgroup_parent
  - container_name
  - devices
  - dns
  - dns_search
  - tmpfs
  - external_links
  - links
  - network_mode
  - security_opt
  - stop_signal
  - sysctls
  - userns_mode



Docker Stack Deploy (Compose)

- Compose syntax: (docker stack deploy)

```
docker stack deploy –c <compose file> <stack name>
```

```
docker stack ls
```

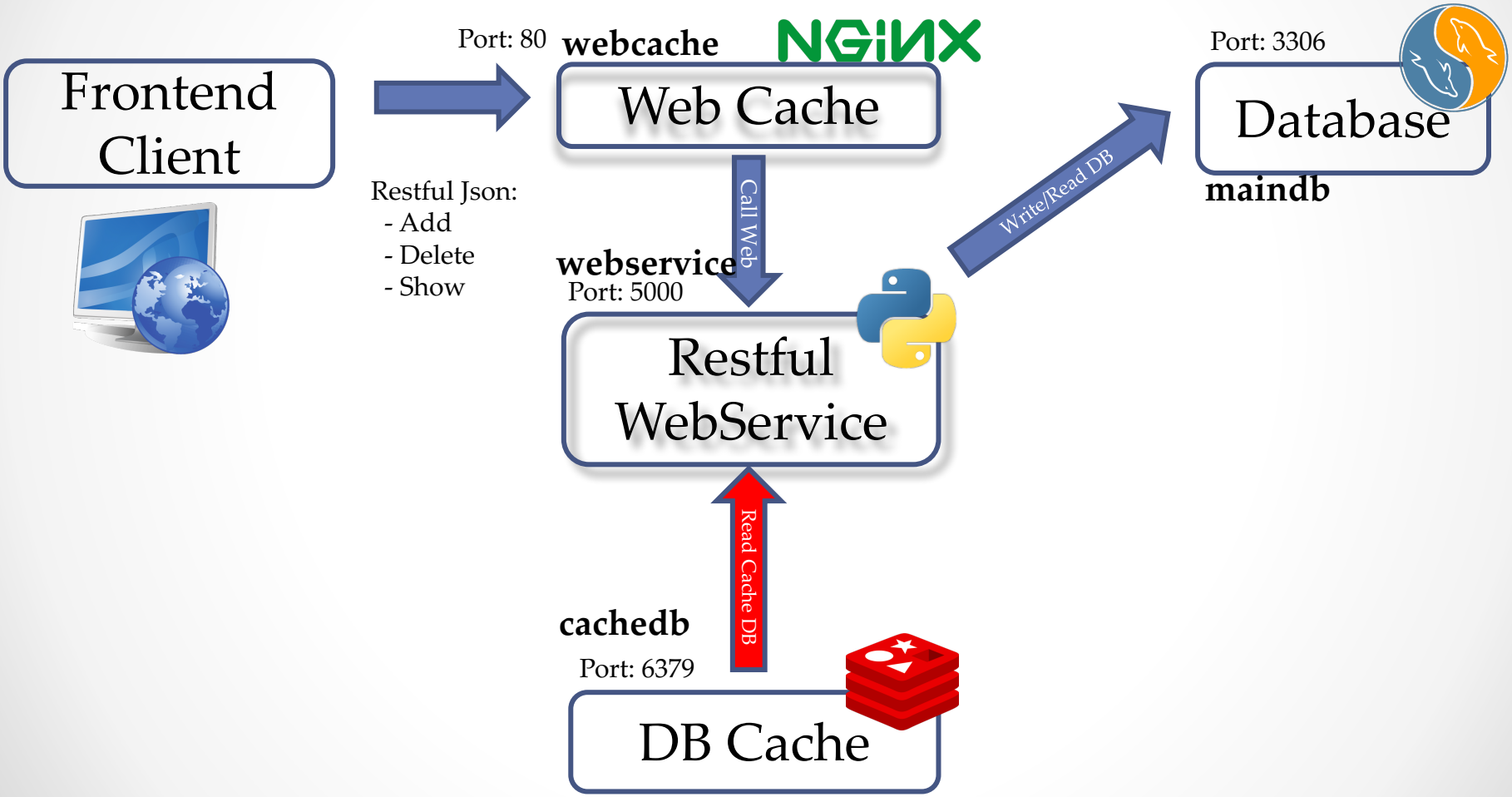
```
docker stack ps <stack name>
```

```
docker stack services <stack name>
```

