

Docker:Zero to Hero (Day 1)

By Praparn Luengphoonlap
Email: praparn@opcellent.com

Docker: The Next-Gen of Virtualization



Outline Day 1

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

Outline Day 2

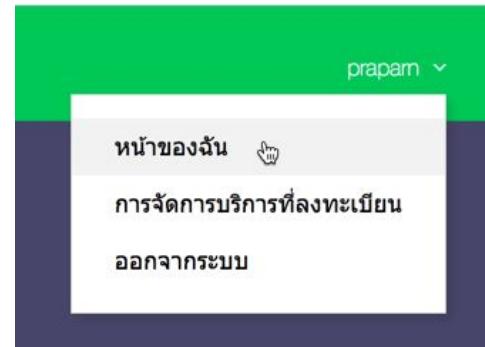
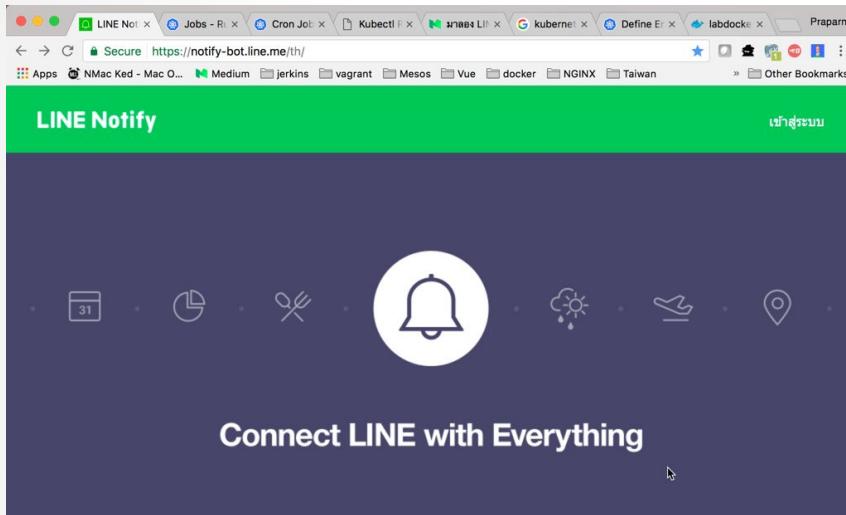
- Dockerfile and Build
- Compose
- Docker Security
- Registry
- Swarm Mode
 - Conceptual of Swarm
 - Swarm Mode Architecture
 - Swarm init/join cluster system
 - Swarm service
 - Orchestrator Assignment
 - Config and Secret
 - Network Overlay and Ingress
 - HA Manager Role
 - Docker Stack Deploy (Compose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

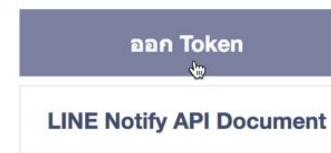
Prerequisite

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



ออก Access Token (สำหรับผู้พัฒนา)

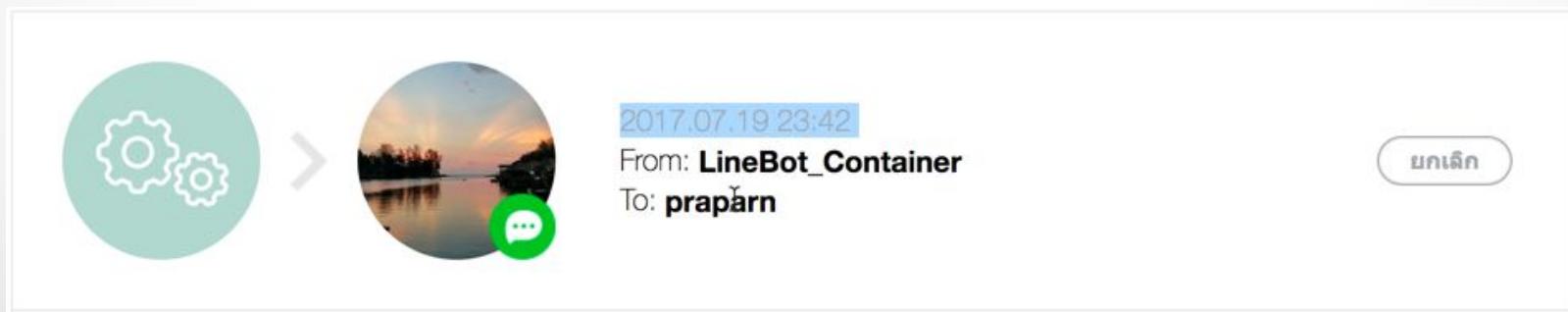
เมื่อใช้ Access Token แบบบุคคล จะสามารถตั้งค่าการแจ้งเตือนได้โดยไม่ต้องลงทะเบียนกับเว็บเซอร์วิส



Prerequisite

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

The screenshot shows the process of generating a LINE Token. On the left, a modal window titled "ออก Token" (Generate Token) displays the URL "https://notify-bot.line.me". It asks for a group name, which is filled with "LINEBOT". Below it, a note says "โปรดเลือกห้องแชทที่ต้องการส่งข้อความแจ้งเตือน" (Please select the chat room you want to send a message to). A search bar shows "Search by group name" and a result "รับการแจ้งเตือนแบบตัวต่อตัวจาก LINE Notify". On the right, the generated token "zHOlcJCcpIIS8mEedn" is shown in a large redacted box. Below it, a note says "ถ้าออกจากหน้านี้ ระบบจะไม่แสดง Token ที่ออกใหม่อีกต่อไป โปรดศัลล์ Token ก่อนออกจากหน้านี้". At the bottom are two buttons: "คัดลอก" (Copy) in green and "ปิด" (Close) in grey.



Lab Resource

- Repository for lab

The screenshot shows a web interface for managing Docker repositories. At the top, there is a navigation bar with icons for 'Explore' and 'Help', a search bar containing the text 'labdocker', and buttons for 'Sign up' and 'Log In'. Below the search bar, the text 'Repositories (7)' is displayed. A dropdown menu is open, showing the option 'All'. The main content area displays three repository cards:

Repository	Type	Stars	Pulls	Details
labdocker/alpineweb	public	0	31	DETAILS
labdocker/nginx	public	0	16	DETAILS
labdocker/alpine	public	0	7	DETAILS

Lab Resource

- Software in lab

The screenshot shows a Windows file explorer window with the path: Computer > DATA (D:) > Docker_Nodejs > Workshop > Workshop_1-11_Registry. Below the file list, a Notepad window is open with the following content:

instruction - Notepad

File Edit Format View Help

Link for download:

<https://www.docker.com/products/docker-toolbox>

1. See PDF document for detail to install
2. After finished then run below command for check docker-machine (Command prompt)
 2.1 docker-machine --version ==> check version of docker machine & readiness
 2.2 docker-machine create --driver virtualbox labdocker ==> create new docker-machine for lab
 2.3 docker-machine ls ==> check ip address of new docker-machine

*Remark: default username/password for access docker-machine is docker/tcuser

3. SSH to docker-machine (labdocker)
 3.1 docker-machine ssh labdocker ==> default ssh via command prompt
 3.2 access via putty(windows) to ip address
 3.3 access via shell (mac)
 - Shell ==> New Remote Connection (Service: ssh)

4. Incase Upgrade docker-machine. Please check PDF document (Upgrade_Docker_1.10.pdf)

Lab Resource

- Download on Google Drive
 - <https://tinyurl.com/feu5jhyr>
- Download on GitHub
 - `git clone https://github.com/praparn/docker-workshop-092021`

The screenshot shows a GitHub repository page for 'praparn / docker-workshop-072020'. The repository has 1 branch and 0 tags. The master branch was last updated 5 days ago. The repository has 6 commits. The commit history lists 16 commits, each corresponding to a workshop directory (e.g., Workshop-1-1-Download-Install, Workshop-1-2-Access-PoolImage, etc.) with a creation date of 2020-07-05. The repository has 1 star, 0 forks, and 0 issues. It includes sections for About, Releases, Packages, and Languages. The Languages section shows Python at 57.6%, JavaScript at 33.5%, and Shell at 8.9%.

Commit	Date
Workshop-1-1-Download-Install	2020-07-05 22:15:52
Workshop-1-2-Access-PoolImage	2020-07-05
Workshop-1-3-Create-PushImage	2020-07-05
Workshop-1-4-Run-Container	2020-07-05
Workshop-1-5-CPU-Memory-IO	2020-07-05
Workshop-1-6-Network	2020-07-05 10:51:49
Workshop-1-7-Volume	2020-07-05 22:15:52
Workshop-1-8-Inspect-Logs	2020-07-05 22:15:52
Workshop-2-1-DockerFile	2020-07-05 22:15:52
Workshop-2-2-Compose	2020-07-05 22:15:52
Workshop-2-3-Docker-Security	2020-07-05 22:15:52
Workshop-2-4-Registry	2020-07-07 10:51:49
Workshop-2-5-Swarm	2020-07-07 10:51:49
Workshop-2-6-Portainer	2020-07-05

Lab Resource

- <https://tinyurl.com/y9svjua2>



DockerCon2021



Pre-register for DockerCon Live 2021.

As the calendar leaves 2020 in the rear view mirror, we're looking forward to the year ahead and we're thrilled to announce that the next DockerCon Live will take place on **May 27th, 2021**.

Once again, DockerCon Live will be a free, online experience full of demos of products and innovation from Docker and our partners, deep technical sessions from Docker experts, Docker Captains and luminaries from across the industry, along with a chance for the community to gather and connect with colleagues around the world.

Sign up to pre-register for DockerCon Live 2021!

Sign up

First Name

Last Name

Email Address

Company

Country

By checking this box you acknowledge that Docker will process your personal data according to this Privacy Policy.

[Pre-Register Now](#)



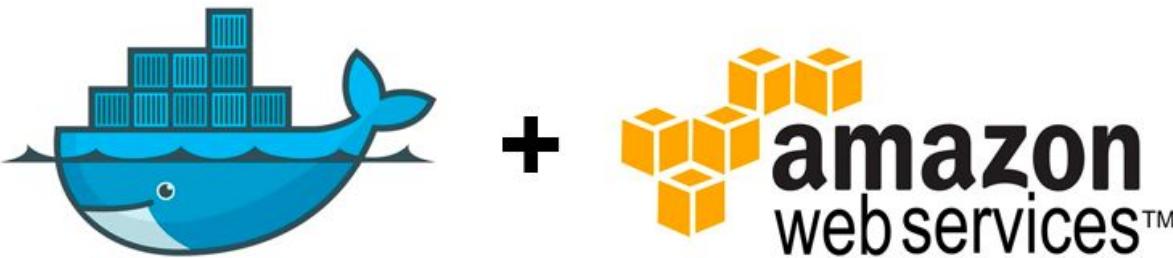
© 2021 Docker Inc. All Rights Reserved.



Docker: The Next-Gen of Virtualization



Workshop: Access Docker on AWS



Docker on AWS

Docker: The Next-Gen of Virtualization



Workshop: Access Docker on AWS

The screenshot shows the 'Play with Docker' interface. On the left, there's a sidebar with a whale logo, navigation links like 'Medium', 'Infra', 'NOVA', 'jenkins', 'vagrant', 'Mesos', 'Vue', 'docker', 'NGINX', 'Taiwan', 'Kubernetes', and 'PWA_Pr'. Below the sidebar, it says 'Play with Docker' and 'A simple, interactive and fun playground'. There's a 'Login' button. The main area has a digital clock at 03:59:30 and a 'CLOSE SESSION' button. It shows 'Instances' with one entry: '192.168.0.23 node1'. To the right, a terminal window displays a Docker session. The session starts with a warning about using personal credentials. It then shows the output of the 'docker version' command, which includes details about the client and server engines, API versions, Go versions, Git commits, build dates, OS/architecture, and experimental status. The session ends with a prompt '\$'.

```
# WARNING!!!!
# This is a sandbox environment. Using personal credentials #
# is HIGHLY! discouraged. Any consequences of doing so are #
# completely the user's responsibilites. #
#
# The PWD team.
#####
[node1] (local) root@192.168.0.23 ~

[node1] (local) root@192.168.0.23 ~
$ docker version
Client: Docker Engine - Community
  Version:          20.10.0
  API version:     1.41
  Go version:      go1.13.15
  Git commit:      7287ab3
  Built:           Tue Dec  8 18:54:00 2020
  OS/Arch:         linux/amd64
  Context:          default
  Experimental:    true

Server: Docker Engine - Community
  Engine:
    Version:          20.10.0
    API version:     1.41 (minimum version 1.12)
    Go version:      go1.13.15
    Git commit:      eeddea2
    Built:           Tue Dec  8 18:58:04 2020
    OS/Arch:         linux/amd64
    Experimental:    true
  containerd:
    Version:          v1.4.3
    GitCommit:        269548fa27e0089a8b8278fc4fc781d7f65a939b
  runc:
    Version:          1.0.0-rc92
    GitCommit:        ff819c7e9184c13b7c2607fe6c30ae19403a7aff
  docker-init:
    Version:          0.19.0
    GitCommit:        de40ad0
[node1] (local) root@192.168.0.23 ~
$
```

Docker: The Next-Gen of Virtualization



Who are we ? (Opcellent)



Docker: The Next-Gen of Virtualization



● SERVICE

Lorum ipsum is simply dummy text of the printing and typesetting industry. Lorum ipsum has been the industry's standard dummy text ever since the 1500s.

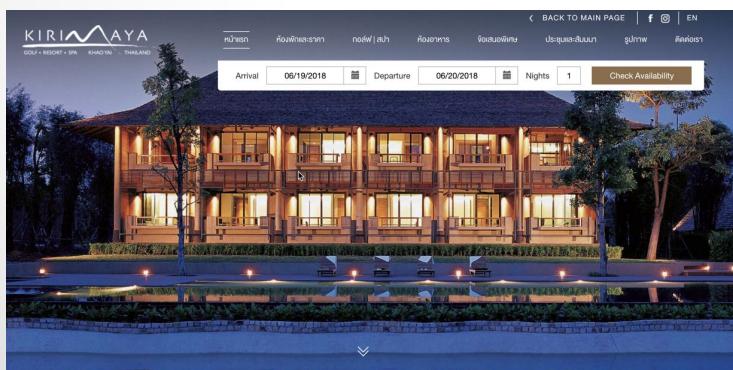
Docker
Lorum ipsum is simply dummy text of the printing and typesetting industry.

Kubernetes
Lorum ipsum is simply dummy text of the printing and typesetting industry.

● TRAINING

Lorum ipsum is simply dummy text of the printing and typesetting industry. Lorum ipsum has been the industry's standard dummy text ever since the 1500s.

Lorum ipsum is simply dummy text of the printing and typesetting industry.
Lorum ipsum has been the industry's standard dummy text ever since the 1500s.



Landscape of the world now

CONTAINERS ARE NOW MAINSTREAM AND USAGE IS ONLY GROWING.

130B

Total Pulls
on Hub

8B

Pulls in the
past month*

6M

Repositories
on Hub

5M

Hub Users

2.4M

Desktop
Installations

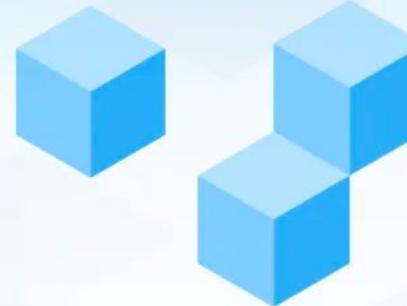
*UP FROM 5.5 B A YEAR AGO

Landscape of the world now

USERS WANT CHOICE.

Docker Desktop Users*

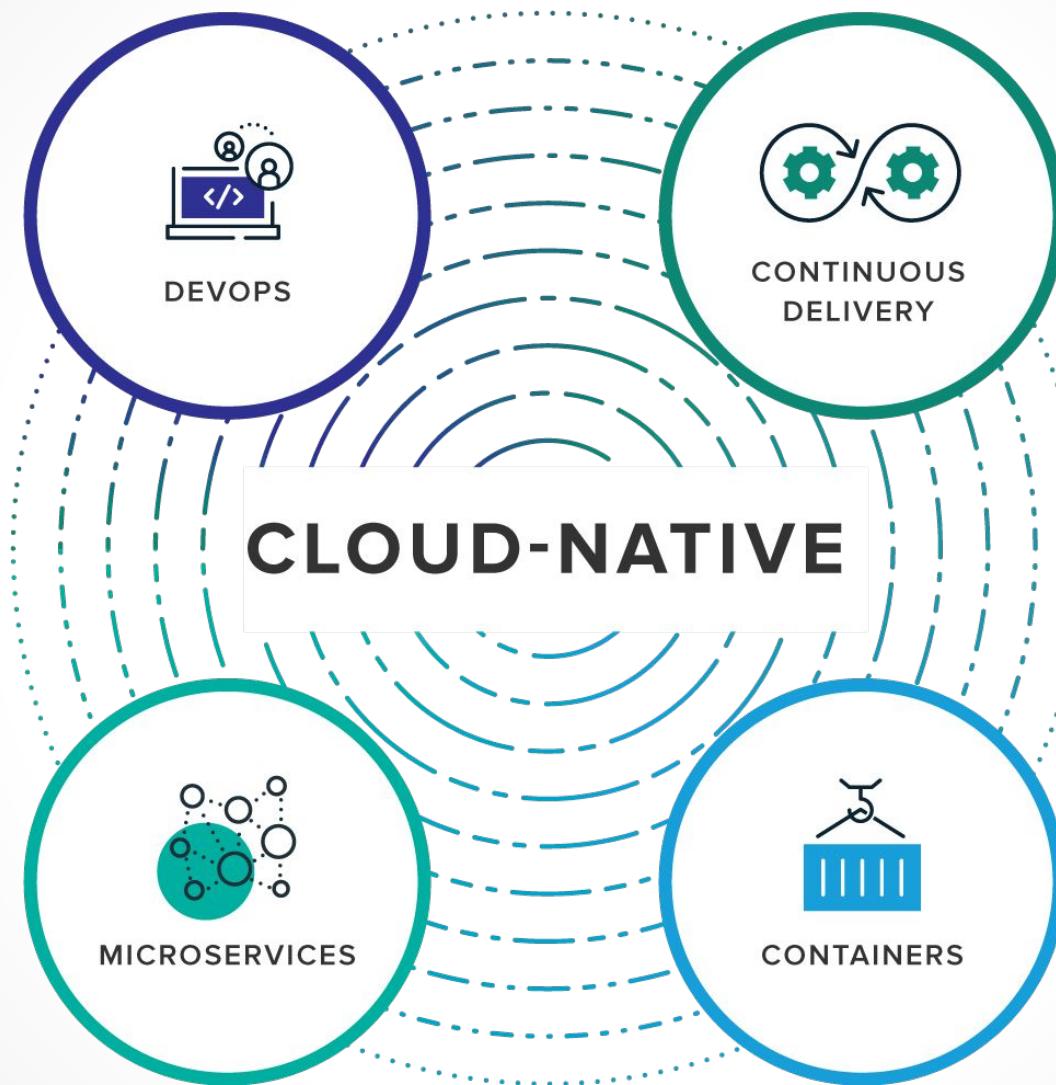
61%
Mac | **39%**
Windows



Top Architecture Used
amd64 **ppc64le**
arm **s390x**
arm64 **386**

*COMPARED TO 66% MAC AND 34% WINDOWS IN JANUARY 2019

Landscape of the world now



Landscape of the world now



PRICING CONTACT US LOG IN Se

Products Use Cases Open Source Resources Company

Sysdig 2021 container security and usage report: Shifting left is not enough

By Aaron Newcomb
on January 13, 2021

Security

74% of customers are scanning images during the CI/CD build stage

58% of containers run as root

49% of containers live less than 5 minutes

Open Source

3X increase in Falco adoption

35% growth of Prometheus metric use

4.7x increase in usage of Go

Container Usage

4X increase in containerd and CRI-O

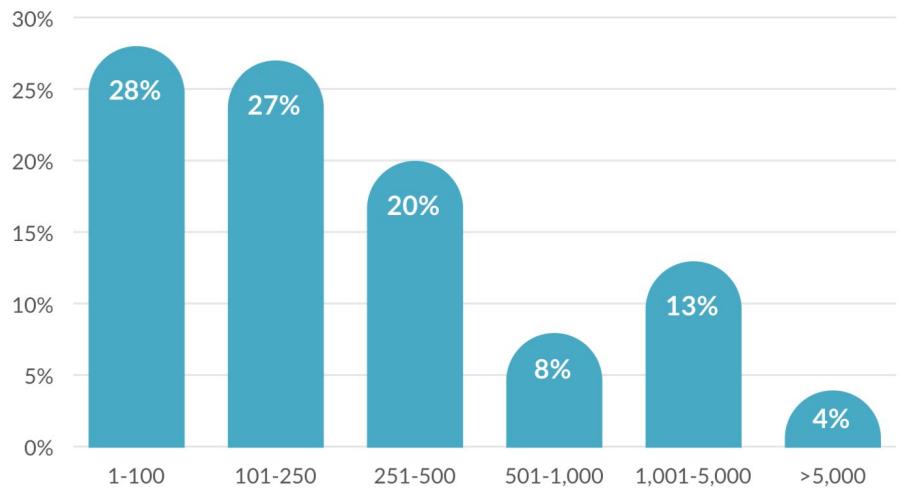
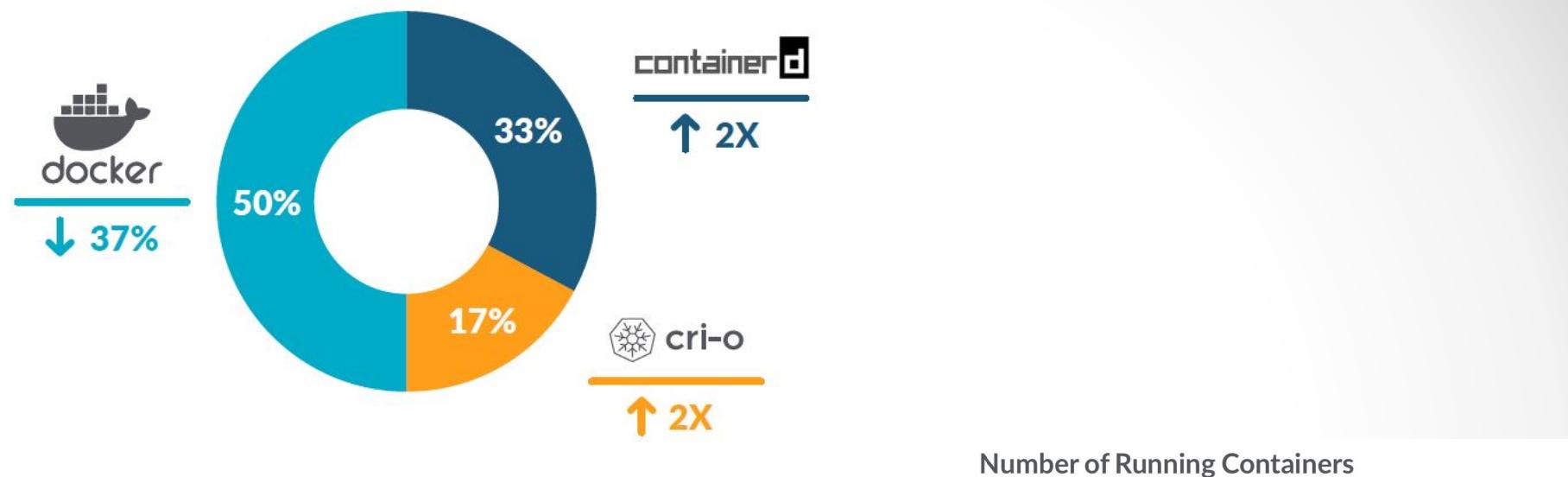
33% growth in container density

60% increase in Quay.io usage

Ref: <https://sysdig.com/blog/sysdig-2021-container-security-usage-report/>



Landscape of the world now



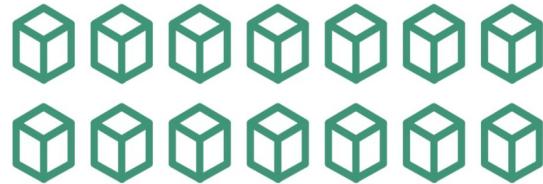
Docker: The Next-Gen of Virtualization



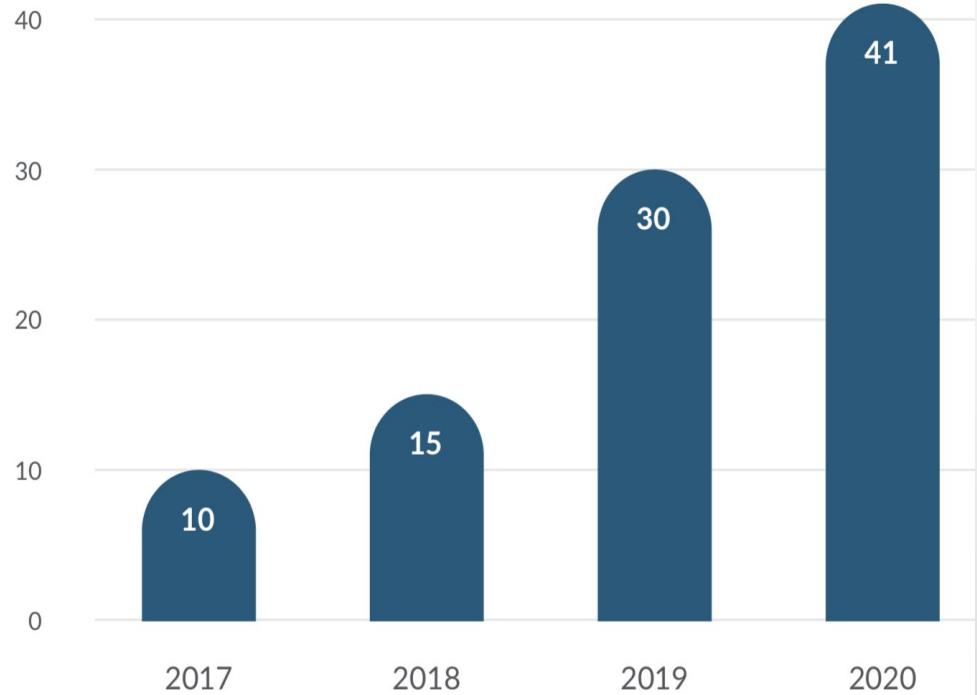
Landscape of the world now

Average Image Size Observed

376 MB



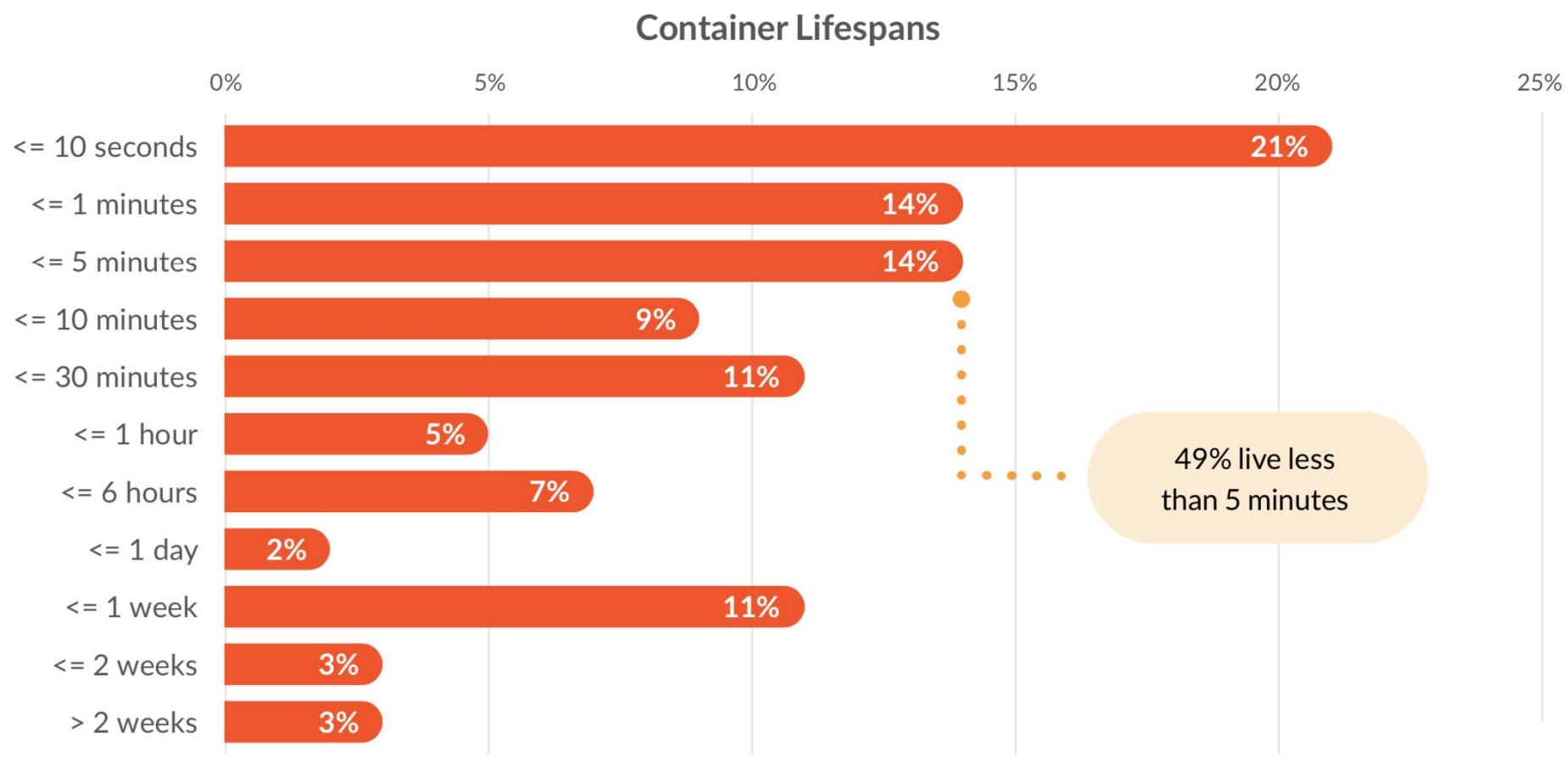
Median Containers per Host



Docker: The Next-Gen of Virtualization

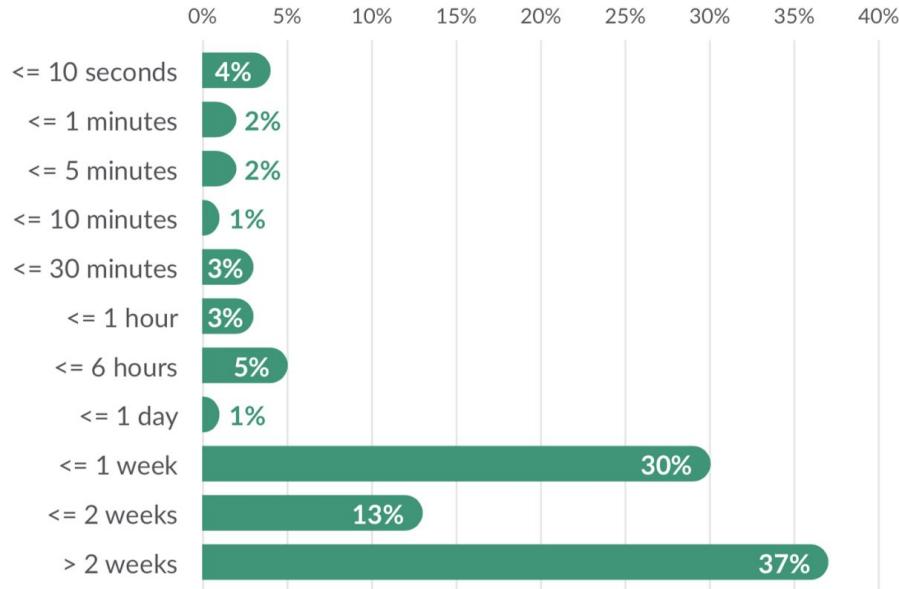


Landscape of the world now

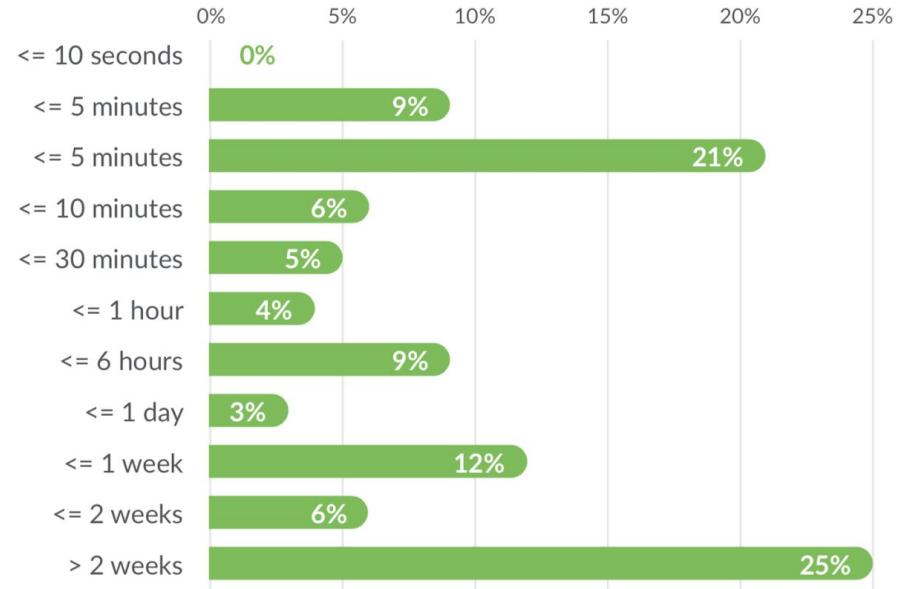


Landscape of the world now

Container Image Lifespans

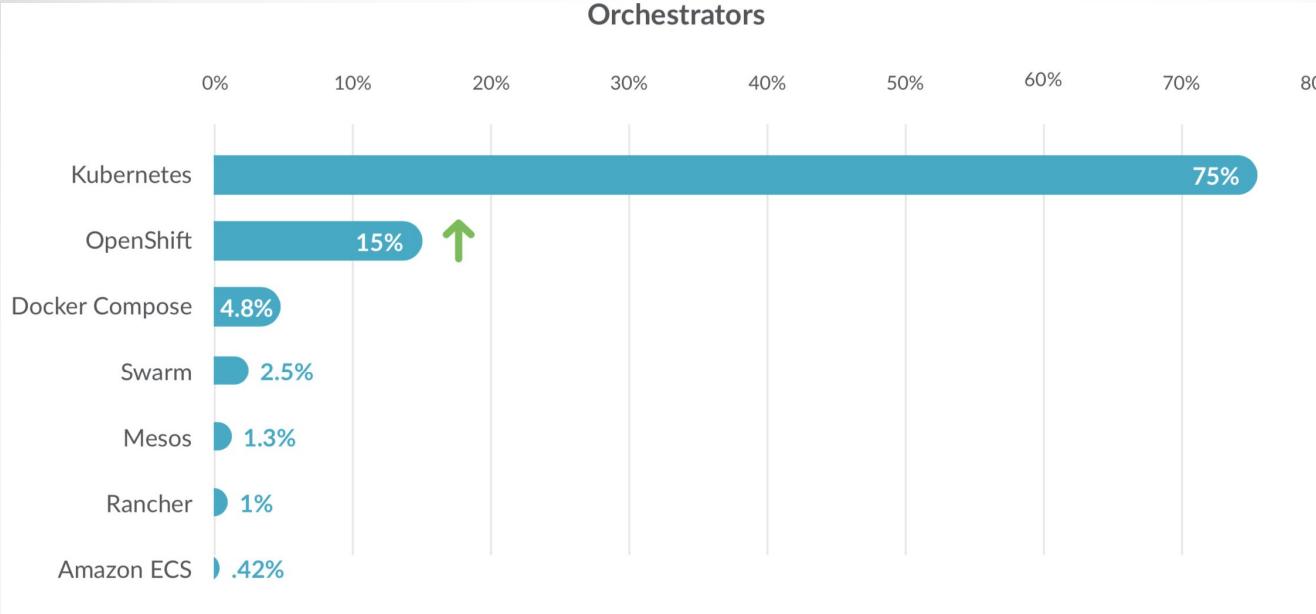


Service Lifespans



Landscape of the world now

Orchestrators



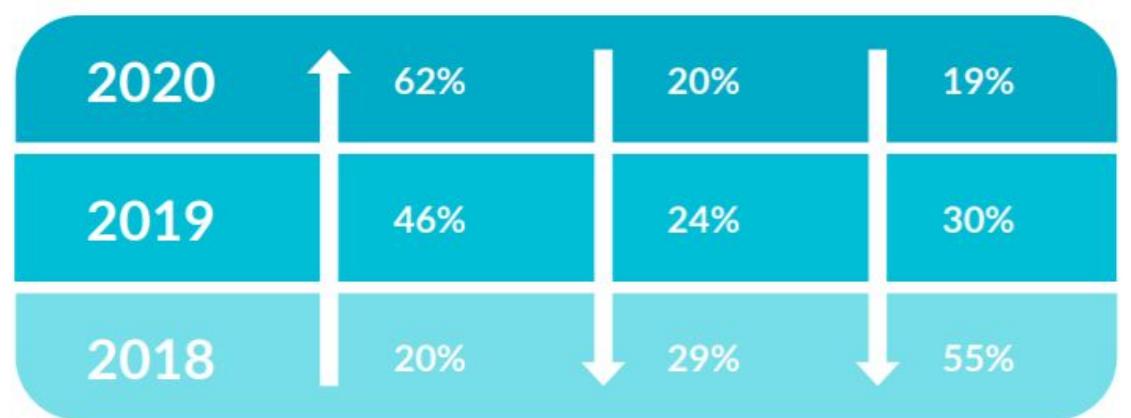
Prometheus



STATSD



JMX

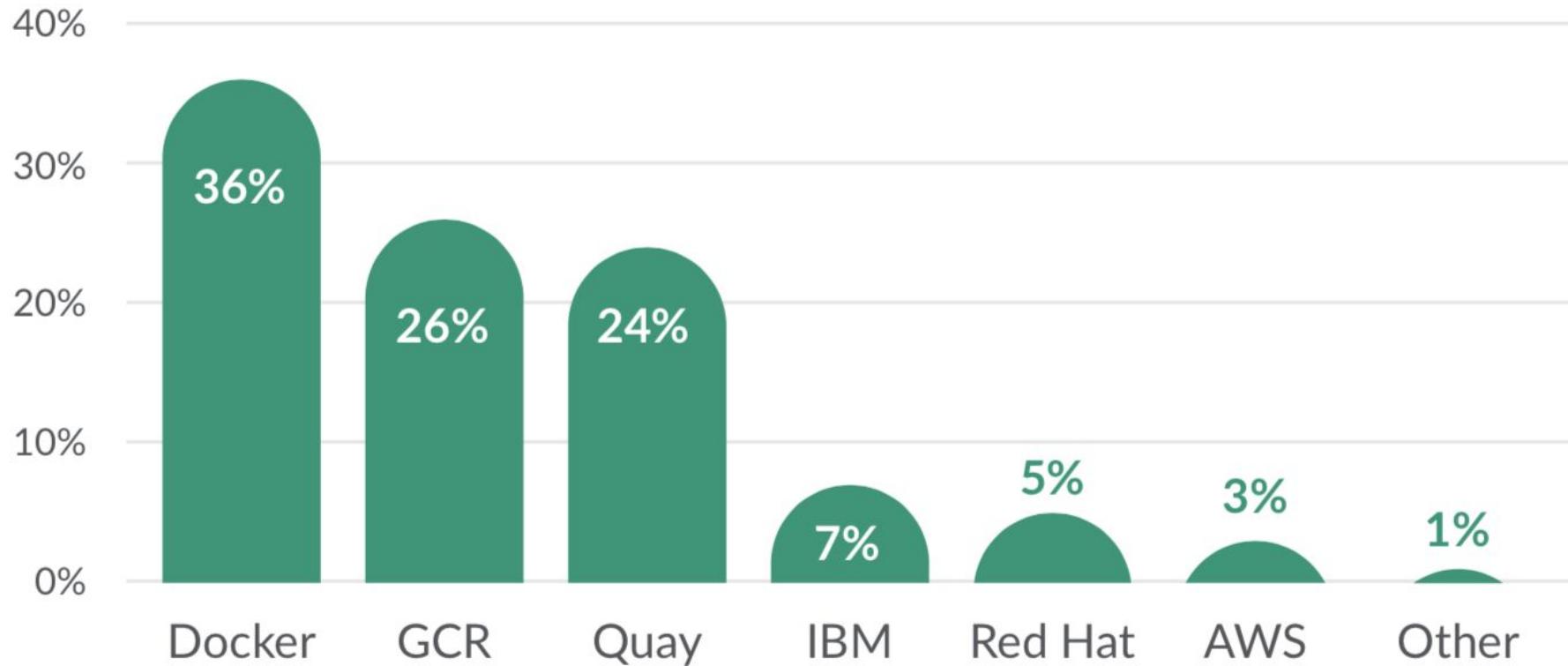


Docker: The Next-Gen of Virtualization



Landscape of the world now

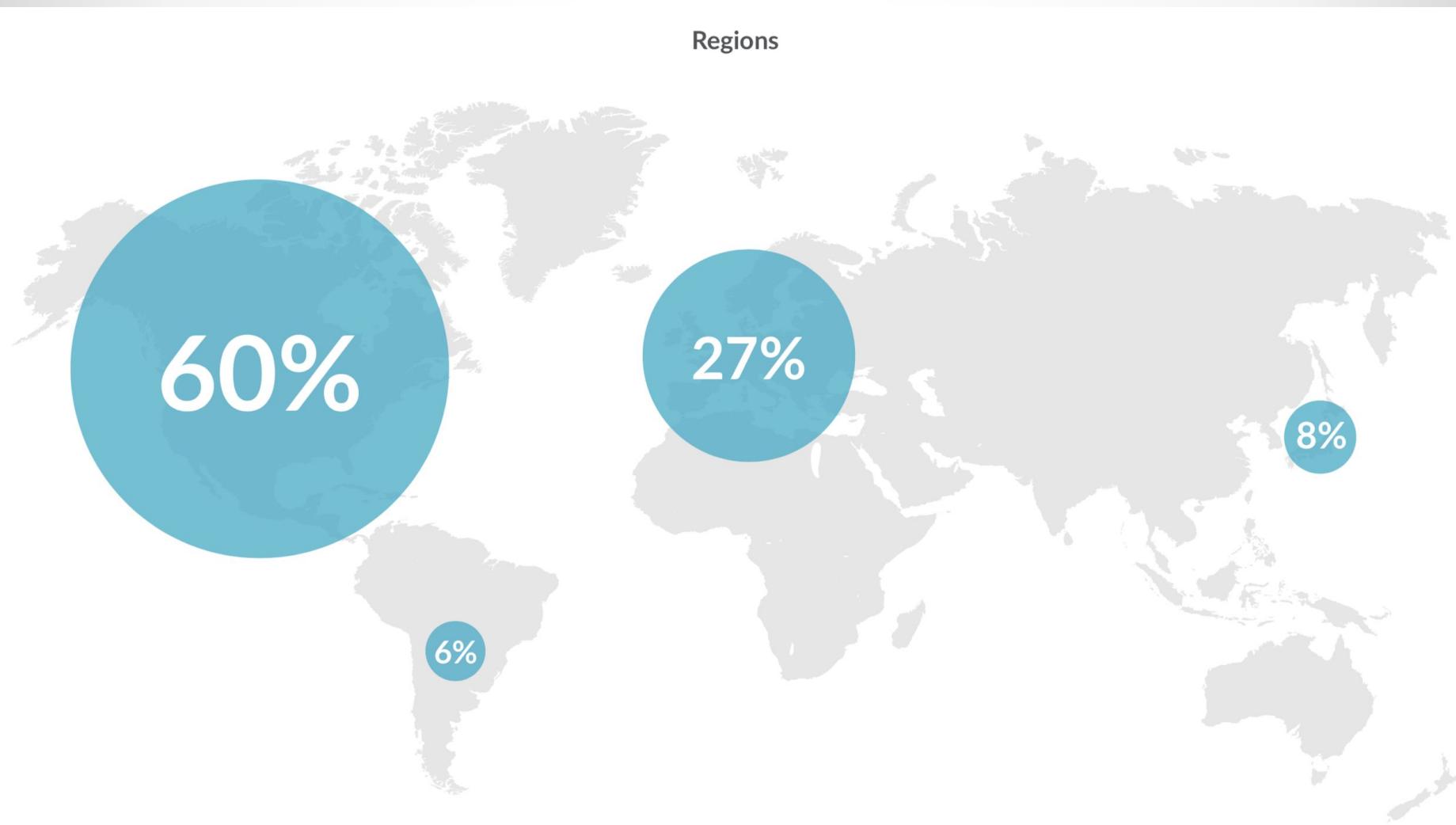
Container Registries



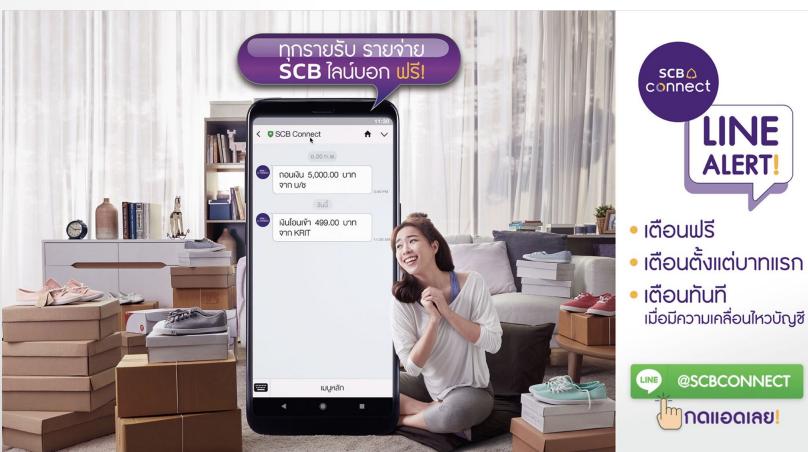
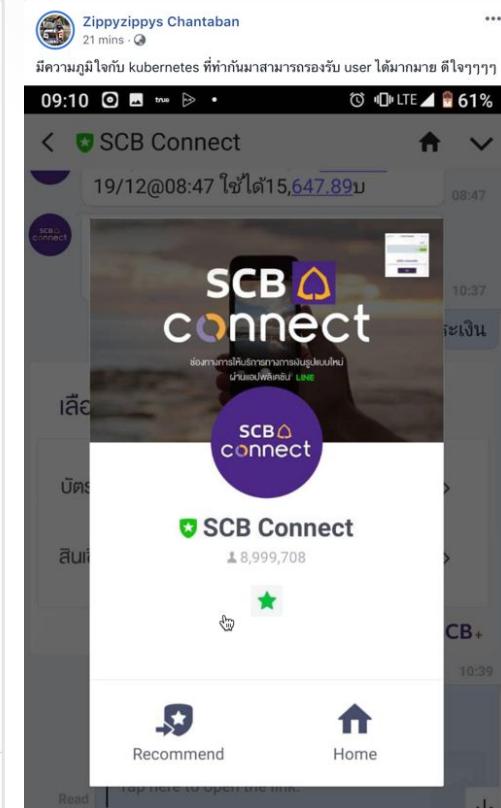
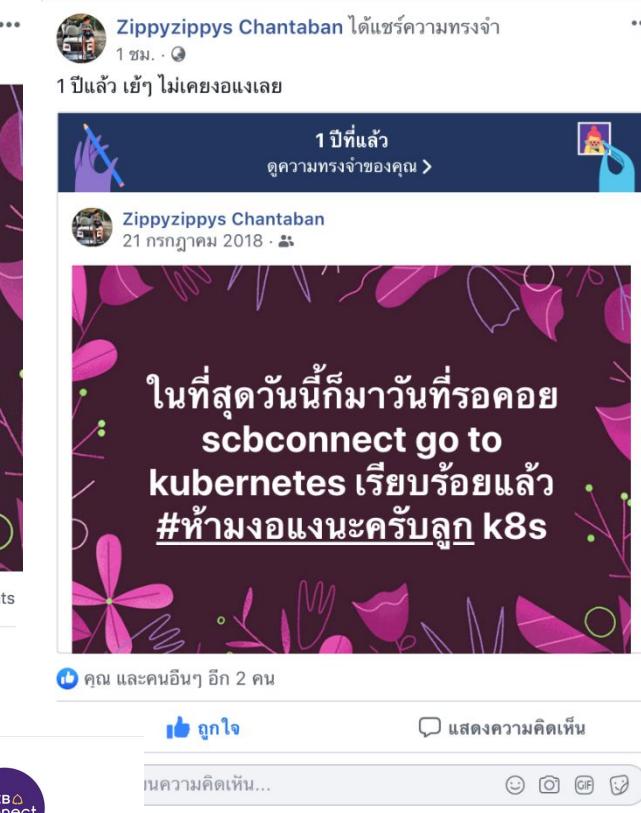
Landscape of the world now