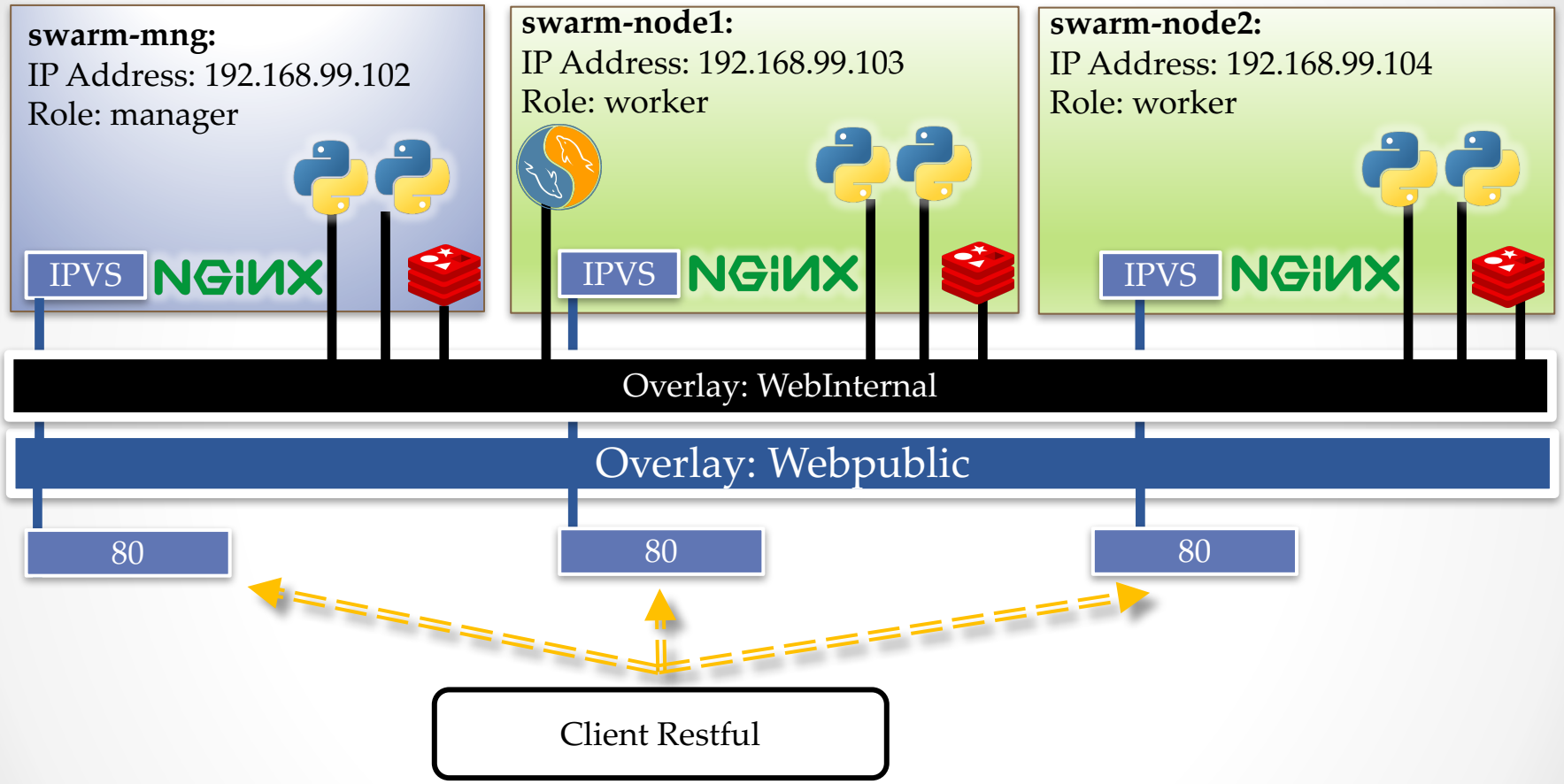
```
docker stack rm <stack name>
```

Workshop 2-4: Swarm Compose

- Optimize for WorkLoad



Workshop 2-4: Swarm Compose



Workshop 2-4: Swarm Compose

```yaml
version: '3.3'
services:
  webcache:
    image: labdocker/cluster:webcache
    container_name: nginx
    deploy:
      mode: global
      update_config:
        parallelism: 1
        delay: 10s
      restart_policy:
        condition: on-failure
        delay: 30s
        max_attempts: 5
        window: 60s
      endpoint_mode: vip
    depends_on:
      - webservice
      - cachedb
      - maindb
    networks:
      webpublic:
        aliases:
        - webcache
      webinternal:
        aliases:
        - webcache
    ports:
      - "80:80"

```

```yaml
  webservice:
    image: labdocker/cluster:webservice
    container_name: webservice
    deploy:
      mode: replicated
      replicas: 6
      update_config:
        parallelism: 2
        delay: 10s
      restart_policy:
        condition: on-failure
        delay: 30s
        max_attempts: 3
        window: 60s
      endpoint_mode: vip
    depends_on:
      - cachedb
      - maindb
    networks:
      webinternal:
        aliases:
        - webservice
    ports:
      - "5000:5000"
```

Workshop 2-4: Swarm Compose

```yaml
  maindb:
    image: labdocker/mysql:latest
    container_name: maindb
    deploy:
      mode: replicated
      replicas: 1
      endpoint_mode: vip
    environment:
      - MYSQL_ROOT_PASSWORD=password
    networks:
      webinternal:
        aliases:
        - maindb

  cachedb:
    image: labdocker/redis:latest
    container_name: cachedb
    deploy:
      mode: global
      endpoint_mode: vip
    networks:
      webinternal:
        aliases:
        - cachedb
```

```yaml
networks:
  webpublic:
    driver: overlay
    ipam:
      driver: default
      config:
      - subnet: 192.168.100.0/24
  webinternal:
    driver: overlay
    ipam:
      driver: default
      config:
      - subnet: 192.168.101.0/24
```

Workshop 2-4: Swarm Compose

```
docker@swarm-mng:/Share_DockerToolbox/python_restfulset$ docker stack deploy -c docker-compose_swarm.yml webservice
Ignoring deprecated options:

container_name: Setting the container name is not supported.

Creating network webservice_webpublic
Creating network webservice_webinternal
Creating service webservice_webservice
Creating service webservice_maindb
Creating service webservice_cachedb
Creating service webservice_webcache
```

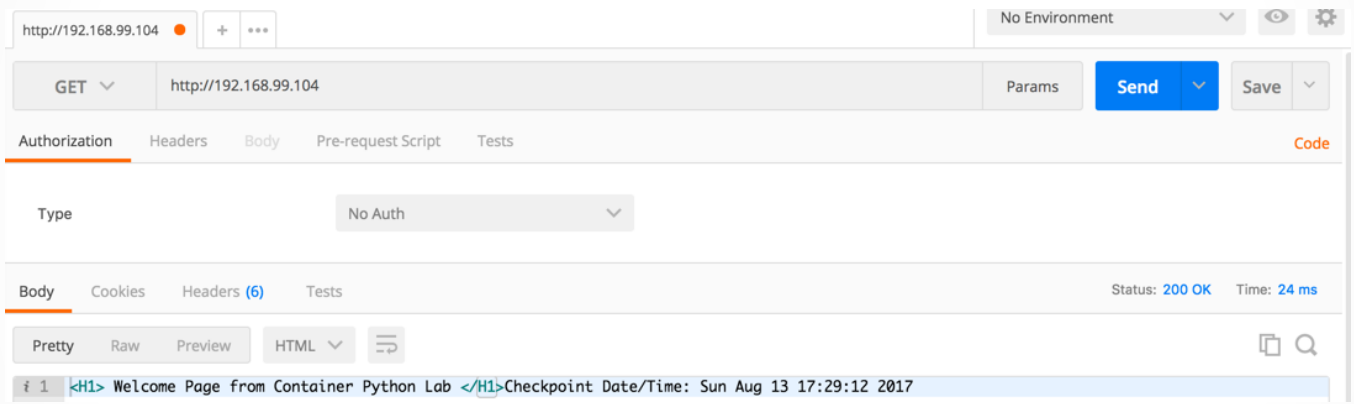
```
docker@swarm-mng:/Share_DockerToolbox/python_restfulset$ docker stack ps webservice
ID                  NAME                                        IMAGE                          NODE                DESIRED STATE       CURRENT STATE
        ERROR                       PORTS
mcj0ux4x25uv        webservice_webcache.wwzx60rvl5res39v0lxir2gfh   labdocker/cluster:webcache     swarm-node2         Running             Running 46 seconds ag
o
ol223n2c2htp        webservice_webcache.0k95omm28xfef22thummpz3uf   labdocker/cluster:webcache     swarm-mng           Running             Running 49 seconds ag
o
fj0qu565u8mt        webservice_webcache.q814dhi3bzl4sze4zmjpiy3qa   labdocker/cluster:webcache     swarm-node1         Running             Running 50 seconds ag
o
kw8oprgn8b3v        webservice_webcache.wwzx60rvl5res39v0lxir2gfh   labdocker/cluster:webcache     swarm-node2         Shutdown            Failed about a minute
 ago    "task: non-zero exit (1)"
a4foun5hzks3        webservice_webcache.0k95omm28xfef22thummpz3uf   labdocker/cluster:webcache     swarm-mng           Shutdown            Failed about a minute
 ago    "task: non-zero exit (1)"
horm2noczrvt        webservice_webcache.q814dhi3bzl4sze4zmjpiy3qa   labdocker/cluster:webcache     swarm-node1         Shutdown            Failed about a minute
 ago    "task: non-zero exit (1)"
vhutisinb7np        webservice_webcache.wwzx60rvl5res39v0lxir2gfh   labdocker/cluster:webcache     swarm-node2         Shutdown            Failed about a minute
 ago    "task: non-zero exit (1)"
ktjzx8thiq6k        webservice_webcache.q814dhi3bzl4sze4zmjpiy3qa   labdocker/cluster:webcache     swarm-node1         Shutdown            Failed about a minute
 ago    "task: non-zero exit (1)"
7siaoo4hnvmh        webservice_webcache.0k95omm28xfef22thummpz3uf   labdocker/cluster:webcache     swarm-mng           Shutdown            Failed about a minute
 ago    "task: non-zero exit (1)"
axdh6t2ua971        webservice_cachedb.wwzx60rvl5res39v0lxir2gfh    labdocker/redis:latest         swarm-node2         Running             Running about a minut
e ago
t8jc8aopm6wu        webservice_cachedb.q814dhi3bzl4sze4zmjpiy3qa    labdocker/redis:latest         swarm-node1         Running             Running about a minut
e ago
32d2fao3cjcu        webservice_cachedb.0k95omm28xfef22thummpz3uf    labdocker/redis:latest         swarm-mng           Running             Running about a minut
e ago
mtbhxlkuwjg7        webservice_webservice.1                         labdocker/cluster:webservice   swarm-node1         Running             Running 39 seconds ag
o
nw2jky8drn42         \_ webservice_webservice.1                     labdocker/cluster:webservice   swarm-mng           Shutdown            Failed about a minute
 ago    "task: non-zero exit (1)"
ivhofu5u9kxe        webservice_maindb.1                             labdocker/mysql:latest         swarm-node2         Running             Running about a minut
```