Landscape of the world now



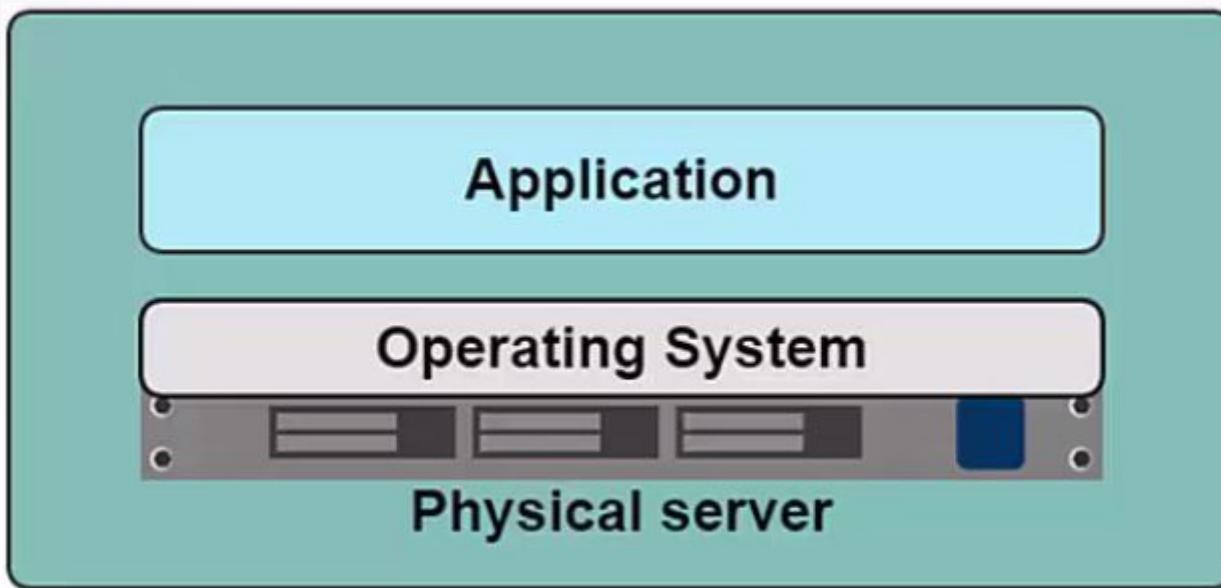
Landscape of the world now



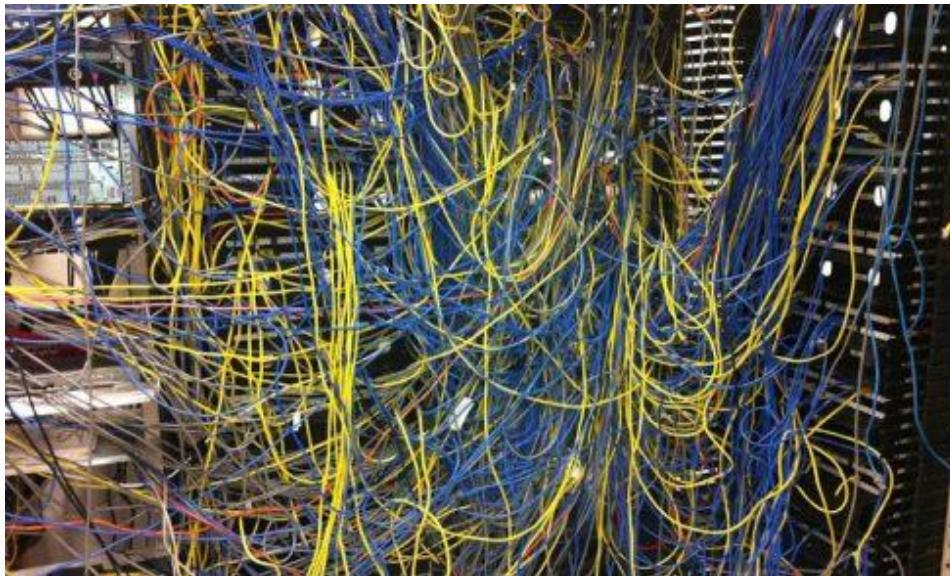
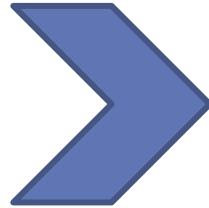
Docker Principle

• • •

What is docker ?



Existing Technology

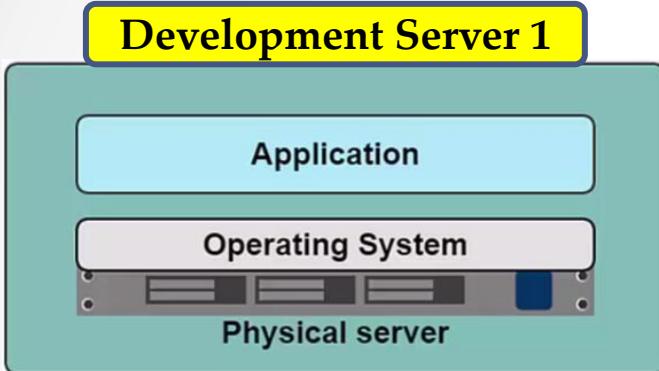


Docker: The Next-Gen of Virtualization

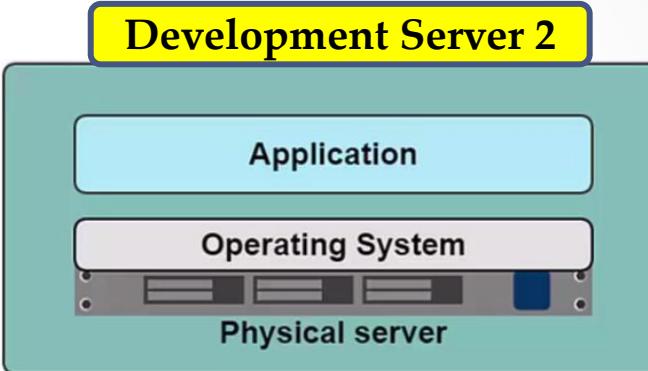


Existing Technology

- Development Environment (Mix everything possible)



- Apache 2.20 Web Server
 - PHP 5.5 Engine
 - Laravel 4.1 Framework
 - MySQL 5.1
 - Etc
- (All-in-One Server)

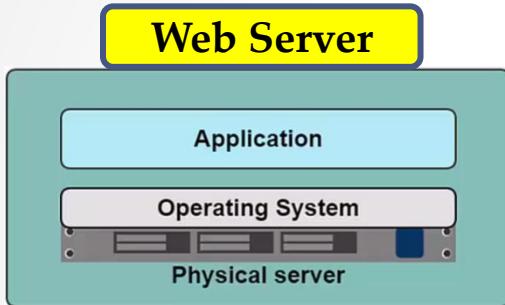


- IIS 8.0
- .Net Framework 3.5
- ASP.NET
- Etc

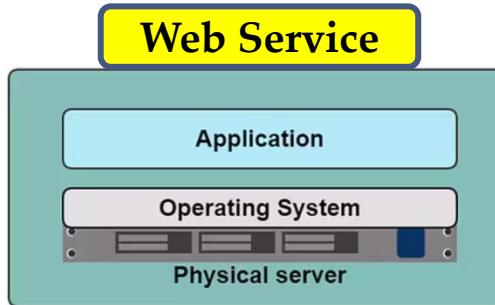
- Need concern about conflict component
- Survive among legacy dependency
- Lack for environment for fulfill develop & test (module test/integrate test/ UAT test / MOT test etc)
- Unexpected software conflict frequently occur
- Incomplete software's integrated test

Existing Technology

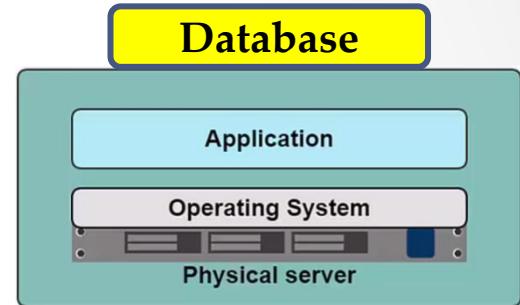
- Production Environment (Best design)
- Day 1: Application 1: Implement



- Apache 2.2.0 Web Server
- PHP 5.5 Engine
- Laravel 4.1 Framework



- IIS 8
- .Net Framework 3.5



- MariaDB 5.1

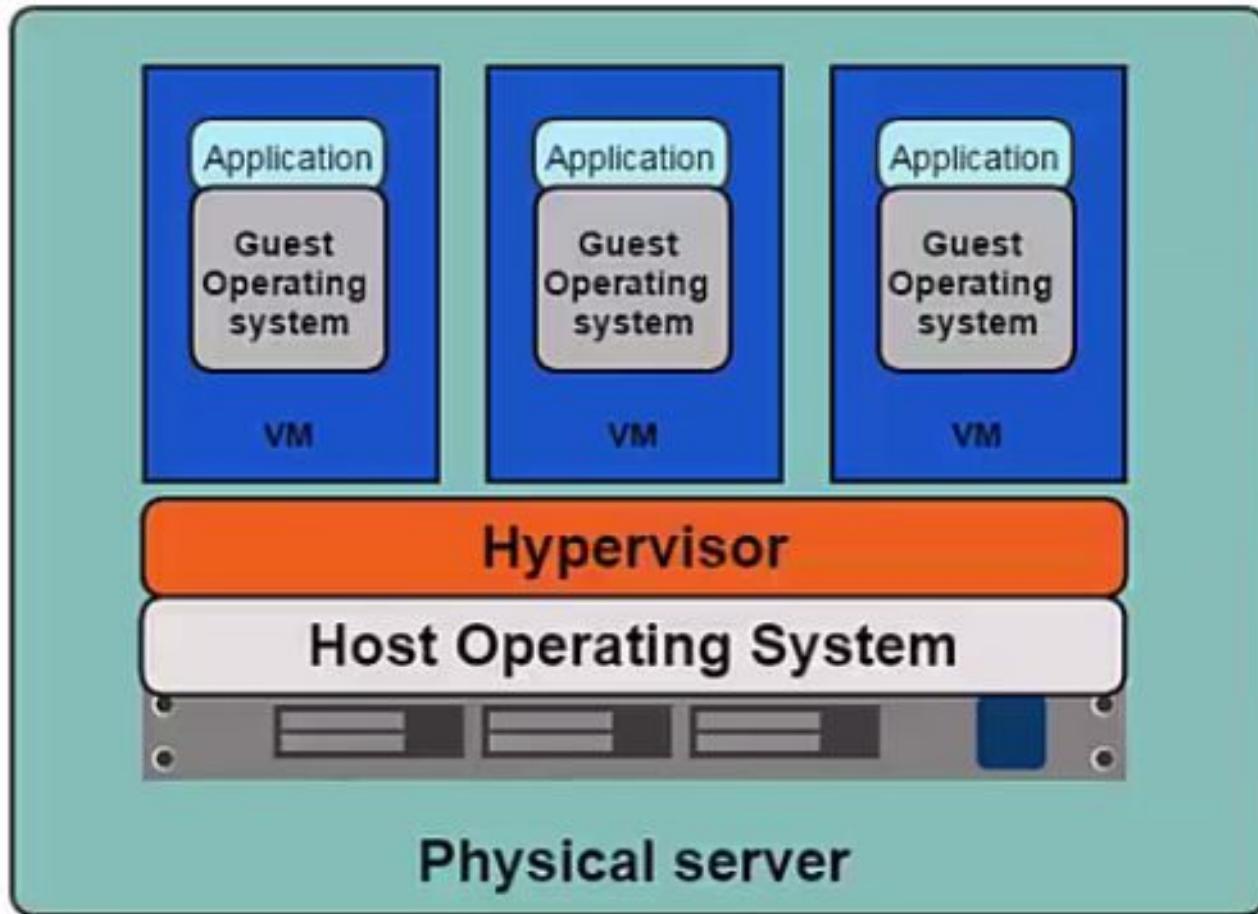
- Day 2: Application 2: Need to implement
 - Need PHP 7.0 ?
 - MariaDB 10.1.14 (Need search feature on 10.1)
- Problem ?
 - Possible to upgrade PHP to 7.0 ? / How to test existing application ?
 - What effect to MariaDB upgrade ?

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)

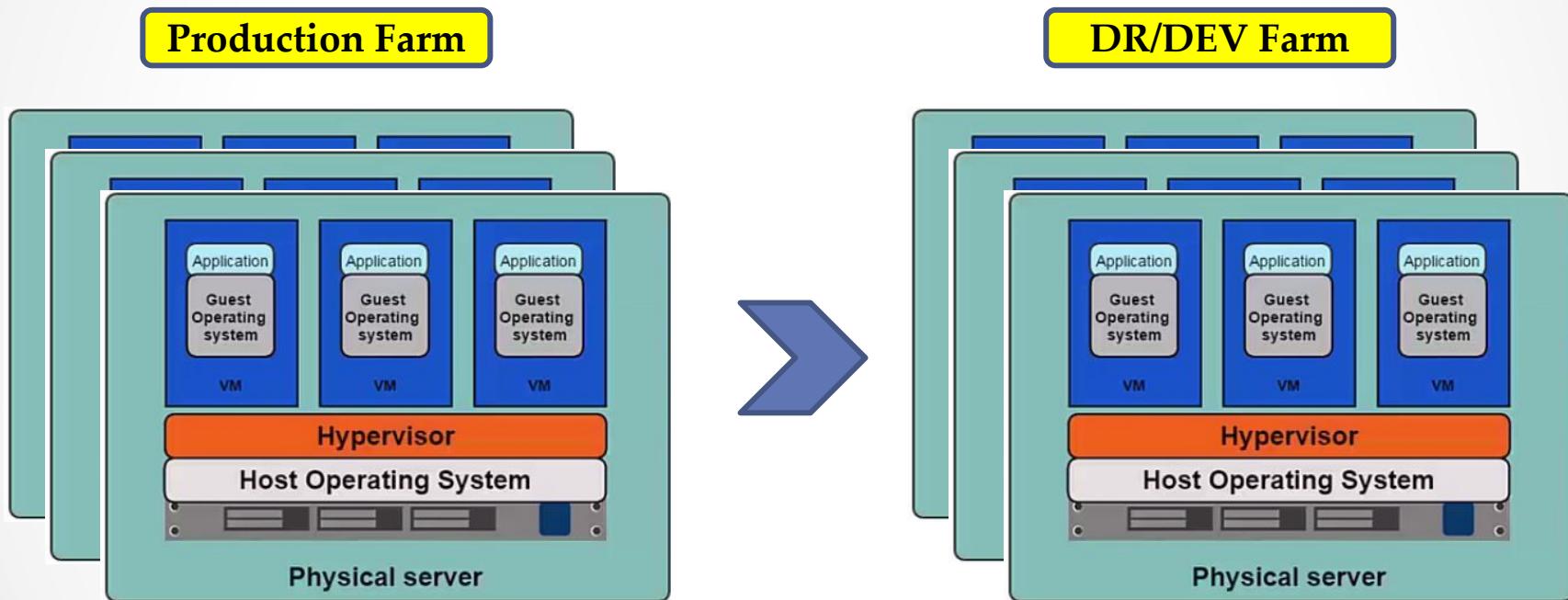


What is docker ?



Existing Technology

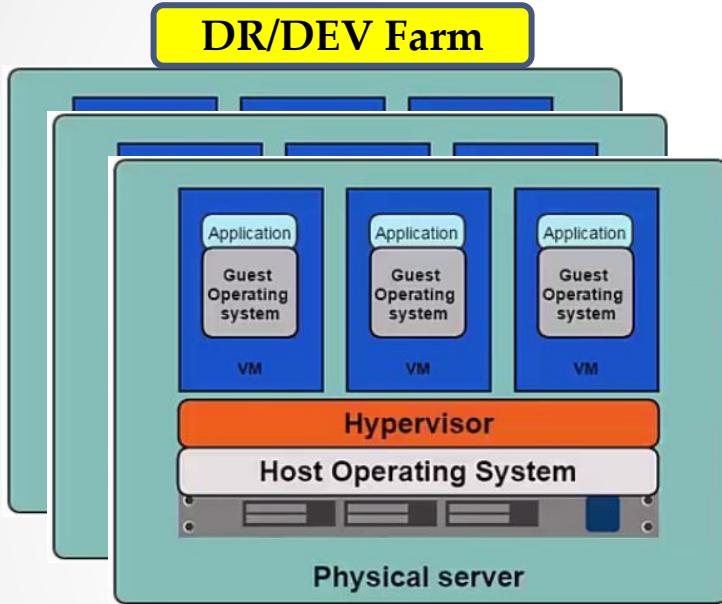
- 1 Physical server : 1 – N VMWare (&OS)
- Virtualize Hardware (CPU, Memory, Disk, Network etc)



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

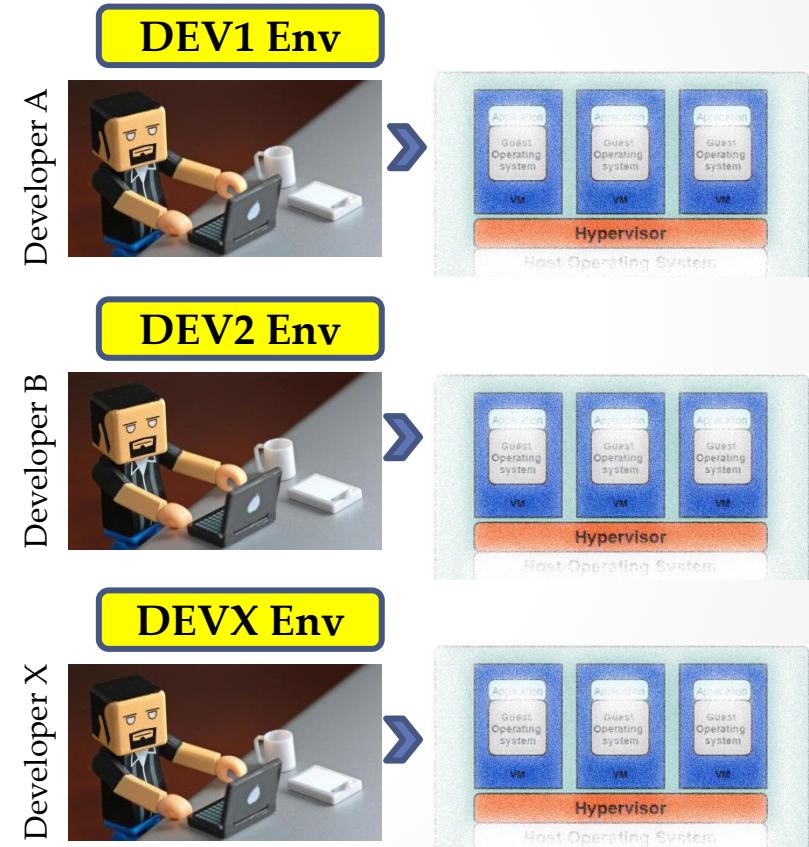
Existing Technology

- Development Environment (Clone from Production)



Virtual Machine reach limit:

- Resource insufficient (Almost from disk)
- Conflict version
- Huge of disk duplication
- Conflict & dependency still exist



Docker: The Next-Gen of Virtualization



Existing Technology

- Production Environment
- Day 1: Application 1: Implement



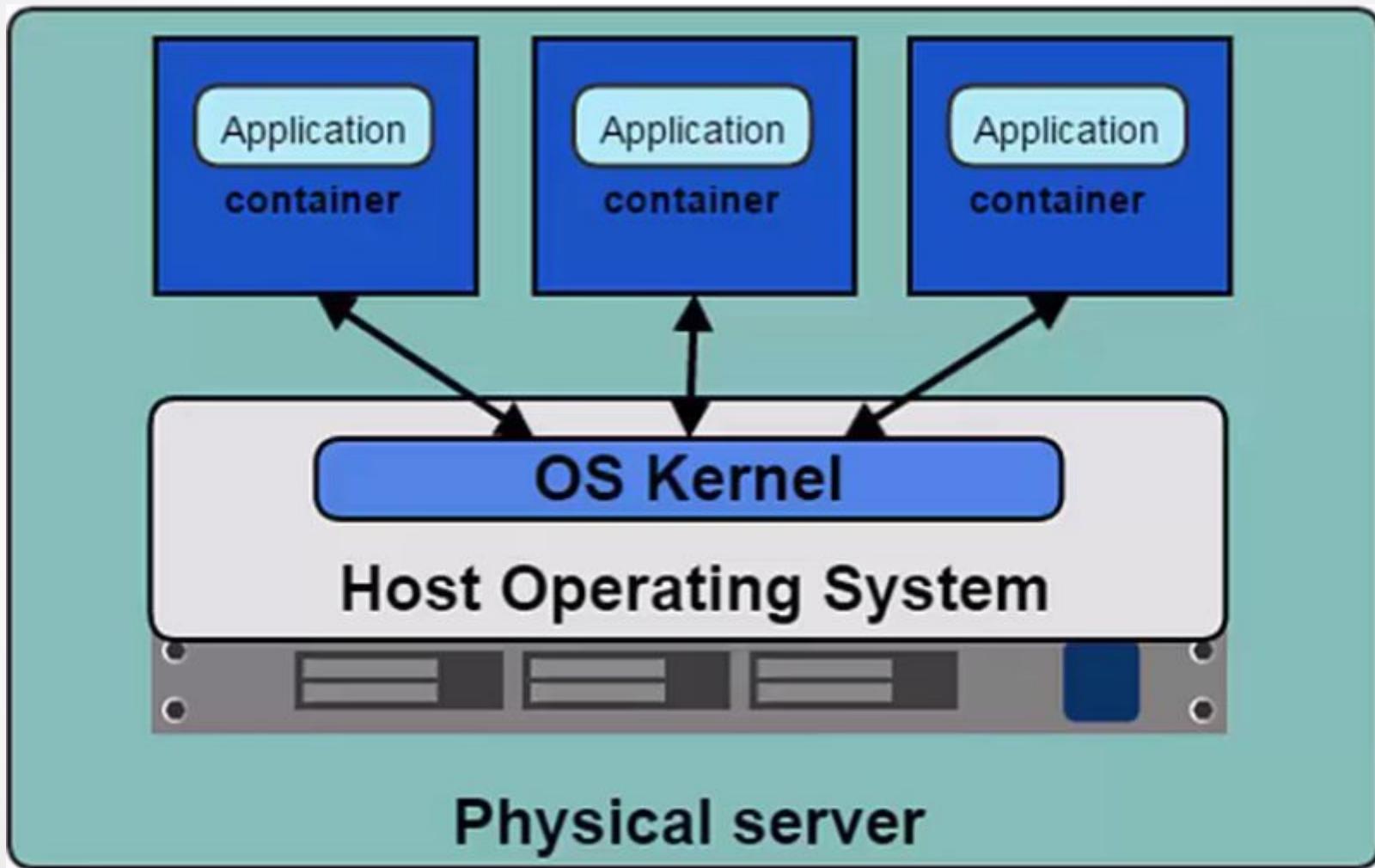
- Apache 2.20 Web Server
- PHP 5.5 Engine
- Laravel 4.1 Framework

- IIS 8
- .Net FrameWork 3.5

- MariaDB 5.1

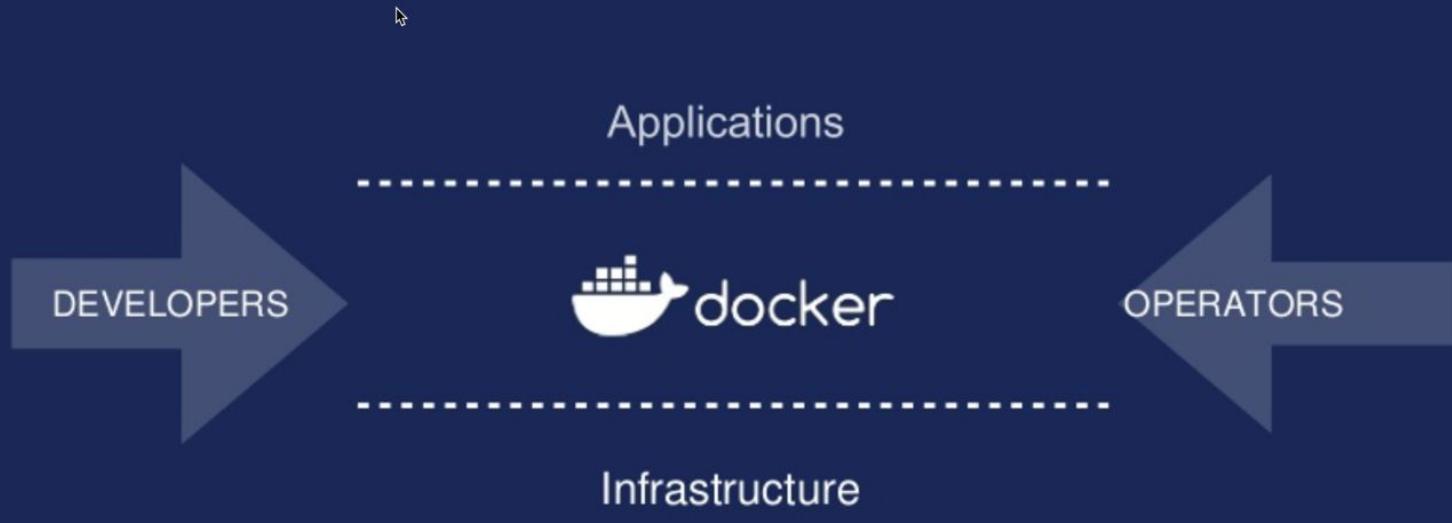
- Day 2: Application 2: Need to implement
 - Need PHP 7.0 ?
 - MariaDB 10.1.14 (Need search feature on 10.1)
- So... The problem still exist.

What is docker ?



What is docker ?

The Docker Platform in a nutshell



What is docker ?

Core Principles of the Docker Platform

INDEPENDENCE



OPENNESS



SIMPLICITY



 dockercon¹⁷ EU

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 and upper) (Official)
 - Ubuntu/ Debian (X64/ARM/ARM64)
 - CentOS (Obsolete)
 - Fedora
 - Red Hat Enterprise Linux
 - Microsoft Windows Server
 - Raspbian

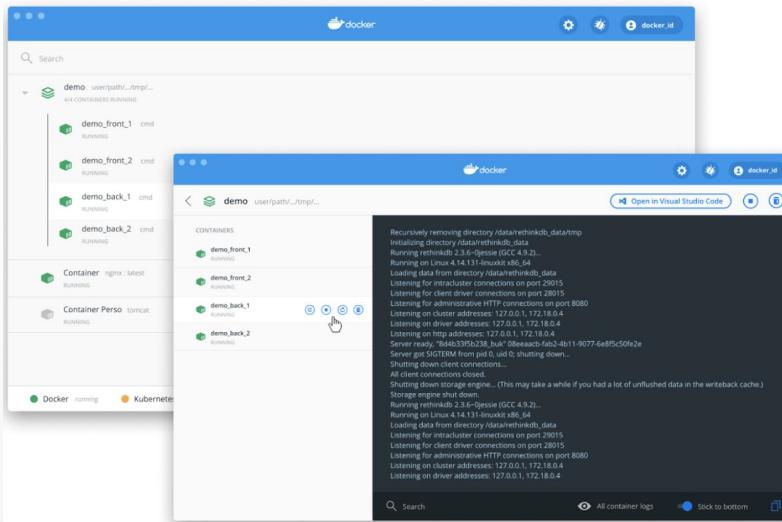
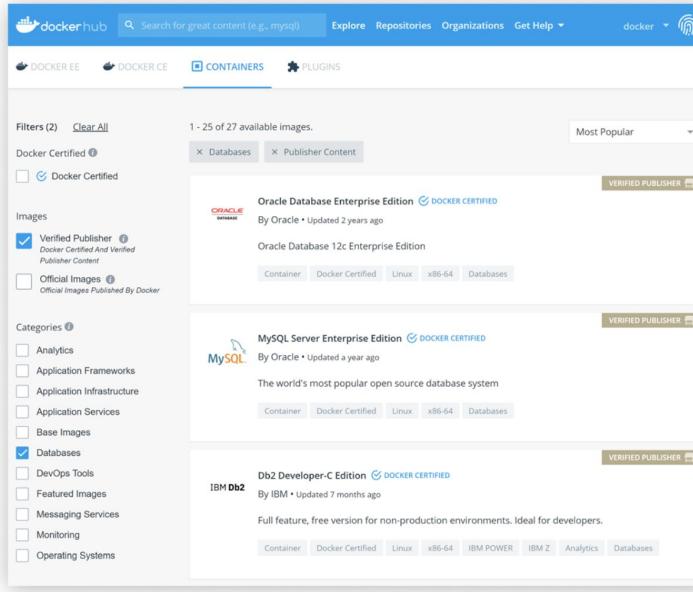
Docker's product

Docker Hub

The world's leading service for finding and sharing container images with your team and the Docker community.

For developers and those experimenting with Docker, Docker Hub is your starting point into Docker containers. Create an account and start exploring the millions of images that are available from the community and verified publishers.

[See Docker Hub](#)



Docker: The Next-Gen of Virtualization

Docker Desktop

The preferred choice for millions of developers that are building containerized apps.

Docker Desktop is an application for MacOS and Windows machines for the building and sharing of containerized applications. Access [Docker Desktop](#) and follow the [guided onboarding](#) to build your first containerized application in minutes.

[See Docker Desktop](#)

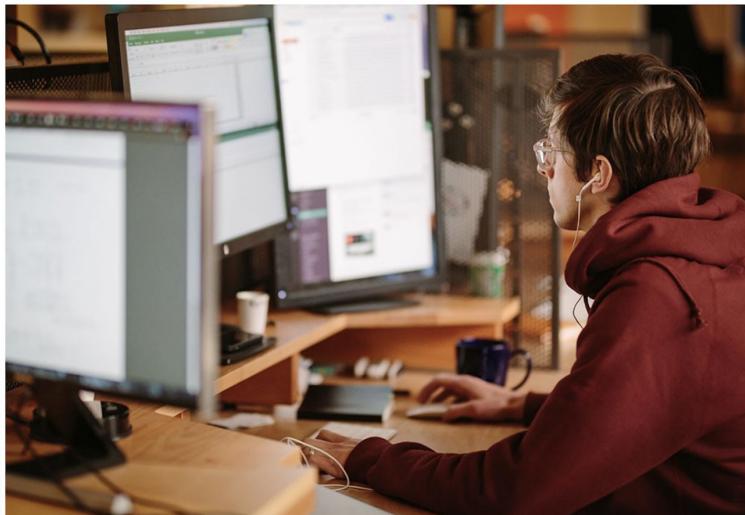
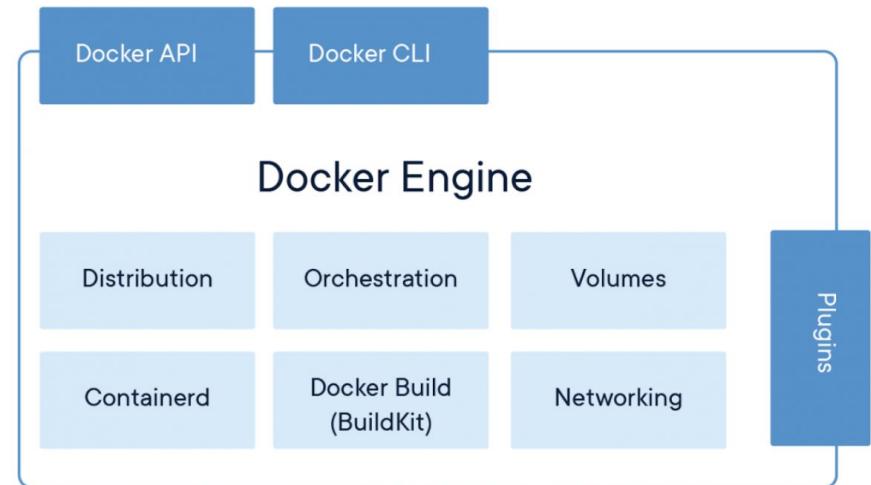


Docker's feature

Container Runtime

Docker Engine powers millions of applications worldwide, providing a standardized packaging format for diverse applications.

[See Container Runtime](#)



Developer Tools

The fastest way to securely build, test, and share cloud-ready modern applications from your desktop.

[See Developer Tools](#)

Docker: The Next-Gen of Virtualization



Docker's feature

Kubernetes

Kubernetes has become the standard orchestration platform for containers. All the major cloud providers support it, making it the logical choice for organizations looking to move more applications to the cloud.

[See Kubernetes](#)

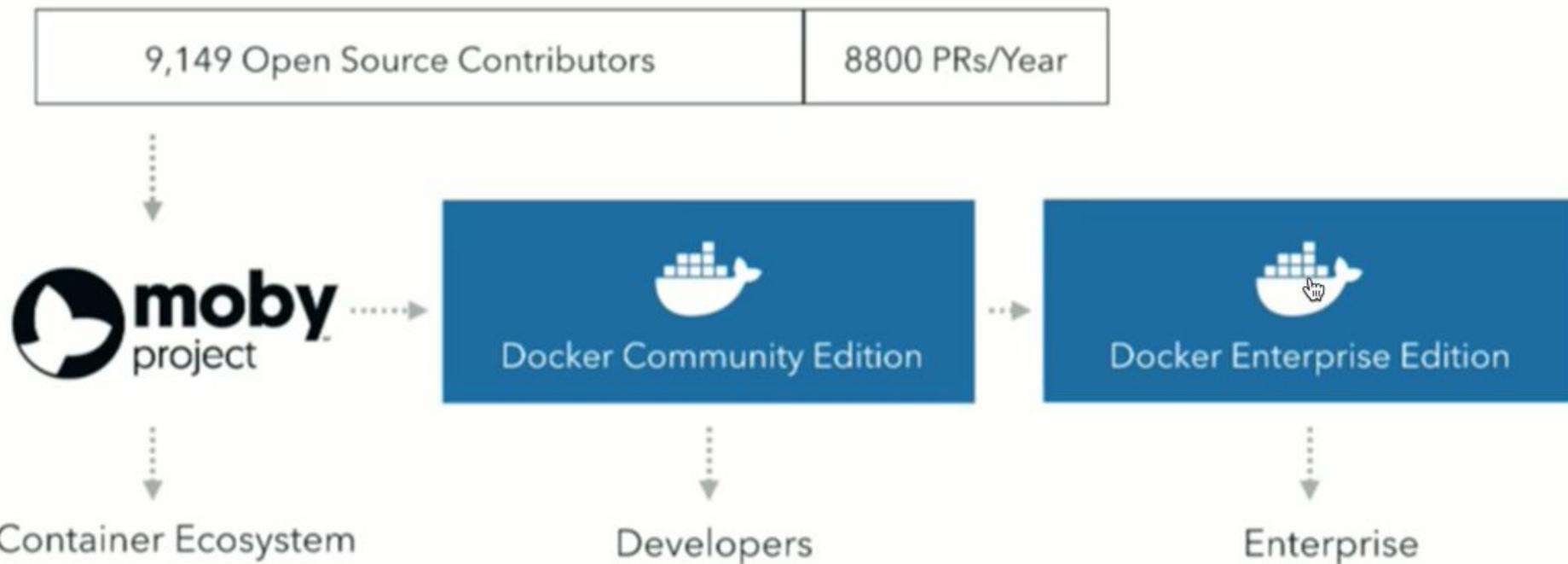


Docker: The Next-Gen of Virtualization



What is docker ?

The Docker Innovation Model



What is docker ?



Docker Enterprise Edition (EE) and Community Edition (CE)

Enterprise Edition (EE)

- CaaS enabled platform subscription (integrated container orchestration, management and security)
- Enterprise class support
- Quarterly releases, supported for one year each with backported patches and hotfixes.
- Certified Infrastructure, Plugins, Containers

Community Edition (CE)

- Free Docker platform for "do it yourself" dev and ops
- Monthly Edge release with latest features for developers
- Quarterly release with maintenance for ops

Lifecycle

Squaring the circle: Faster releases and better stability



Docker EE Availability

From Docker



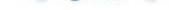
Docker Sales Team



docker store



DVAR
AUTHORIZED RESELLER



OEM: Direct L2 / L2 Support Included



Alibaba Cloud aliyun.com



Hewlett Packard Enterprise



amazon web services

CANONICAL



Microsoft Azure

cloudera



Microsoft

Windows Server 2016

Docker: The Next-Gen of Virtualization



What is docker ?

About Docker CE

Estimated reading time: 7 minutes

Docker Community Edition (CE) is ideal for developers and small teams looking to get started with Docker and experimenting with container-based apps. Docker CE has three types of update channels, **stable**, **test**, and **nightly**:

- **Stable** gives you latest releases for general availability.
- **Test** gives pre-releases that are ready for testing before general availability.
- **Nightly** gives you latest builds of work in progress for the next major release.

For more information about Docker CE, see [Docker Community Edition](#).

Releases

For the Docker CE engine, the open repositories [Docker Engine](#) and [Docker Client](#) apply.

Releases of Docker Engine and Docker Client for general availability are versioned using dotted triples. The components of this triple are `YY.mm.<patch>` where the `YY.mm` component is referred to as the year-month release. The version numbering format is chosen to illustrate cadence and does not guarantee SemVer, but the desired date for general availability. The version number may have additional information, such as beta and release candidate qualifications. Such releases are considered “pre-releases”.

The cadence of the year-month releases is every 6 months starting with the `18.09` release. The patch releases for a year-month release take place as needed to address bug fixes during its support cycle.

Docker CE binaries for a release are available on [download.docker.com](#) as packages for the supported operating systems. Docker EE binaries are available on the [Docker Hub](#) for the supported operating systems. The release channels are available for each of the year-month releases and allow users to “pin” on a year-month release of choice. The release channel also receives patch releases when they become available.

Ref: <http://dockerdocs.gclearning.cn/install/>

Docker: The Next-Gen of Virtualization



What is docker ?

- o DOCKER CE

Desktop			
Platform	x86_64 / amd64	ARM	ARM64 / AARCH64
Docker Desktop for Mac (macOS)	✓		
Docker Desktop for Windows	✓		
Server			
Docker provides <code>.deb</code> and <code>.rpm</code> packages from the following Linux distributions and architectures:			
Platform	x86_64 / amd64	ARM	ARM64 / AARCH64
CentOS	✓		✓
Debian	✓	✓	✓
Fedora	✓		✓
Raspbian		✓	✓
Ubuntu	✓	✓	✓

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



A circular portrait of Solomon Hykes, a man with dark hair and a beard, wearing a black t-shirt. The portrait is set against a white background and has a gold-colored circular border.

Solomon Hykes

CTO and Founder

 dockercon¹⁷ EU

Docker: The Next-Gen of Virtualization

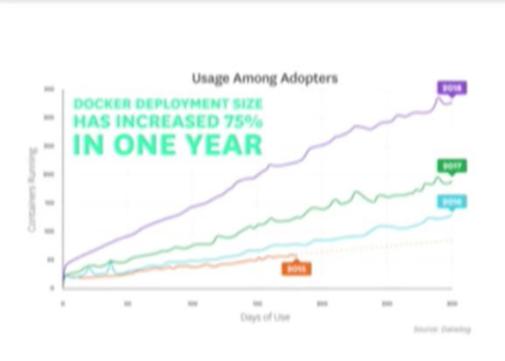


Growth of Docker

By 2020, more than

50%

of global organizations will
be running containers in production



Container adoption and workload increasing



Cloud Strategy Survey

80%

say Docker is part
of cloud strategy

60%

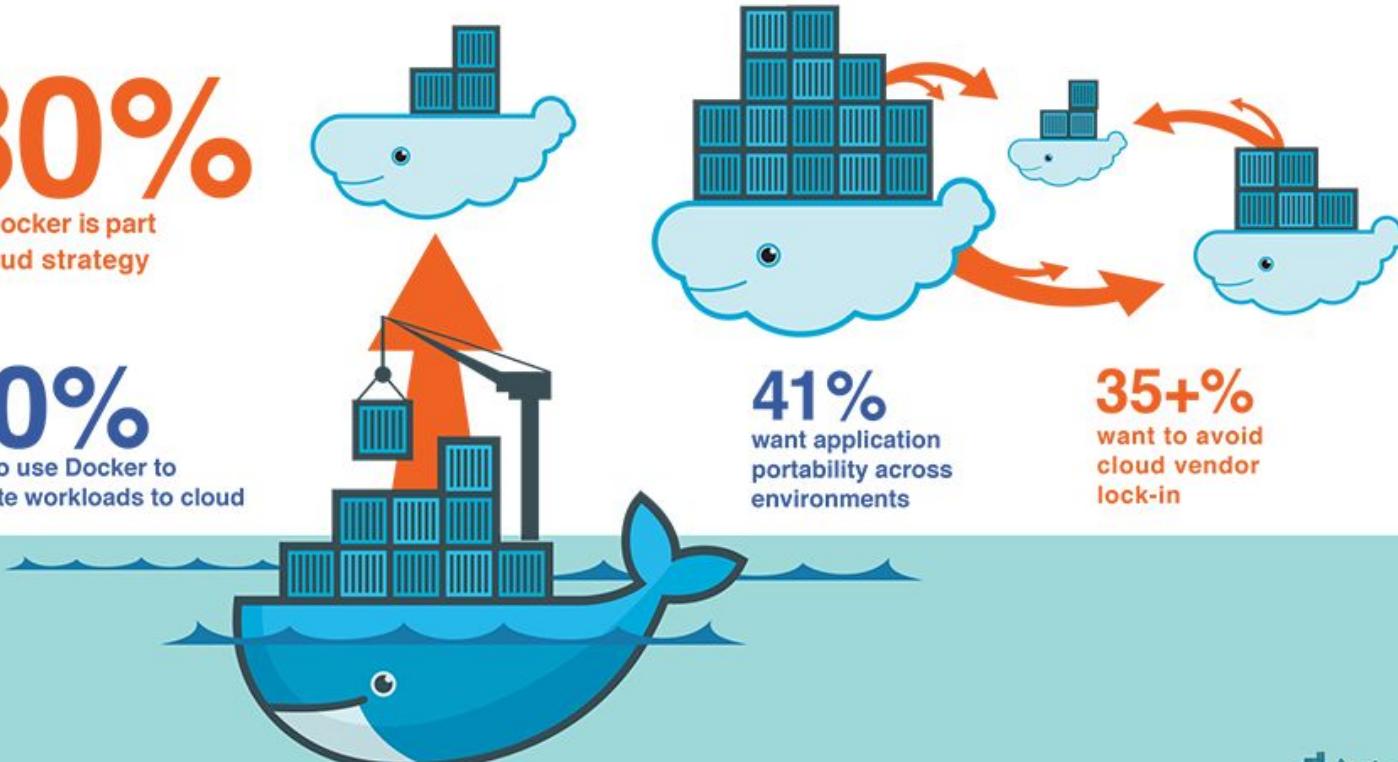
plan to use Docker to
migrate workloads to cloud

41%

want application
portability across
environments

35+%

want to avoid
cloud vendor
lock-in



Docker in Thailand

- ...Who not use container tech ?