Workshop 2-4: Swarm Compose

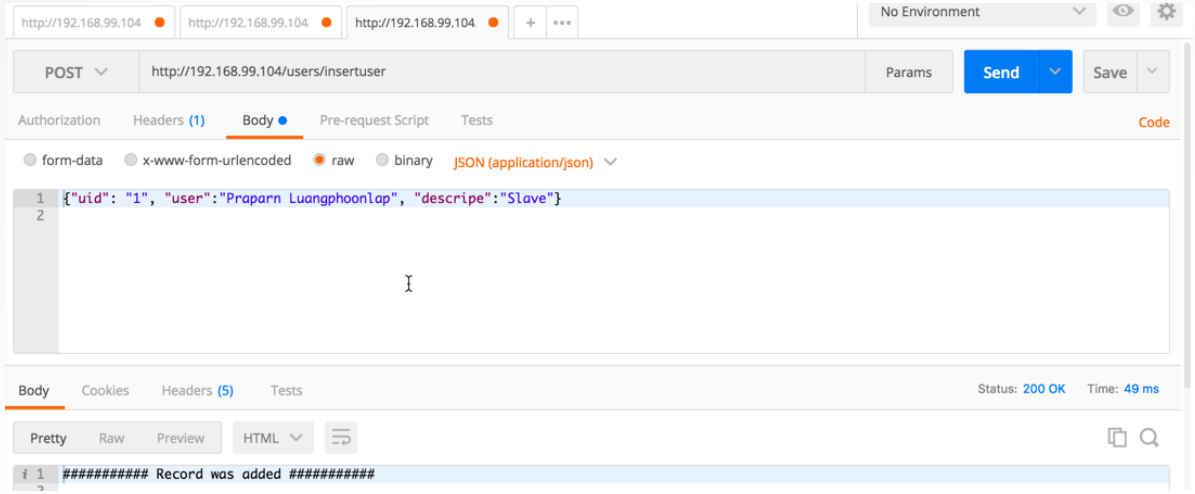
```
docker@swarm-mng:/Share_DockerToolbox/python_restfulset$ docker stack ps webservice
ID                  NAME                                                IMAGE                          NODE                DESIRED STATE       CURRENT STATE
        ERROR                       PORTS
mcj0ux4x25uv        webservice_webcache.wwzx60rvl5res39v0lxir2gfh       labdocker/cluster:webcache     swarm-node2         Running             Running 46 seconds ag
o
ol223n2c2htp        webservice_webcache.0k95omm28xfef22thummpz3uf       labdocker/cluster:webcache     swarm-mng           Running             Running 49 seconds ag
o
fj0qu565u8mt        webservice_webcache.q814dhi3bzl4sze4zmjpiy3qa       labdocker/cluster:webcache     swarm-node1         Running             Running 50 seconds ag
o
kw8oprgn8b3v        webservice_webcache.wwzx60rvl5res39v0lxir2gfh       labdocker/cluster:webcache     swarm-node2         Shutdown            Failed about a minute
 ago    "task: non-zero exit (1)"
a4foun5hzks3        webservice_webcache.0k95omm28xfef22thummpz3uf       labdocker/cluster:webcache     swarm-mng           Shutdown            Failed about a minute
 ago    "task: non-zero exit (1)"
horm2noczrvt        webservice_webcache.q814dhi3bzl4sze4zmjpiy3qa       labdocker/cluster:webcache     swarm-node1         Shutdown            Failed about a minute
 ago    "task: non-zero exit (1)"
vhutisinb7np        webservice_webcache.wwzx60rvl5res39v0lxir2gfh       labdocker/cluster:webcache     swarm-node2         Shutdown            Failed about a minute
 ago    "task: non-zero exit (1)"
ktjzx8thiq6k        webservice_webcache.q814dhi3bzl4sze4zmjpiy3qa       labdocker/cluster:webcache     swarm-node1         Shutdown            Failed about a minute
 ago    "task: non-zero exit (1)"
7siaoo4hnvmh        webservice_webcache.0k95omm28xfef22thummpz3uf       labdocker/cluster:webcache     swarm-mng           Shutdown            Failed about a minute
 ago    "task: non-zero exit (1)"
axdh6t2ua971        webservice_cachedb.wwzx60rvl5res39v0lxir2gfh        labdocker/redis:latest         swarm-node2         Running             Running about a minut
e ago
t8jc8aopm6wu        webservice_cachedb.q814dhi3bzl4sze4zmjpiy3qa        labdocker/redis:latest         swarm-node1         Running             Running about a minut
e ago
32d2fao3cjcu        webservice_cachedb.0k95omm28xfef22thummpz3uf        labdocker/redis:latest         swarm-mng           Running             Running about a minut
e ago
mtbhxlkuwjg7        webservice_webservice.1                             labdocker/cluster:webservice   swarm-node1         Running             Running 39 seconds ag
o
nw2jky8drn42         \_ webservice_webservice.1                         labdocker/cluster:webservice   swarm-mng           Shutdown            Failed about a minute
 ago    "task: non-zero exit (1)"
ivhofu5u9kxe        webservice_maindb.1                                 labdocker/mysql:latest         swarm-node2         Running             Running about a minut
```