Docker: The Next-Gen of Virtualization



Who use docker now ?

VISA

Supporting Global
Growth in
e-Commerce with
Microservices

100M e-commerce transactions
processed on Black Friday

10x increase in scalability with
containers



Who use docker now ?

Docker Innovation Awards



Creating Exceptional Experiences



Culture Transformation



Digital Transformation



Global Impact



CIO of the Year



Operating at Scale



Docker: The Next-Gen of Virtualization



Who use docker now ?

PAYPAL USES DOCKER TO CONTAINERIZE EXISTING APPS, SAVE MONEY AND BOOST SECURITY



Who use docker now ?



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

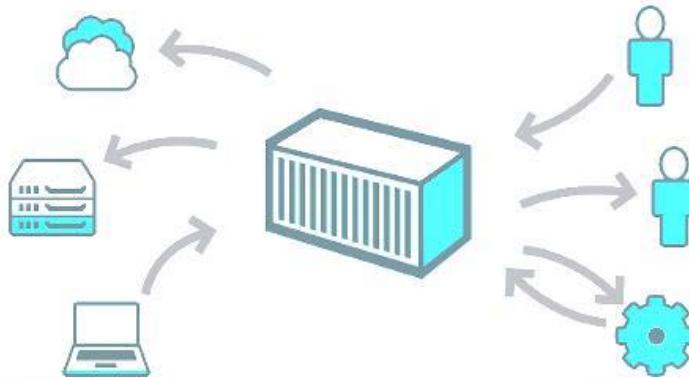
700+ apps

18 months

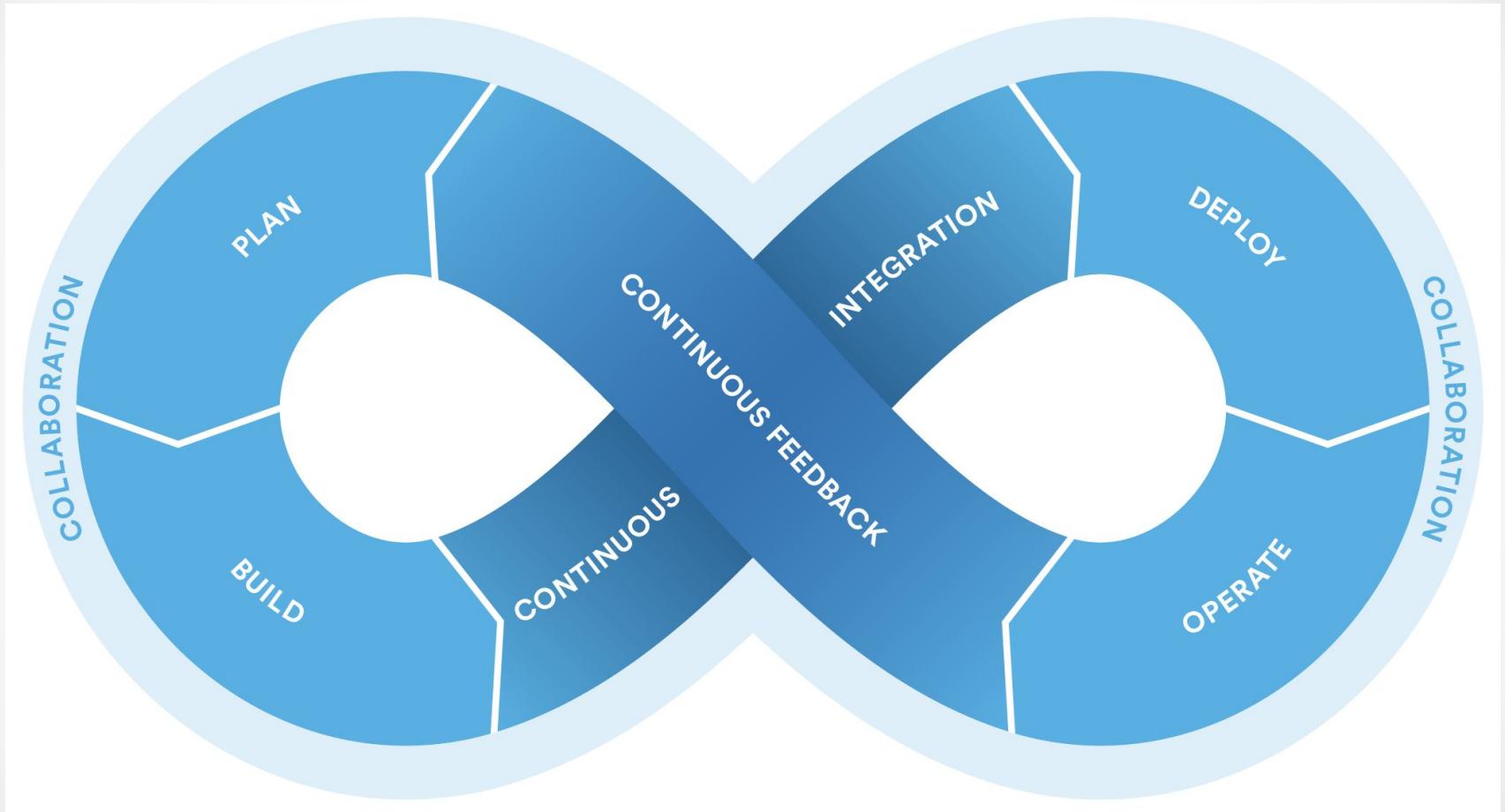
0 code changes

Container Life Cycle

- Developer
 - สร้าง template สำหรับโปรแกรม (build)
 - เริ่มรัน template สำหรับพัฒนาโปรแกรม (run)
 - พัฒนาเซอร์วิสเรียบเรียง สั่ง save version เพื่อเตรียมนำขึ้นใช้งาน (commit)
- Operation
 - เริ่มรัน template ที่ได้รับจาก developer (run) บนเครื่อง production
 - หยุดการให้บริการโปรแกรม (stop, kill)
 - ลบโปรแกรมออกจากเครื่อง production (rm, rmi)



Container Life Cycle



What Cool of Docker ?

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

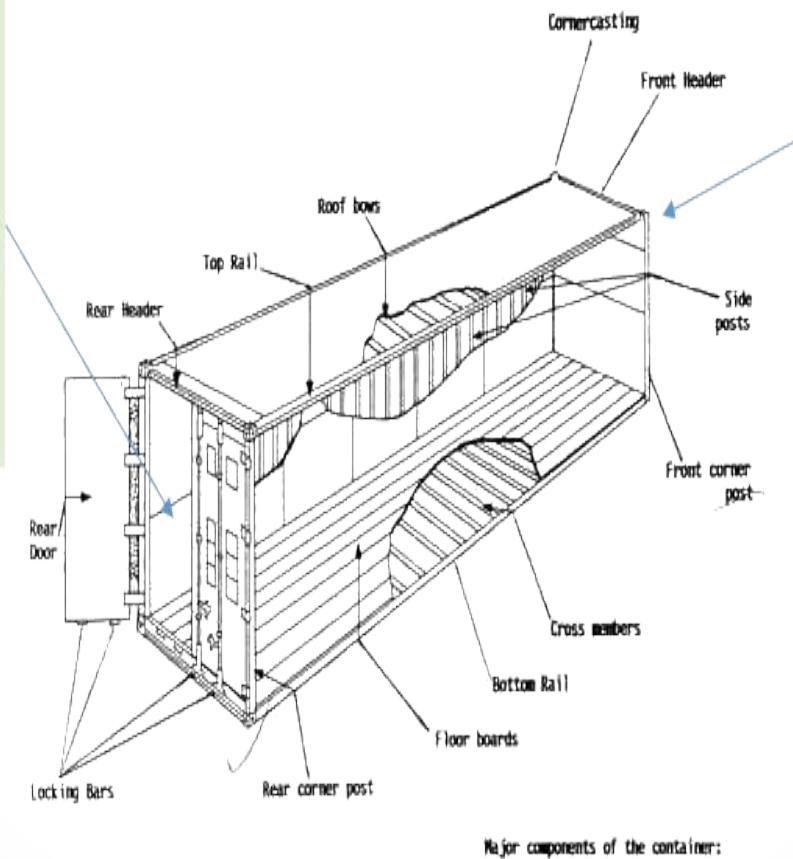
Separate of Concern

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

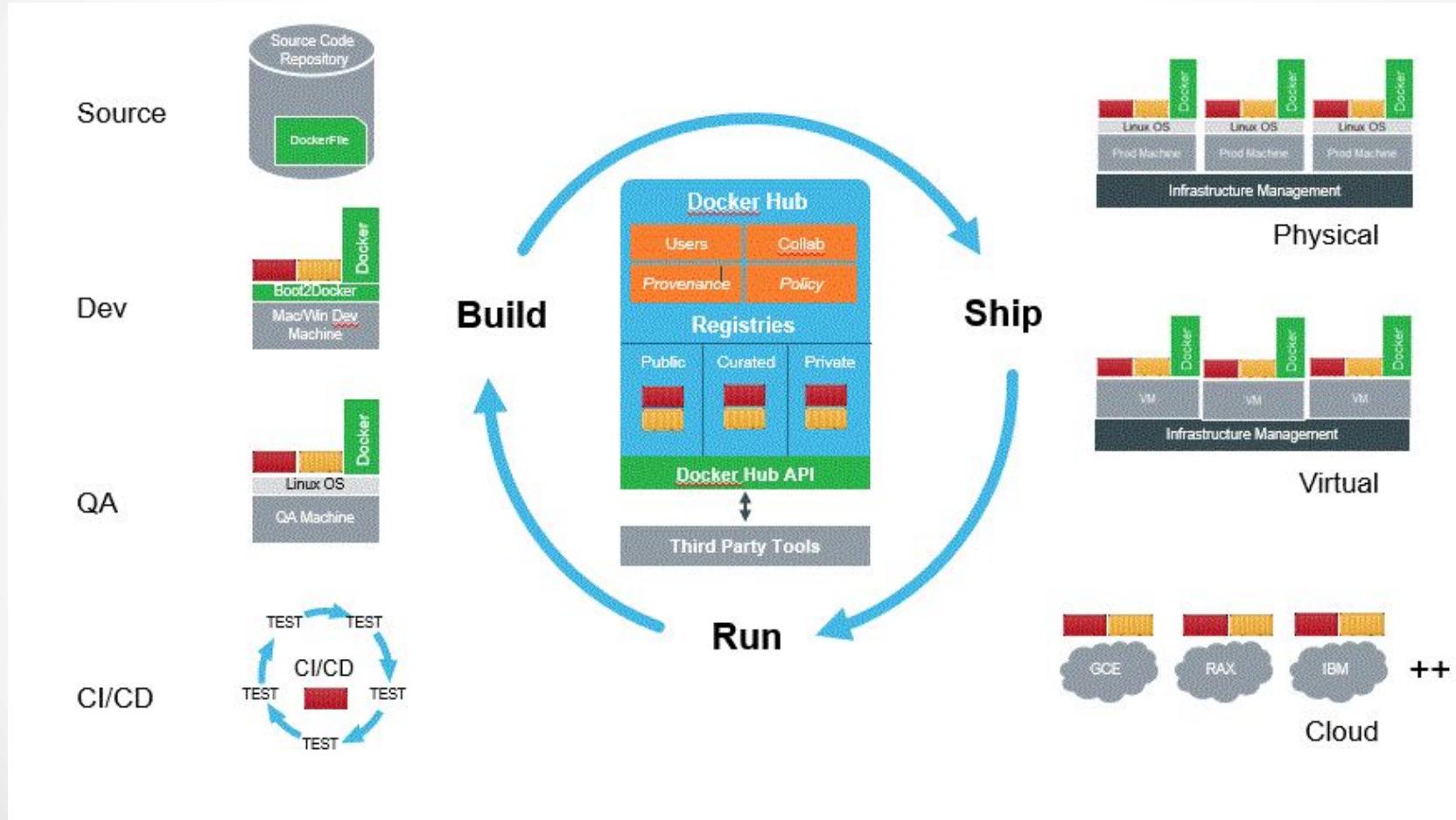
Oscar the Ops Guy

- 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



Docker Info

```
[ubuntu@ip-10-0-1-90:~$ docker version
Client: Docker Engine - Community
Version:           20.10.8
API version:      1.41
Go version:       go1.16.6
Git commit:       3967b7d
Built:            Fri Jul 30 19:54:27 2021
OS/Arch:          linux/amd64
Context:          default
Experimental:    true

Server: Docker Engine - Community
Engine:
Version:           20.10.8
API version:      1.41 (minimum version 1.12)
Go version:       go1.16.6
Git commit:       75249d8
Built:            Fri Jul 30 19:52:33 2021
OS/Arch:          linux/amd64
Experimental:    false
containerd:
Version:           1.4.9
GitCommit:        e25210fe30a0a703442421b0f60afac609f950a3
runc:
Version:           1.0.1
GitCommit:        v1.0.1-0-g4144b63
docker-init:
Version:           0.19.0
GitCommit:        de40ad0
ubuntu@ip-10-0-1-90:~$ ]
```

```
[ubuntu@ip-10-0-1-90:~$ docker info
Client:
  Context:    default
  Debug Mode: false
  Plugins:
    app: Docker App (Docker Inc., v0.9.1-beta3)
    buildx: Build with BuildKit (Docker Inc., v0.6.1-docker)
    scan: Docker Scan (Docker Inc., v0.8.0)

Server:
  Containers: 0
  Running: 0
  Paused: 0
  Stopped: 0
  Images: 12
  Server Version: 20.10.8
  Storage Driver: overlay2
    Backing Filesystem: extfs
    Supports d_type: true
    Native Overlay Diff: true
    userxattr: false
    Logging Driver: json-file
    Cgroup Driver: systemd
    Cgroup Version: 1
    Plugins:
      Volume: local
      Network: bridge host ipvlan macvlan null overlay
      Log: awslogs fluentd gcplogs gelf journalctl json-file local logentries splunk syslog
  Swarm: inactive
  Runtimes: io.containerd.runc.v2 io.containerd.runtime.v1.linux runc
  Default Runtime: runc
  Init Binary: docker-init
  containerd version: e25210fe30a0a703442421b0f60afac609f950a3
  runc version: v1.0.1-0-g4144b63
  init version: de40ad0
  Security Options:
    apparmor
    seccomp
      Profile: default
  Kernel Version: 5.4.0-1045-aws
  Operating System: Ubuntu 20.04.2 LTS
  OSType: linux
  Architecture: x86_64
  CPUs: 2
  Total Memory: 1.91GiB
  Name: ip-10-0-1-90
  ID: 32LG:5TFQ:TTIC:Y7NA:QY5J:XQCB:L4XE:224H:FK5L:KLK4:NGBG:H5DQ
  Docker Root Dir: /var/lib/docker
  Debug Mode: false
  Username: labdocker
  Registry: https://index.docker.io/v1/
  Labels:
  Experimental: false
  Insecure Registries:
    127.0.0.0/8
  Live Restore Enabled: false

  WARNING: No swap limit support
ubuntu@ip-10-0-1-90:~$ ]
```

Docker Version

Docker Engine release notes

This document describes the latest changes, additions, known issues, and fixes for Docker Engine.

Note: The client and container runtime are now in separate packages from the daemon in Docker Engine 18.09. Users should install and update all three packages at the same time to get the latest patch releases. For example, on Ubuntu:

```
sudo apt install docker-ce docker-ce-cli containerd.io . See the install instructions for the corresponding linux distro for details.
```

Version 20.10

20.10.8

2021-08-03

! IMPORTANT

Due to [net/http changes in Go 1.16](#), HTTP proxies configured through the `$HTTP_PROXY` environment variable are no longer used for TLS (`https://`) connections. Make sure you also set an `$HTTPS_PROXY` environment variable for handling requests to `https://` URLs.

Refer to the [HTTP/HTTPS proxy](#) section to learn how to configure the Docker Daemon to use a proxy server.

Deprecation

- Deprecate support for encrypted TLS private keys. Legacy PEM encryption as specified in RFC 1423 is insecure by design. Because it does not authenticate the ciphertext, it is vulnerable to padding oracle attacks that can let an attacker recover the plaintext. Support for encrypted TLS private keys is now marked as deprecated, and will be removed in an upcoming release. [docker/cli#3219](#)
- Deprecate Kubernetes stack support. Following the deprecation of Compose on Kubernetes, support for Kubernetes in the `stack` and `context` commands in the Docker CLI is now marked as deprecated, and will be removed in an upcoming release [docker/cli#3174](#).

Docker API Version

Engine API version history

Estimated reading time: 36 minutes

v1.41 API changes ↗

Docker Engine API v1.41 documentation

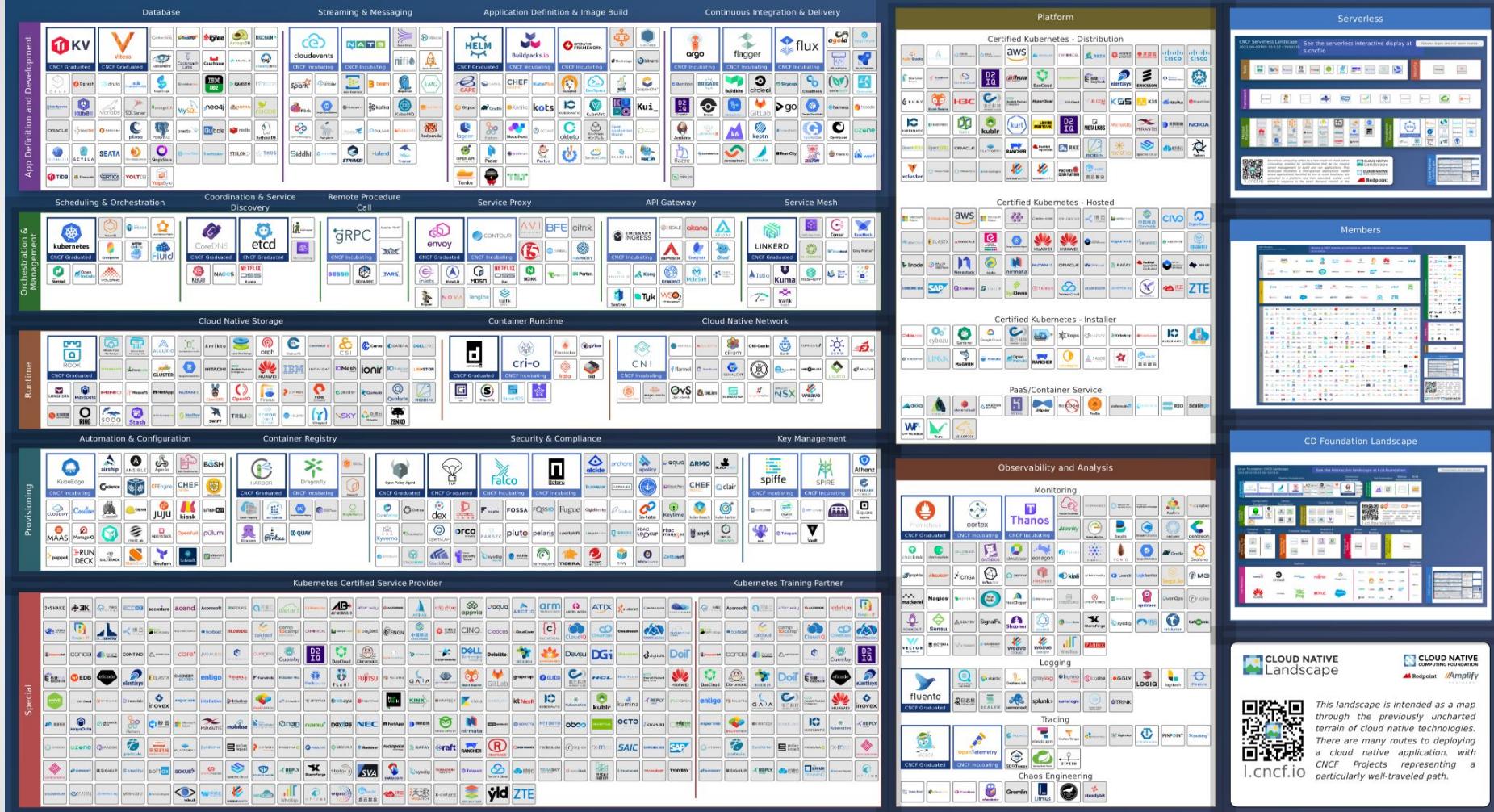
- `GET /events` now returns `prune` events after pruning resources have completed. Prune events are returned for `container`, `network`, `volume`, `image`, and `builder`, and have a `reclaimed` attribute, indicating the amount of space reclaimed (in bytes).
- `GET /info` now returns a `CgroupVersion` field, containing the cgroup version.
- `GET /info` now returns a `DefaultAddressPools` field, containing a list of custom default address pools for local networks, which can be specified in the `daemon.json` file or `--default-address-pool` dockerd option.
- `POST /services/create` and `POST /services/{id}/update` now supports `BindOptions.NonRecursive`.
- The `ClusterStore` and `ClusterAdvertise` fields in `GET /info` are deprecated and are now omitted if they contain an empty value. This change is not versioned, and affects all API versions if the daemon has this patch.
- The `filter` (singular) query parameter, which was deprecated in favor of the `filters` option in Docker 1.13, has now been removed from the `GET /images/json` endpoint. The parameter remains available when using API version 1.40 or below.
- `GET /services` now returns `CappAdd` and `CapDrop` as part of the `ContainerSpec`.
- `GET /services/{id}` now returns `CapAdd` and `CapDrop` as part of the `ContainerSpec`.
- `POST /services/create` now accepts `CapAdd` and `CapDrop` as part of the `ContainerSpec`.
- `POST /services/{id}/update` now accepts `CapAdd` and `CapDrop` as part of the `ContainerSpec`.
- `GET /tasks` now returns `CapAdd` and `CapDrop` as part of the `ContainerSpec`.
- `GET /tasks/{id}` now returns `CapAdd` and `CapDrop` as part of the `ContainerSpec`.
- `GET /services` now returns `Pids` in `TaskTemplate.Resources.Limits`.
- `GET /services/{id}` now returns `Pids` in `TaskTemplate.Resources.Limits`.
- `POST /services/create` now accepts `Pids` in `TaskTemplate.Resources.Limits`.
- `POST /services/{id}/update` now accepts `Pids` in `TaskTemplate.Resources.Limits` to limit the maximum number of PIDs.
- `GET /tasks` now returns `Pids` in `TaskTemplate.Resources.Limits`.

Cloud Native Computing Foundation

CNCF Cloud Native Landscape
2021-09-03T05:35:12Z c765d135

Overwhelmed? Please see the CNCF Trail Map. That and the interactive landscape are at l.cncf.io

Greyed logos are not open source



Kubernetes: Production Workload Orchestration



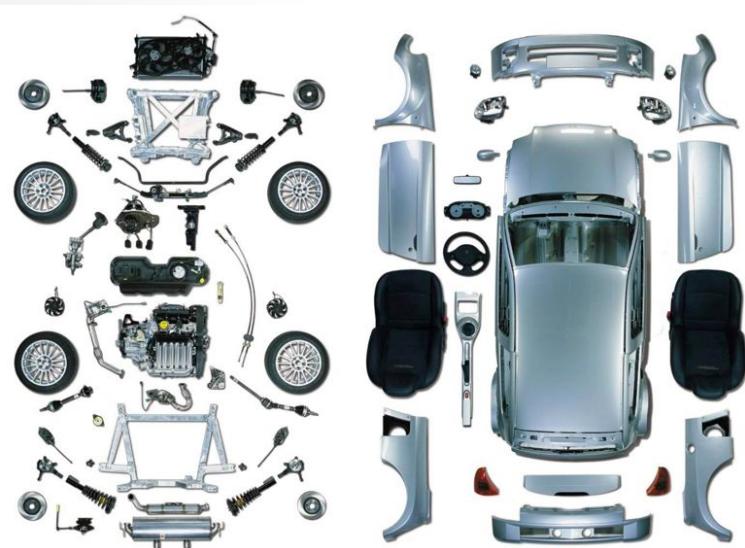
What's New

Secure <https://mobyproject.org>

NMac Ked - Mac O... Medium Jenkins vagrant Mesos Vue docker NGINX Taiwan Kubernetes PWA_Progressive_...

Moby Project

An open framework to assemble specialized container systems without reinventing the wheel.



Moby project

Orchestration
Image Management
Secret Management
Configuration Management
Networking
Provisioning
Your Component here

Component Library

Assemblies

Moby Tools

Docker: The Next-Gen of Virtualization



What's New

Docker is Updating and Extending Our Product Subscriptions



SCOTT JOHNSTON

Aug 31 2021



Docker is used by millions of developers to build, share, and run any app, anywhere, and 55% of professional developers use Docker every day at work. In these work environments, the increase in outside attacks on software supply chains is accelerating developer demand for Docker's trusted content, including Docker Official Images and Docker Verified Publisher images. Finally, the rapid global growth in developers – to an estimated 45 million by 2030 – pushes us to scale sustainably so we may continue to provide an innovative, free Docker experience that developers love.

To meet these challenges, today we're announcing updates and extensions to our product subscriptions: **Personal, Pro, Team, and Business**. These updated product subscriptions provide the productivity and collaboration developers rely on with the scale, security, and trusted content businesses require, and do so in a manner sustainable for Docker.

What you need to know:

- We're introducing a **new** product subscription, Docker Business, for organizations using Docker at scale for application development and require features like secure software supply chain management, single sign-on (SSO), container registry access controls, and more.
- Our [Docker Subscription Service Agreement](#) includes a change to the terms for **Docker Desktop**:
 - Docker Desktop **remains free** for small businesses (fewer than 250 employees AND less than \$10 million in annual revenue), personal use, education, and non-commercial open source projects.
 - It requires a paid subscription (**Pro, Team** or **Business**), starting at \$5 per user per month, for professional use in larger businesses. You may directly purchase [here](#), or share this post and our [solution brief](#) with your manager.
 - While the effective date of these terms is August 31, 2021, there is a grace period until January 31, 2022 for those that require a paid subscription to use Docker Desktop.
- Docker Pro, Docker Team, and Docker Business subscriptions **include** commercial use of Docker Desktop.
- The **existing** Docker Free subscription has been renamed Docker Personal.
 - **No changes** to Docker Engine or any upstream open source Docker or Moby project.
- Check out our [FAQ](#) or [more information](#).

Personal	Pro	Team	Business
\$0 Ideal for individual developers, education, open source communities, and small businesses. <small>Includes Docker Desktop</small>	\$5 /month Ideal for individual developers. <small>Includes Docker Desktop</small>	\$7 /user/month minimum 5 seats <small>Includes Docker Desktop</small>	\$21 /user/month 50+ <small>Includes Docker Desktop</small>



Docker Machine

• • •

Platform of Docker

- Docker Toolbox (Obsolete) 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 Personal, Pro, Team Business)
 - 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 and upper
 - Docker for Ubuntu,Debian
 - Docker for CentOS
 - Docker for Red Hat Enterprise
 - Docker for Fedora

Linux vs Windows vs MAC OS

Not Secure | boot2docker.io

Apps NMak Ked - Mac ... Medium Infra NOVA jenkins vagrant Mesos Vue docker NGINX Taiwan Kubernetes

State of boot2docker

The `boot2docker` CLI tool is *long*-since officially deprecated in favor of [Docker Machine](#).

On the other hand, the `boot2docker` distribution (as in, `boot2docker.iso`) is in "maintenance mode". See <https://github.com/boot2docker/boot2docker> for more details.

It is **highly** recommended that users transition from Boot2Docker over to [Docker for Mac](#) or [Docker for Windows](#) instead.

 docker docs Search the docs Guides Product manuals Glossary Reference Samples

Docker Enterprise Edition

Docker Cloud

Docker Compose

Docker for Mac

Docker for Windows

Docker ID accounts

Docker Machine

- Machine overview
- Install Machine

Get started with Docker Machine and a local VM

Estimated reading time: 13 minutes

Let's take a look at using `docker-machine` to create, use and manage a Docker host inside of a local virtual machine.

Prerequisite Information

With the advent of [Docker for Mac](#) and [Docker for Windows](#) as replacements for [Docker Toolbox](#), we recommend that you use these for your primary Docker workflows. You can use these applications to run Docker natively on your local system without using Docker Machine at all. (See [Docker for Mac vs. Docker Toolbox](#) for an explanation on the Mac side.)

For now, however, if you want to create *multiple* local machines, you still need Docker Machine to create and manage machines for multi-node experimentation. Both Docker for Mac and Docker for Windows include the newest version of Docker Machine, so when you install either of these, you get `docker-machine`.

Docker: The Next-Gen of Virtualization



Docker-machine CLI

- ตรวจสอบสถานะ docker-machine

```
docker-machine ls
```

- สั่งเริ่มการทำงานของ docker-machine

```
docker-machine start <machine name>
```

- สั่งหยุดการทำงานของ docker-machine

```
docker-machine stop <machine name>
```

- สั่งสร้าง docker-machine เครื่องใหม่

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

Workshop 1-2: Pull Image

ทำการ download image ubuntu ลงมาที่เครื่อง boot2docker โดยใช้คำสั่งดังนี้

```
docker image pull labdocker/alpine:3.13.6
```

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

```
docker image pull labdocker/cadvisor:0.40.0
```

Compare with Ubuntu image

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

```
[ubuntu@ip-10-0-1-90:~$ docker image ls
REPOSITORY          TAG      IMAGE ID   CREATED        SIZE
labdocker/alpineweb latest   75f4bf61fa65  51 minutes ago  62.1MB
labdocker/alpine    3.13.6   12adea71a33b  2 days ago   5.61MB
labdocker/ubuntu    latest   fb52e22af1b0  3 days ago   72.8MB
labdocker/cadvisor  0.40.0   1ed215a61956  8 weeks ago   86.9MB
ubuntu@ip-10-0-1-90:~$
```

Workshop 1-2: Pull Image

ทำการตรวจสอบประวัติของ image ที่ใช้งานผ่านคำสั่ง docker image history

```
docker image history labdocker/alpine:3.13.6
```

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

```
ubuntu@ip-10-0-1-90:~$ docker image history labdocker/alpine:3.13.6
IMAGE          CREATED      CREATED BY
12adea71a33b  2 days ago   /bin/sh -c #(nop)  CMD ["/bin/sh"]
<missing>      2 days ago   /bin/sh -c #(nop) ADD file:ecdfb91a737d6c292...
ubuntu@ip-10-0-1-90:~$ docker image history labdocker/alpineweb:latest
IMAGE          CREATED      CREATED BY
75f4bf61fa65  53 minutes ago /bin/sh -c #(nop)  EXPOSE 3000
<missing>      53 minutes ago /bin/sh -c #(nop)  HEALTHCHECK &{["CMD-SHELL..."]
<missing>      53 minutes ago /bin/sh -c #(nop)  ENTRYPOINT ["node" "hello..."]
<missing>      53 minutes ago /bin/sh -c #(nop) WORKDIR /nodejs
<missing>      53 minutes ago /bin/sh -c #(nop) COPY file:7a1f27eb22f7a835...
<missing>      53 minutes ago /bin/sh -c mkdir /nodejs
<missing>      53 minutes ago /bin/sh -c apk update && apk add nodejs ...
<missing>      2 hours ago   /bin/sh -c #(nop)  ENV NODE_VERSION=v14.15.4...
<missing>      2 hours ago   /bin/sh -c #(nop)  LABEL Description=NodeJS/...
<missing>      2 hours ago   /bin/sh -c #(nop)  LABEL maintainer=Praparn ...
<missing>      2 days ago    /bin/sh -c #(nop)  CMD ["/bin/sh"]
<missing>      2 days ago    /bin/sh -c #(nop) ADD file:ecdfb91a737d6c292...
ubuntu@ip-10-0-1-90:~$
```

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 builder	Manage builds
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 context	Manage contexts
docker cp	Copy files/folders between a container and the local filesystem
docker create	Create a new container
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

<https://docs.docker.com/engine/reference/commandline/docker/>
Docker: The Next-Gen of Virtualization



General Command in Docker

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 manifest	Manage Docker image manifests and manifest lists
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

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

Docker: The Next-Gen of Virtualization



General Command in Docker

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
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
docker unpause	Unpause all processes within one or more containers

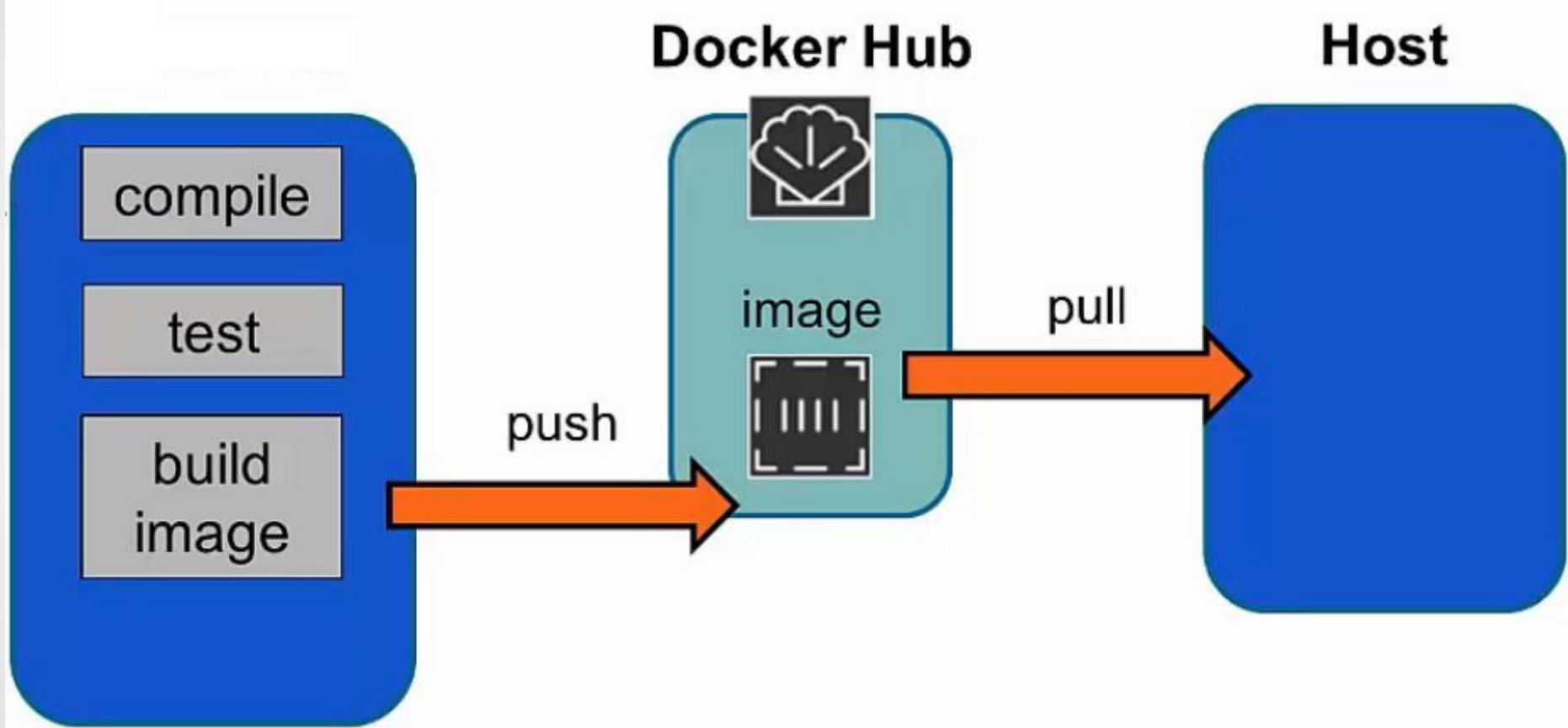
General Command in Docker

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

Image, Repository and Container

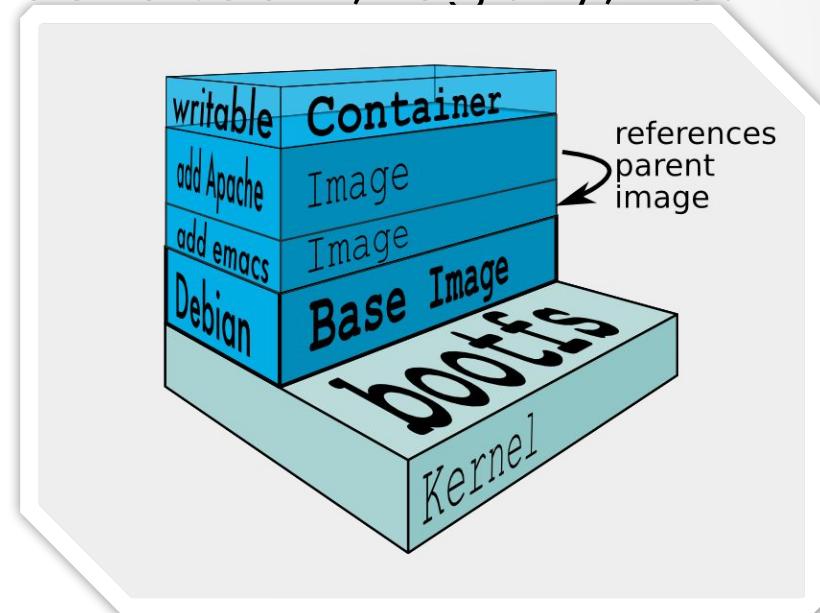
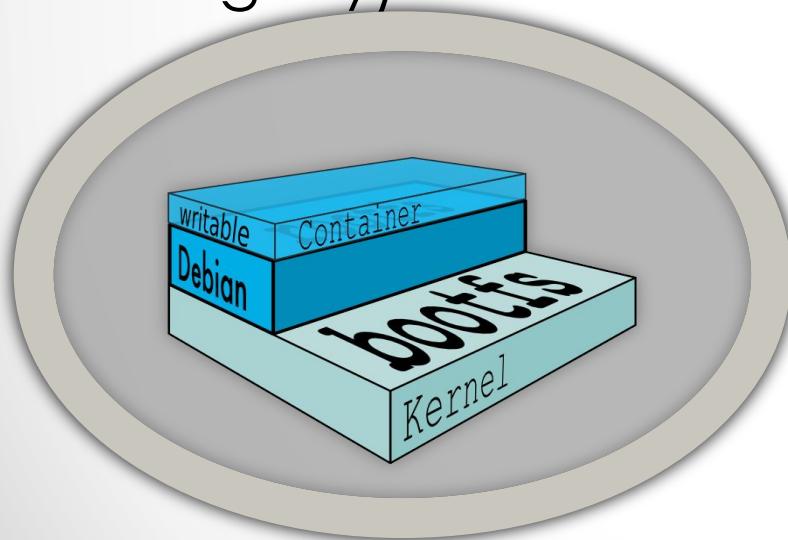
• • •

Docker Deployment



Docker Image

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



Docker Image

- เรียกดู image ที่อยู่ภายในเครื่อง

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

```
[ubuntu@ip-10-0-1-90:~$ docker image ls
REPOSITORY          TAG      IMAGE ID   CREATED    SIZE
labdocker/linenotify  bot_v2   7f073d0abe25  8 minutes ago  86.4MB
labdocker/alpineweb   latest   75f4bf61fa65  54 minutes ago  62.1MB
labdocker/alpine       3.13.6   12adea71a33b  2 days ago   5.61MB
labdocker/mariadb     10.5.12  b7b798989225  3 days ago   407MB
labdocker/ubuntu       latest   fb52e22af1b0   3 days ago   72.8MB
labdocker/cadvisor    0.40.0   1ed215a61956  8 weeks ago  86.9MB
labdocker/cluster      webservicelite 837c8f41c918  4 years ago  82.6MB
labdocker/alpinepython 2.7-onbuild 0f4df961b16b   4 years ago  475MB
ubuntu@ip-10-0-1-90:~$ ]
```

- tag image ใหม่เพื่อให้ตรงตามความต้องการในการใช้งาน

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

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

Docker Image

- ตรวจสอบรายละเอียดของ image

```
docker images history <image id/image name>
```

```
ubuntu@ip-10-0-1-90:~$ docker image history labdocke/alpine:3.13.6
IMAGE      CREATED      CREATED BY
12adea71a33b  2 days ago  /bin/sh -c #(nop)  CMD ["/bin/sh"]
<missing>  2 days ago  /bin/sh -c #(nop) ADD file:ecdfb91a737d6c292...
[ubuntu@ip-10-0-1-90:~$      docker image history labdocke/alpineweb:latest
IMAGE      CREATED      CREATED BY
75f4bf61fa65  53 minutes ago  /bin/sh -c #(nop)  EXPOSE 3000
<missing>  53 minutes ago  /bin/sh -c #(nop)  HEALTHCHECK &{["CMD-SHELL..."]
<missing>  53 minutes ago  /bin/sh -c #(nop)  ENTRYPOINT ["node" "hello...
<missing>  53 minutes ago  /bin/sh -c #(nop)  WORKDIR /nodejs
<missing>  53 minutes ago  /bin/sh -c #(nop) COPY file:7a1f27eb22f7a835...
<missing>  53 minutes ago  /bin/sh -c mkdir /nodejs
<missing>  53 minutes ago  /bin/sh -c apk update && apk add nodejs ...
<missing>  2 hours ago   /bin/sh -c #(nop)  ENV NODE_VERSION=v14.15.4...
<missing>  2 hours ago   /bin/sh -c #(nop)  LABEL Description=NodeJS...
<missing>  2 hours ago   /bin/sh -c #(nop)  LABEL maintainer=Praparn ...
<missing>  2 days ago    /bin/sh -c #(nop)  CMD ["/bin/sh"]
<missing>  2 days ago    /bin/sh -c #(nop) ADD file:ecdfb91a737d6c292...
ubuntu@ip-10-0-1-90:~$
```

Repository (Registry)

- component ในการจัดเก็บ docker (image) ต่างๆรวมไปที่ศูนย์กลางเพื่อให้ docker engine บนเครื่องต่างๆมาเรียก image ไปใช้งาน
- รองรับการเก็บ version ของ image อย่างเป็นระบบ
- สามารถให้ข้อมูลหรือคุณมีอะไรแน่นำการใช้งานกับผู้ 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)

All legacy individual and organizational repository plans expire on their January 2021 billing cycle date. [Read the FAQ](#)

 Search for great content (e.g., mysql) Explore Pricing Sign In Sign Up

Build and Ship any Application Anywhere

Docker Hub is the world's easiest way to create, manage, and deliver your teams' container applications.

Get Started Today for Free
Already have an account? [Sign In](#)

Docker ID
 Email
 Password 
 Send me occasional product updates and announcements.



Sign Up

By creating an account, you agree to the [Terms of Service](#), [Privacy Policy](#), and [Data Processing Terms](#).

Docker Hub is the world's largest library and community for container images

Browse over 100,000 container images from software vendors, open-source projects, and the community.

Official Images



Docker: The Next-Gen of Virtualization



Repository (Registry)

[Why Docker?](#)[Products](#)[Developers](#)[Pricing](#)[Company](#) [Sign In](#)[Get Started](#)

Understanding Docker Hub Rate Limiting

Learn More

On November 20, 2020, rate limits anonymous and free authenticated use of Docker Hub went into effect. Anonymous and Free Docker Hub users are limited to 100 and 200 container image pull requests per six hours.

If you are affected by these changes you will receive this error message:

ERROR: too many requests: Too Many Requests.

OR

You have reached your pull rate limit. You may increase the limit by authenticating and upgrading: <https://www.docker.com/increase-rate-limits>.

To increase your pull rate limits you can upgrade your account to a [Docker Pro or Team subscription](#).

The rate limits of 100 container image requests per six hours for anonymous usage, and 200 container image requests per six hours for free Docker accounts are now in effect. Image requests exceeding these limits will be denied until the six hour window elapses.

NOTE: Docker Pro and Docker Team accounts continue to have unlimited access to pull container images from Docker Hub.

Docker: The Next-Gen of Virtualization

Related Resources

- [Rate Limiting Documentation](#)
- [Resource Consumption Update FAQ](#)
- [Blog post on Resource Consumption and Image Retention Policy Updates](#)
- [Docker Subscription Pricing Page](#)
- [Pricing FAQ](#)
- [Guidance for Setting Up a Mirror](#)
- [Understanding Inner Loop Development and Pull Rates](#)
- [Docker Partner Information Request for Rate Limiting Exclusions](#)



Repository (Registry)

 **google/cadvisor** ☆

By [google](#) • Updated 12 hours ago

Analyzes resource usage and performance characteristics of running containers.