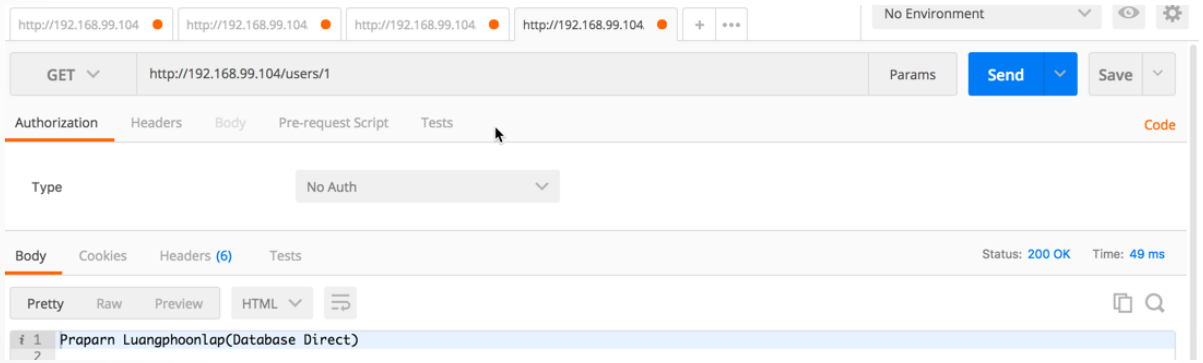
Workshop 2-4: Swarm Compose

```
praparns-MacBook-Pro:~ praparn$ docker-machine ls
NAME          ACTIVE   DRIVER       STATE     URL                         SWARM   DOCKER        ERRORS
labdocker     -        virtualbox   Running   tcp://192.168.99.103:2376           Unknown       Unable to query docker version: Get https://192.168.99.103:2376/
v1.15/version: x509: certificate is valid for 192.168.99.100, not 192.168.99.103
swarm-mng     -        virtualbox   Running   tcp://192.168.99.104:2376           v17.06.0-ce
swarm-node1   -        virtualbox   Running   tcp://192.168.99.105:2376           v17.06.0-ce
swarm-node2   -        virtualbox   Running   tcp://192.168.99.106:2376           v17.06.0-ce
praparns-MacBook-Pro:~ praparn$ export Server_IP=192.168.99.104
praparns-MacBook-Pro:~ praparn$ curl http://$Server_IP:$Server_Port/
<H1> Welcome Page from Container Python Lab </H1>Checkpoint Date/Time: Sun Aug 13 17:27:58 2017
```