Container

[Overview](#) [Tags](#)



cAdvisor

cAdvisor (Container Advisor) provides container users an understanding of the resource usage and performance characteristics of their running containers. It is a running daemon that collects, aggregates, processes, and exports information about running containers. Specifically, for each container it keeps resource isolation parameters, historical resource usage, and histograms of complete historical resource usage. This data is exported by container and machine-wide.

<https://github.com/google/cadvisor>

Official cAdvisor releases are built on Linux and exported over a scratch image, this guarantees a small image size.

Dockerfile: <https://github.com/google/cadvisor/blob/master/deploy/Dockerfile>

Each cAdvisor version is tagged. We also have 2 tags for the beta and stable track:

- **latest**: Latest stable build, this is the latest officially supported releases.
- **canary**: Images built from HEAD periodically. Potentially unstable!

We also have an Automated Build canary release of cAdvisor which is continuously built from HEAD. This can be found in the [google/cadvisor-canary](#) image. It is not recommended for production use due to its size and volatility.

Pulls: 10M+

Docker Pull Command

```
docker pull google/cadvisor
```

Owner

 [google](#)

Repository (Registry)

- download image จาก 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 xxxxxxxx -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

Repository (Registry)

- Save image ออกมาเป็น tar file สำหรับ offline machine

```
docker image save -o xxx.tar image name
```

Ex: docker image save -o test.tar labdocker/alpinelab:1.0

- Load image จาก tar file สำหรับ offline machine

```
docker image load -i xxx.tar
```

Ex: docker image load -i test.tar

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

The screenshot shows the Docker Hub interface for creating a new repository. At the top, there's a navigation bar with 'Explore', 'Repositories', 'Organizations', 'Get Help', and a user profile icon. Below the navigation, it says 'Using 0 of 1 private repositories. [Get more](#)'. The main section is titled 'Create Repository'. It has a dropdown for 'Owner' set to 'labdockerthailand' and a text input for 'Repository Name' set to 'alpineweb'. A 'Pro tip' box contains the command: 'You may push a new image to this repository using the CLI:
docker tag local-image:tagname new-repo:tagname
docker push new-repo:tagname'. Below this, there's a 'Visibility' section with two options: 'Public' (selected) and 'Private'. The 'Public' option is described as 'Public repositories appear in Docker Hub search results'. The 'Private' option is described as 'Only you can view private repositories'. Under 'Build Settings (optional)', it says 'Autobuild triggers a new build with every git push to your source code repository. [Learn More](#)'. There's a note about GitHub/Bitbucket integration: 'Please re-link a GitHub or Bitbucket account' with a note: 'We've updated how Docker Hub connects to GitHub and Bitbucket. You'll need to re-link a GitHub or Bitbucket account to create new automated builds. [Learn More](#)'. At the bottom, there are three buttons: 'Cancel', 'Create' (highlighted in blue), and 'Create & Build'.

Workshop 1-3: Build & Push Image

- ตรวจสอบ 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
```

Workshop 1-3: Build & Push Image

- ทดสอบทำการ save image ออกมายังไฟล์ .tar

```
docker image save -o ~/alpineweb.tar  
<account>/alpineweb:latest
```

- ดำเนินการลบและ load image จากไฟล์ .tar

```
docker image rm <account>/alpineweb:latest  
docker image load -i ~/alpineweb.tar
```

Other service in hub.docker.com

Access the world's largest library of container images

Official Images

nginx
mongoDB
alpine
node
redis
couchbase
ubuntu
busybox
mysql
postgres
hello-world
registry
traefik
docker
mariadb

docker hub Search for great content (e.g., mysql)

Explore Repositories Organizations Get Help labdockertthailand

ubuntu ☆
Docker Official Images
Ubuntu is a Debian-based Linux operating system based on free software.
10M+
Container Linux 386 ARM 64 ARM x86-64 IBM Z PowerPC 64 LE Base Images Operating Systems
Official Image

DESCRIPTION REVIEWS TAGS

Supported tags and respective Dockerfile links

- 18.04, bionic-20190204, bionic, latest (bionic/Dockerfile)
- 18.10, cosmic-20190131, cosmic, rolling (cosmic/Dockerfile)
- 19.04, disco-20190204, disco, devel (disco/Dockerfile)
- 14.04, trusty-20190122, trusty (trusty/Dockerfile)
- 16.04, xenial-20190122, xenial (xenial/Dockerfile)

Add Product Review
Select a product tier Start Your Review

docker hub Search for great content (e.g., mysql)

Explore Repositories Organizations Get Help labdockertthailand

Docker EE Docker CE Containers Plugins

Filters 1 - 25 of 2,039,306 available images.

Docker Certified Docker Certified

Images Oracle Database Enterprise Edition DOCKER CERTIFIED By Oracle • Updated a year ago Oracle Database 12c Enterprise Edition Container Docker Certified Linux x86-64 Databases

Verified Publisher Docker Certified And Verified Publisher Content

Official Images Official Images Published By Docker

Categories Analytics Application Frameworks Application Infrastructure Application Services Base Images Databases DevOps Tools Featured Images Messaging Services Monitoring Operating Systems Programming Languages Security Storage

Operating Systems Linux Windows

Architectures ARM ARM 64 IBM POWER x86-64

Oracle Java 8 SE (Server JRE) DOCKER CERTIFIED By Oracle • Updated 2 months ago Oracle Java 8 SE (Server JRE) Container Docker Certified Linux x86-64 Programming Languages

MySQL Server Enterprise Edition DOCKER CERTIFIED By Oracle • Updated 3 months ago The world's most popular open source database system MySQL Container Docker Certified Linux x86-64 Databases

Oracle WebLogic Server DOCKER CERTIFIED By Oracle • Updated a month ago Oracle WebLogic Server Container Docker Certified Linux x86-64 Application Frameworks Application Infrastructure

couchbase 10M+ 375 Downloads Stars Updated 22 minutes ago Couchbase Server is a NoSQL document database with a distributed architecture. Container Linux x86-64 Storage Application Frameworks

Docker: The Next-Gen of Virtualization



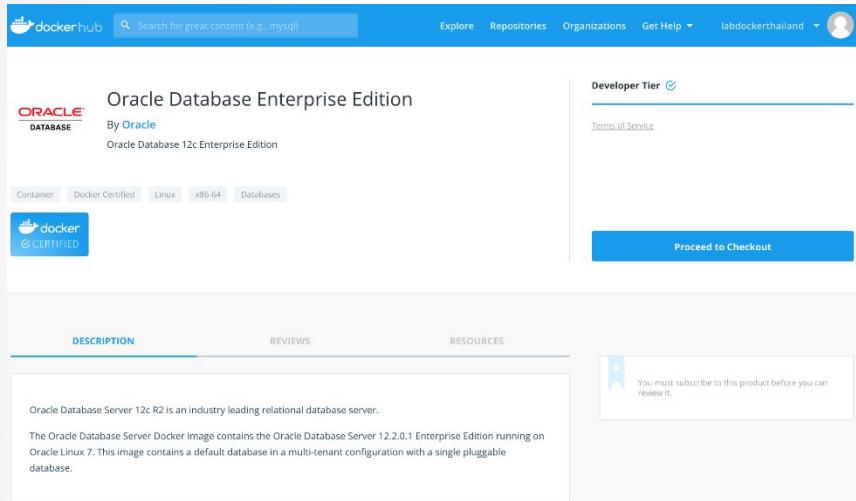
Other service in hub.docker.com



Docker Certified:
Trusted & Supported Products

- Certified Containers provide ISV apps available as containers.
- Certified Plugins for networking and volumes in containers.
- Certified Infrastructure delivers an optimized and validated Docker platform for enterprise OS and Cloud Providers.

[View Certified Images](#)



Oracle Database Enterprise Edition
By Oracle
Oracle Database 12c Enterprise Edition

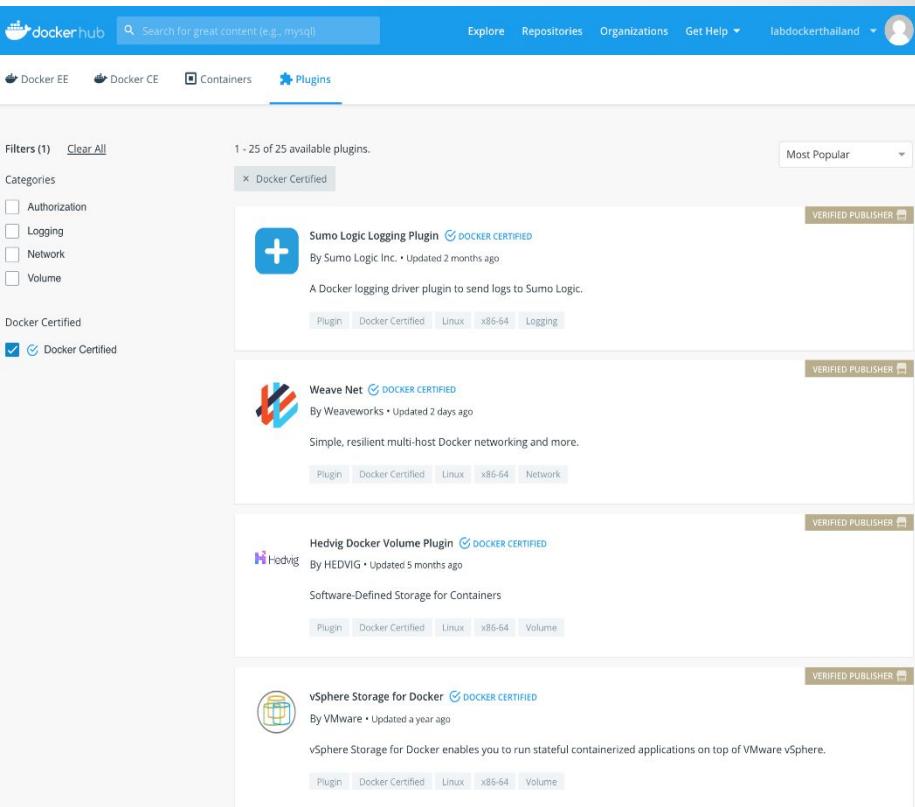
Container Docker Certified Linux x86-64 Databases

[@CERTIFIED](#)

DESCRIPTION REVIEWS RESOURCES

Oracle Database Server 12c R2 is an industry leading relational database server.
The Oracle Database Server Docker Image contains the Oracle Database Server 12.2.0.1 Enterprise Edition running on Oracle Linux 7. This image contains a default database in a multi-tenant configuration with a single pluggable database.

You must subscribe to this product before you can review it.



dockerhub Search for great content (e.g., mysql)

Explore Repositories Organizations Get Help labdockertailand

Docker EE Docker CE Containers Plugins

Filters (1) Clear All

Categories

- Authorization
- Logging
- Network
- Volume

Docker Certified

Docker Certified

1 - 25 of 25 available plugins.

Sumo Logic Logging Plugin DOCKER CERTIFIED
By Sumo Logic Inc. • Updated 2 months ago

A Docker logging driver plugin to send logs to Sumo Logic.

Plugin Docker Certified Linux x86-64 Logging

Weave Net DOCKER CERTIFIED
By Weaveworks • Updated 2 days ago

Simple, resilient multi-host Docker networking and more.

Plugin Docker Certified Linux x86-64 Network

Hedvig Docker Volume Plugin DOCKER CERTIFIED
By HEDVIG • Updated 5 months ago

Software-Defined Storage for Containers

Plugin Docker Certified Linux x86-64 Volume

vSphere Storage for Docker DOCKER CERTIFIED
By VMware • Updated a year ago

vSphere Storage for Docker enables you to run stateful containerized applications on top of VMware vSphere.

Plugin Docker Certified Linux x86-64 Volume

Docker: The Next-Gen of Virtualization



Other service in hub.docker.com

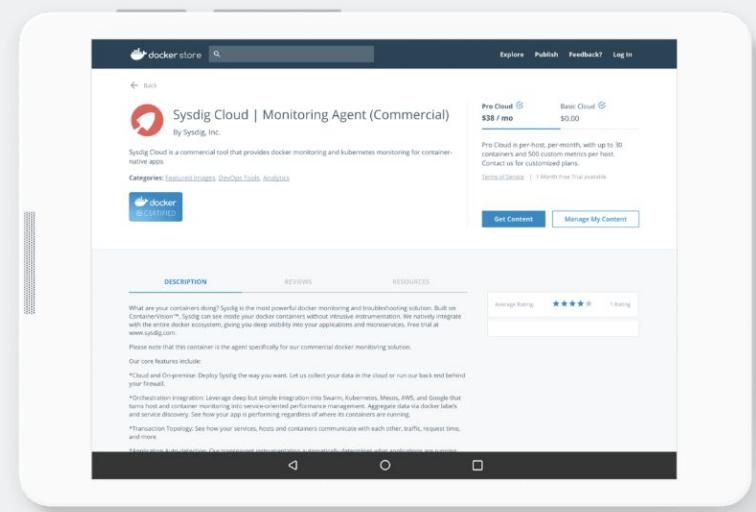
PUBLISHER PROGRAM

Deliver your business through Docker Hub

Package and publish apps and plugins as containers in Docker Hub for easy download and deployment by millions of Docker users worldwide.

[Apply To Publish](#)

[Learn More](#)



 **Sysdig Monitor (Commercial)**
By [Sysdig, Inc.](#)

Sysdig Monitor is a commercial tool that provides docker monitoring and kubernetes monitoring for container-native apps.

Container Docker Certified Linux x86-64 Featured Images DevOps Tools Analytics Monitoring



Pro Cloud \$38 / mo Basic Cloud \$25 / mo

Pro Cloud is per-host, per-month, with up to 30 containers and 500 custom metrics per host. Contact us for customized plans.

[Terms of Service](#) | 1 Month Free Trial Available

[Proceed to Checkout](#)

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](#).

You must subscribe to this product before you can review it.

 **gitlab** [Explore](#) [Repositories](#) [Organizations](#) [Get Help](#) labdockertiland 

Product Overview

 **GitLab Enterprise Edition**
By [GitLab, Inc.](#)

Copy and paste to pull this image

`docker pull store/gitlab/gitlab-ee`

Bring Your Own License Details
All EE features can be seen here: <https://about.gitlab.com/products/#compare-options>

SETUP INSTRUCTIONS

<https://docs.gitlab.com/omnibus/docker/README.html>

Docker: The Next-Gen of Virtualization



Status.docker.com



Docker system status real-time view

[SUBSCRIBE](#)

All Systems Operational

Updated a few seconds ago

Docker Package Repositories

Operational

Docker Hub Web [i](#)

Operational

Docker Hub Registry [i](#)

Operational

Docker Hub Automated Builds

Operational

Docker.com Web [i](#)

Operational

Docker Docs [i](#)

Operational

Docker Community Forums [i](#)

Operational

Docker Support Site

Operational

Metrics

[Today](#) [Week](#) [Month](#)

DOCKER HUB API RESPONSE TIME

505.16MS



<https://status.docker.com/>

Metrics

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%

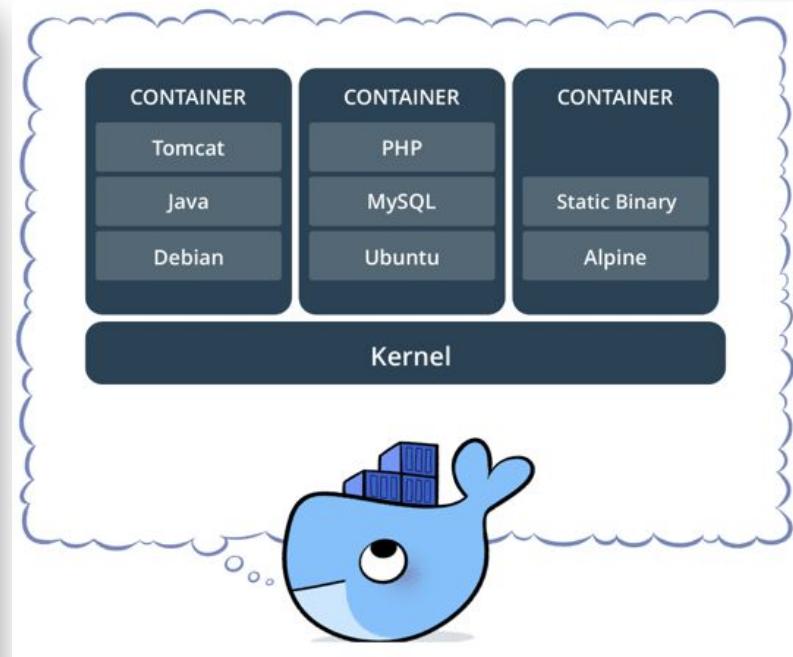
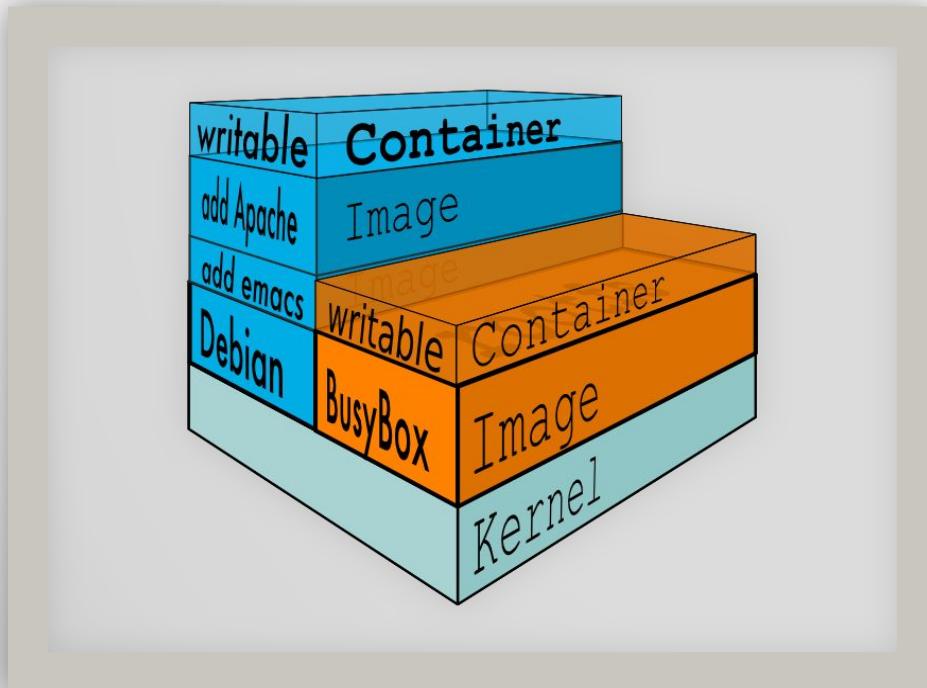


Docker: The Next-Gen of Virtualization



Docker Container

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



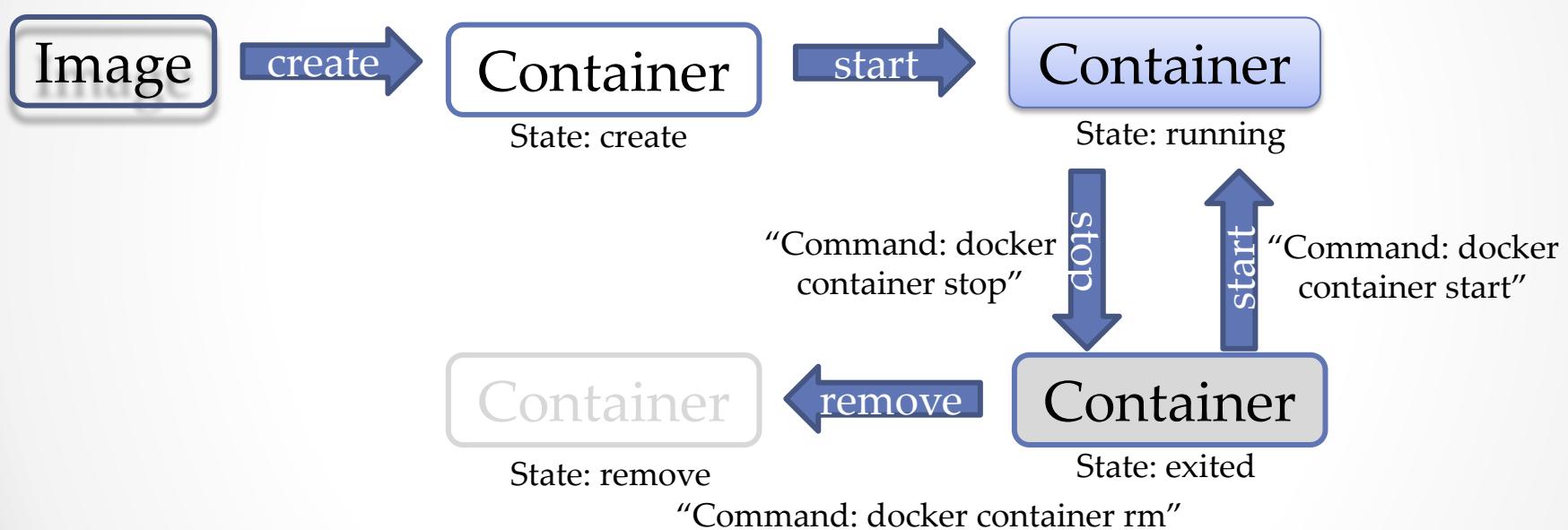
Docker Container

- Container State:

“Command: docker container run (create + run)”

“Command: docker container create”

“Command: docker container start”



Docker Container

- Container Different (Compare with Image):

```
docker container diff <container name>
```

```
[ubuntu@ip-10-0-1-90:~$ docker container diff nodejs
C /nodejs
A /nodejs/test.js
C /root
A /root/.ash_history
[ubuntu@ip-10-0-1-90:~$ docker container ls
CONTAINER ID   IMAGE          COMMAND           CREATED          STATUS          PORTS          NAMES
4b04b8ba10e0   labdocker/alpineweb:latest "node hello.js"   48 seconds ago   Up 47 seconds (healthy)   0.0.0.0:3000->3000/tcp, :::3000->3000/tcp   nodejs
ubuntu@ip-10-0-1-90:~$ ]
```

Image

difference →

Container

Docker Container

- Container Performance/Port:

```
docker container stats <container name>
```

```
docker container top <container name>
```

```
docker container port <container name>
```

CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
115bb4a5b92b	nodejs	0.00%	8.375MiB / 1.91GiB	0.43%	5.9kB / 2.3kB	36.9kB / 0B	6
UID	PID	PPID	C	STIME	TTY	TIME	CMD
root	3069	3043	0	14:15	pts/0	00:00:00	node
hello.js							
ubuntu@ip-10-0-1-58:~\$	docker container top nodejs						
ubuntu@ip-10-0-1-58:~\$	3000/tcp -> 0.0.0.0:3000						
ubuntu@ip-10-0-1-58:~\$							

```
ubuntu@ip-10-0-1-58:~$ docker container port nodejs
3000/tcp -> 0.0.0.0:3000
ubuntu@ip-10-0-1-58:~$
```

Docker Container

- Container change name on-the-fly:

```
docker container rename <old name> <new name>
```

```
[ubuntu@ip-10-0-1-90:~$ docker container ls
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
4b04b8ba10e0 labdockerc/alpineweb:latest "node hello.js" 3 minutes ago Up 49 seconds (healthy) 0.0.0.0:3000->3000/tcp, :::3000->3000/tcp nodejs
[ubuntu@ip-10-0-1-90:~$ docker container rename nodejs nodejsnew
[ubuntu@ip-10-0-1-90:~$ docker container ls
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
4b04b8ba10e0 labdockerc/alpineweb:latest "node hello.js" 3 minutes ago Up About a minute (healthy) 0.0.0.0:3000->3000/tcp, :::3000->3000/tcp nodejsnew
ubuntu@ip-10-0-1-90:~$ ]
```

Docker Container

- ลั่ง 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

- ลั่ง 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: Run Container

- Interactive NODEJS
- ลั่งรัน 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: Run Container

- DAEMON LINE BOT



ธนาคารแห่งประเทศไทย

ข้อมูลที่นำไปใช้ของ API

ประเภทของ API :	REST
ประเภทของข้อมูล :	JSON
ความปลอดภัย :	PUBLIC

คำแนะนำที่อยู่ของ API

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

พารามิเตอร์ใน Header

api-key : xk3h6ash-ahw5l3mch6hl3-2hhg6l4mng2346l34l6

ข้อมูลพารามิเตอร์สำหรับการใช้งาน API

ชื่อตัวแปร	ประเภท	ค่าอธิบาย
start_period	Datetime	วันที่เริ่มคุณสมบัติอยู่ (YYYY-MM-DD) เช่น 2017-06-30
end_period	Datetime	วันที่สิ้นสุดคุณสมบัติ (YYYY-MM-DD) เช่น 2017-06-30

ข้อมูลพารามิเตอร์ที่จะได้รับ

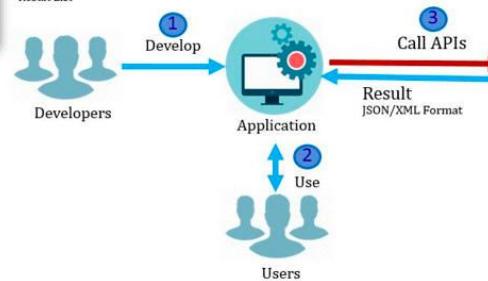
ชื่อ	ประเภท	ค่าอธิบาย
report_name_eng	String	ชื่อรายงาน ภาษาอังกฤษ
rereport_name_th	String	ชื่อรายงาน ภาษาไทย
report_uoq_name_eng	String	หน่วย ภาษาอังกฤษ
report_uoq_name_th	String	หน่วย ภาษาไทย
report_source_of_data	String	แหล่งมาของข้อมูล
report_remark_eng	String	หมายเหตุ รายงานภาษาอังกฤษ
report_remark_th	String	หมายเหตุ รายงานภาษาไทย
last_updated	String	วันที่แก้ไขข้อมูลล่าสุด
period	String	วันที่รวมคุณสมบัติ
rate	String	อัตรา



BOT Website
BANK OF THAILAND
Developer Portal
<https://iapi.bot.or.th/developer>



APIs URL,
Parameter List,
Result List



BOT API Services Process



Workshop: Run Container

- Ex 2: DAEMON LINE BOT

The screenshot shows the Bank of Thailand's API documentation page for the Exchange Rates 2.0.1 API. The left sidebar lists other APIs like Weighted-average Interbank Exchange and Average Exchange Rate. The main content area displays the Exchange Rates 2.0.1 API details, including its logo, a brief description, and a table of plans. The table shows two plans: 'Default Plan' (200 per hour) and 'Free'. A 'Subscribe' button is also present.

ธนาคารแห่งประเทศไทย

Home Getting started API Products Apps Support

0 eva10409@gmail.com praparn.lueangphoonlap

อปท. จะเพิ่มการเผยแพร่ข้อมูลสถิติเศรษฐกิจและการเงินภูมิภาค และสถิติการชำระเงิน ในรูปแบบ API ตั้งแต่วันที่ 25 มกราคม 2562 เป็นต้นไป [อ่านต่อ]
BOT will launch regional economic and financial statistics and payment systems statistics publication in the form of "API" from January 25, 2019, onwards. [Click more]

Exchange Rates 2.0.1

APIs

Weighted-average Interbank Exchange

Rate - THB / USD

Average Exchange Rate - THB / Foreign Currency

Exchange Rates 2.0.1

Plans

	Default Plan
Weighted-average Interbank Exchange Rate - ...	200 per hour
Average Exchange Rate - THB / Foreign Curre...	200 per hour
	Free

Subscribe

* = Mouseover for more information

Bookmark this

Workshop: Run Container

- DAEMON LINE BOT

```
[docker@labdocker:~$ docker container run --rm --name linebot -e "TITLE=Line BOT (Bank of Thailand)" -e "TOKEN=EIeqyillzkzpCo1ROrebZTcGbIyzDZhP0jcd0t6CX" 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 EIeqyillzkzpCo1ROrebZTcGbIyzDZhP0jcd0t6CX", "content-length": 466}}}
{\\"status\\":200,\\"message\\":\\"ok\\"
docker@labdocker:~$ ]
```

```
1 const request = require('request');
2 const qs = require('querystring');
3 const TITLE=process.env.TITLE;
4 const KEY =process.env.KEY; //Input API-KEY to Header
5 //const KEY='U9G1L457H60CugT7VmBaEacbHV9RX0PyS005cYaGsm';
6 const URL =process.env.URL; //Input URL for Request
7 //const URL="https://japi.bot.or.th/Stat/Stat-ReferenceRate/DAILY_REF_RATE_V1/?";
8 //const TOKEN = 'EIeqyillzkzpCo1ROrebZTcGbIyzDZhP0jcd0t6CX';
9 const TOKEN=process.env.TOKEN; //Input TOKEN LINE
10 //Set Date
11 var dateFormat = require('dateformat');
12 var daynow = new Date(); // Today!
13 daynow.setDate(daynow.getDate() - 1); // Yesterday!
14 var daynow=dateFormat(daynow, "yyyy-mm-dd");
15 var DAYSTARTPERIOD=daynow;
16 var DAYENDPERIOD=daynow;
17 //Set Date
18 var stickerPkg=2; //stickerPackageId
19 var stickerId=161; //stickerId
20 var Message="";
21 //Setup QueryString
22 var queryString = qs.stringify({
23   start_period: DAYSTARTPERIOD,
24   end_period: DAYENDPERIOD
25 });
26 //Setup QueryString
27 function callback(error, response, body) {
28   //console.log(URL+queryString);
29   //console.log('Response Code: '+ response.statusCode);
30   //console.log(body)
31   if (!error && response.statusCode == 200) {
32     var info = JSON.parse(body);
33   }
34 }
```



LineBot_Container: TITLE:Line BOT (Bank of Thailand)
==Report from BOT API==
Report Name:Rates of Exchange of Commercial Banks in Bangkok Metropolis (2002-present)
Report Source:Bank of Thailand
Data:33.2770000 THD/USD
Last Update Timestamp:2017-08-10 16:39:04
Remark:Daily Weighted-average Interbank Exchange Rate - THB / USD

16:39



16:39



Workshop: Run Container

- DAEMON LINE BOT
- ลั่งรัน container แบบ Daemon โดยตั้งชื่อว่า linebot เพื่อทำการดึงข้อมูลจาก API ของธนาคารแห่งประเทศไทยอุปกรณ์แล้วส่ง LINE Notify ไปทาง Token Key ที่กำหนด

```
docker container run -it --rm --name linebot \
-e TITLE="Line BOT (Bank of Thailand)" \
-e "TOKEN=<LINE TOKEN>" \
labdocker/linenotify:bot_v2
```

Workshop: Run Container

- Detach Mode NODEJS
- ลั่งรัน 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: Run Container

- Detach Mode NODEJS
- สั่งหยุดเริ่ม container ด้วยคำสั่ง stop

```
docker container stop nodejs
```

```
docker container start nodejs
```

- ทำการตรวจสอบ container offline ด้วยคำสั่ง

```
docker container ls -a
```

- ทดสอบ Shell เข้าสู่ container ด้วยคำสั่ง

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

```
docker container attach nodejs
```

Workshop: Run Container

- Detach Mode NODEJS
- ทำการตรวจสอบ process ภายใน container
 - `docker container top nodejs`
 - `docker container stats nodejs`
- ทำการตรวจสอบความแตกต่างระหว่าง container กับ image ต้นฉบับ
 - `docker container diff nodejs`
- ตรวจสอบการ map port container
 - `docker container port nodejs`
- เปลี่ยนแปลงชื่อ container แบบ online
 - `docker container rename nodejs nodejsnew`

Workshop: Run Container

- Detach Mode NODEJS

```
1 var http = require('http');
2
3 http.createServer(function (req, res) {
4     res.writeHead(200, {'Content-Type': 'text/plain'});
5     res.end('Hello World Container Docker for Nodejs\n');
6 }).listen(3000, '0.0.0.0');
7
8 console.log('Server running at http://0.0.0.0:3000/');
```



Workshop: Run Container

- Detach Mode Python
- ลั่งสร้าง container แบบ detach (daemon) โดยตั้งชื่อว่า python และ map network 5000:5000

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

- ทำการรัน

```
docker container ls -a  
docker container start python
```

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

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

```
docker container attach python
```

Workshop: Run Container

- Detach Mode Python

```
1  from flask import Flask
2  import os
3  import time
4  app = Flask(__name__)
5
6  @app.route('/')
7  def hello():
8      return '<H1> Welcome Page from Container Python Lab </H1>Checkpoint Date/Time: ' + time.strftime("%c") + '\n'
9
10 if __name__ == "__main__":
11     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) architecture
`--cpuset-mems="1,3"`

Workshop: CPU Configure

- Download cAdvisor

```
docker image pull labdocker/cadvisor:0.40.0
```

- ลั่งรัน 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:0.40.0
```

Workshop: CPU Configure

- cAdvisor

The screenshot shows the cAdvisor interface with the following sections:

- root**: A top-level navigation item.
- Docker Containers**: A section listing Docker containers.
- Subcontainers**: A section listing subcontainers.
- /docker**: A detailed view of the Docker container resources.
- Isolation**: A section for isolation settings.
- CPU**: A detailed view of the CPU configuration, showing "Shares 1024 shares".

Workshop: 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: CPU Configure

- Result



Quiz ?

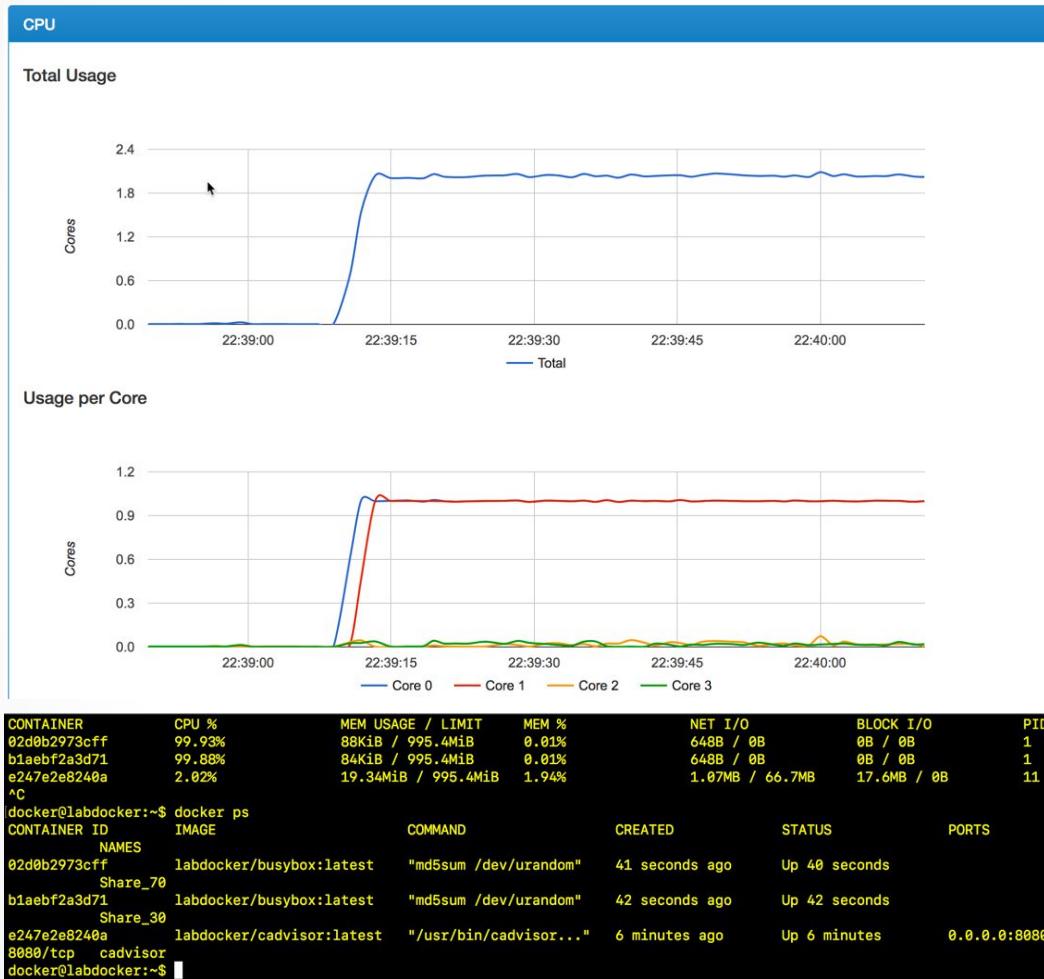
- Scenario (Multiple CPU: 70/30)

```
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
```

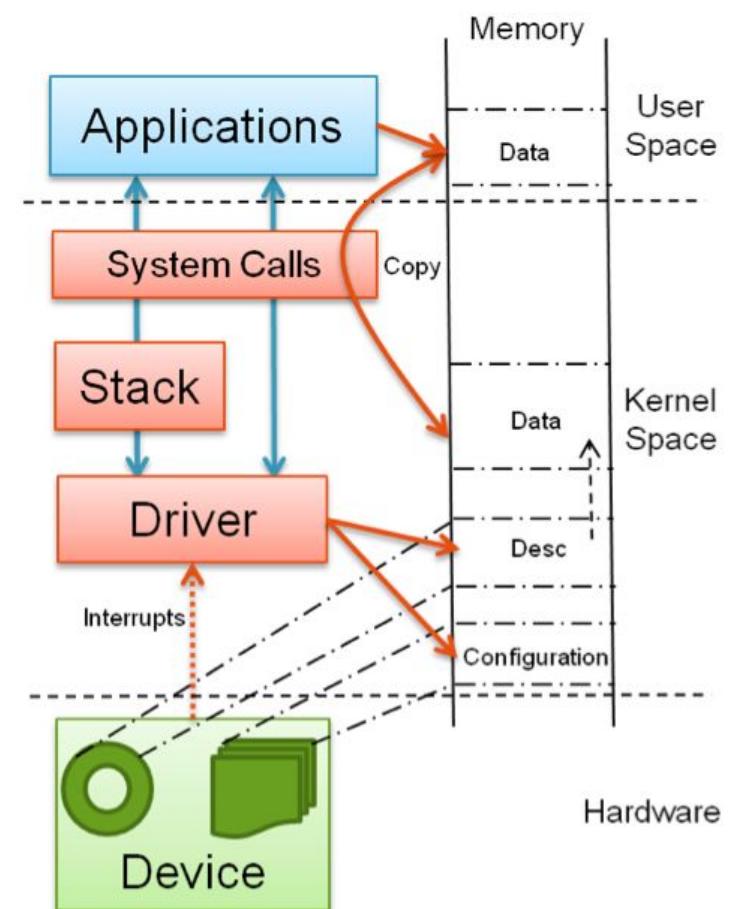
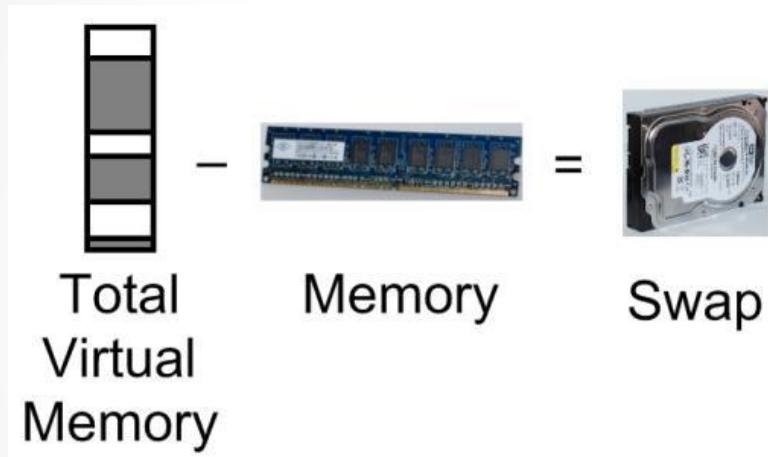
Quiz ?

- Result



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 ควรกำหนดเฉพาะในกรณีที่ application ต้องทำงานกับ direct i/o (slow than cache)
- Monitor การใช้งาน I/O ของ container (IOSTAT -xtc) และปรับแต่ง

device	extended device statistics								tty			cpu			
	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	RAID	Write Penalty
15,000	175	0	1
10,000	125	1	2
7200	75	5	4
5400	50	6	6
		DP	2
		10	2

- Raw disk performance: disk iops x unit of disk
 - **Ex:** SAS 128GB (15K) x 6 units => $175 \times 6 = 1060$ iops
- Raid disk performance:
 - $((\text{raw iops} \times \% \text{write}) / \text{penalty}) + (\text{raw} \times \% \text{read})$
 - Normal situation (write 30%, read 70%)
 - **Ex:** Raid 5 $((1060 \times .3) / 4) + (1060 \times .7) \square 821.6$ iops
 - **Ex:** Raid 1 $((1060 \times .3) / 2) + (1060 \times .7) \square 901$ iops

Network

• • •

Network

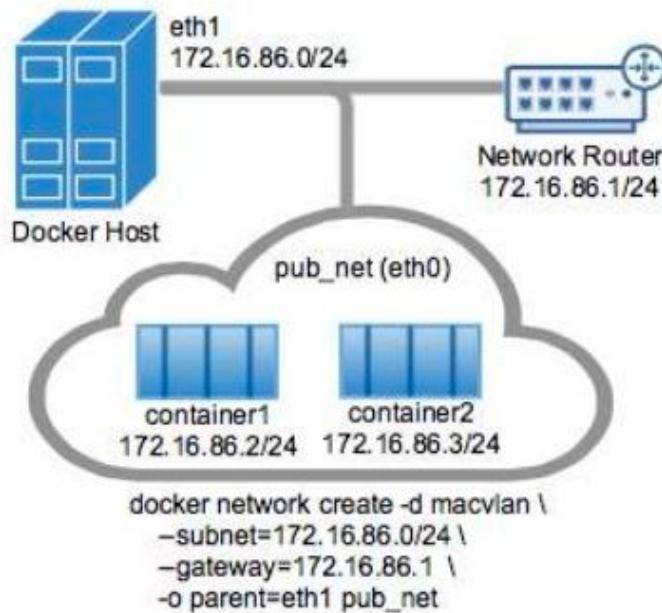
- Software define network by design (virtual switch)
- default docker จะจัดเตรียม network มาให้สามรูปแบบ

```
[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/User Defined** 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 หรือใช้งานกับการเชื่อมต่อแบบอื่นๆ
- **host** คือ network host ที่ container ใช้งาน host network stack ในการทำงาน
(ใช้ในกรณี ต้องการ network performance สูงสุด) (security concern)

Network

- Additional network type
- **MACVLAN**



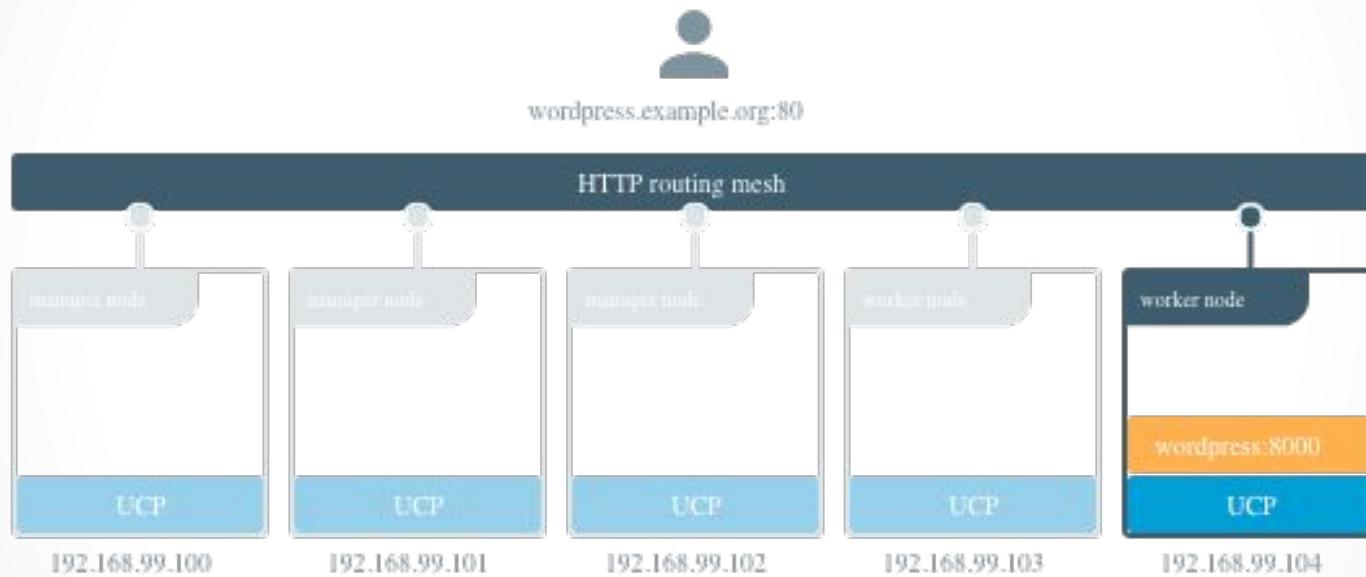
- **Overlay (Swarm Mode)**
- **3rd Party Network Plugin (Swarm Mode)**

Network

- Summary
 - **Bridge/User Defined Network:** best when you need multiple containers to communicate on the same Docker host.
 - **Host networks:** best when the network stack should not be isolated from the Docker host, but you want other aspects of the container to be isolated.
 - **Overlay networks:** best when you need containers running on different Docker hosts to communicate, or when multiple applications work together using swarm services.
 - **Macvlan networks:** best when you are migrating from a VM setup or need your containers to look like physical hosts on your network, each with a unique MAC address
 - **Third-party network:** allow you to integrate Docker with specialized network stacks.

Network

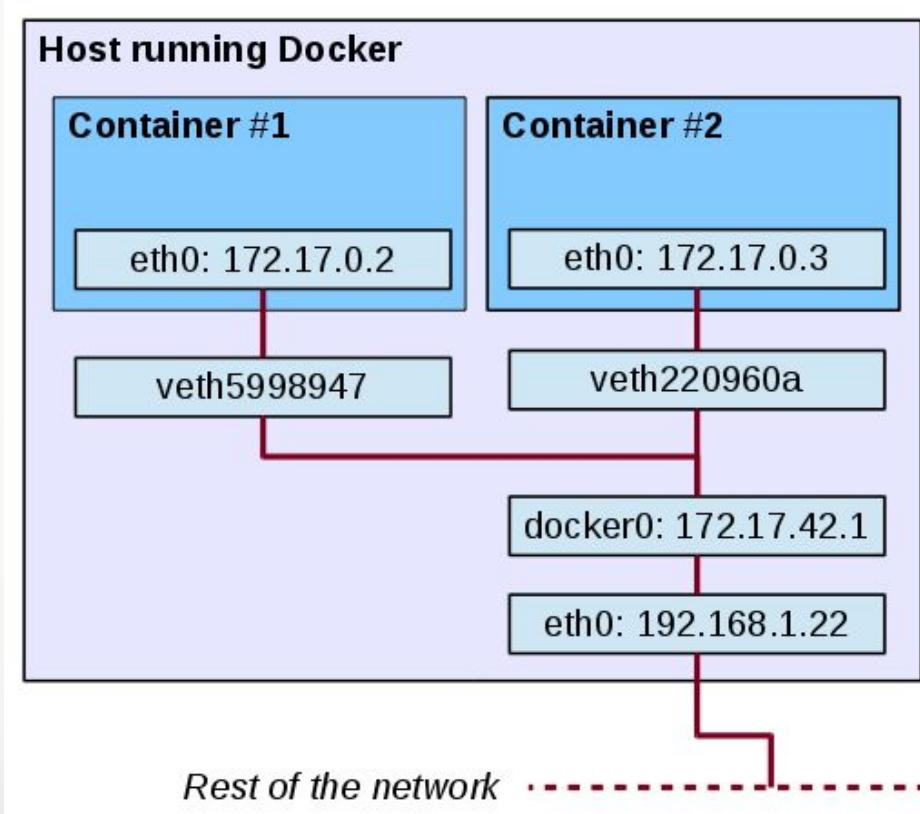
- Docker EE Network Feature:
 - **HTTP Route Mesh**: load balance L4 to target container on specific docker host



- **Session Stickiness**: (Cookies Base) for re-route traffic from original to same end-point container (Stateful)

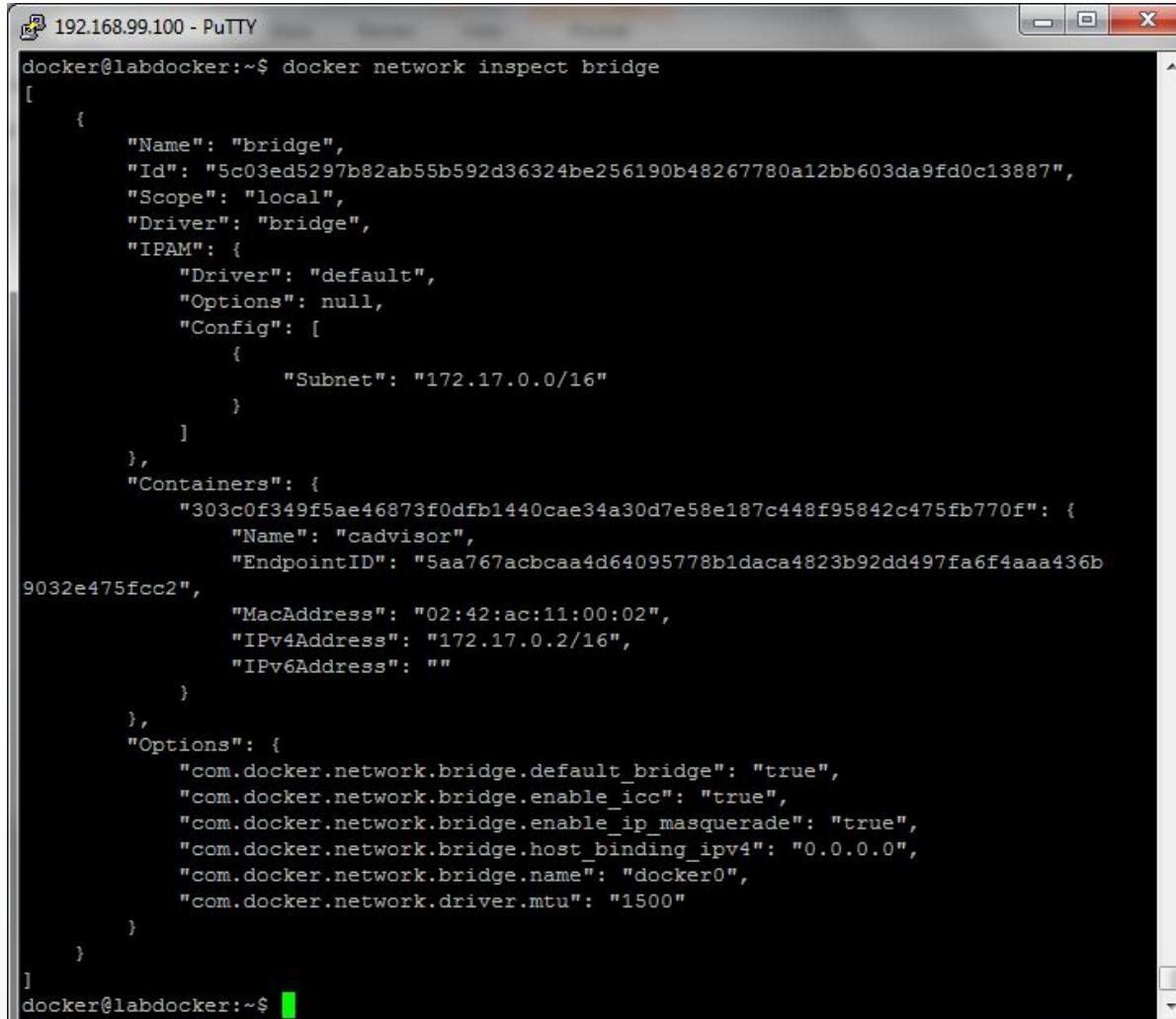
Network

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



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": "5aa767acbc当地4d64095778b1daca4823b92dd497fa6f4aaa436b9032e475fcc2",
                "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 สำหรับลั่ง 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)

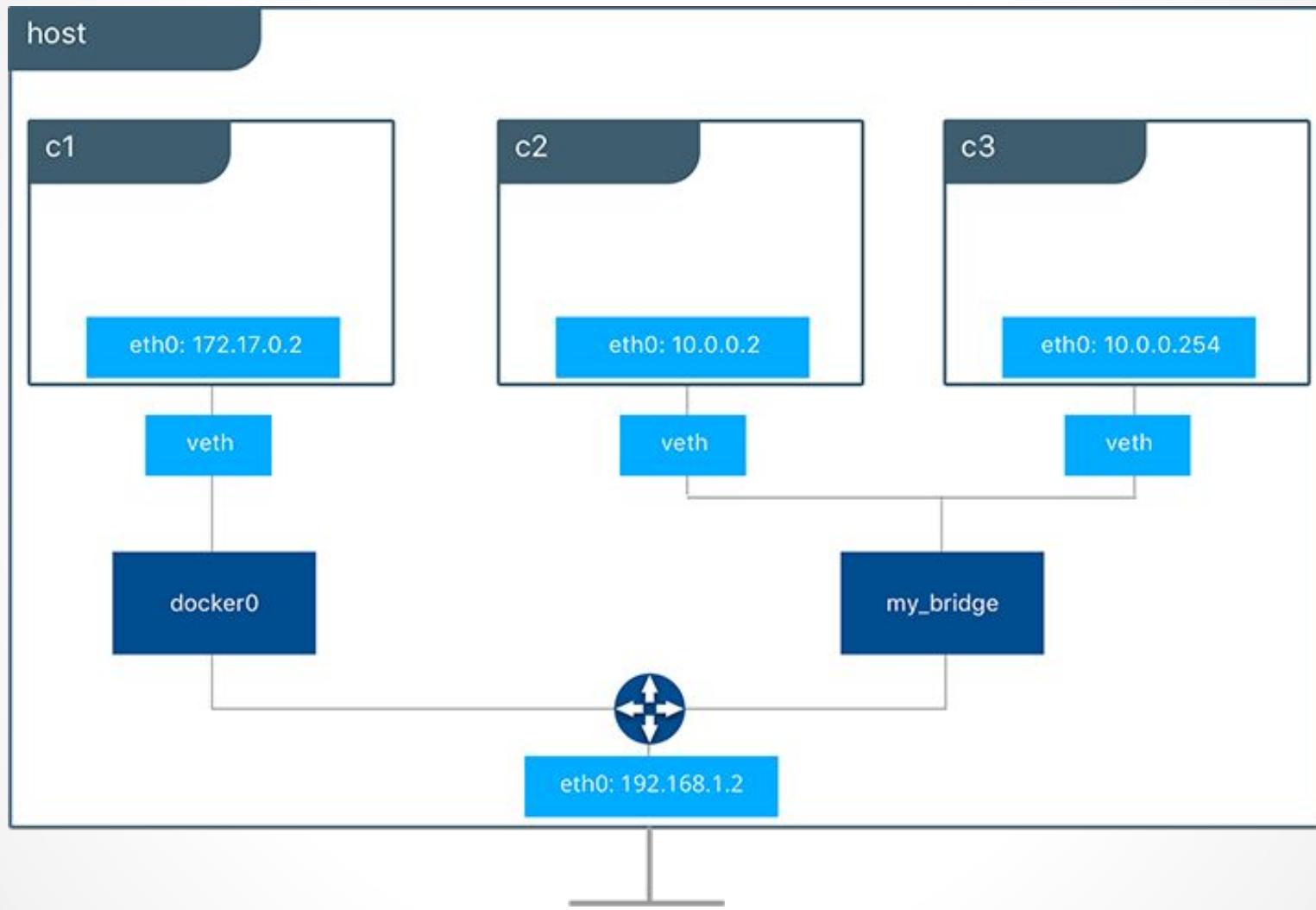
```
docker network create --driver <default/null/host> name
```

```
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



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)

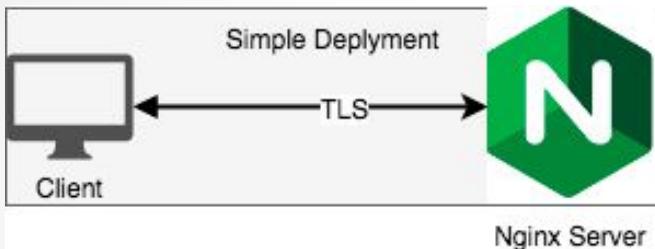
Workshop: Network Configure

- Part 1: Reverse Proxy Network (DNS)
- 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

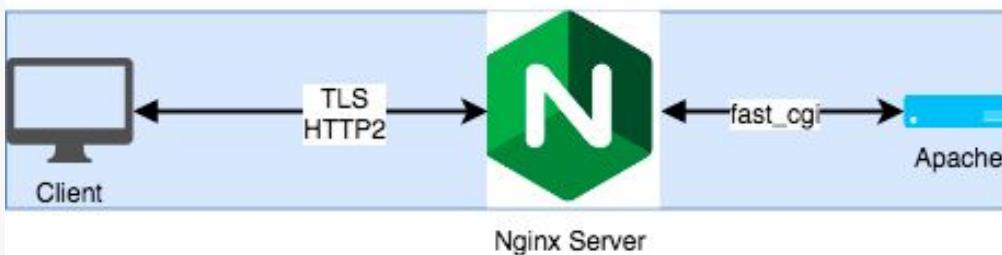
Workshop: Network Configure



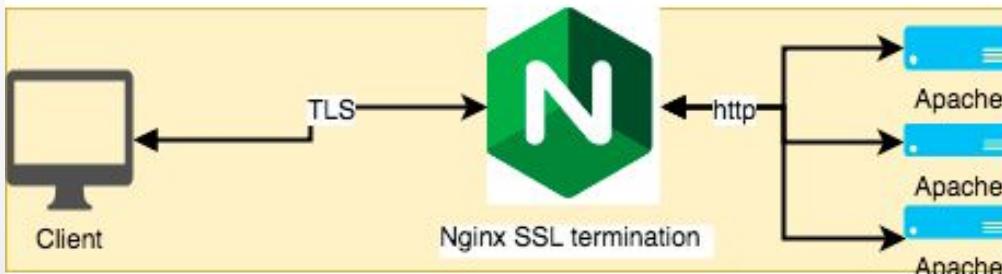
Workshop: Network Configure



Nginx Server A
Plain Deployment

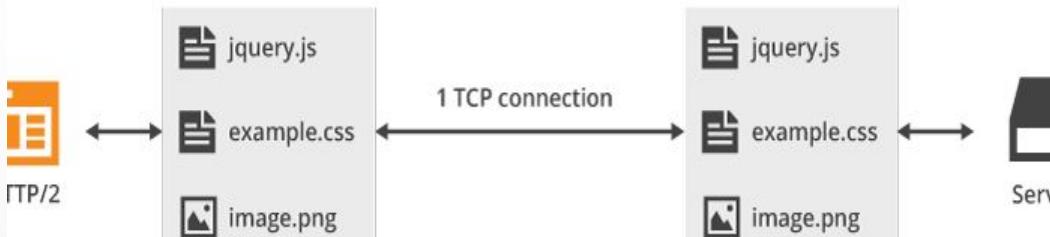
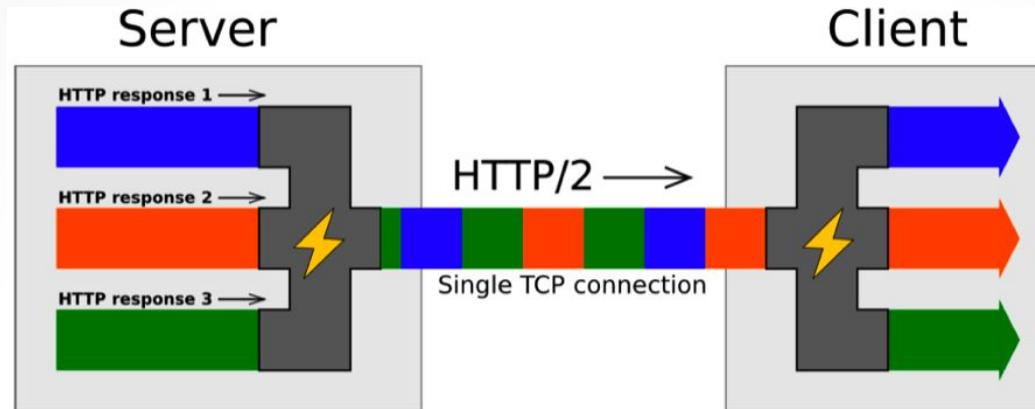


Nginx Reverse Proxy

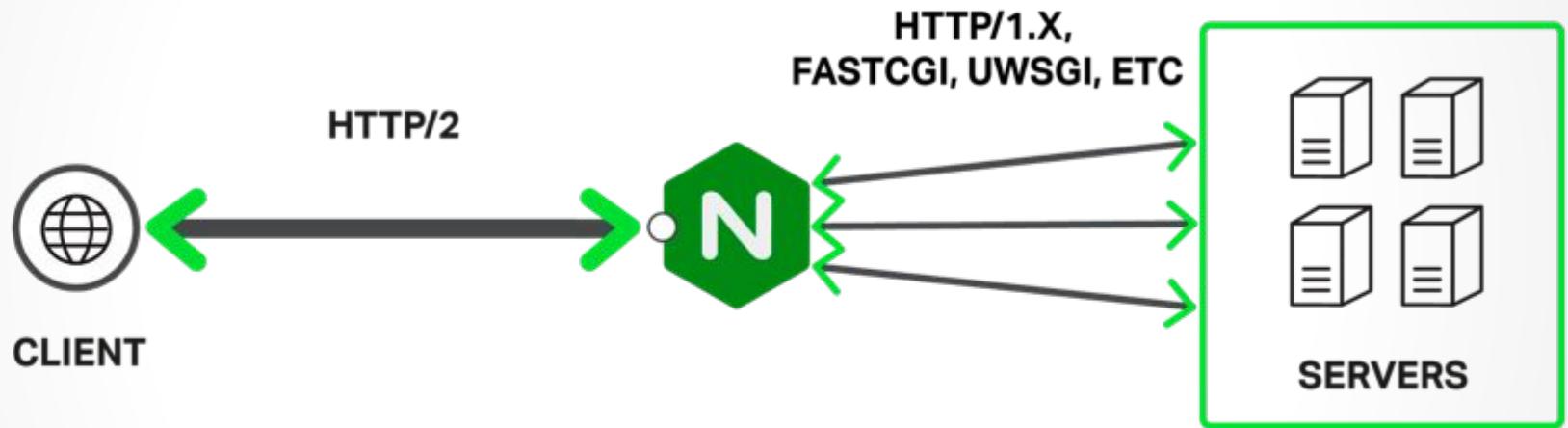


Nginx SSL Offloading

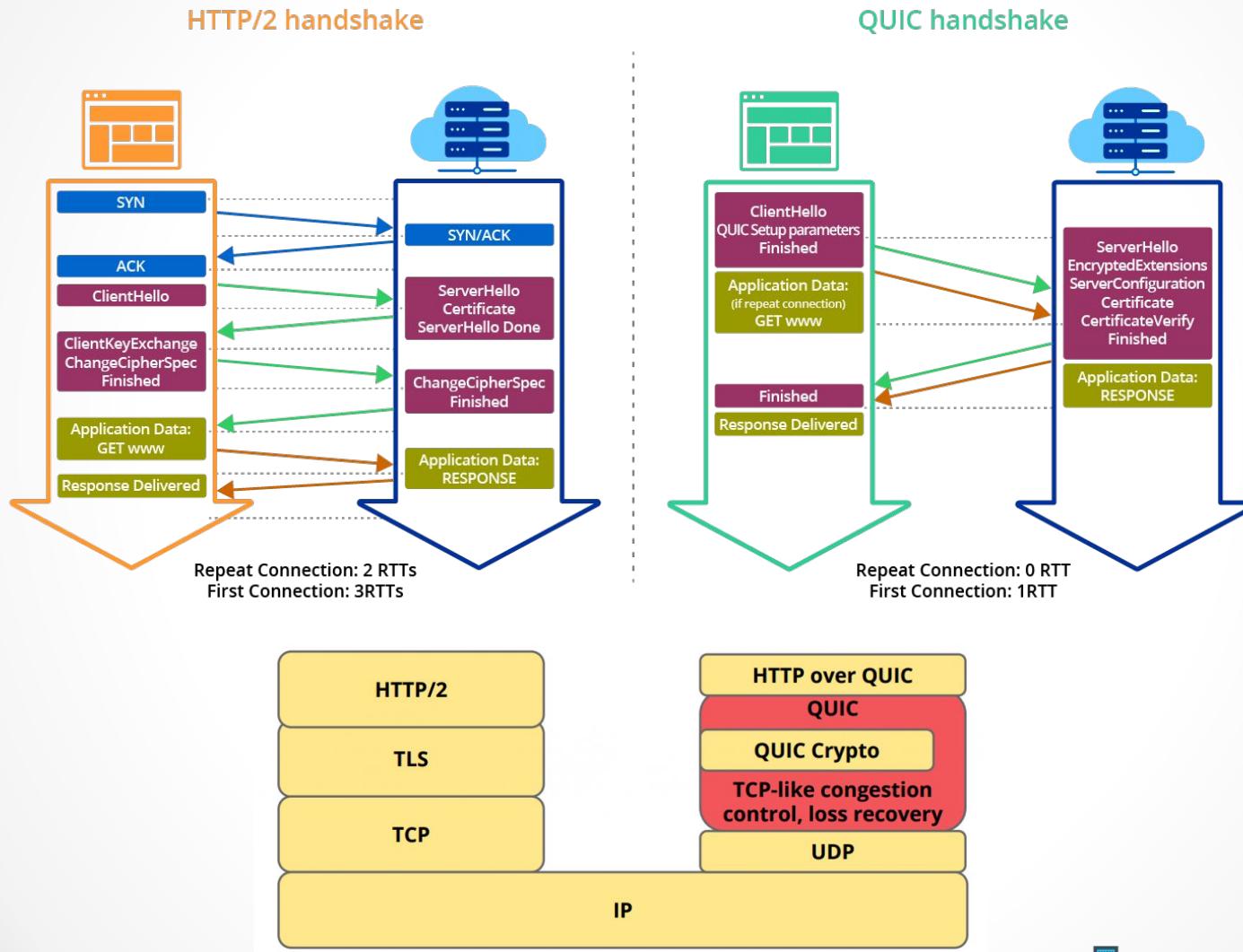
Workshop: Network Configure



Workshop: Network Configure

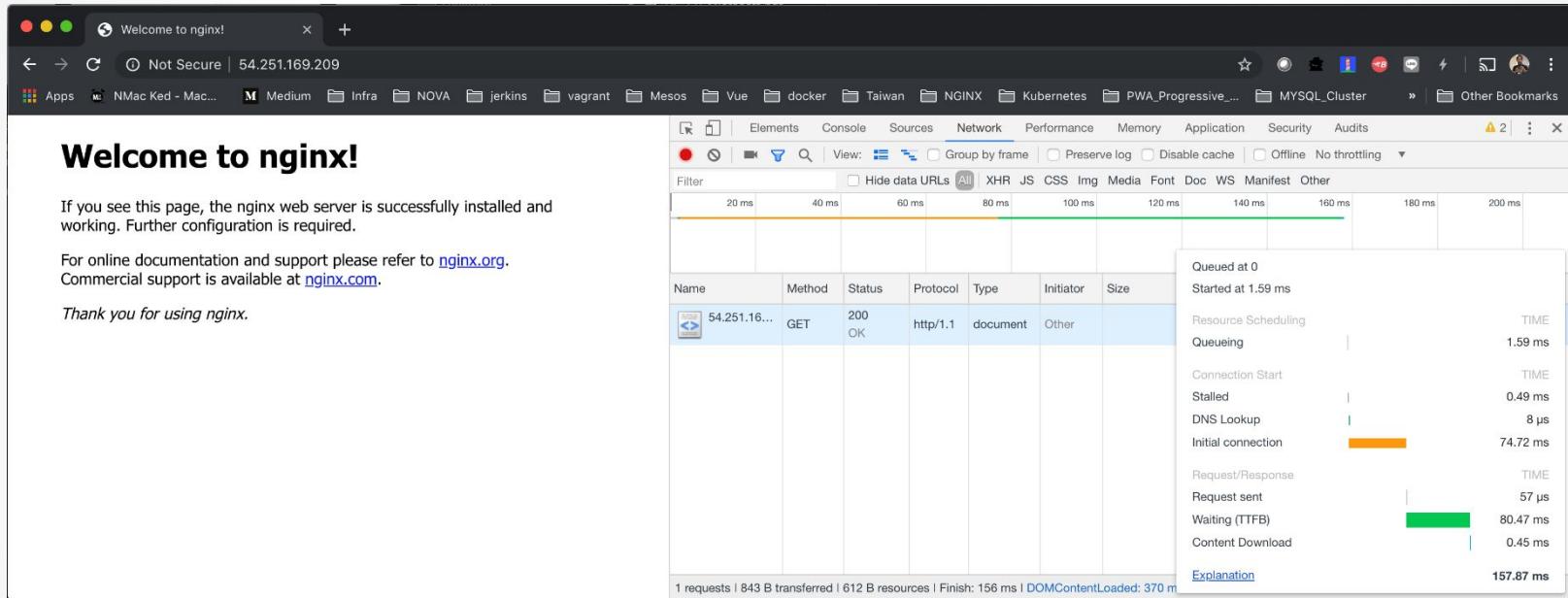


Workshop: Network Configure



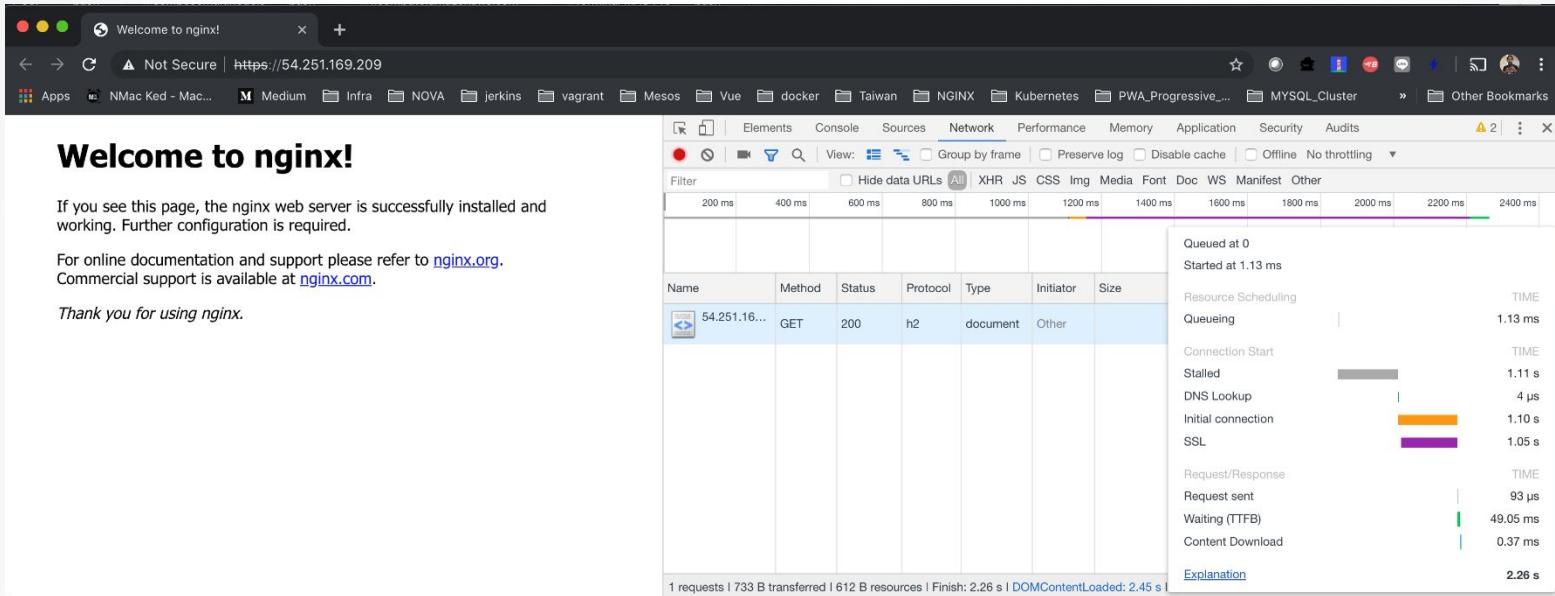
Workshop: Network Configure

- Normal HTTP/1.1



Workshop: Network Configure

- HTTP/2 HTTPS (Old word: SPDY)



Workshop: Network Configure

WEB1 (No Map)

DNS Name: web1 (Private)

WEB2 (No Map)

DNS Name: web2 (Private)

vSwitch: Webinternal

IP Address: 192.168.101.0/24

NGINX (Map Port:80:8080, 443:8443)

Join Network: Webinternal

Join Network: Webpublic

vSwitch: Webpublic

IP Address: 192.168.100.0/24

Map Port
(80:8080
443:8443)

Public
Network

Workshop: 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

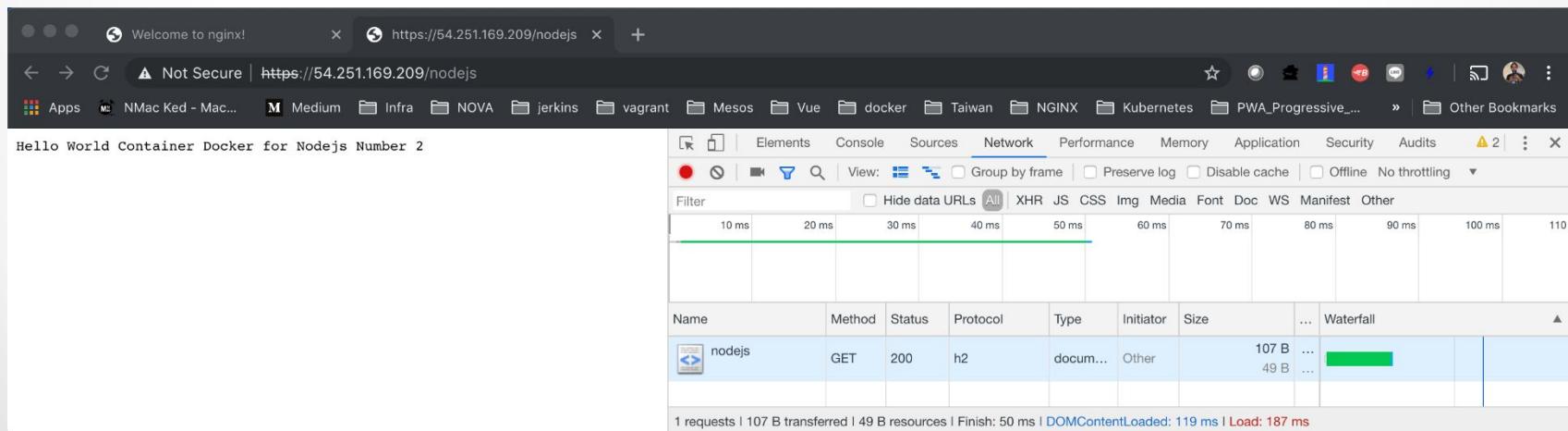
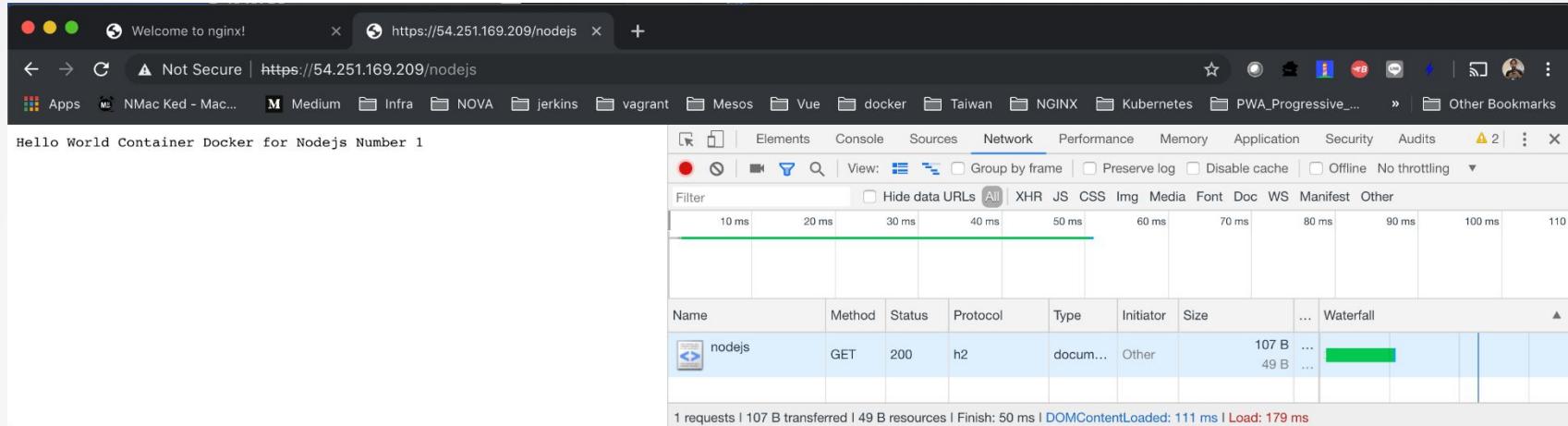
Workshop: Network Configure

- 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 -p 443:8443 labdocker/nginx:labnetworkhttp2

docker network connect webpublic nginx

Workshop: Network Configure

- url: http://<Public IP>/nodejs



Workshop: Network Configure

- curl result:

```
...ntu@ip-10-0-1-55: ~ — -bash ... | ...composemultinodejs — bash
[ubuntu@ip-10-0-1-55:~/temp$ docker container exec -it nginx sh
/usr/sbin # curl http://web1:3000
Hello World Container Docker for Nodejs Number 1
/usr/sbin # curl http://web1:3000 -I
HTTP/1.1 200 OK
Content-Type: text/plain
Date: Sat, 22 Jun 2019 02:50:39 GMT
Connection: keep-alive

/usr/sbin # curl http://web2:3000
Hello World Container Docker for Nodejs Number 2
[/usr/sbin # curl http://web2:3000 -I
HTTP/1.1 200 OK
Content-Type: text/plain
Date: Sat, 22 Jun 2019 02:50:40 GMT
Connection: keep-alive

/usr/sbin # █
```

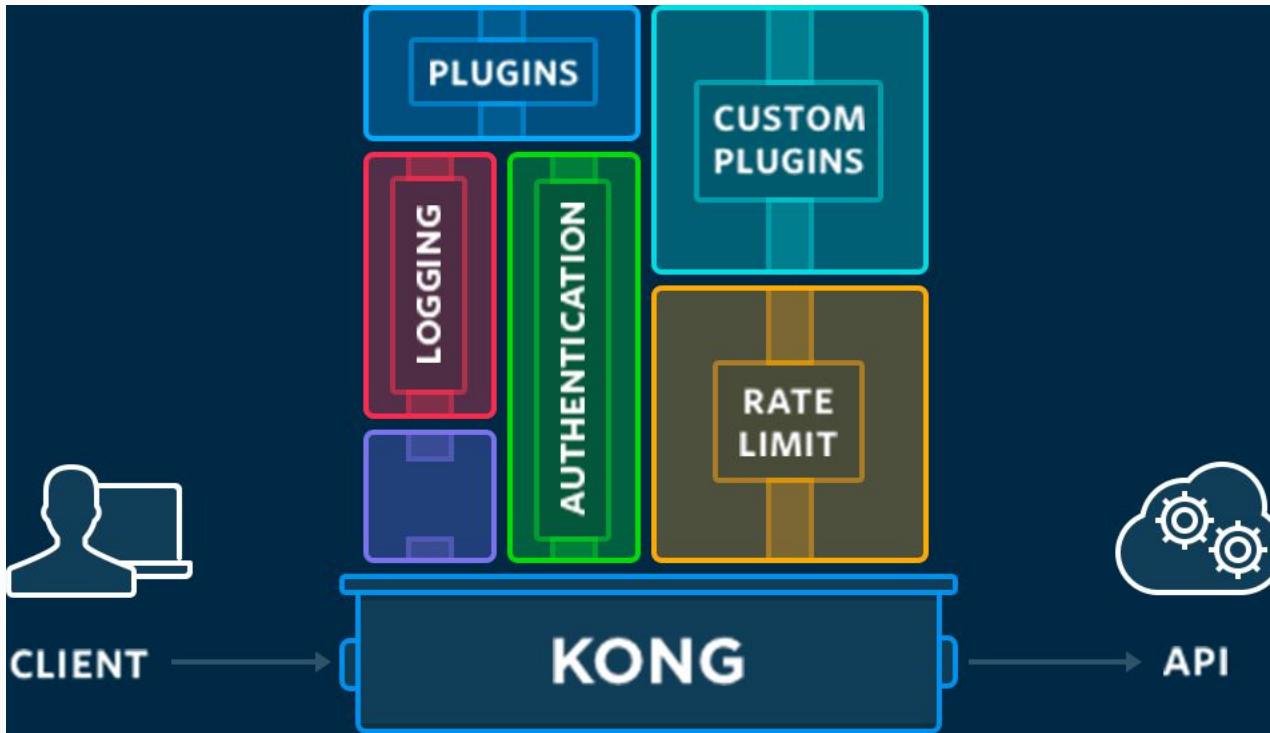
Workshop: Network Configure

- nginx.conf

```
upstream nodejs_web {  
    server web1:3000;  
    server web2:3000;  
}  
  
server {  
    listen 8080 default_server;  
    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;  
    }  
}  
  
server {  
    listen 8443 ssl http2;  
    ssl_certificate      labdocker.com.crt;  
    ssl_certificate_key  labdocker.com.key;  
    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;  
    }  
}
```

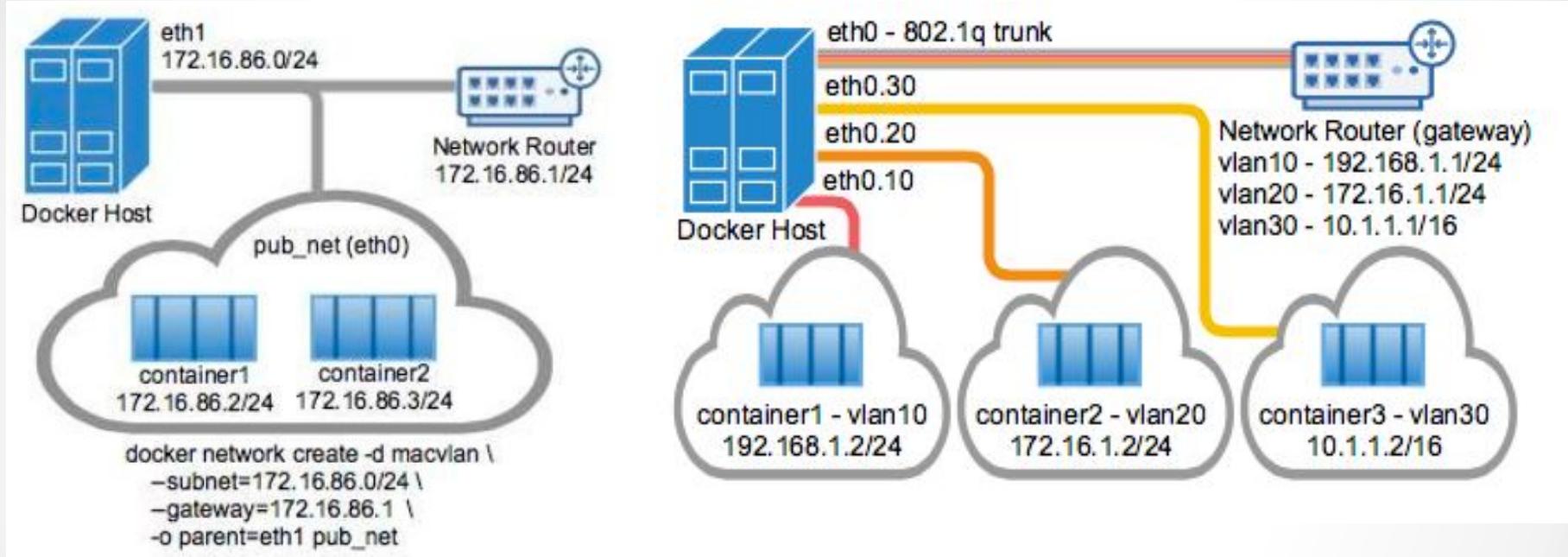
Workshop: Network Configure

- Bonus: Kong API Gateway the basic



Network

- 802.1q Tagging (MACVLAN)



Demo: MACVLAN

- Reverse Proxy Network (MACVLAN) (This need docker-machine)
- 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.

Demo: MACVLAN

Hostname: labdocker

WEB1:

IP Address: 192.168.99.193

DNS Name: web1

Service Port: 3000

WEB2:

IP Address: 192.168.99.194

DNS Name: web2

Service Port: 3000

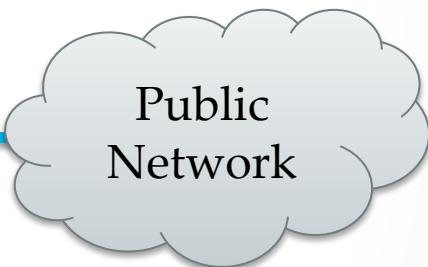
NGINX:

IP Address: 192.168.99.195

DNS Name: nginx

Service Port: 8080

Network Card: Eth1
IP Address: 192.168.99.100



Demo: MACVLAN

- 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
- ในการนี้ต้องการทำ 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

Demo: MACVLAN

- 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:labnetworkhttp2

Demo: MACVLAN

- Internal test:

```
...10-0-1-55: ~ — -bash ... | ...emultinodejs — -bash | ...ute.amazonaws.com ... | ...chine ssh labdocker
[docker@labdocker:~$ docker container exec -it nginx curl http://web1:3000
Hello World Container Docker for Nodejs Number 1
[docker@labdocker:~$ docker container exec -it nginx curl http://web1:3000 -I
HTTP/1.1 200 OK
Content-Type: text/plain
Date: Sat, 22 Jun 2019 03:39:07 GMT
Connection: keep-alive

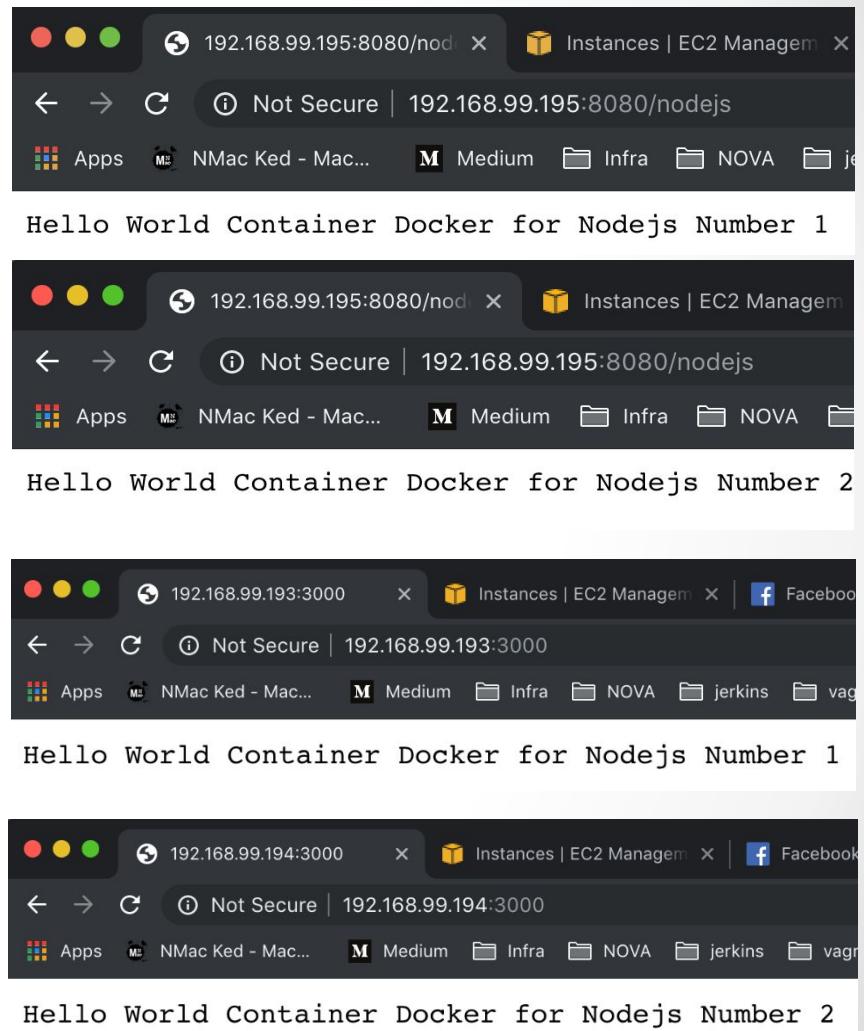
[docker@labdocker:~$ docker container exec -it nginx curl http://web2:3000
Hello World Container Docker for Nodejs Number 2
[docker@labdocker:~$ docker container exec -it nginx curl http://web2:3000 -I
HTTP/1.1 200 OK
Content-Type: text/plain
Date: Sat, 22 Jun 2019 03:39:13 GMT
Connection: keep-alive

[docker@labdocker:~$ docker container 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=0.042 ms
^C
--- web1 ping statistics ---
1 packets transmitted, 1 packets received, 0% packet loss
round-trip min/avg/max = 0.042/0.042/0.042 ms
[docker@labdocker:~$ docker container 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=0.115 ms
64 bytes from 192.168.99.194: seq=1 ttl=64 time=0.069 ms
^C
--- web2 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 0.069/0.092/0.115 ms
docker@labdocker:~$ ]
```

Demo: MACVLAN

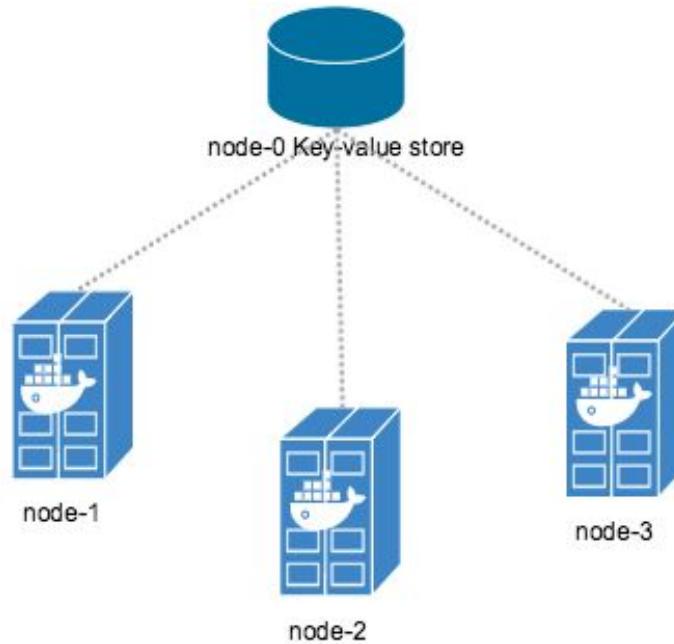
- External Test:

```
...10-0-1-55: ~ -- bash ... | ... emultinodejs -- bash | ...ute.amazonaws.com ... |  
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=0.346 ms  
64 bytes from 192.168.99.193: icmp_seq=1 ttl=64 time=0.508 ms  
^C  
--- 192.168.99.193 ping statistics ---  
2 packets transmitted, 2 packets received, 0.0% packet loss  
round-trip min/avg/max/stddev = 0.346/0.427/0.508/0.081 ms  
praparns-MacBook-Pro:~ praparn$  
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=0.365 ms  
64 bytes from 192.168.99.194: icmp_seq=1 ttl=64 time=0.470 ms  
^C  
--- 192.168.99.194 ping statistics ---  
2 packets transmitted, 2 packets received, 0.0% packet loss  
round-trip min/avg/max/stddev = 0.365/0.417/0.470/0.052 ms  
praparns-MacBook-Pro:~ praparn$  
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=0.357 ms  
64 bytes from 192.168.99.195: icmp_seq=1 ttl=64 time=0.331 ms  
^C  
--- 192.168.99.195 ping statistics ---  
2 packets transmitted, 2 packets received, 0.0% packet loss  
round-trip min/avg/max/stddev = 0.331/0.344/0.357/0.013 ms  
praparns-MacBook-Pro:~ praparn$  
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://192.168.99.193:3000  
Hello World Container Docker for Nodejs Number 1  
praparns-MacBook-Pro:~ praparn$ curl http://192.168.99.194:3000  
Hello World Container Docker for Nodejs Number 2  
praparns-MacBook-Pro:~ praparn$ curl https://192.168.99.195:8443/nodejs -k  
Hello World Container Docker for Nodejs Number 1  
praparns-MacBook-Pro:~ praparn$ curl https://192.168.99.195:8443/nodejs -k  
Hello World Container Docker for Nodejs Number 2  
praparns-MacBook-Pro:~ praparn$
```



Network

- Network across host (Overlay Network)



Network

- 3rd Party Network Plugin

Plugin	Description
Contiv Networking	An open source network plugin to provide infrastructure and security policies for a multi-tenant micro services deployment, while providing an integration to physical network for non-container workload. Contiv Networking implements the remote driver and IPAM APIs available in Docker 1.9 onwards.
Kuryr Network Plugin	A network plugin is developed as part of the OpenStack Kuryr project and implements the Docker networking (libnetwork) remote driver API by utilizing Neutron, the OpenStack networking service. It includes an IPAM driver as well.
Weave Network Plugin	A network plugin that creates a virtual network that connects your Docker containers - across multiple hosts or clouds and enables automatic discovery of applications. Weave networks are resilient, partition tolerant, secure and work in partially connected networks, and other adverse environments - all configured with delightful simplicity.

Volume

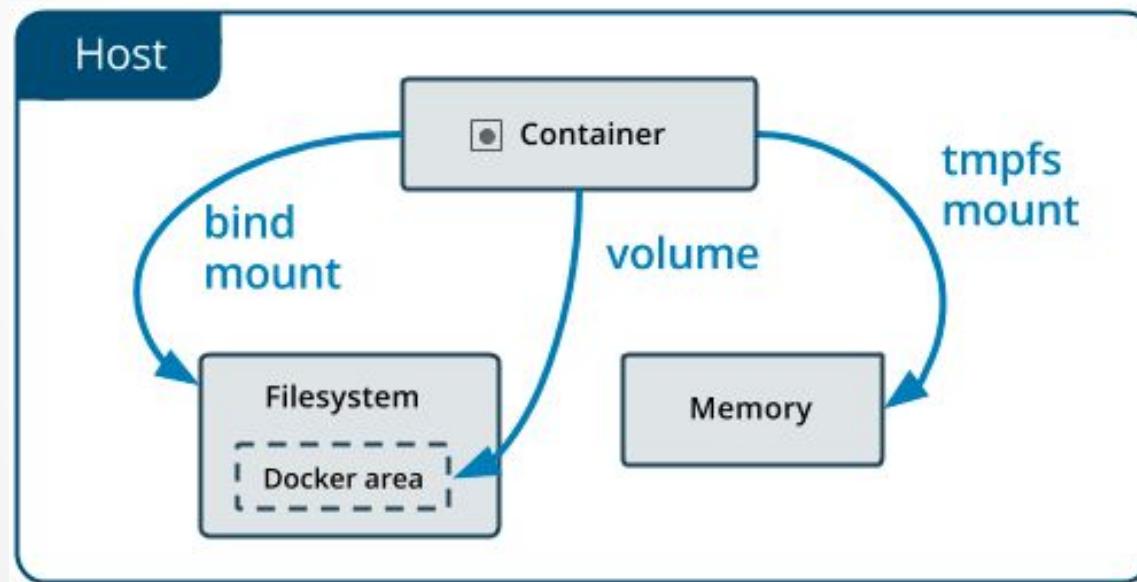
• • •

Volume

- ตามปกติแล้ว docker จะเก็บข้อมูลทุกอย่างเอาไว้ภายใน container
 - /var/log
 - /sys/data
 - /etc/nagios/
 - /etc/mysql
 - Etc.
- สำหรับการใช้งาน container ใน production environment docker ได้สร้าง tool สำหรับอำนวยความสะดวกในการใช้งานข้อมูลร่วมกันในหลายๆ กรณี 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

- ตรวจสอบการคอนฟิกบัน container (inspect)

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

Volume

- 2. Volumes สร้าง volume กลາງເພື່ອໃຊ້ໃນການຈັດເກີບຂໍ້ມູນ ອີ່ວົງ share volume ຮະຫວັງ host/container/container (local: /var/lib/docker/volumes, driver: 3rd Party)
 - ສ້າງ Volume ສໍາທັບໃຊ້ເກີບຂໍ້ມູນ

```
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

- ການໃຊ້ 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

Plugin	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 <i>always persist</i> , 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 environments.