Workshop 2-4: Swarm Compose





Workshop 2-4: Swarm Compose

http://192.168.99.1 | http://192.168.99.1 | http://192.168.99.1 | http://192.168.99.1 | http://192.168.99.1 | No Environment

GET http://192.168.99.104/users/removeuser/1 Params Send Save

Authorization Headers Body Pre-request Script Tests Code

Type No Auth

Body Cookies Headers (5) Tests Status: 200 OK Time: 33 ms

Pretty Raw Preview HTML

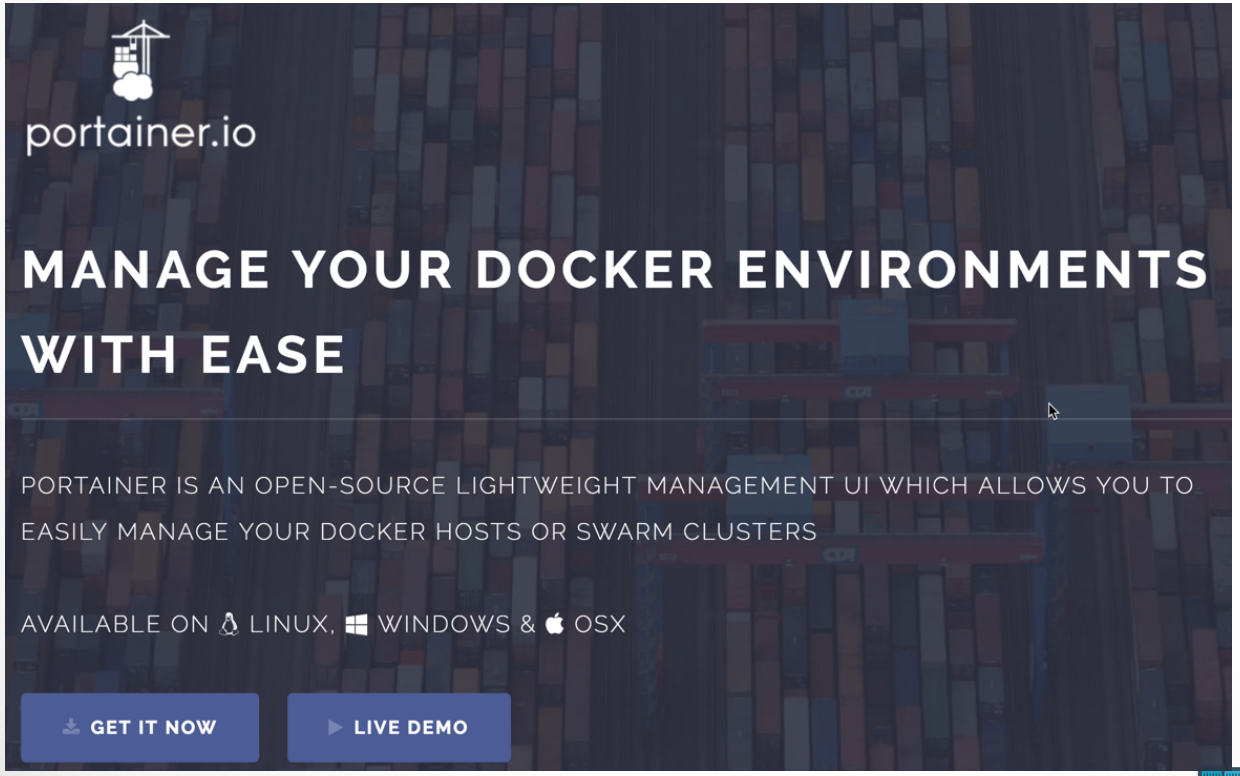
```
1 ########### Record was deleted (Both Database Cache) ###########
```