Docker: The Next-Gen of Virtualization



Volume

- ການ backup volume ຈາກ 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
```

- ການ restore volume ຈາກ 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-persistence space โดย tmpfs ไม่สามารถ Share ระหว่าง container และไม่สามารถใช้งานบน Windows ได้

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

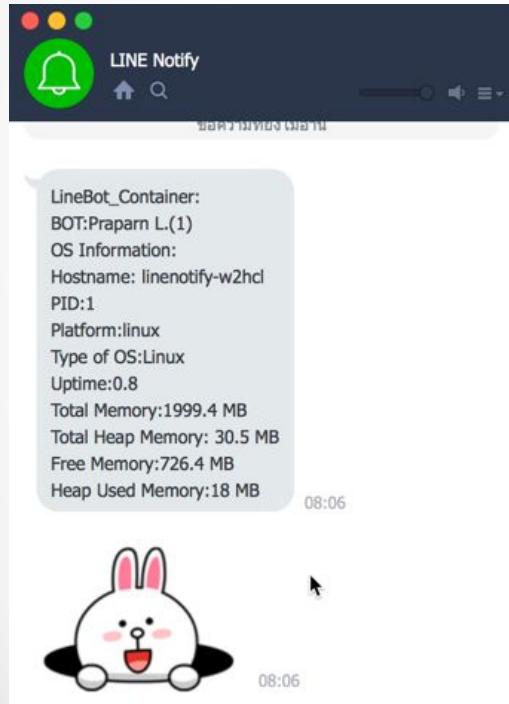
Ex: docker volume create --driver local --opt type=tmpfs \ --opt device=tmpfs --opt o=size=100m,uid=1000 tmptest

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: Share Volume

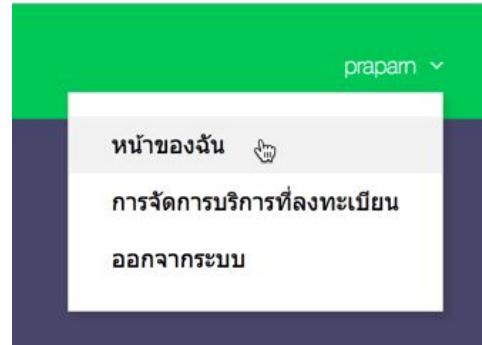
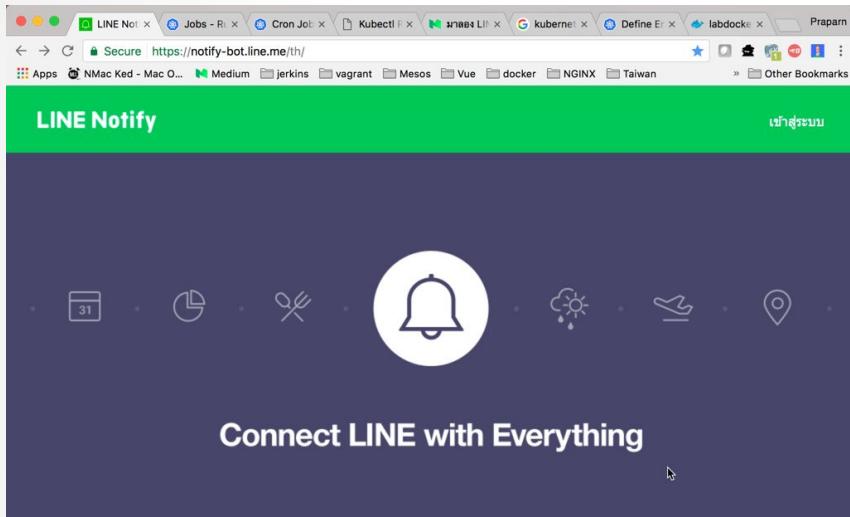
- Part 1: Host Path debug program
- Purpose: ทำการ Map volume เพื่อนำ source code เข้าไปทำการ debug/run บน container
- Example on WorkShop: "Monitor and LINE notify container"



LINE

Workshop: Share Volume

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



ออก Access Token (สำหรับผู้พัฒนา)

เมื่อใช้ Access Token แบบบุคคล จะสามารถตั้งค่าการแจ้งเตือนได้โดยไม่ต้องลงทะเบียนกับเว็บเซอร์วิส



Workshop: Share Volume

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

ออก Token

โปรดใส่ชื่อ Token (จะแสดงเมื่อมีการแจ้งเตือน)

LINEBOT

โปรดเลือกห้องแชทที่ต้องการส่งข้อความแจ้งเตือน

Search by group Name

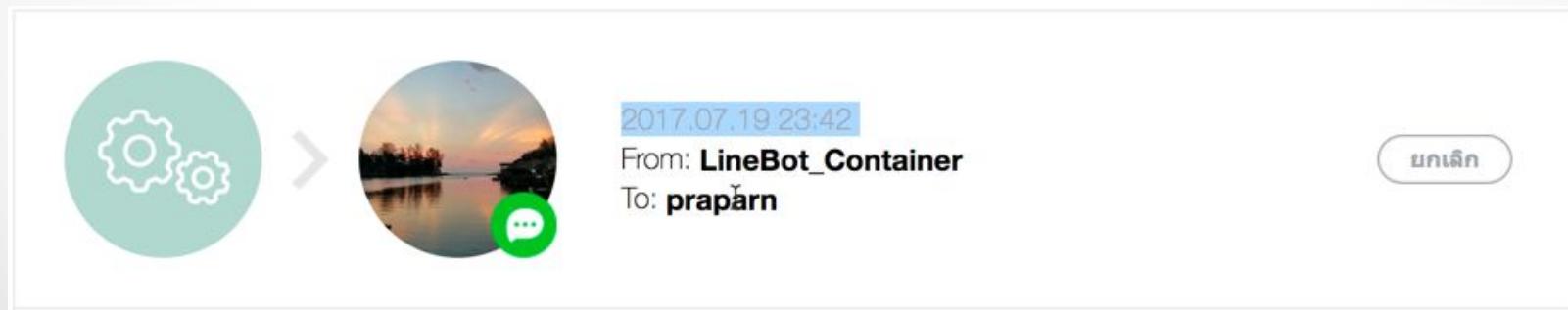
 รับการแจ้งเตือนแบบตัวต่อตัวจาก LINE Notify

Token ที่ออก

zHOlcJCcpIIS8mEedn [REDACTED]

ถ้าออกจากหน้านี้ ระบบจะไม่แสดง Token ที่ออกใหม่ล่าสุดไป โปรดคัดลอก Token ก่อนออกจากหน้านี้

คัดลอก **ปิด**



Workshop: 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
26   if(HEAP_HIGH<((heapUsed/heapTotal)*100)){heapWarning="Y";}
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
```

```
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   if(HEAP_HIGH<((heapUsed/heapTotal)*100)){heapWarning="Y";}
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: Share Volume

The screenshot shows a Mac desktop with three terminal windows and a LINE Notify application.

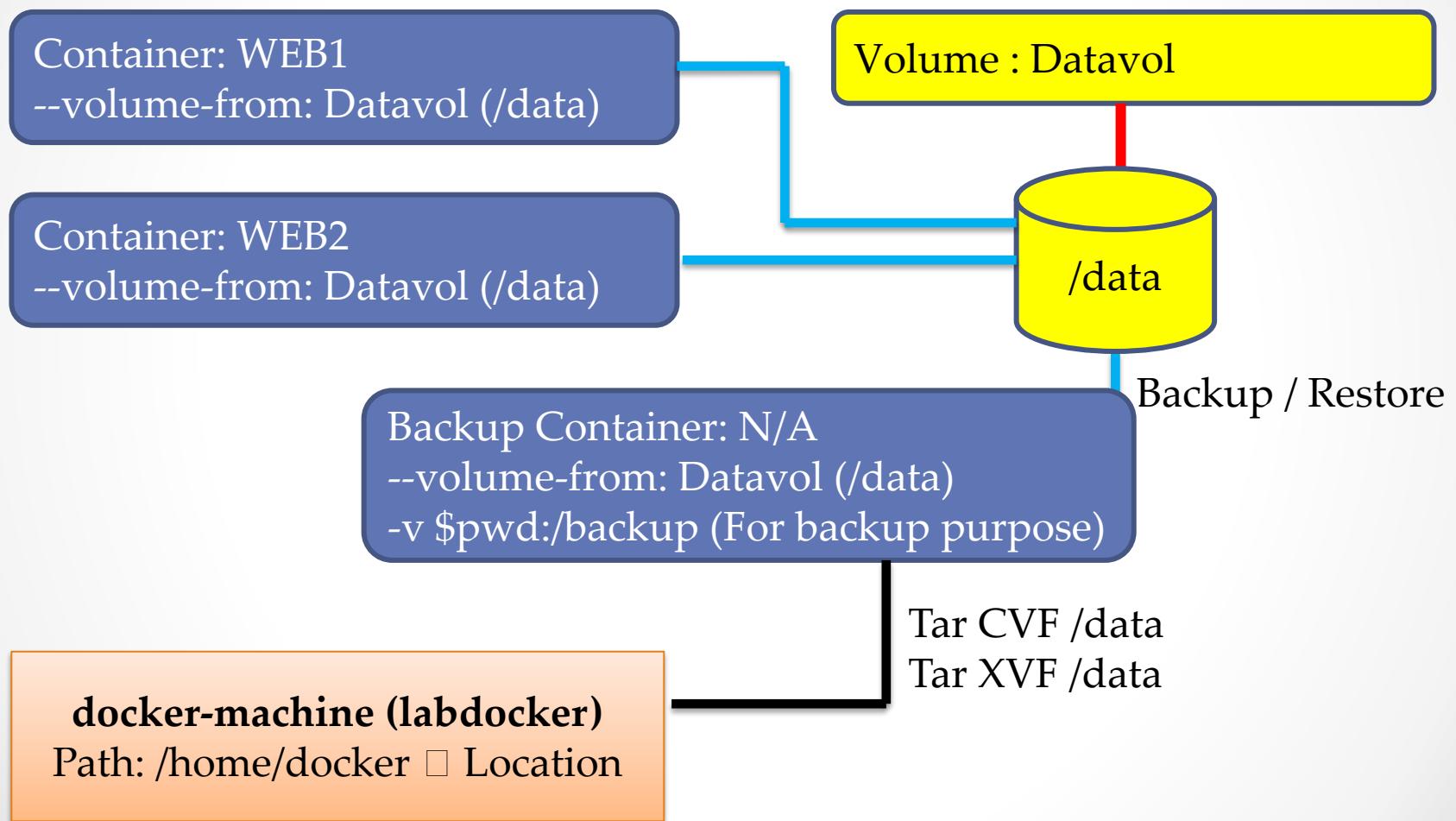
Terminal 1: Shows Docker logs from a container named LineBot_Container. The logs include environment variable exports (HEAP_HIGH=20, MEM_HIGH=20, SH_OS=N), a node.js command (node index.js), and a JSON response object. The response object contains a statusCode of 200, a body with a status of 200 and a message of "ok", and various headers including server (nginx), date (Sun, 06 Aug 2017 04:30:41 GMT), content-type (application/json; charset=UTF-8), transfer-encoding (chunked), connection (keep-alive), and several X-RateLimit headers.

Terminal 2: Shows a node.js command (node index.js) which outputs a similar JSON response object with a statusCode of 200, a body with a status of 200 and a message of "ok", and various headers.

LINE Notify: A message from LineBot_Container. It includes a summary of memory usage: Current Heap Used: 18.2 MB, Total Heap: 30.5 MB, Memory Used Warning: Current Used: 477.6 MB, and Total Memory: 995.8 MB. The message was sent at 11:30. The notification includes a cartoon rabbit icon with a speech bubble saying "NO!".

Workshop: Share Volume

- Part 2: Container Volume



Log and Inspect

• • •

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 หรือกำหนด yyyy-mm-dd
 - tail = "all" / number of line
 - until แสดง log ก่อนเวลาที่กำหนด (Ex: 20180619220001) หรือ Relative (Ex: 42m = 42 minute before)
 - details แสดงรายละเอียดเพิ่มเติมของล็อก เช่น Env variable, labels โดยจะเป็นรายละเอียดเพิ่มเติมจากการใส่ option --log-opt ตอนสร้าง container

Log

- Server side. Big problem will come with logging !!!
- All container log will keep on
“/var/lib/docker/containers/<container
id>/<container-id>-json.log” and it take mega size on this path
until full
- We have 2 option for manage this
- Global Configuration
 - Add daemon.json on path /etc/docker/daemon.json for
global apply (need to restart docker daemon for take
effect)

```
{  
    "exec-opts": ["native.cgroupdriver=systemd"],  
    "log-driver": "json-file",  
    "log-opt": {  
        "max-size": "100m",  
        "max-file": "10"  
    },  
    "storage-driver": "overlay2"  
}
```

Log

Driver	Description
none	No logs are available for the container and <code>docker logs</code> does not return any output.
local	Logs are stored in a custom format designed for minimal overhead.
json-file	The logs are formatted as JSON. The default logging driver for Docker.
syslog	Writes logging messages to the <code>syslog</code> facility. The <code>syslog</code> daemon must be running on the host machine.
journald	Writes log messages to <code>journald</code> . The <code>journald</code> daemon must be running on the host machine.
gelf	Writes log messages to a Graylog Extended Log Format (GELF) endpoint such as Graylog or Logstash.
fluentd	Writes log messages to <code>fluentd</code> (forward input). The <code>fluentd</code> daemon must be running on the host machine.
awslogs	Writes log messages to Amazon CloudWatch Logs.
splunk	Writes log messages to <code>splunk</code> using the HTTP Event Collector.
etwlogs	Writes log messages as Event Tracing for Windows (ETW) events. Only available on Windows platforms.
gcplogs	Writes log messages to Google Cloud Platform (GCP) Logging.
logentries	Writes log messages to Rapid7 Logentries.

Ref <https://docs.docker.com/config/containers/logging/configure/>

Docker: The Next-Gen of Virtualization



Log

- Container Configuration
 - Specific on run command of docker container
 - --log-driver json-file (default)
 - --log-opt max-size=10m
 - --log-opt max-file=10

```
ubuntu@ip-10-0-1-55:~$ docker container run -dt --name nginx -p 80:80 \
> --log-driver json-file \
> --log-opt max-size=10m \
> --log-opt max-file=10 \
[> labdocker/nginx:badversion
07af88d6368bdf8a74608882963a50052e5c887fc32da812369d78068643e51
ubuntu@ip-10-0-1-55:~$ █
```

Inspect

- การตรวจสอบค่าคอนฟิกของ container / network / volume etc

```
docker inspect <container>
```

```
docker network inspect
```

```
docker volume inspect
```

Workshop: 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 กำหนดให้หยุดการทำงานของ container ชั่วคราวในระหว่างทำการ commit

Docker Desktop

• • •

Docker Desktop

- GUI tool for developer/devops on your machine



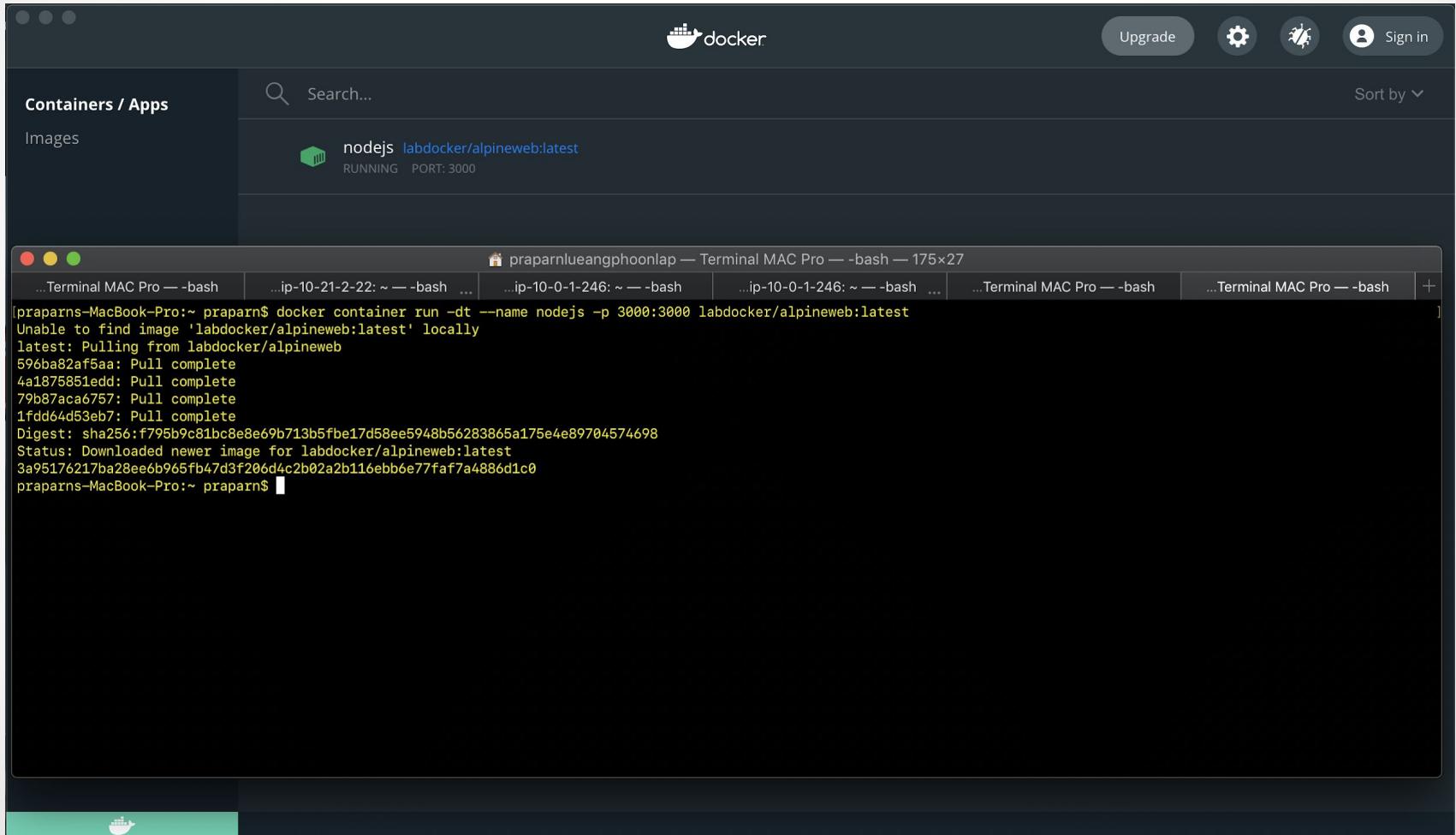
A screenshot of the "Images on disk" section in the Docker Desktop interface. The interface has a dark theme. At the top, it shows "0 images" and "Total size: 0 Bytes". There are tabs for "IN USE" and "UNUSED", and a "Clean up..." button. Below this, there are two tabs: "LOCAL" and "REMOTE REPOSITORIES", with "REMOTE REPOSITORIES" being the active tab. It lists several Docker images:

REPOSITORY	TAGS	OS	VULNERABILITIES	LAST PUSHED	SIZE
labdocker/alpineweb	latest, web7, lua		Not available, Not available, Not available	1 day ago, over 4 years ago, over 3 years ago	24.41 MB, 9.27 MB, 18.56 MB
labdocker/cluster	webservicev2set2, webservicev2, webcache2		Not available, Not available, Not available	over 1 year ago, over 1 year ago, over 2 years ago	146.88 MB, 146.45 MB, 3.69 MB

At the bottom of the list, there are "See more" buttons.

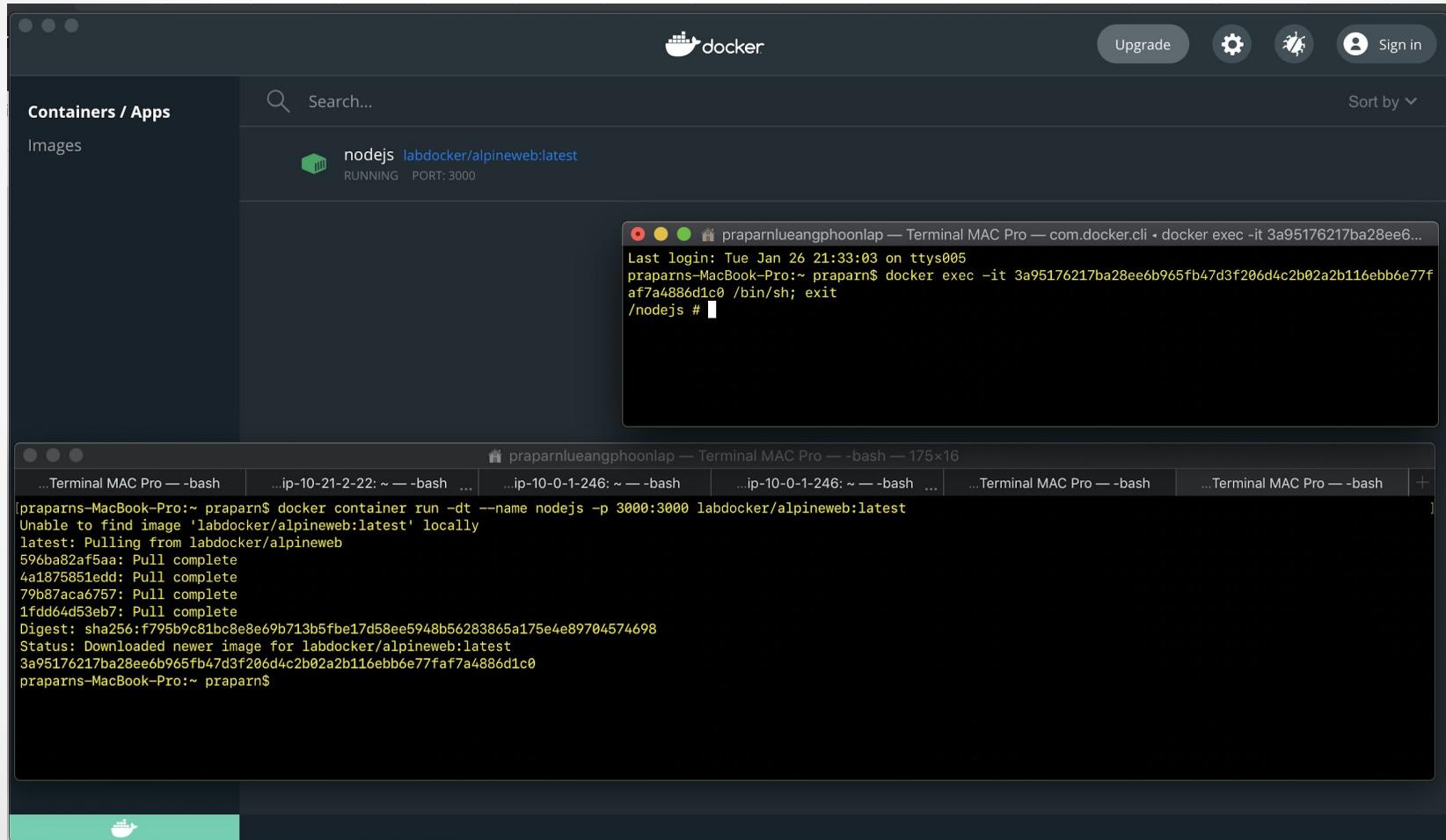
Docker Desktop

- GUI tool for developer/devops on your machine



Docker Desktop

- GUI tool for developer/devops on your machine



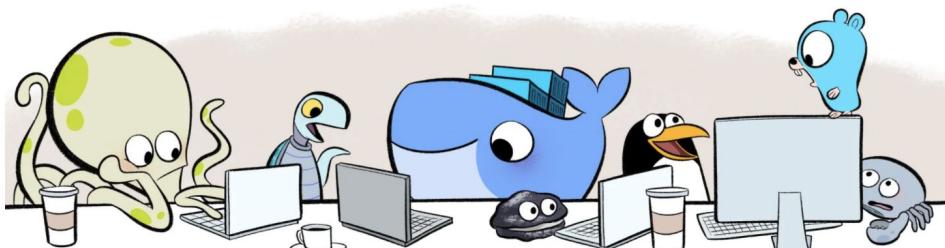
Docker Desktop

Docker is Updating and Extending Our Product Subscriptions



SCOTT JOHNSTON

Aug 31 2021



Docker is used by millions of developers to build, share, and run any app, anywhere, and 55% of professional developers use Docker every day at work. In these work environments, the increase in outside attacks on software supply chains is accelerating developer demand for Docker's trusted content, including Docker Official Images and Docker Verified Publisher images. Finally, the rapid global growth in developers – to an estimated 45 million by 2030 – pushes us to scale sustainably so we may continue to provide an innovative, free Docker experience that developers love.

To meet these challenges, today we're announcing updates and extensions to our product subscriptions: **Personal, Pro, Team, and Business**. These updated product subscriptions provide the productivity and collaboration developers rely on with the scale, security, and trusted content businesses require, and do so in a manner sustainable for Docker.

What you need to know:

- We're introducing a **new** product subscription, Docker Business, for organizations using Docker at scale for application development and require features like secure software supply chain management, single sign-on (SSO), container registry access controls, and more.
- Our [Docker Subscription Service Agreement](#) includes a change to the terms for **Docker Desktop**:
 - Docker Desktop **remains free** for small businesses (fewer than 250 employees AND less than \$10 million in annual revenue), personal use, education, and non-commercial open source projects.
 - It requires a paid subscription (**Pro, Team** or **Business**), starting at \$5 per user per month, for professional use in larger businesses. You may directly purchase [here](#), or share this post and our [solution brief](#) with your manager.
 - While the effective date of these terms is August 31, 2021, there is a grace period until January 31, 2022 for those that require a paid subscription to use Docker Desktop.
- Docker Pro, Docker Team, and Docker Business subscriptions **include** commercial use of Docker Desktop.
- The **existing** Docker Free subscription has been renamed Docker Personal.
 - **No changes** to Docker Engine or any upstream open source Docker or Moby project.
- Check out our [FAQ](#) or [more information](#).

Personal	Pro	Team	Business
\$0 Ideal for individual developers, education, open source communities, and small businesses. Includes Docker Desktop	\$5 /month Ideal for individual developers Includes Docker Desktop	\$7 /user/month minimum 5 seats Includes Docker Desktop	\$21 /user/month 50+ Includes Docker Desktop



Recapture for Day 1

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

Q&A for Day 1

• • •



Docker:Zero to Hero (Day 2)

By Praparn Luengphoonlap
Email: eva10409@gmail.com

Docker: The Next-Gen of Virtualization



Outline Day 2

- Dockerfile and Build
- Compose
- Docker Security
- 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

• • •

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
 - ARG
 - ENV
 - COPY /ADD (source) (Destination), [(source) (destination)]
 - ENTRYPOINT
 - WORKDIR
 - HEALTHCHECK
 - Etc(<https://docs.docker.com/engine/reference/builder>)
- เมื่อสร้าง dockerfile เสร็จแล้วสามารถลั่น image ผ่านคำสั่ง build

```
docker build <option> <path of dockerfile>
```

Dockerfile

- Option สำหรับคำสั่ง docker image build (Partial)
 - --add-host Add customer /etc/hosts
 - --build-arg Set build-time variables
 - --cache-from Image to consider
 - --cgroup-parent Specific parent control group
 - --compress Compress context with gzip
 - --cpu-shares CPU shares
 - --cpuset-cpus CPU no. for use
 - --memory, -m Memory limit
 - --disable-content-trust image verification
 - --file, -f Specify docker file
 - --rm Remove intermediate image after build finished
 - --force-rm Force remove intermediate image
 - --network Set network in build operate (RUN)
 - --no-cache Never use cache
 - --pull Always attempt pull new version image
 - --tag, -t Tag image name

Ref: <https://docs.docker.com/engine/reference/commandline/build/>

Docker: The Next-Gen of Virtualization



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 เท่านั้นที่จำเป็นต้องใช้งานบน container
- คำสั่ง rbg เพื่อติดตั้ง software รวมยอดใน 1 ชุดคำสั่ง
- ควรมีการลบ temp ที่เกิดขึ้นจากการติดตั้ง software เพื่อลดขนาดของ image
- จัดเรียง dockerfile ให้อ่านง่าย
 - apt-update && apt-install -y \
 - curl \
 - automake \
- ควรระบุ EXPOSE port ที่ออกแบบให้ใช้งานไว้ในทุกครั้ง

Ref: https://docs.docker.com/develop/develop-images/dockerfile_best-practices/

Docker: The Next-Gen of Virtualization



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 pdo_mysql \
    && 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 จะปรับเทียบ instruction ที่กำหนดไว้กับ image layer ที่
 - Consider: instruction, base image
- ควรระบุ HealthCheck เพื่อตรวจสอบการทำงานของ container

Docker Image Version

- Docker start to introduce standard of image manifest and schema on version 1.13.0 with version1 (deprecate)
- So standard image version is base on docker version that install on machine to build image
- In case that we run the deprecate version of docker image (schema v1). Docker will show warning during start container
- Converting image manifest is possible just “docker image pull” and “docker image push” from docker machine with up-to-date version. Docker will convert image format automatically
- Current docker image have 3 release of manifest
 - Manifest v1, Schema v1 (Deprecate)
 - Manifest v2, Schema v1 (Many vulnerability)
 - Manifest v2, Schema v2 (Recommend)

Docker Image Version

- Main feature of “Manifest v2, Schema v2
 - Support multi-architecture (fat manifest) image for contain single image
 - Keep image configuration to hash as id and embed on image
- Verify manifest and schema version by command:

```
docker manifest inspect <image version>
```

- application/vnd.docker.distribution.manifest.v1+json
- application/vnd.docker.distribution.manifest.v2+json
- application/vnd.docker.distribution.manifest.list.v2+json
- application/vnd.docker.container.image.v1+json
- application/vnd.docker.image.rootfs.diff.tar.gzip
- application/vnd.docker.image.rootfs.foreign.diff.tar.gzip
- application/vnd.docker.plugin.v1+json

Docker Image Version

- Verify manifest and schema version by command:

```
[ubuntu@ip-10-0-1-65:~$ docker manifest inspect labdocker/alpine:latest
{
  "schemaVersion": 2,
  "mediaType": "application/vnd.docker.distribution.manifest.v2+json",
  "config": {
    "mediaType": "application/vnd.docker.container.image.v1+json",
    "size": 1472,
    "digest": "sha256:7731472c3f2a25edbb9c085c78f42ec71259f2b83485aa60648276d408865839"
  },
  "layers": [
    {
      "mediaType": "application/vnd.docker.image.rootfs.diff.tar.gzip",
      "size": 2810825,
      "digest": "sha256:596ba82af5aaa3e2fd9d6f955b8b94f0744a2b60710e3c243ba3e4a467f051d1"
    }
  ]
}
ubuntu@ip-10-0-1-65:~$ ]
```

How can check dockerfile ?

FROM:latest

```
1 FROM labdocker/alpine:latest
2 MAINTAINER Praparn Lueangphoonglap (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

Show All X

Workshop: DockerFile

- Part1: SCRATCH

<https://github.com/docker-library/hello-world>

Maintained by: [the Docker Community](#)

This is the Git repo of the Docker "Official Image" for `hola-mundo` (not to be confused with any official `hola-mundo` image provided by `hola-mundo` upstream). See the [Docker Hub page](#) for the full readme on how to use this Docker image and for information regarding contributing and issues.

The full description from Docker Hub is generated over in [docker-library/docs](#), specifically in [docker-library/docs/hola-mundo](#).

```
instruction.txt  nginx  nodejs  python_restfulset  scratch
ubuntu@ip-10-0-1-104:~$ docker image build -t labdocker/hello-world:1.0 ~/docker-workshop-042019/Workshop-2-1-DockerFile/scratch/
Sending build context to Docker daemon 16.9kB
Step 1/3 : FROM scratch
-->
Step 2/3 : COPY hello /
--> Using cache
--> 937200b29847
Step 3/3 : CMD ["/hello"]
--> Using cache
--> e759df7ef1b1
Successfully built e759df7ef1b1
Successfully tagged labdocker/hello-world:1.0
ubuntu@ip-10-0-1-104:~$ docker container run labdocker/hello-world:1.0

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
1. The Docker client contacted the Docker daemon.
2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
   (amd64)
3. The Docker daemon created a new container from that image which runs the
   executable that produces the output you are currently reading.
4. The Docker daemon streamed that output to the Docker client, which sent it
   to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/

For more examples and ideas, visit:
https://docs.docker.com/get-started/
```

Workshop: DockerFile

- Part2: 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)

AWS's Machine

Path: ~/dockerworkshop/Workshop-2-1-DockerFile

/nodejs

dockerfile



/nginx

dockerfile



Workshop: DockerFile

- ตรวจสอบ dockerfile ตามตัวอย่างด้านล่าง

```
FROM labdocker/alpine:3.13.6
LABEL maintainer="Praparn Lueangphoonlap (eva10409@gmail.com)"
LABEL Description="NodeJS/NGINX Build Container" Version="1.0"
ENV NODE_VERSION=v14.15.4 NPM_VERSION=v14.15.4
RUN apk update && \
    apk add nodejs nodejs-npm curl --no-cache && \
    rm -rf /var/cache/apk/*
RUN mkdir /nodejs
COPY hello.js /nodejs/
WORKDIR /nodejs
ENTRYPOINT ["node","hello.js"]
EXPOSE 3000
HEALTHCHECK --interval=15s --timeout=5s --start-period=10s --retries=3 \
CMD curl -f http://localhost:3000/ || exit 1
```

```
docker image build -t labdocker/node:1.0
~/docker-workshop-072019/Workshop-2-1-DockerFile/nodejs
```

Workshop: DockerFile

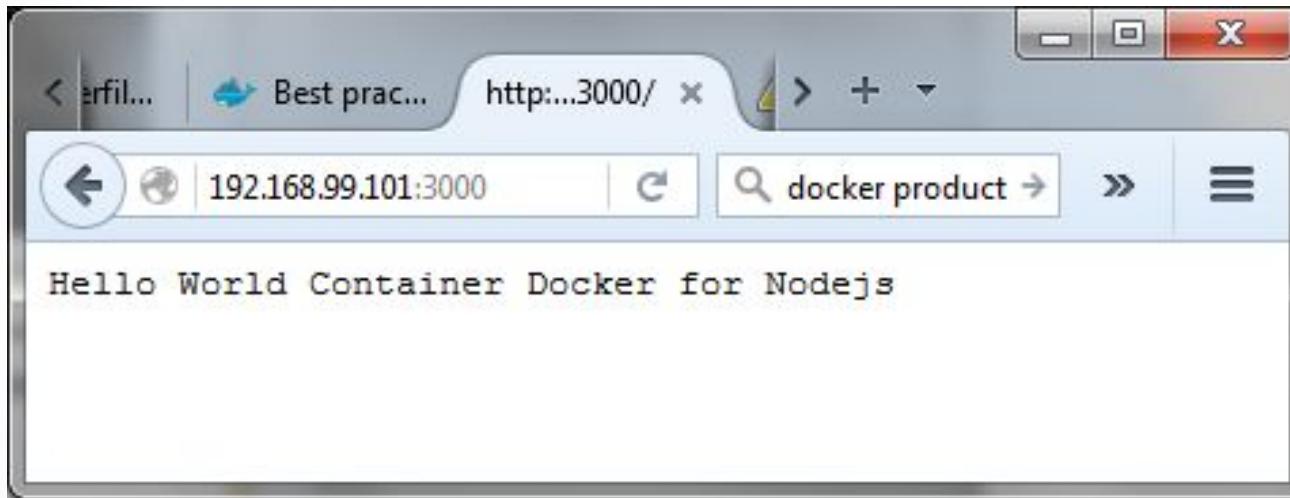
- Output

```
Sending build context to Docker daemon 3.072 kB
Step 1 : FROM labdocker/alpine:latest
--> 14f89d0e6257
Step 2 : MAINTAINER Praparn Lueangphoonlap (eval0409@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: DockerFile

- Test run

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



Workshop: DockerFile

- ตรวจสอบ dockerfile ตามตัวอย่างด้านล่าง

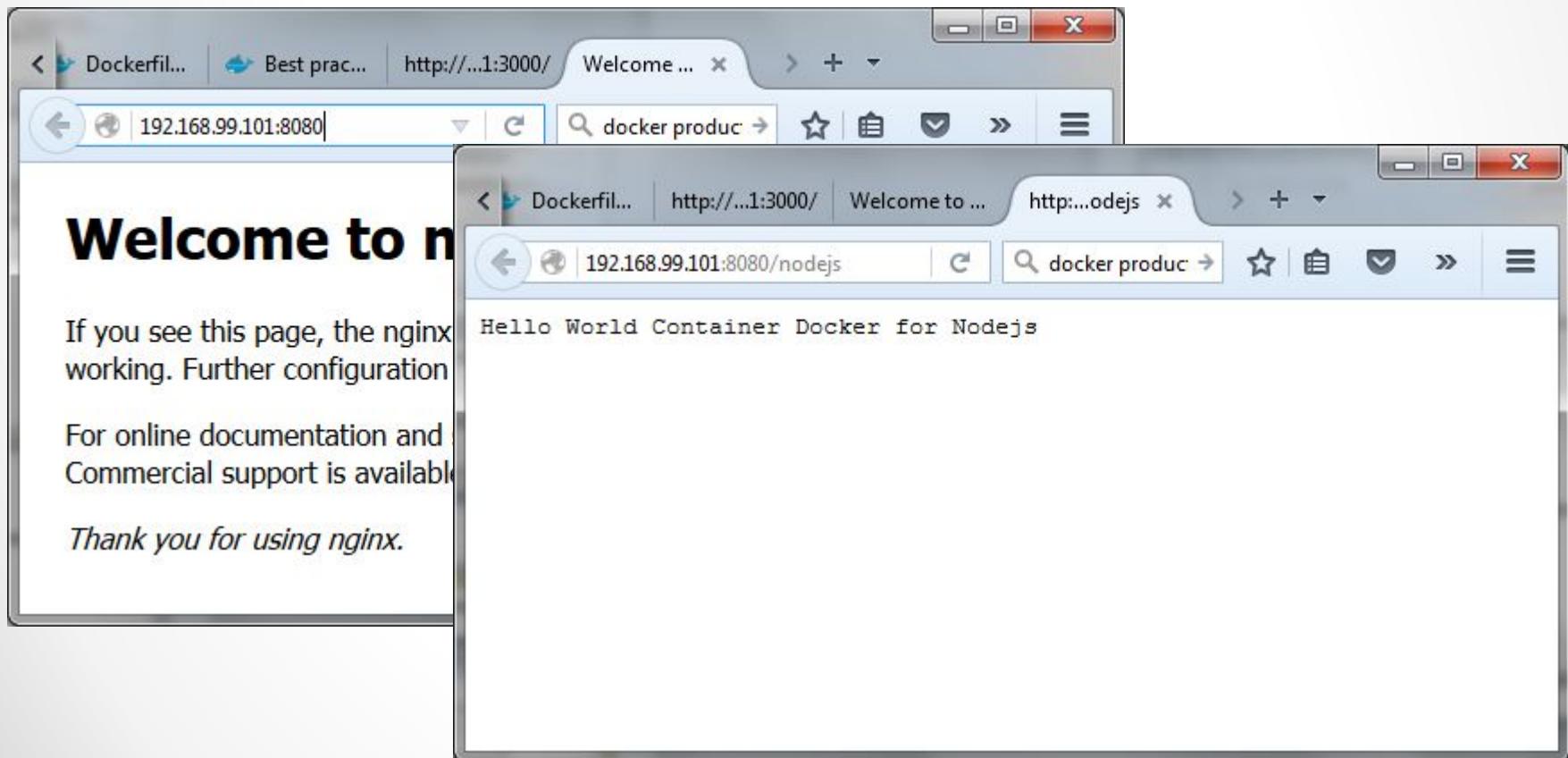
```
FROM labdocker/alpine:3.13.6
LABEL maintainer="Praparn Lueangphoonlap (eva10409@gmail.com)"
LABEL Description="NodeJS/NGINX Build Container" Version="1.0"
ENV NODE_VERSION=v14.15.4 NPM_VERSION=v14.15.4
RUN mkdir -p /run/nginx
RUN apk update && \
    apk add nginx curl --no-cache && \
    rm /etc/nginx/conf.d/default.conf && \
    rm -rf /var/cache/apk/*
COPY nginx.conf /etc/nginx/nginx.conf
WORKDIR /usr/sbin
ENTRYPOINT ["nginx","-c","/etc/nginx/nginx.conf"]
EXPOSE 8080
HEALTHCHECK --interval=15s --timeout=5s --start-period=10s --retries=3 \
CMD curl -f http://localhost:8080/ || exit 1
```