Portainer for Docker

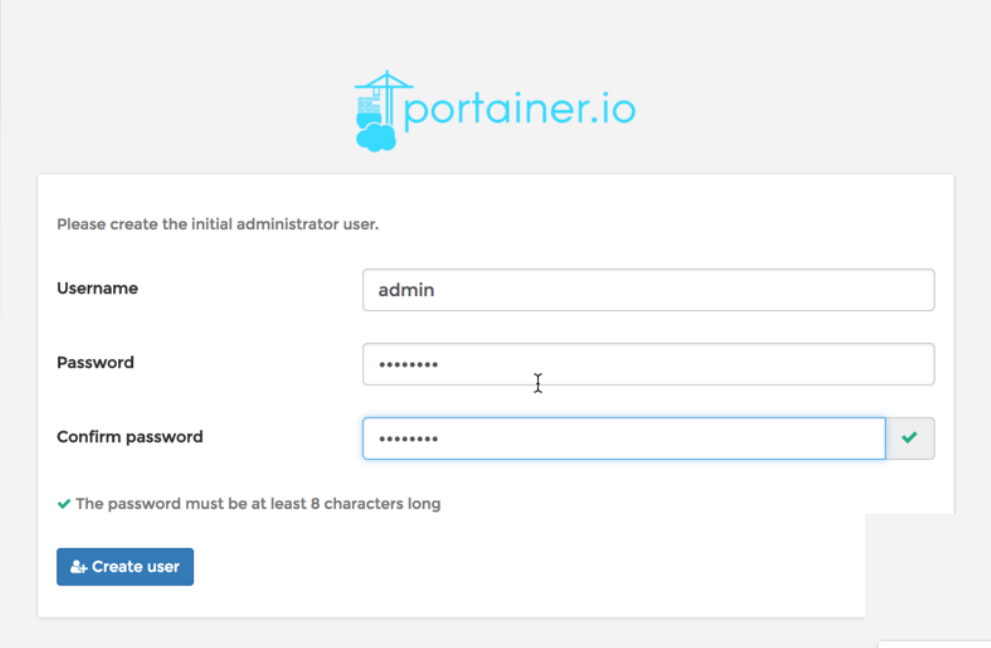
...

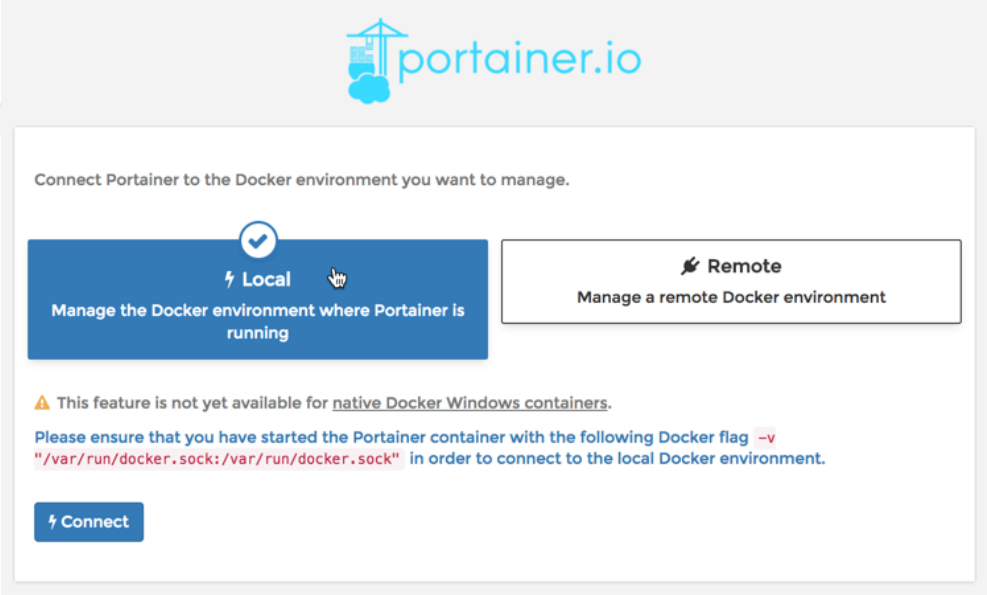
portainer for Docker

- portainer.io เป็น open source management ที่สามารถใช้บริหารจัดการ docker-machine ผ่านหน้า GUI web ได้อย่างมีประสิทธิภาพแบบ On premise
- การใช้งาน portainer จะใช้การบริหารจัดการผ่านหน้าเว็บ (x.x.x.x:9000)



portainer for Docker





portainer for Docker

portainer.io

ACTIVE ENDPOINT
local

ENDPOINT ACTIONS
- Dashboard
- App Templates
- Containers
- Images
- Networks
- Volumes
- Events
- Engine

PORTAINER SETTINGS
- User management
- Endpoints
- Registries
- Settings

Home
Dashboard

Help support portainer admin
my account log out

Node info

Name	labdocker
Docker version	18.01.0-ce
CPU	4
Memory	1 GB

1 Containers — 1 running, 0 stopped

31 Images — 2.4 GB

5 Volumes

4 Networks

Container list
Containers

Help support portainer admin
my account log out

Containers — Search Settings

Start | Stop | Kill | Restart | Pause | Resume | Remove | + Add container

Name	State (Filter)	Quick actions	Stack	Image	IP Address	Published Ports	Ownership
vigilant_pare	running	Containers	-	portainer/portainer	172.17.0.2	9000:9000	public