```
docker build -t labdocker/web:1.0
~/docker-workshop-072019/Workshop-2-1-DockerFile/nginx
```

Workshop: DockerFile

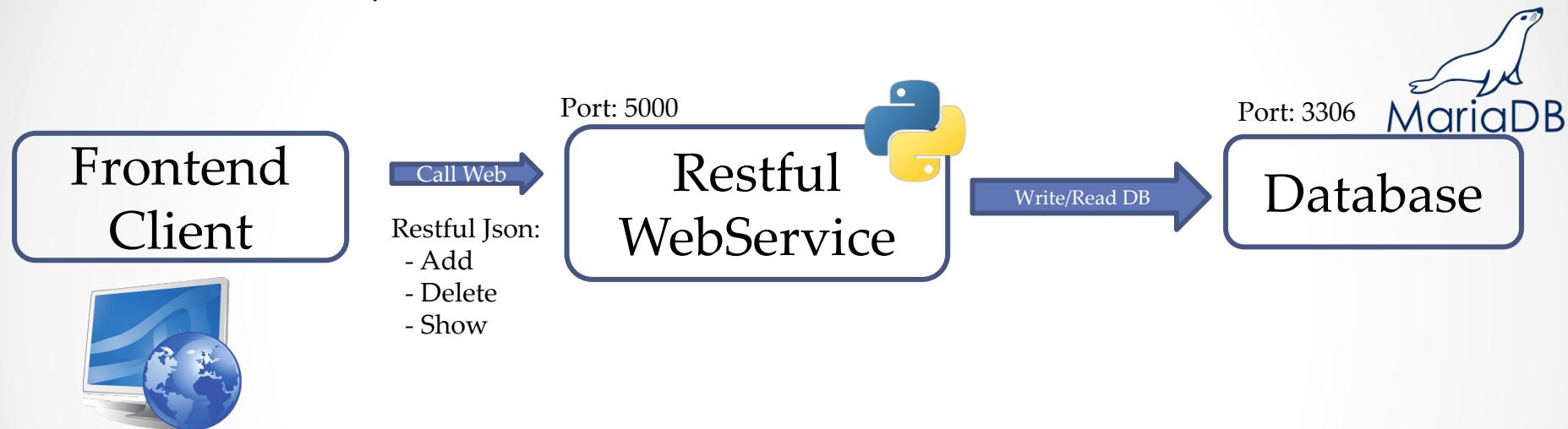
- Test run

```
docker container run -dt --name NGINX -p 8080:8080 -p  
8443:8443 labdocker/web:1.0
```



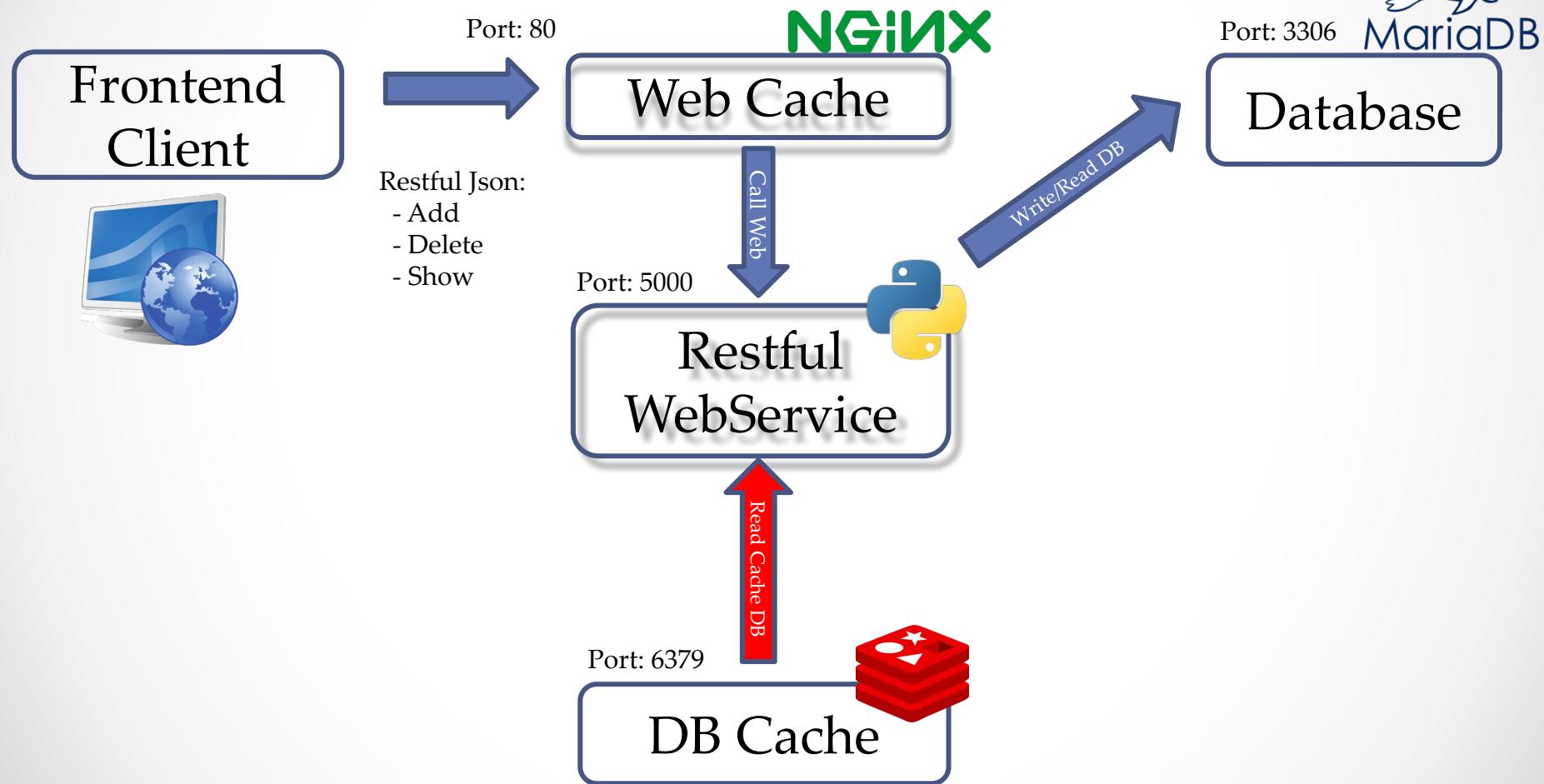
Workshop: DockerFile

- Part3: Python RESTFUL
- Basic Component



Workshop: DockerFile

- Optimize for WorkLoad



Workshop: 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),
        DESCRIBE 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, DESCRIBE) 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: 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: 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: 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;
    [REDACTED]
    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: 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
```

→ Maria Database

→ Redis Key-Value Database

Workshop: DockerFile

- Dockerfile: WebService

```
FROM labdocker/alpinepython:2.7-onbuild
LABEL maintainer="Praparn Lueangphoonlap (eva10409@gmail.com)"
LABEL Description="NodeJS/NGINX Build Container" Version="1.0"
RUN apk update && \
    apk add curl --no-cache && rm -rf /var/cache/apk/*
EXPOSE 5000
CMD [ "python", "main.py" ]
HEALTHCHECK --interval=30s --timeout=5s --start-period=30s --retries=3 \
    CMD curl -f http://localhost:5000/ || exit 1
```

```
docker build -t labdocker/webservice:1.0 \
-f dockerfile_python Path:
~/dockerworkshop/Workshop-2-1-DockerFile/python_restfulset/
```

Workshop: DockerFile

- Dockerfile: Webcache

```
FROM labdocker/alpine:3.13.6
LABEL 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 nginx curl --no-cache && rm -rf /var/cache/apk/*
COPY nginx.conf /etc/nginx/nginx.conf
WORKDIR /usr/sbin
ENTRYPOINT ["nginx","-c","/etc/nginx/nginx.conf"]
EXPOSE 8080
HEALTHCHECK --interval=30s --timeout=5s --start-period=30s --retries=3 \
CMD curl -f http://localhost:8080/ || exit 1
```

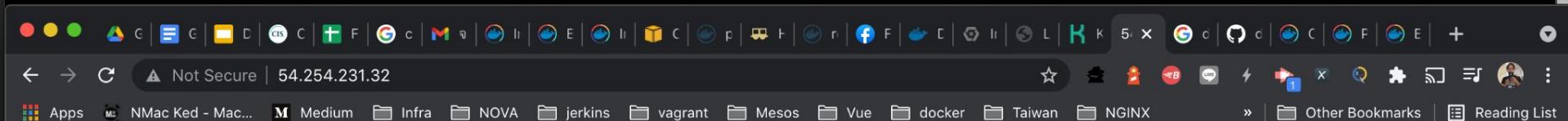
```
docker build -t labdocker/webcache:1.0 \
-f dockerfile_nginx
~/dockerworkshop/Workshop-2-1-DockerFile/python_restfulset/
```

Workshop: DockerFile

- Test run container

```
[ubuntu@ip-10-0-1-90:~/docker-workshop-092021/Workshop-2-1-DockerFile/python_restfulset$ docker container ls
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
ab037be198e2 labdocker/webcache:1.0 "nginx -c /etc/nginx..." 43 seconds ago Up 42 seconds (healthy) 0.0.0.0:80->8080/tcp, :::80->8080/tcp webcache
e7b40d9b3683 labdocker/webservice:1.0 "python main.py" 13 minutes ago Up 13 minutes (healthy) 0.0.0.0:5000->5000/tcp, :::5000->5000/tcp webservice
00b582c4da1d labdocker/redis:latest "docker-entrypoint.s..." 14 minutes ago Up 14 minutes 6379/tcp cachedb
82b1e278d02f labdocker/mariadb:10.5.12 "docker-entrypoint.s..." 14 minutes ago Up 14 minutes 3306/tcp maindb
ubuntu@ip-10-0-1-90:~/docker-workshop-092021/Workshop-2-1-DockerFile/python_restfulset$ ]
```

```
[... .ssh — ubuntu@ip-10-0-1-90: ~docke... ssh -i docker_lab.pem ubuntu@ec2-54-254-231-32.ap-southeast-1.compute.amazonaws.com — 187x31
...092021 — Terminal MAC Pro — bash ... ...cesetup — Terminal MAC Pro — bash | ...eacher — Terminal MAC Pro — bash | ...utheast-1.compute.amazonaws.com | ...utheast-1.compute.amazonaws.com + D
[ubuntu@ip-10-0-1-90:~/docke...092021$ curl ifconfig.co
54.254.231.32
[ubuntu@ip-10-0-1-90:~/docke...092021$ export Server_IP=54.254.231.32
[ubuntu@ip-10-0-1-90:~/docke...092021$ export Server_Port=80
[ubuntu@ip-10-0-1-90:~/docke...092021$ curl http://$Server_IP:$Server_Port/
<H1> Welcome Page from Container Python Lab </H1>Checkpoint Date/Time: Fri Sep 3 18:33:20 2021
[ubuntu@ip-10-0-1-90:~/docke...092021$ curl http://$Server_IP:$Server_Port/init
##### Database Create New Account Table Done #####
ubuntu@ip-10-0-1-90:~/docke...092021$ ]
```



Welcome Page from Container Python Lab

Checkpoint Date/Time: Fri Sep 3 18:33:56 2021

Workshop: DockerFile

- Init / Insert / Delete Data

```
##### Record was added #####
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl -i -H "Content-Type: application/json" -X POST -d '{"uid": "8", "user":"Pansa Bunsong", "desribe":"Security Guard"}' http://$Server_IP:$Server_Port/users/insertuser
HTTP/1.1 200 OK
Server: nginx/1.18.0
Date: Fri, 03 Sep 2021 18:34:55 GMT
Content-Type: application/json
Content-Length: 41
Connection: keep-alive

##### Record was added #####
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl -i -H "Content-Type: application/json" -X POST -d '{"uid": "9", "user":"Wiphanee Wongsaisawan", "desribe":"Administrator"}' http://$Server_IP:$Server_Port/users/insertuser
HTTP/1.1 200 OK
Server: nginx/1.18.0
Date: Fri, 03 Sep 2021 18:34:57 GMT
Content-Type: application/json
Content-Length: 41
Connection: keep-alive

##### Record was added #####
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/1
Praparn Luangphoonaip(Database Direct)
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/1
Praparn Luangphoonaip(Database Cache)
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/2
Somchai Sunskwan(Database Direct)
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/2
Somchai Sunskwan(Database Cache)
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/3
Sanyachan Panrudee(Database Direct)
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/3
Sanyachan Panrudee(Database Cache)
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/1
#####
Record was deleted (Both Database Cache) #####
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/removeuser/2
#####
Record was deleted (Both Database Cache) #####
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/removeuser/3
#####
Record was deleted (Both Database Cache) #####
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/removeuser/4
#####
Record was deleted #####
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ [ ]
```

Workshop: DockerFile

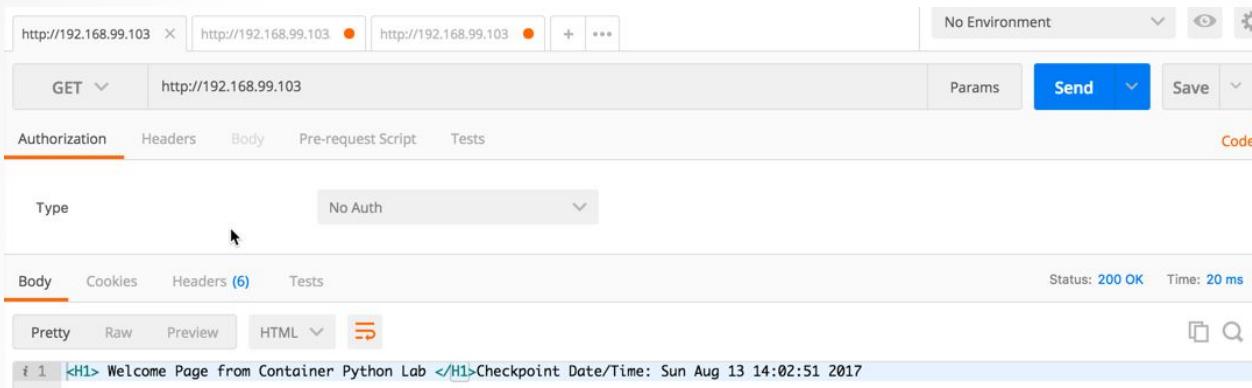
- Get Data (Direct/Cache) and Delete Data

```
[ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/1
Praparn Luangphoonlap(Database Direct)
[ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/1
Praparn Luangphoonlap(Database Cache)
[ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/2
Somchai Sunsukwan(Database Direct)
[ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/2
Somchai Sunsukwan(Database Cache)
[ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/3
Sanyachan Panrudee(Database Direct)
[ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/3
Sanyachan Panrudee(Database Cache)
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/removeuser/1
#####
Record was deleted (Both Database Cache) #####
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/removeuser/2
#####
Record was deleted (Both Database Cache) #####
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/removeuser/3
#####
Record was deleted (Both Database Cache) #####
[ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ curl http://$Server_IP:$Server_Port/users/removeuser/4
#####
Record was deleted #####
ubuntu@ip-10-0-1-90:~/docker-workshop-092021$ ]
```



Workshop: DockerFile

- Case for POSTMAN



http://192.168.99.103 X http://192.168.99.103 ● http://192.168.99.103 ● + *** No Environment Send Save Code

GET http://192.168.99.103 Params Send Save Code

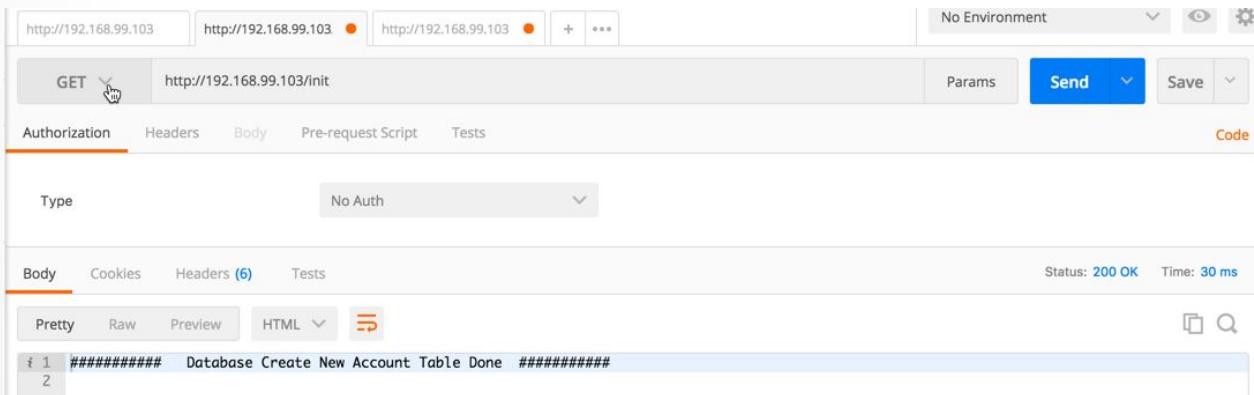
Authorization Headers Body Pre-request Script Tests

Type: No Auth

Body Cookies Headers (6) Tests Status: 200 OK Time: 20 ms

Pretty Raw Preview HTML Copy Search

i 1 <H1> Welcome Page from Container Python Lab </H1>Checkpoint Date/Time: Sun Aug 13 14:02:51 2017



http://192.168.99.103 X http://192.168.99.103 ● http://192.168.99.103 ● + *** No Environment Send Save Code

GET http://192.168.99.103/init Params Send Save Code

Authorization Headers Body Pre-request Script Tests

Type: No Auth

Body Cookies Headers (6) Tests Status: 200 OK Time: 30 ms

Pretty Raw Preview HTML Copy Search

i 1 ##### Database Create New Account Table Done #####
2

Workshop: DockerFile

- Case for POSTMAN

The screenshot shows the Postman application interface. At the top, there are three tabs with URLs: http://192.168.99.103, http://192.168.99.103 (highlighted with a red dot), and http://192.168.99.103. To the right of these are buttons for '+', '...', 'No Environment' (with a dropdown arrow), and settings (eye and gear icons). Below the tabs, the method is set to 'POST' and the URL is 'http://192.168.99.103/users/insertuser'. There are buttons for 'Params', 'Send' (highlighted with a blue background), and 'Save'. Under the 'Body' tab, which is selected (indicated by an orange underline), the content type is set to 'JSON (application/json)'. The body content is a JSON object:

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

Below the body content, there is a large text input area with a cursor. At the bottom of the interface, there are tabs for 'Body', 'Cookies', 'Headers (5)', and 'Tests'. On the right side, the status is shown as 'Status: 200 OK' and 'Time: 25 ms'. Below the status, there are buttons for 'Pretty', 'Raw', 'Preview', and 'HTML' (with a dropdown arrow). To the far right are icons for copy and search.

Workshop: DockerFile

- Case for POSTMAN

The image displays two separate instances of the Postman application window, each showing a GET request to `http://192.168.99.103/users/1`.
The top instance shows a response status of `200 OK` and a time of `22 ms`. The response body is shown in Pretty format and contains the text: `i 1 Praparn Luangphoonlap(Database Direct)`.
The bottom instance shows a response status of `200 OK` and a time of `24 ms`. The response body is also in Pretty format and contains the same text: `i 1 Praparn Luangphoonlap(Database Cache)`.

Workshop: DockerFile

- Case for POSTMAN

The screenshot shows two separate API requests in the Postman application.

Request 1: GET `http://192.168.99.103/users/removeuser/1`

Request 2: GET `http://192.168.99.103/users/removeuser/3`

In both requests, the **Authorization** tab is selected, showing "No Auth". The **Body** tab contains the response body:

```
i 1 ##### Record was deleted #####
2
```

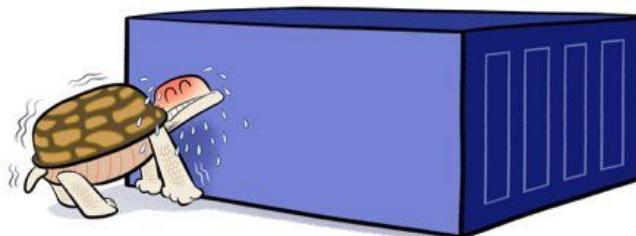
The status for both requests is **200 OK**.

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

Build smaller images with Multi-stage builds

**First stage:
complete build
environment**



**Second stage:
minimal runtime
environment** ❤️



One Dockerfile, one build

Dockerfile

Multi-state dockerfile:

```
1 #####  
2 # STEP 1 build executable binary  
3 #####  
4 FROM golang:alpine AS builder  
5 # Install git.  
6 # Git is required for fetching the dependencies.  
7 RUN apk update && apk add --no-cache git  
8 WORKDIR $GOPATH/src/mypackage/myapp/  
9 COPY . .  
10 # Fetch dependencies.  
11 # Using go get.  
12 RUN go get -d -v  
13 # Build the binary.  
14 RUN go build -o /go/bin/hello  
15 #####  
16 # STEP 2 build a small image  
17 #####  
18 FROM scratch  
19 # Copy our static executable.  
20 COPY --from=builder /go/bin/hello /go/bin/hello  
21 # Run the hello binary.  
22 ENTRYPOINT ["/go/bin/hello"]
```

Output: Final Image 1 Unit

Compose

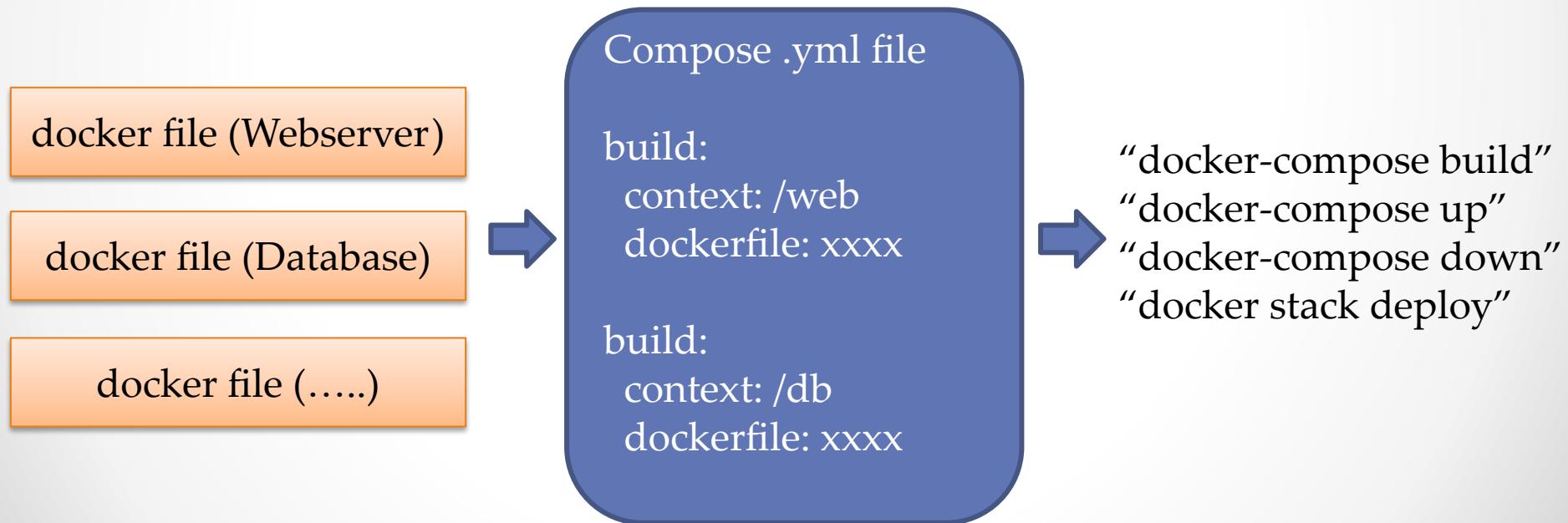
• • •

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
- หมายสำหรับการสร้าง development environment / test environment / automatic deploy to production (docker-machine / swarm) (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



Compose

Compatibility matrix

There are several versions of the Compose file format – 1, 2, 2.x, and 3.x

This table shows which Compose file versions support specific Docker releases.

Compose file format	Docker Engine release
Compose specification	19.03.0+
3.8	19.03.0+
3.7	18.06.0+
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+

Latest release
1.29.2
by ulyssessouza released this on May 10
Compare

List of PRs / issues for this release

Miscellaneous

- Remove prompt to use `docker compose` in the `up` command
- Bump `py` to `1.10.0` in `requirements-indirect.txt`

59 3 12 11 8 79 people reacted

Assets 11

- `docker-compose-Darwin-x86_64` 9.94 MB
- `docker-compose-Darwin-x86_64.sha256` 95 Bytes
- `docker-compose-Darwin-x86_64.tgz` 9.96 MB
- `docker-compose-Darwin-x86_64.tgz.sha256` 99 Bytes
- `docker-compose-Linux-x86_64` 12.1 MB
- `docker-compose-Linux-x86_64.sha256` 94 Bytes
- `docker-compose-Windows-x86_64.exe` 9.96 MB
- `docker-compose-Windows-x86_64.exe.sha256` 101 Bytes
- `run.sh` 2.52 KB
- `Source code (zip)`
- `Source code (tar.gz)`

Compose

- Compose syntax: (docker compose up/down/run)
 - version: x (Current Version 3)
 - 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>

Docker: The Next-Gen of Virtualization



Compose

Control startup and shutdown order in Compose

Estimated reading time: 2 minutes

You can control the order of service startup and shutdown with the `depends_on` option. Compose always starts and stops containers in dependency order, where dependencies are determined by `depends_on`, `links`, `volumes_from`, and `network_mode: "service:..."`.

However, for startup Compose does not wait until a container is “ready” (whatever that means for your particular application) - only until it’s running. There’s a good reason for this.

The problem of waiting for a database (for example) to be ready is really just a subset of a much larger problem of distributed systems. In production, your database could become unavailable or move hosts at any time. Your application needs to be resilient to these types of failures.

To handle this, design your application to attempt to re-establish a connection to the database after a failure. If the application retries the connection, it can eventually connect to the database.

The best solution is to perform this check in your application code, both at startup and whenever a connection is lost for any reason. However, if you don’t need this level of resilience, you can work around the problem with a wrapper script:

- Use a tool such as `wait-for-it`, `dockerize`, or sh-compatible `wait-for`. These are small wrapper scripts which you can include in your application’s image to poll a given host and port until it’s accepting TCP connections.

For example, to use `wait-for-it.sh` or `wait-for` to wrap your service’s command:

```
version: "2"
services:
  web:
    build: .
    ports:
      - "80:8000"
    depends_on:
      - "db"
    command: ["./wait-for-it.sh", "db:5432", "--", "python", "app.py"]
  db:
    image: postgres
```

Ref: <https://docs.docker.com/compose/startup-order/>

Compose

[eficode / wait-for](https://github.com/Eficode/wait-for)
forked from [mrako/wait-for](#)

Code Pull requests 12 Projects 0 Wiki Security Insights

./wait-for is a script to wait for another service to become available.

15 commits 1 branch 0 releases 5 contributors MIT

Branch: master New pull request Create new file Upload files Find File Clone or download ▾

This branch is 8 commits ahead of mrako:master. #16 Compare

 **suonto** Merge pull request #7 from szTheory/patch-1 ... Latest commit 8283864 on Apr 9, 2018

.gitignore	Add testing using bats	2 years ago
.travis.yml	Move travis build and status under Eficode	2 years ago
Dockerfile	Add testing using bats	2 years ago
LICENSE	initial commit	2 years ago
README.md	Fix also the other url that had capital E	last year
package.json	add name and version so it can be installed with npm	2 years ago
wait-for	use 'exec "\$@"'	2 years ago
wait-for.bats	Add testing using bats	2 years ago

[README.md](#)

Wait for another service to become available

./wait-for is a script designed to synchronize services like docker containers. It is sh and alpine compatible. It was inspired by [vishnubob/wait-for-it](#), but the core has been rewritten at [Eficode](#) by [dsuni](#) and [mrako](#).

When using this tool, you only need to pick the `wait-for` file as part of your project.

build passing

Ref: <https://github.com/Eficode/wait-for>

Docker: The Next-Gen of Virtualization



Compose

[vishnubob / wait-for-it](https://github.com/vishnubob/wait-for-it)

Code Issues 16 Pull requests 18 Projects 0 Wiki Security Insights

Pure bash script to test and wait on the availability of a TCP host and port

36 commits 1 branch 0 releases 8 contributors MIT

Branch: master New pull request Create new file Upload files Find File Clone or download

douglas-gibbons Merge branch 'fwoelffel-master' Latest commit 54d1f0b on Nov 4, 2018

test Fixes to test script for flake8 2 years ago
.gitignore Start of test framework 2 years ago
.travis.yml Fixes to test script for flake8 2 years ago
LICENSE license added 3 years ago
README.md README: community section + mention Debian package 10 months ago
wait-for-it.sh Merge branch 'master' of https://github.com/fwoelffel/wait-for-it into master 8 months ago

README.md

wait-for-it

`wait-for-it.sh` is a pure bash script that will wait on the availability of a host and TCP port. It is useful for synchronizing the spin-up of interdependent services, such as linked docker containers. Since it is a pure bash script, it does not have any external dependencies.

Usage

```
wait-for-it.sh host:port [-s] [-t timeout] [-- command args]
-h HOST | --host=HOST      Host or IP under test
-p PORT | --port=PORT      TCP port under test
                           Alternatively, you specify the host and port as host:port
-s | --strict               Only execute subcommand if the test succeeds
-q | --quiet                Don't output any status messages
-t TIMEOUT | --timeout=TIMEOUT
                           Timeout in seconds, zero for no timeout
-- COMMAND ARGS             Execute command with args after the test finishes
```

Ref: <https://github.com/vishnubob/wait-for-it>

Docker: The Next-Gen of Virtualization

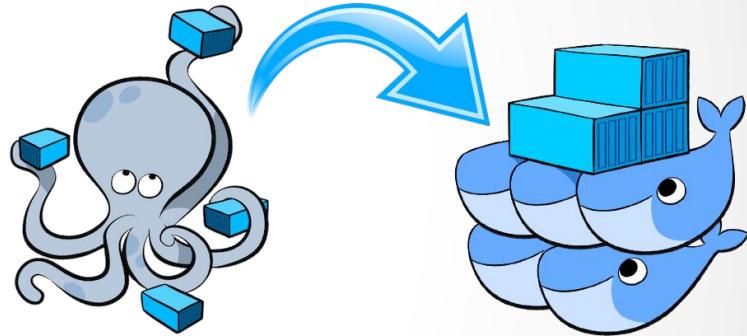


Compose

```
Workshop-2-1-DockerFile > python_restfulset > main.py
 1  from flask import Flask
 2  from flask import Response
 3  from flask import request
 4  from redis import Redis
 5  from datetime import datetime
 6  import MySQLdb
 7  import sys
 8  import redis
 9  import time
10  import hashlib
11  import os
12  import json
13  flagloop= 0
14  app = Flask(__name__)
15  startTime = datetime.now()
16  while flagloop == 0:
17      try:
18          db = MySQLdb.connect("maindb","root","password")
19      except:
20          time.sleep(2)
21          continue
22      else:
23          flagloop= 1
24
25 CACHE_DB = redis.Redis(host=os.environ.get('REDIS_HOST', 'cachedb'), port=6379)
26 MAIN_DB = db.cursor()
27 @app.route('/')
28 def hello():
29     return '<H1> Welcome Page from Container Python Lab </H1>Checkpoint Date/Time: ' + time.strftime("%c") +'\n'
30 @app.route('/init')
31 def init():
32     MAIN_DB.execute("DROP DATABASE IF EXISTS ACCTABLE")
33     MAIN_DB.execute("CREATE DATABASE ACCTABLE")
34     MAIN_DB.execute("USE ACCTABLE")
35     sql = """CREATE TABLE users (
36             ID int,
37             USER char(30),
38             DESCRIPE char(250)
39         )"""
40     MAIN_DB.execute(sql)
41     db.commit()
42     return "##### Database Create New Account Table Done #####\n"
```

Compose

- Compose syntax: (docker stack deploy)
 - services:
 - XXX (service name):
 - 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



Compose

- Compose State:

 - “Command: docker-compose up (build + create + run)” □

“Command: docker-compose build”

Compose.yaml

build

Images

State: build image

“Command: docker-compose create”

Containers

create

Containers

State: create

start

“Command: docker-compose stop”

Containers

remove

State: remove

Containers

State: exited

stop

start

Containers

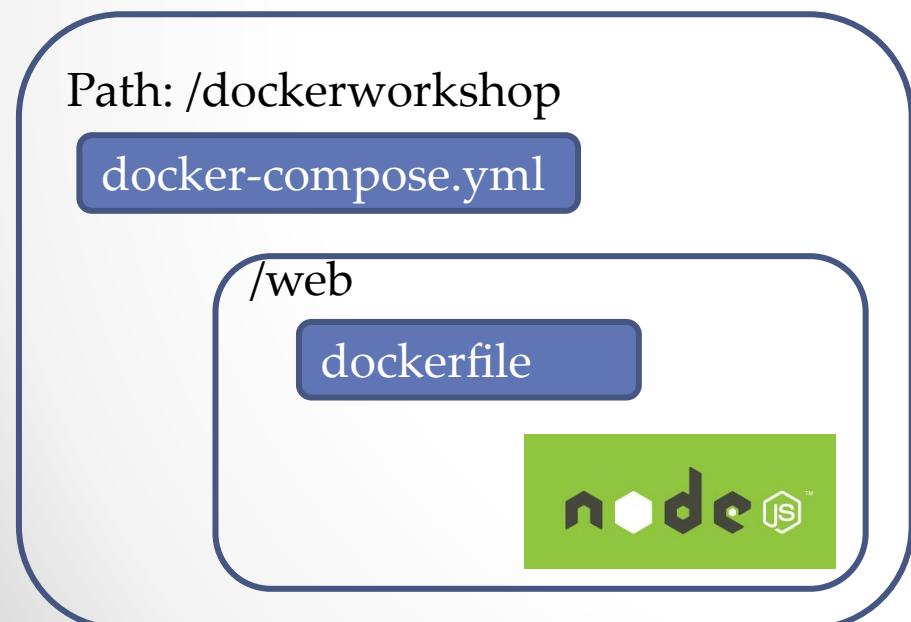
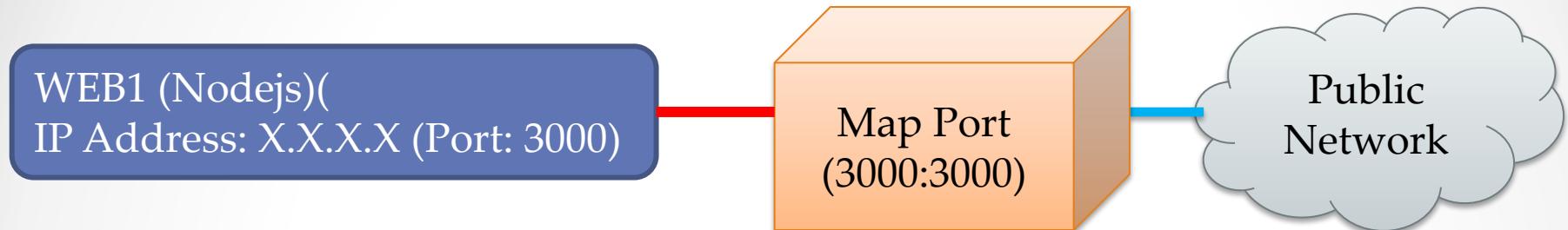
State: running

“Command: docker-compose down”

“Command: docker-compose start”

Workshop: Compose

- Part1: componenodejs



Docker: The Next-Gen of Virtualization



Workshop: Compose

- dockerfile

```
FROM labdocker/alpine:3.13.6
LABEL 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 curl --no-cache && rm -rf /var/cache/apk/*
RUN mkdir /nodejs
COPY hello.js /nodejs/
CMD ["nginx","-c","/etc/nginx/nginx.conf"]
WORKDIR /nodejs
ENTRYPOINT ["node","hello.js"]
EXPOSE 3000
HEALTHCHECK --interval=15s --timeout=5s --start-period=10s --retries=3 \
    CMD curl -f http://localhost:3000/ || exit 1
```

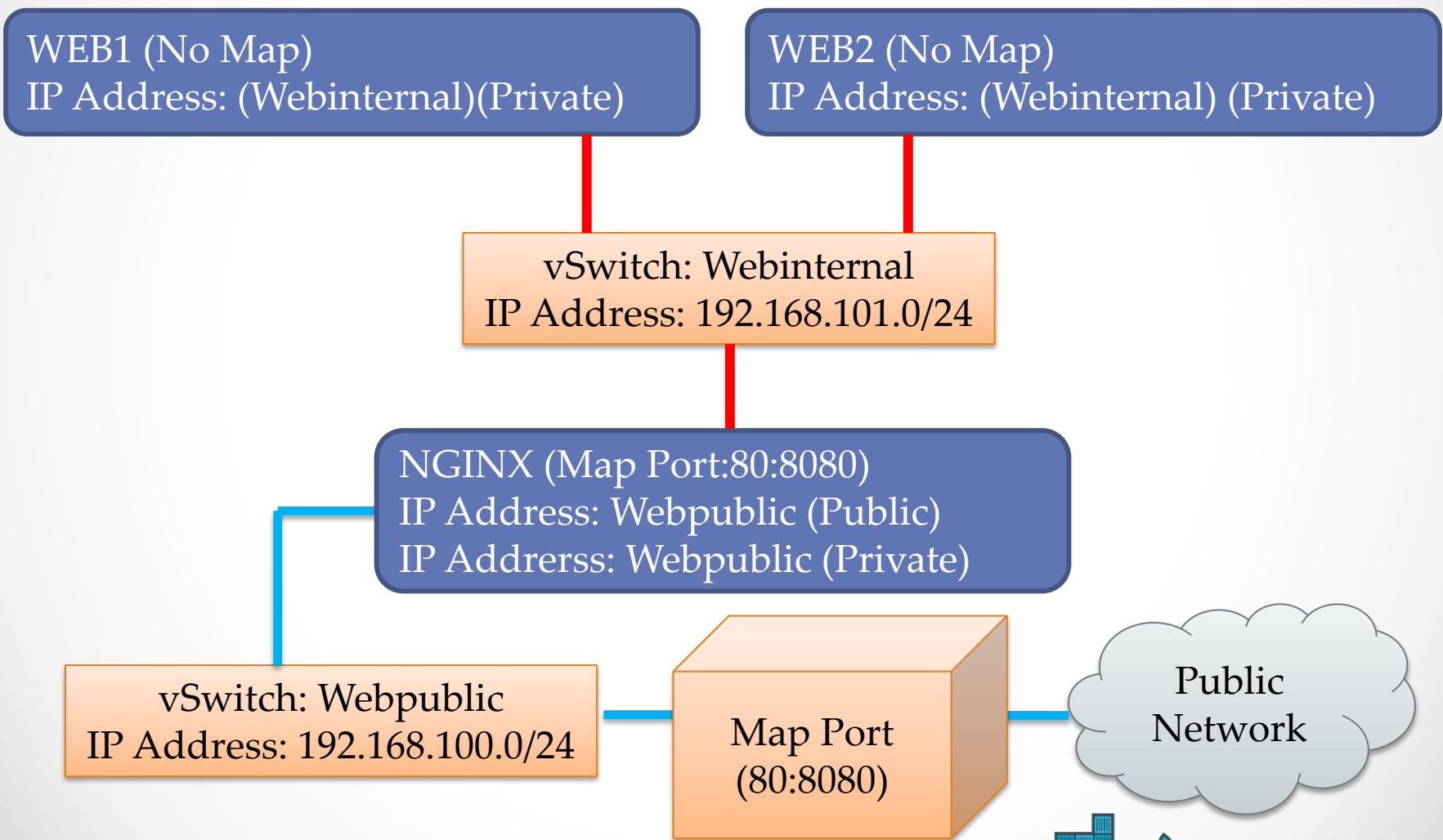
Workshop: Compose

- 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
    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>
    ports:
      - 3000:3000
```

Workshop: Compose

- Part 2: composemultinodejs



Workshop: Compose

- Use case: multinodejs with nginx

Path: /dockerworkshop

docker-compose.yml

/nginx

dockerfile
(webinternal)
(webpublic)

nginx.conf
load balance:
web1
web2



/web1

dockerfile (webinternal)



/web2

dockerfile (webinternal)



Workshop: Compose

- nginx: dockerfile

```
FROM labdocker/alpine:3.13.6
LABEL maintainer="Praparn Lueangphoonlap (eva10409@gmail.com)"
LABEL Description="NodeJS/NGINX Build Container" Version="1.0"
ENV NODE_VERSION=v10.14.2-r0 NPM_VERSION=v10.14.2-r0
RUN mkdir -p /run/nginx
RUN apk update && \
    apk add nginx curl --no-cache && \
    rm /etc/nginx/conf.d/default.conf \
    rm -rf /var/cache/apk/*
COPY nginx.conf /etc/nginx/nginx.conf
COPY labdocker.com.crt /etc/nginx/labdocker.com.crt
COPY labdocker.com.key /etc/nginx/labdocker.com.key
WORKDIR /usr/sbin
ENTRYPOINT ["nginx","-c","/etc/nginx/nginx.conf"]
EXPOSE 8080 8443
HEALTHCHECK --interval=15s --timeout=5s --start-period=10s --retries=3 \
CMD curl -f http://localhost:8080/ || exit 1
```

Workshop: Compose

- Web1 & Web 2: dockerfile

```
FROM labdocker/alpine:3.13.6
LABEL 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 curl --no-cache && rm -rf /var/cache/apk/*
RUN mkdir /nodejs
COPY hello.js /nodejs/
WORKDIR /nodejs
ENTRYPOINT ["node","hello.js"]
EXPOSE 3000
HEALTHCHECK --interval=15s --timeout=5s --start-period=10s --retries=3 \
CMD curl -f http://localhost:3000/ || exit 1
```

Workshop: 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: Compose

- docker-compose.yml

```
1  version: '3.4'
2  services:
3    nginx:
4      build:
5        context: ./nginx
6        dockerfile: dockerfile          # optional for specific dockerfile
7        cache_from:
8          - alpine:latest
9      container_name: nginx
10     depends_on:
11       - web1
12       - web2
13     healthcheck:
14       test: ["CMD", "curl", "-f", "http://localhost:80"]  # option for health check and send curl for check http://localhost:3000
15       interval: 30s                                     # interval health check
16       timeout: 10s                                     # timeout for check
17       retries: 3                                       # maximum retries
18       start_period: 30s                                # start period <news on 3.4>
19     networks:
20       webpublic:
21         aliases:
22           - nginx
23       webinternal:
24         aliases:
25           - nginx
26     ports:
27       - "80:8080"
```

Workshop: Compose

- docker-compose.yml

```
29  web1:
30    build:
31      context: ./web1
32      dockerfile: dockerfile          # optional for specific dockerfile
33      cache_from:
34        - labdocker/alpineweb:latest
35    container_name: web1
36    healthcheck:
37      test: ["CMD", "curl", "-f", "http://localhost:3000"] # option for health check and send curl for check http://localhost:3000
38      interval: 30s                                # interval health check
39      timeout: 10s                               # timeout for check
40      retries: 3                                 # maximum retries
41      start_period: 30s                         # start period <news on 3.4>
42    networks:
43      webinternal:
44        aliases:
45        - web1
46
47  web2:
48    build:
49      context: ./web2
50      dockerfile: dockerfile          # optional for specific dockerfile
51      cache_from:
52        - labdocker/alpineweb:latest
53    container_name: web2
54    healthcheck:
55      test: ["CMD", "curl", "-f", "http://localhost:3000"] # option for health check and send curl for check http://localhost:3000
56      interval: 30s                                # interval health check
57      timeout: 10s                               # timeout for check
58      retries: 3                                 # maximum retries
59      start_period: 30s                         # start period <news on 3.4>
60    networks:
61      webinternal:
62        aliases:
63        - web2
```

Workshop: Compose

- docker-compose.yml