Items per page 10

docker

portainer for Docker

portainer.io

ACTIVE ENDPOINT
local

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PORTAINER SETTINGS
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portainer.io 1.16.2

Create container
Containers > Add container

Help support portainer admin
my account log out

Name: nginx

Image configuration

Name: labdocker/nginx:latest
Registry: DockerHub

Always pull the image

Ports configuration

Publish all exposed ports

Port mapping map additional port

host 80 → container 80 TCP UDP

Access control

Enable access control

Administrators
I want to restrict the management of this resource to administrators only

Restricted
I want to restrict the management of this resource to a set of users and/or teams

Actions

Deploy the container

Advanced container settings

portainer for Docker

192.168.99.100

NMac Ked - Mac OS... | Medium | jerkins | vagrant | Mesos | Vue | docker | NGINX | Taiwan | Kubernetes | PWA_Progressive_W... | MYSQL_Cluster

Welcome to nginx!

If you see this page, the nginx web server is successfully installed and working. Further configuration is required.

For online documentation and support please refer to nginx.org.
Commercial support is available at nginx.com.

Thank you for using nginx.

Container list
Containers

Help support portainer | admin
my account | log out

Containers | Search | Settings

Start | Stop | Kill | Restart | Pause | Resume | Remove | + Add container

Name	State Filter	Quick actions	Stack	Image	IP Address	Published Ports	Ownership
nginx	running		-	labdocker/nginx:latest	172.17.0.3	80:80	administrators
vigilant_pare	running		-	portainer/portainer	172.17.0.2	9000:9000	public

Items per page 10

docker

Shipyard for Docker

portainer.io

ACTIVE ENDPOINT
local

ENDPOINT ACTIONS
- Dashboard
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- Images
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- Volumes
- Events
- Engine

PORTAINER SETTINGS
- User management
- Endpoints
- Registries
- Settings

Container statistics
Containers > nginx > Stats

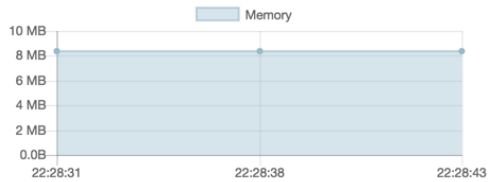
Help support portainer admin
my account log out

About statistics

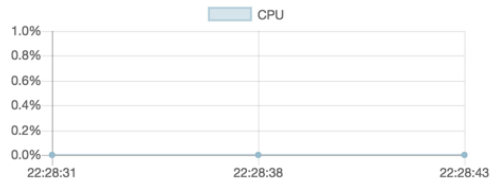
This view displays real-time statistics about the container nginx as well as a list of the running processes inside this container.

Refresh rate 5s

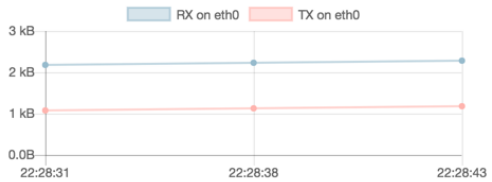
Memory usage



CPU usage



Network usage



Processes Search

UID	PID	PPID	C	STIME	TTY	TIME	CMD

portainer.io

ACTIVE ENDPOINT
local

ENDPOINT ACTIONS
- Dashboard
- App Templates
- Containers
- Images
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- Volumes
- Events
- Engine

PORTAINER SETTINGS

Container console
Containers > nginx > Console

Help support portainer admin
my account log out

Console

Exec into container as `default user` using command `sh` Disconnect

```
/usr/sbin # ls
add-shell     arping      chroot      deluser     fakeidentd  ftpd        killall5    nanddump    nginx       rdate       readprofile  sendmail    udhcpd
addgroup      brctl       crond       dnsd        fbset       httpd       loadfont    nandwrite   ntpd        rdev        remove-shell setfont
adduser       chpasswd    delgroup    ether-wake  fdformat    inetd       lspci       nbd-client  powertop    readahead   rfkill       setlogcons
/usr/sbin #
```

Docker: The Next-Gen of Virtualization

docker

Recapture for Day 2

- Dockerfile and Build
- Compose
- Registry
- Swarm Mode
  - Conceptual of Swarm
  - Swarm Mode Architecture
  - Swarm init/join cluster system
  - Swarm service
  - Orchestrator Assignment
  - Config and Secret
  - Network Overlay and Ingress
  - HA Manager Role
  - Docker Stack Deploy (Compose Swarm Mode)
- portainer for Docker
- Q&A

Q&A

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