```
65 networks:
66   webpublic:
67     driver: bridge
68     ipam:
69       driver: default
70       config:
71         - subnet: 192.168.100.0/24
72   webinternal:
73     driver: bridge
74     ipam:
75       driver: default
76       config:
77         - subnet: 192.168.101.0/24
78
```

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
 - Control user inside container with limit capability
 - Some activity should be prohibited on container
 - Mount disk operation
 - Access system path (/bin, /usr/bin, /proc etc)
 - Create network socket
 - Execute shell
 - etc

Docker Security

- Docker Image Scanning
 - How can you make sure that your image is not vulnerability

Security and Compliance

As organizations move container workloads to production, they are recognizing the need to integrate security and compliance into the DevOps workflow. "Shift security left" has become a buzz phrase that often refers to scanning containers for vulnerabilities. Scanning is clearly critical given the high percentage of container images pulled from public registries and the high failure rate of scanned images. But the data also highlights the need for compliance checks and stringent runtime policies to reduce risk. To provide insights into the state of security and compliance in Kubernetes and cloud-native environments, we've analyzed data points that include vulnerability scanning, runtime security, and compliance.

Image scanning

Regardless of the source of the container images, it is critical to perform image scanning and identify known vulnerabilities prior to deploying into production. To quantify the scope of the risk of vulnerabilities, we sampled pass and fail rates for images scanned over a seven-day period. Over half of the images failed, meaning they were found to have known vulnerabilities with a severity of high or greater.



"The more you scan, the faster flaws get identified and fixed. We have found that scanning in the CI/CD pipeline allows us to reduce risk and ensure security is not a blocker for fast app delivery."

- Natnael Teferi
Lead DevSecOps Cloud Security Architect at FIS

Docker Security

- Docker Bench for Security
 - Docker container / script for check best practice to use docker in production (Ref: CIS Test)

README.md

Docker Bench for Security

```
# -- Docker Bench for Security v1.3.5
# Docker, Inc. (c) 2015-
#
# Checks for dozens of common best-practices around deploying Docker containers in production.
# Inspired by the CIS Docker Benchmark v1.2.0.
# ---

Initializing Tue Nov  5 10:27:42 UTC 2019

[INFO] 1 - Host Configuration

[INFO] 1.1 - General Configuration
[NOTE] 1.1.1 - Ensure the container host has been Hardened
[INFO] 1.1.2 - Ensure Docker is up to date
[INFO]     * Using 19.03.4, verify is it up to date as deemed necessary
[INFO]     * Your operating system vendor may provide support and security maintenance for Docker

[INFO] 1.2 - Linux Hosts Specific Configuration
[WARN] 1.2.1 - Ensure a separate partition for containers has been created
[INFO] 1.2.2 - Ensure only trusted users are allowed to control Docker daemon
[INFO]     * docker:x:998:
[WARN] 1.2.3 - Ensure auditing is configured for the Docker daemon
[WARN] 1.2.4 - Ensure auditing is configured for Docker files and directories - /var/lib/docker
[WARN] 1.2.5 - Ensure auditing is configured for Docker files and directories - /etc/docker
[WARN] 1.2.6 - Ensure auditing is configured for Docker files and directories - docker.service
[WARN] 1.2.7 - Ensure auditing is configured for Docker files and directories - docker.socket
[WARN] 1.2.8 - Ensure auditing is configured for Docker files and directories - /etc/default/docker
[INFO] 1.2.9 - Ensure auditing is configured for Docker files and directories - /etc/sysconfig/docker
[INFO]     * File not found
[INFO] 1.2.10 - Ensure auditing is configured for Docker files and directories - /etc/docker/daemon.json
[INFO]     * File not found
[WARN] 1.2.11 - Ensure auditing is configured for Docker files and directories - /usr/bin/containerd
[INFO] 1.2.12 - Ensure auditing is configured for Docker files and directories - /usr/sbin/runc
[INFO]     * File not found

[INFO] 2 - Docker daemon configuration
[WARN] 2.1 - Ensure network traffic is restricted between containers on the default bridge
[PASS] 2.2 - Ensure the logging level is set to 'info'
[PASS] 2.3 - Ensure Docker is allowed to make changes to intables
```

The Docker Bench for Security is a script that checks for dozens of common best-practices around deploying Docker containers in production. The tests are all automated, and are inspired by the [CIS Docker Benchmark v1.2.0](#).

Ref: <https://github.com/docker/docker-bench-security>

Docker: The Next-Gen of Virtualization

```
ubuntu@ip-10-0-1-234:~/docker-bench-security$ docker run -it --net host --pid host --cap-add audit_control \
>   -e DOCKER_CONTENT_TRUST=$DOCKER_CONTENT_TRUST \
>   -v /var/lib:/var/lib:ro \
>   -v /var/run/docker.sock:/var/run/docker.sock:ro \
>   -v /usr/lib/systemd:/usr/lib/systemd:ro \
>   -v /etc:/etc:ro --label docker_bench_security \
>   docker-bench-security
#
# Docker Bench for Security v1.3.5
#
# Docker, Inc. (c) 2015-
#
# Checks for dozens of common best-practices around deploying Docker containers in production.
# Inspired by the CIS Docker Benchmark v1.2.0.
# ---

Initializing Tue Mar  3 12:24:34 UTC 2020

[INFO] 1 - Host Configuration

[INFO] 1.1 - General Configuration
[NOTE] 1.1.1 - Ensure the container host has been Hardened
[INFO] 1.1.2 - Ensure Docker is up to date
[INFO]     * Using 19.03.6, verify is it up to date as deemed necessary
[INFO]     * Your operating system vendor may provide support and security maintenance for Docker

[INFO] 1.2 - Linux Hosts Specific Configuration
[WARN] 1.2.1 - Ensure a separate partition for containers has been created
[INFO] 1.2.2 - Ensure only trusted users are allowed to control Docker daemon
[INFO]     * docker:x:1001:ubuntu,1001
[WARN] 1.2.3 - Ensure auditing is configured for the Docker daemon
[WARN] 1.2.4 - Ensure auditing is configured for Docker files and directories - /var/lib/docker
[WARN] 1.2.5 - Ensure auditing is configured for Docker files and directories - /etc/docker
[INFO] 1.2.6 - Ensure auditing is configured for Docker files and directories - docker.service
[INFO]     * File not found
[INFO] 1.2.7 - Ensure auditing is configured for Docker files and directories - docker.socket
[INFO]     * File not found
[WARN] 1.2.8 - Ensure auditing is configured for Docker files and directories - /etc/default/docker
[INFO] 1.2.9 - Ensure auditing is configured for Docker files and directories - /etc/sysconfig/docker
[INFO]     * File not found
[WARN] 1.2.10 - Ensure auditing is configured for Docker files and directories - /etc/docker/daemon.json
[INFO] 1.2.11 - Ensure auditing is configured for Docker files and directories - /usr/bin/containerd
[INFO] 1.2.12 - Ensure auditing is configured for Docker files and directories - /usr/sbin/runc
[INFO]     * File not found
```



Docker Security

- Default apparmor in docker (1.13.0 and above) apply on all docker container

```
[ubuntu@ip-10-0-1-104:~$ docker container exec -it sectestdefault sh
/ # touch /tmp/testcreatefile
/ # ls -hl /tmp
total 0
-rw-r--r-- 1 root root 0 Mar 3 07:33 testcreatefile
/ # touch /proc/testprohibitfile
touch: /proc/testprohibitfile: No such file or directory
/ # ls -hl /proc
total 0
dr-xr-xr-x 9 root root 0 Mar 3 07:33 1
dr-xr-xr-x 9 root root 0 Mar 3 07:34 14
dr-xr-xr-x 9 root root 0 Mar 3 07:33 6
drwxrwxrwt 2 root root 40 Mar 3 07:33 acpi
-r--r--- 1 root root 0 Mar 3 07:34 buddyinfo
dr-xr-xr-x 4 root root 0 Mar 3 07:33 bus
-r--r--- 1 root root 0 Mar 3 07:34 cgroups
-r--r--- 1 root root 0 Mar 3 07:34 cmdline
-r--r--- 1 root root 0 Mar 3 07:34 consoles
-r--r--- 1 root root 0 Mar 3 07:34 cpufreq
-r--r--- 1 root root 0 Mar 3 07:34 crypto
-r--r--- 1 root root 0 Mar 3 07:34 devices
-r--r--- 1 root root 0 Mar 3 07:34 diskstats
-r--r--- 1 root root 0 Mar 3 07:34 dma
dr-xr-xr-x 2 root root 0 Mar 3 07:34 driver
-r--r--- 1 root root 0 Mar 3 07:34 execdomains
-r--r--- 1 root root 0 Mar 3 07:34 fb
-r--r--- 1 root root 0 Mar 3 07:34 filesystems
dr-xr-xr-x 6 root root 0 Mar 3 07:33 fs
-r--r--- 1 root root 0 Mar 3 07:34 interrupts
-r--r--- 1 root root 0 Mar 3 07:34 iomem
-r--r--- 1 root root 0 Mar 3 07:34 ioports
dr-xr-xr-x 23 root root 0 Mar 3 07:33 irq
-r--r--- 1 root root 0 Mar 3 07:34 kallsyms
crw-rw-rw- 1 root root 1, 3 Mar 3 07:33 kcore
-r--r--- 1 root root 0 Mar 3 07:34 key-users
crw-rw-rw- 1 root root 1, 3 Mar 3 07:33 keys
/ # ls -hl /proc | grep test
/ # cp /tmp/testcreatefile /proc/testprohibitfile
cp: can't create '/proc/testprohibitfile': No such file or directory
/ # ls -hl /proc | grep test
/ # exit
[ubuntu@ip-10-0-1-104:~$ docker container stop sectestdefault
sectestdefault
```

moby / moby

Branch: master | moby / profiles / apparmor / template.go

cypar apparmor: allow receiving of signals from 'docker kill'

4822fb1 on Sep 12, 2018

5 contributors

51 lines (42 sloc) | 1.53 KB

```
// +build linux
package apparmor // import "github.com/docker/docker/profiles/apparmor"
// baseTemplate defines the default apparmor profile for containers.
const baseTemplate = `

{{range $value := .Imports}}
{{($value)}}
{{end}}
```

profile {{.Name}} flags=(attach_disconnected,mediate_deleted) {

```
{{range $value := .InnerImports}}
{{($value)}}
{{end}}
```

network,

```
capability,
file,
umount,
{{if ge .Version 200806}}
{{/* Allow 'docker kill' to actually send signals to container processes. */}}
signal (receive) peers{{.DaemonProfile}},
{{/* Allow container processes to send signals amongst themselves. */}}
signal (send,receive) peer={{.Name}},
{{end}}
```

deny @PROC/* w, # deny write for all files directly in /proc (not in a subdir)

```
# deny write to files not in /proc/<number>/** or /proc/sys/**
```

deny @PROC/{[^-01,^-1-0,^-1-0[^-0-9],^-1-9-]^-0-9,^-0-9[^-0-9][^-0-9][^-0-9]*}/* w,

deny @PROC/sys/*[^*] w, # deny /proc/sys except /proc/sys/* (effectively /proc/sys/kernel)

deny @PROC/sys/kernel/{??,[\$1|^H][^m]*} w, # deny everything except shm* in /proc/sys/kernel/

deny @PROC/sysrq-trigger rwklx,

deny @PROC/kcore rwklx,

deny mount,

deny /sys/*[^f]*/* rwklx,

deny /sys/f/*[^s]*/* rwklx,

deny /sys/fs/*[^c]*/* rwklx,

deny /sys/fs/c[^q]*/* rwklx,

deny /sys/fs/c/*[^r]*/* rwklx,

deny /sys/fs/*[^r]*/* rwklx,

deny /sys/kernel/security/* rwklx,

{{if ge .Version 200805}}
{{/* suppress prtrace denials when using 'docker ps' or using 'ps' inside a container
prtrace (trace,read) peer={{.Name}},}}
{{end}}

{}

50`

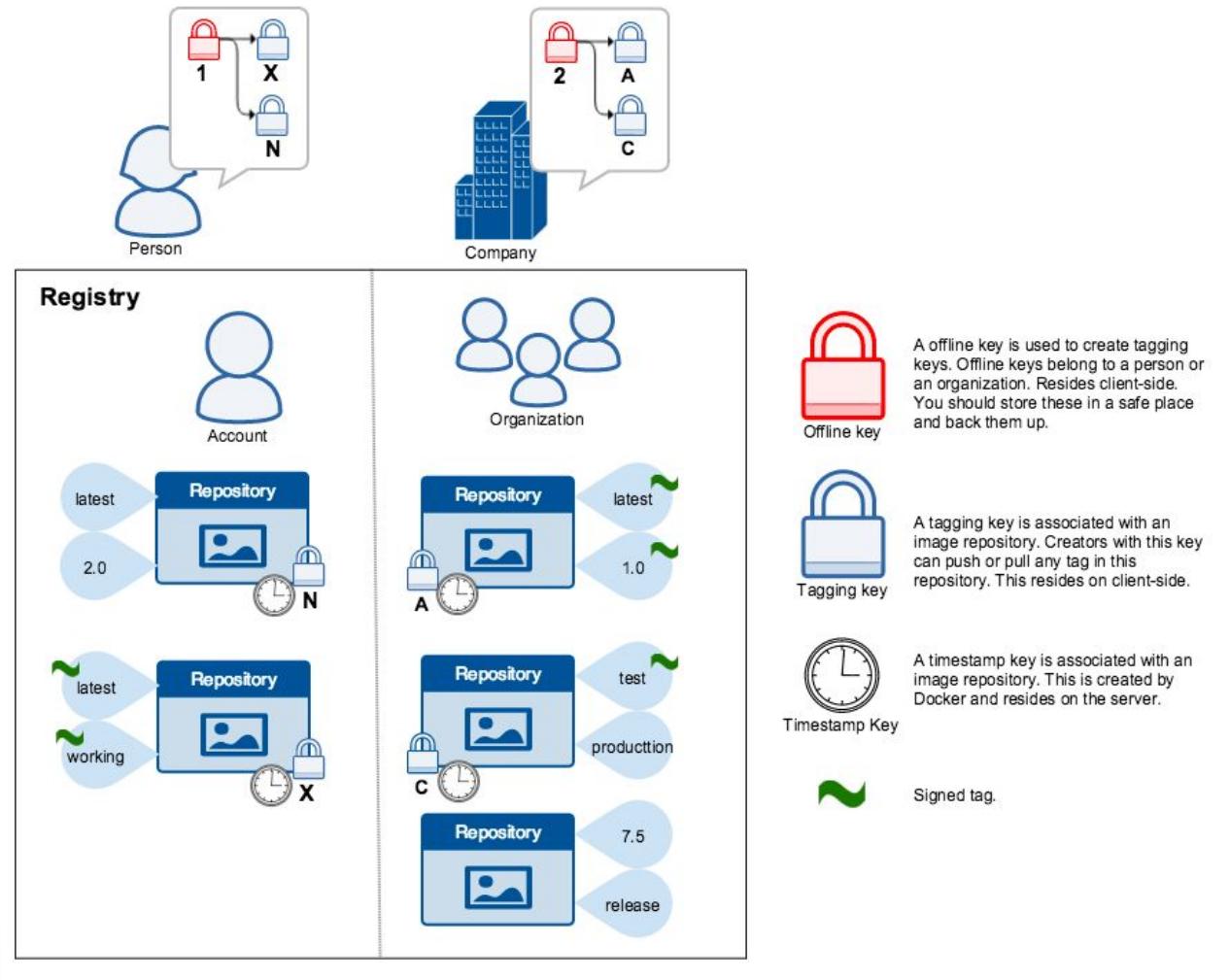
Ref: <https://github.com/moby/moby/tree/master/profiles/apparmor>

Docker: The Next-Gen of Virtualization



Docker Security

- Image Content Trust



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))

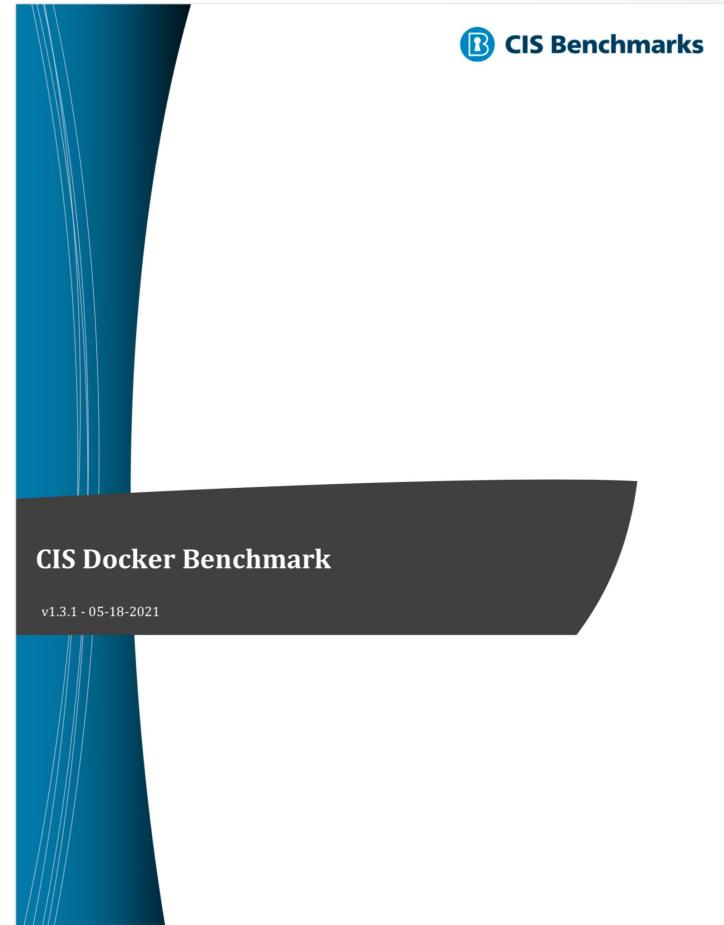
Workshop: Docker Security

- Docker Bench for Security
- Purpose: ทำการตรวจสอบช่องโหว่บน image ก่อนใช้งานใน production environment

```
ubuntu@ip-10-0-1-234:~/docker-bench-security$ docker run -it --net host --pid host --cap-add audit_control \
>   -e DOCKER_CONTENT_TRUST=$DOCKER_CONTENT_TRUST \
>   -v /var/lib:/var/lib:ro \
>   -v /var/run/docker.sock:/var/run/docker.sock:ro \
>   -v /usr/lib/systemd:/usr/lib/systemd:ro \
>   -v /etc:/etc:ro --label docker_bench_security \
>   docker-bench-security
# -----
# Docker Bench for Security v1.3.5
#
# Docker, Inc. (c) 2015-
#
# Checks for dozens of common best-practices around deploying Docker containers in production.
# Inspired by the CIS Docker Benchmark v1.2.0.
# -----
Initializing Tue Mar  3 12:24:34 UTC 2020

[INFO] 1 - Host Configuration
|
[INFO] 1.1 - General Configuration
[NOTE] 1.1.1 - Ensure the container host has been Hardened
[INFO] 1.1.2 - Ensure Docker is up to date
[INFO]     * Using 19.03.6, verify is it up to date as deemed necessary
[INFO]     * Your operating system vendor may provide support and security maintenance for Docker

[INFO] 1.2 - Linux Hosts Specific Configuration
[WARN] 1.2.1 - Ensure a separate partition for containers has been created
[INFO] 1.2.2 - Ensure only trusted users are allowed to control Docker daemon
[INFO]     * docker:x:1001:ubuntu,1001
[WARN] 1.2.3 - Ensure auditing is configured for the Docker daemon
[WARN] 1.2.4 - Ensure auditing is configured for Docker files and directories - /var/lib/docker
[WARN] 1.2.5 - Ensure auditing is configured for Docker files and directories - /etc/docker
[INFO] 1.2.6 - Ensure auditing is configured for Docker files and directories - docker.service
[INFO]     * File not found
[INFO] 1.2.7 - Ensure auditing is configured for Docker files and directories - docker.socket
[INFO]     * File not found
[WARN] 1.2.8 - Ensure auditing is configured for Docker files and directories - /etc/default/docker
[INFO] 1.2.9 - Ensure auditing is configured for Docker files and directories - /etc/sysconfig/docker
[INFO]     * File not found
[WARN] 1.2.10 - Ensure auditing is configured for Docker files and directories - /etc/docker/daemon.json
[INFO] 1.2.11 - Ensure auditing is configured for Docker files and directories - /usr/bin/containerd
[INFO]     * File not found
[INFO] 1.2.12 - Ensure auditing is configured for Docker files and directories - /usr/sbin/runc
[INFO]     * File not found
```



Workshop: Docker Security

- Docker Bench for Security
- Purpose: ทำการตรวจสอบช่องโหว่บน image ก่อนใช้งานใน production environment

```
ubuntu@ip-10-0-1-234:~/docker-bench-security$ docker run -it --net host --pid host --cap-add audit_control \
> -e DOCKER_CONTENT_TRUST=$DOCKER_CONTENT_TRUST \
> -v /var/lib:/var/lib:ro \
> -v /var/run/docker.sock:/var/run/docker.sock:ro \
> -v /usr/lib/systemd:/usr/lib/systemd:ro \
> -v /etc:/etc:ro --label docker_bench_security \
> docker-bench-security
#
# Docker Bench for Security v1.3.5
#
# Docker, Inc. (c) 2015-
#
# Checks for dozens of common best-practices around deploying Docker containers in production.
# Inspired by the CIS Docker Benchmark v1.2.0.
#
# -----
#
# Initializing Tue Mar  3 12:24:34 UTC 2020
#
[INFO] 1 - Host Configuration
[INFO] 1.1 - General Configuration
[NOTE] 1.1.1 - Ensure the container host has been Hardened
[INFO] 1.1.2 - Ensure Docker is up to date
[INFO]   * Using 19.03.6, verify is it up to date as deemed necessary
[INFO]   * Your operating system vendor may provide support and security maintenance for Docker
[INFO] 1.2 - Linux Hosts Specific Configuration
[WARN] 1.2.1 - Ensure a separate partition for containers has been created
[INFO] 1.2.2 - Ensure only trusted users are allowed to control Docker daemon
[INFO]   * docker:x:1001:ubuntu,1001
[WARN] 1.2.3 - Ensure auditing is configured for the Docker daemon
[WARN] 1.2.4 - Ensure auditing is configured for Docker files and directories - /var/lib/docker
[WARN] 1.2.5 - Ensure auditing is configured for Docker files and directories - /etc/docker
[INFO] 1.2.6 - Ensure auditing is configured for Docker files and directories - docker.service
[INFO]   * File not found
[INFO] 1.2.7 - Ensure auditing is configured for Docker files and directories - docker.socket
[INFO]   * File not found
[WARN] 1.2.8 - Ensure auditing is configured for Docker files and directories - /etc/default/docker
[INFO] 1.2.9 - Ensure auditing is configured for Docker files and directories - /etc/sysconfig/docker
[INFO]   * File not found
[WARN] 1.2.10 - Ensure auditing is configured for Docker files and directories - /etc/docker/daemon.json
[INFO] 1.2.11 - Ensure auditing is configured for Docker files and directories - /usr/bin/containerd
[INFO]   * File not found
[INFO] 1.2.12 - Ensure auditing is configured for Docker files and directories - /usr/sbin/runc
[INFO]   * File not found
```

1.1 Linux Hosts Specific Configuration

This section contains recommendations that securing Linux Hosts running Docker Containers.

1.1.1 Ensure a separate partition for containers has been created (Automated)

Profile Applicability:

- Level 1 - Linux Host OS

Description:

All Docker containers and their data and metadata is stored under `/var/lib/docker` directory. By default, `/var/lib/docker` should be mounted under either the `/` or `/var` partitions dependent on how the Linux operating system in use is configured.

Rationale:

Docker depends on `/var/lib/docker` as the default directory where all Docker related files, including the images, are stored. This directory could fill up quickly causing both Docker and the host to become unusable. For this reason, you should create a separate partition (logical volume) for storing Docker files.

Impact:

None.

Audit:

At the Docker host execute one of the below commands:

```
grep '/var/lib/docker\s' /proc/mounts
```

This should return the partition details for the `/var/lib/docker` mountpoint.

```
mountpoint -- "$(docker info -f '{{ .DockerRootDir }}')"
```

This should return whether the configured root directory is a mount point.



Workshop: Docker Security

- Docker Bench for Security
- Purpose: ทำการตรวจสอบช่องโหว่บน image ก่อนใช้งานใน production environment

```
ubuntu@ip-10-0-1-234:~/docker-bench-security$ docker run -it --net host --pid host --cap-add audit_control \
>   -e DOCKER_CONTENT_TRUST=$DOCKER_CONTENT_TRUST \
>   -v /var/lib:/var/lib:ro \
>   -v /var/run/docker.sock:/var/run/docker.sock:ro \
>   -v /usr/lib/systemd:/usr/lib/systemd:ro \
>   -v /etc:/etc:ro --label docker_bench_security \
>   docker-bench-security
# -----
# Docker Bench for Security v1.3.5
#
# Docker, Inc. (c) 2015-
#
# Checks for dozens of common best-practices around deploying Docker containers in production.
# Inspired by the CIS Docker Benchmark v1.2.0.
# -----
# Initializing Tue Mar  3 12:24:34 UTC 2020

[INFO] 1 - Host Configuration
[INFO] 1.1 - General Configuration
[NOTE] 1.1.1 - Ensure the container host has been Hardened
[INFO] 1.1.2 - Ensure Docker is up to date
[INFO]   * Using 19.03.6, verify it is up to date as deemed necessary
[INFO]   * Your operating system vendor may provide support and security maintenance for Docker

[INFO] 1.2 - Linux Hosts Specific Configuration
[WARN] 1.2.1 - Ensure a separate partition for containers has been created
[INFO] 1.2.2 - Ensure only trusted users are allowed to control Docker daemon
[INFO]   * docker:x:1001:ubuntu,1001
[WARN] 1.2.3 - Ensure auditing is configured for the Docker daemon
[WARN] 1.2.4 - Ensure auditing is configured for Docker files and directories - /var/lib/docker
[WARN] 1.2.5 - Ensure auditing is configured for Docker files and directories - /etc/docker
[INFO] 1.2.6 - Ensure auditing is configured for Docker files and directories - docker.service
[INFO]   * File not found
[INFO] 1.2.7 - Ensure auditing is configured for Docker files and directories - docker.socket
[INFO]   * File not found
[WARN] 1.2.8 - Ensure auditing is configured for Docker files and directories - /etc/default/docker
[INFO] 1.2.9 - Ensure auditing is configured for Docker files and directories - /etc/sysconfig/docker
[INFO]   * File not found
[WARN] 1.2.10 - Ensure auditing is configured for Docker files and directories - /etc/docker/daemon.json
[INFO] 1.2.11 - Ensure auditing is configured for Docker files and directories - /usr/bin/containerd
[INFO]   * File not found
[INFO] 1.2.12 - Ensure auditing is configured for Docker files and directories - /usr/sbin/runc
[INFO]   * File not found
```

1.6 Ensure auditing is configured for Docker files and directories - /var/lib/docker (Scored)

Profile Applicability:

- Level 1 - Linux Host OS

Description:

Audit /var/lib/docker.

Rationale:

Apart from auditing your regular Linux file system and system calls, audit all Docker related files and directories. Docker daemon runs with `root` privileges. Its behavior depends on some key files and directories. `/var/lib/docker` is one such directory. It holds all the information about containers. It must be audited.

Audit:

Verify that there is an audit rule corresponding to `/var/lib/docker` directory.

For example, execute below command:

```
auditctl -l | grep /var/lib/docker
```

This should list a rule for `/var/lib/docker` directory.

Remediation:

Add a rule for `/var/lib/docker` directory.

For example,

Add the line as below in `/etc/audit/audit.rules` file:

```
-w /var/lib/docker -k docker
```

Then, restart the audit daemon. For example,

```
service auditd restart
```



Workshop: Docker Security

- Docker Bench for Security
- Purpose: ทำการตรวจสอบช่องโหว่บน image ก่อนใช้งานใน production environment

```
ubuntu@ip-10-0-1-234:~/docker-bench-security$ docker run -it --net host --pid host --cap-add audit_control \
>   -e DOCKER_CONTENT_TRUST=$DOCKER_CONTENT_TRUST \
>   -v /var/lib:/var/lib:ro \
>   -v /var/run/docker.sock:/var/run/docker.sock:ro \
>   -v /usr/lib/systemd:/usr/lib/systemd:ro \
>   -v /etc:/etc:ro --label docker_bench_security \
>   docker-bench-security
# -----
# Docker Bench for Security v1.3.5
#
# Docker, Inc. (c) 2015-
#
# Checks for dozens of common best-practices around deploying Docker containers in production.
# Inspired by the CIS Docker Benchmark v1.2.0.
# -----
# Initializing Tue Mar  3 12:24:34 UTC 2020

[INFO] 1 - Host Configuration
[INFO] 1.1 - General Configuration
[NOTE] 1.1.1 - Ensure the container host has been Hardened
[INFO] 1.1.2 - Ensure Docker is up to date
[INFO]     * Using 19.03.6, verify it is up to date as deemed necessary
[INFO]     * Your operating system vendor may provide support and security maintenance for Docker

[INFO] 1.2 - Linux Hosts Specific Configuration
[WARN] 1.2.1 - Ensure a separate partition for containers has been created
[INFO] 1.2.2 - Ensure only trusted users are allowed to control Docker daemon
[INFO]     * docker:x:1001:ubuntu,1001
[WARN] 1.2.3 - Ensure auditing is configured for the Docker daemon
[WARN] 1.2.4 - Ensure auditing is configured for Docker files and directories - /var/lib/docker
[WARN] 1.2.5 - Ensure auditing is configured for Docker files and directories - /etc/docker
[INFO] 1.2.6 - Ensure auditing is configured for Docker files and directories - docker.service
[INFO]     * File not found
[INFO] 1.2.7 - Ensure auditing is configured for Docker files and directories - docker.socket
[INFO]     * File not found
[WARN] 1.2.8 - Ensure auditing is configured for Docker files and directories - /etc/default/docker
[INFO] 1.2.9 - Ensure auditing is configured for Docker files and directories - /etc/sysconfig/docker
[INFO]     * File not found
[WARN] 1.2.10 - Ensure auditing is configured for Docker files and directories - /etc/docker/daemon.json
[INFO] 1.2.11 - Ensure auditing is configured for Docker files and directories - /usr/bin/containerd
[INFO]     * File not found
[INFO] 1.2.12 - Ensure auditing is configured for Docker files and directories - /usr/sbin/runc
[INFO]     * File not found
```

```
[ubuntu@ip-10-0-1-234:~$ sudo more /etc/audit/rules.d/audit.rules
## First rule - delete all
-D

## Increase the buffers to survive stress events.
## Make this bigger for busy systems
-b 8192

## This determine how long to wait in burst of events
--backlog_wait_time 0

## Set failure mode to syslog
-f 1

-w /usr/bin/docker -p wa
-w /var/lib/docker -p wa
-w /etc/docker -p wa
-w /lib/systemd/system/docker.service -p wa
-w /lib/systemd/system/docker.socket -p wa
-w /etc/default/docker -p wa
-w /etc/docker/daemon.json -p wa
-w /usr/bin/docker-containerd -p wa
-w /usr/bin/docker-runc -p wa
-w /usr/bin/docker -k docker
ubuntu@ip-10-0-1-234:~$ ]
```

Workshop: Docker Security

- Docker Bench for Security
- Purpose: ทำการตรวจสอบช่องโหว่บน image ก่อนใช้งานใน production environment

```
[ubuntu@ip-10-0-1-234:~$ docker run -it --net host --pid host --cap-add audit_control      -e DOCKER_CONTENT_TRUST=$DOCKER_CONTENT_TRUST
      -v /var/lib:/var/lib:ro      -v /var/run/docker.sock:/var/run/docker.sock:ro      -v /usr/lib/systemd:/usr/lib/systemd:ro      -v /etc:/etc:ro --label docker_bench_security      docker-bench-security
#
# -----
# Docker Bench for Security v1.3.5
#
# Docker, Inc. (c) 2015-
#
# Checks for dozens of common best-practices around deploying Docker containers in production.
# Inspired by the CIS Docker Benchmark v1.2.0.
#
# -----
#
# Initializing Tue Mar  3 14:42:09 UTC 2020

[INFO] 1 - Host Configuration

[INFO] 1.1 - General Configuration
[NOTE] 1.1.1 - Ensure the container host has been Hardened
[INFO] 1.1.2 - Ensure Docker is up to date
[INFO]     * Using 19.03.6, verify it is up to date as deemed necessary
[INFO]     * Your operating system vendor may provide support and security maintenance for Docker

[INFO] 1.2 - Linux Hosts Specific Configuration
[WARN] 1.2.1 - Ensure a separate partition for containers has been created
[INFO] 1.2.2 - Ensure only trusted users are allowed to control Docker daemon
[INFO]     * docker:x:1001:ubuntu,1001
[WARN] 1.2.3 - Ensure auditing is configured for the Docker daemon
[PASS] 1.2.4 - Ensure auditing is configured for Docker files and directories - /var/lib/docker
[PASS] 1.2.5 - Ensure auditing is configured for Docker files and directories - /etc/docker
[INFO] 1.2.6 - Ensure auditing is configured for Docker files and directories - docker.service
[INFO]     * File not found
[INFO] 1.2.7 - Ensure auditing is configured for Docker files and directories - docker.socket
[INFO]     * File not found
[PASS] 1.2.8 - Ensure auditing is configured for Docker files and directories - /etc/default/docker
[INFO] 1.2.9 - Ensure auditing is configured for Docker files and directories - /etc/sysconfig/docker
[INFO]     * File not found
[PASS] 1.2.10 - Ensure auditing is configured for Docker files and directories - /etc/docker/daemon.json
[INFO] 1.2.11 - Ensure auditing is configured for Docker files and directories - /usr/bin/containerd
[INFO]     * File not found
[INFO] 1.2.12 - Ensure auditing is configured for Docker files and directories - /usr/sbin/runc
[INFO]     * File not found
```

Workshop: Docker Security

- Apparmor
- Purpose: ระบบการทำงานบางอย่างบน container ที่ไม่จำเป็นเพื่อลดความเสี่ยงในการใช้งานเกินขอบเขตของ application

```
[ubuntu@ip-10-0-1-104:~$ docker container run -dt --name sectestrestrict --security-opt "apparmor=restrict-apparmor" labdocker/alpine:latest sh  
6db2a1be7b9d1b3f15409e49bc1a0e1a9373cc9b8740a017ff8fb163283b8d1b  
[ubuntu@ip-10-0-1-104:~$ docker container exec -it sectestdefault sh  
Error: No such container: sectestdefault  
[ubuntu@ip-10-0-1-104:~$ docker container exec -it sectestrestrict sh  
[/ # ping 1.1.1.1  
PING 1.1.1.1 (1.1.1.1): 56 data bytes  
ping: can't create raw socket: Permission denied  
[/ # apk update  
ERROR: Unable to lock database: Permission denied  
ERROR: Failed to open apk database: Permission denied  
[/ # apk add curl  
ERROR: Unable to lock database: Permission denied  
ERROR: Failed to open apk database: Permission denied  
[/ # curl https://www.google.com  
sh: curl: not found  
/ # touch /tmp/testcreatefile1  
touch: /tmp/testcreatefile1: Permission denied  
/ # touch /home/testcreatefile2  
touch: /home/testcreatefile2: Permission denied  
/ # touch /etc/testcreatefile3  
touch: /etc/testcreatefile3: Permission denied  
/ # touch /proc/testcreatefile4  
touch: /proc/testcreatefile4: No such file or directory  
/ # cp /tmp/testcreatefile /proc/testprohibitfile  
cp: can't stat '/tmp/testcreatefile': No such file or directory  
[/ # ls -hl /proc | grep test  
[/ # exit  
[ubuntu@ip-10-0-1-104:~$ docker container stop sectestrestrict && docker container rm sectestrestrict  
sectestrestrict  
sectestrestrict  
ubuntu@ip-10-0-1-104:~$ ]
```

Workshop: Docker Security

- Content Trust
- Purpose: ทำการ enable feature "DOCKER_CONTENT_TRUST" และ ใช้งาน image แบบ sign/unsigned

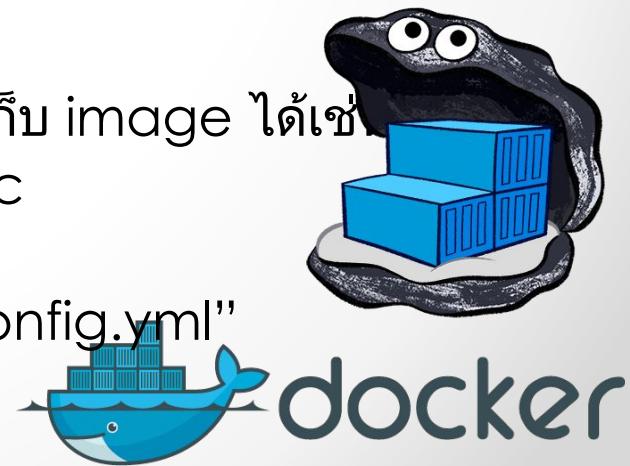
```
[root@labdocker:~# docker push paparn/alpine:sign
The push refers to a repository [docker.io/paparn/alpine]
6102f0d2ad33: Layer already exists
sign: digest: sha256:65242e8220a341cec40628caaee77eb4acd2fc252329aa853526fde15a4a1d85 size: 528
Signing and pushing trust metadata
You are about to create 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/paparn/alpine):
Repeat passphrase for new repository key with ID 68d88cd (docker.io/paparn/alpine):
```

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 ได้ เช่น
 - Etc: s3 (aws), azure, gcs (google cloud) etc
 - มี option gc (garbage collect) ด้วย option
 - “bin/registry garbage-collect [--dry-run] config.yml”



Workshop: Registry

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

```
docker image pull registry:2.7.1 (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:2.7.1
```
- ดำเนินการ tag image และทดสอบ push image docker เข้า registry

```
docker image tag labdocker/alpine:3.13.6 \
localhost:5000/alpine:3.13.6
```



```
docker push localhost:5000/alpine:3.13.6
```
- *ต้องบันทึก digest image ไว้เพื่อใช้อ้างอิงภายหลัง

Workshop: 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: 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:3.13.6
```

- ทำการดึง image ใหม่มาจาก registry

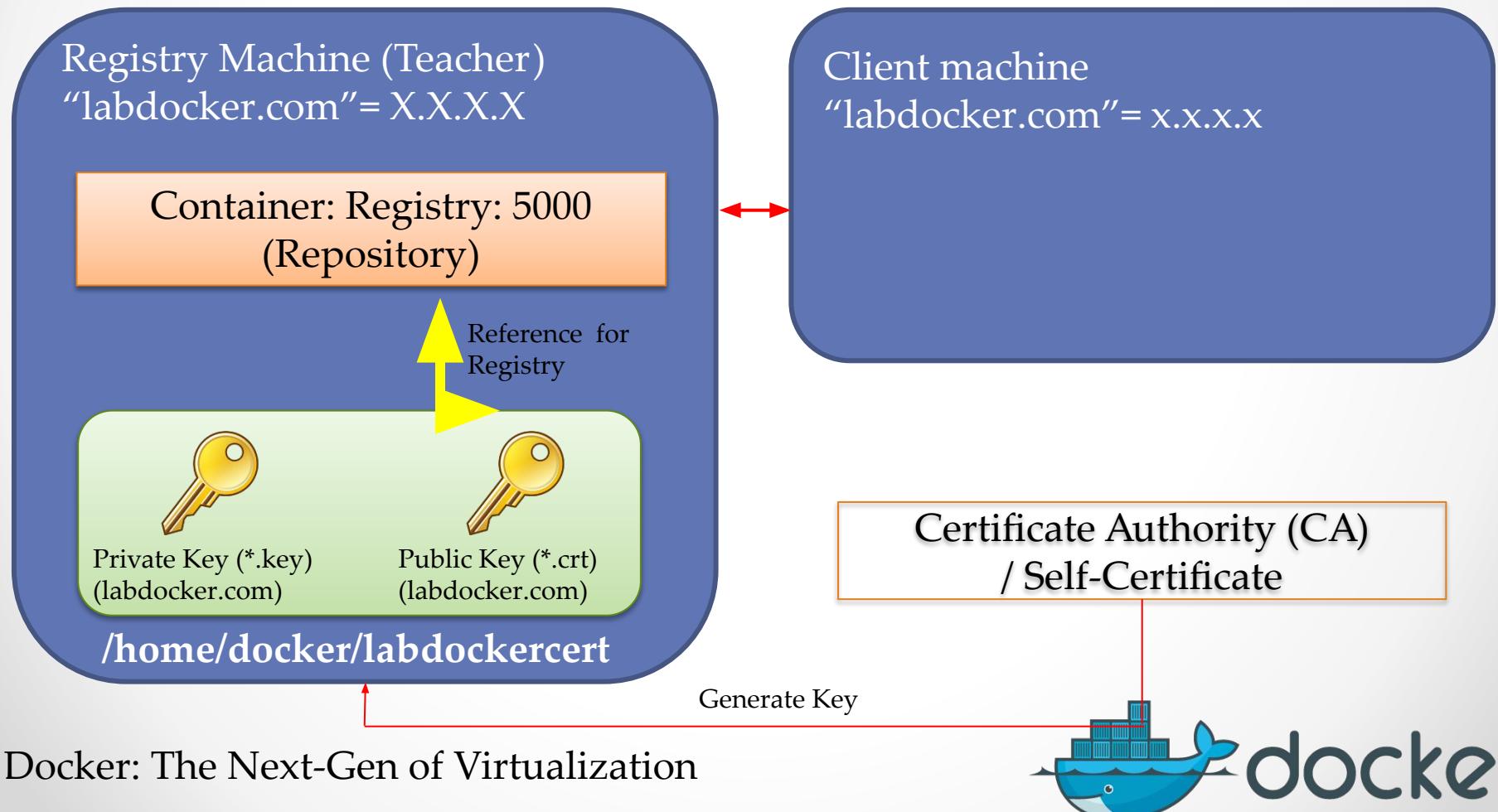
```
docker image pull localhost:5000/alpine:3.13.6
```

- ทำการลบ container registry เพื่อยกเลิกการใช้งาน

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

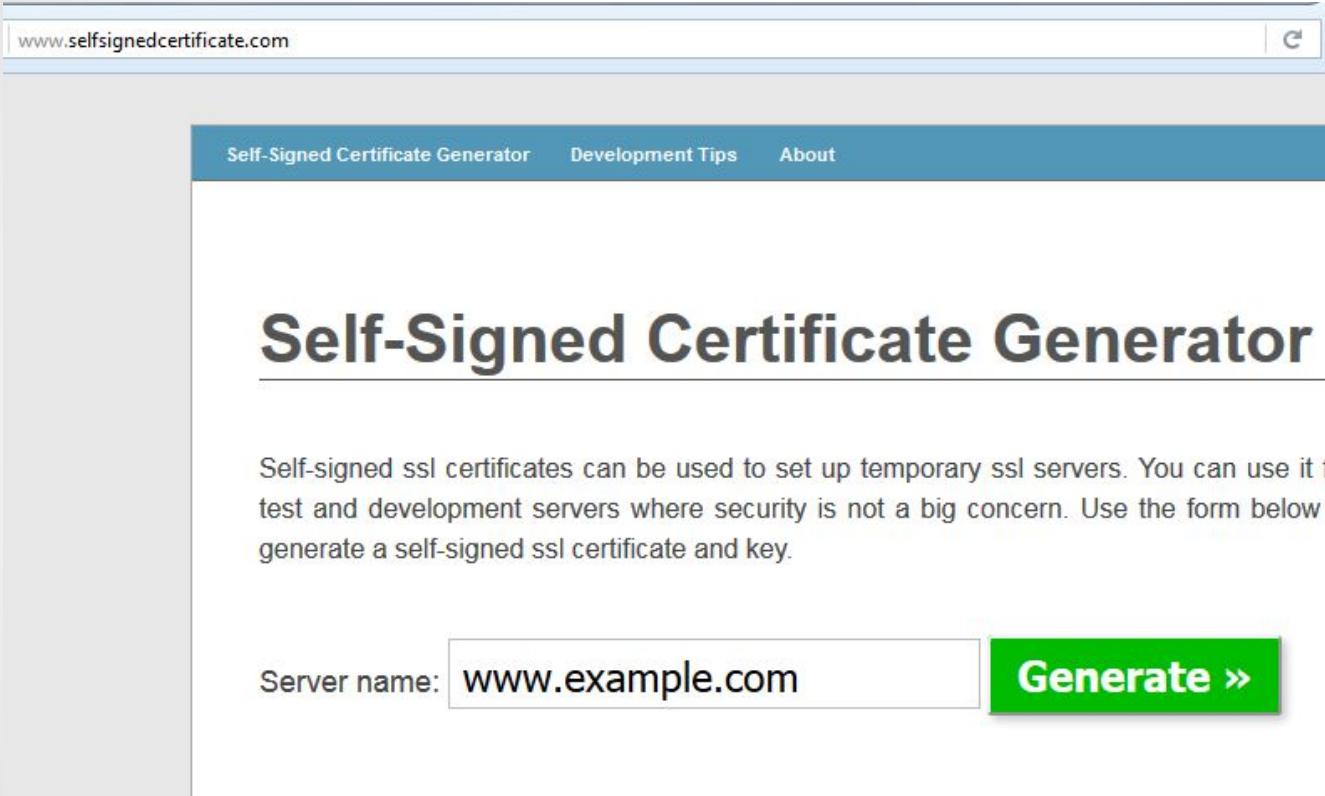
Registry on difference machine

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



Registry on difference machine

- การสร้าง certificate จาก CA / Self-Signed



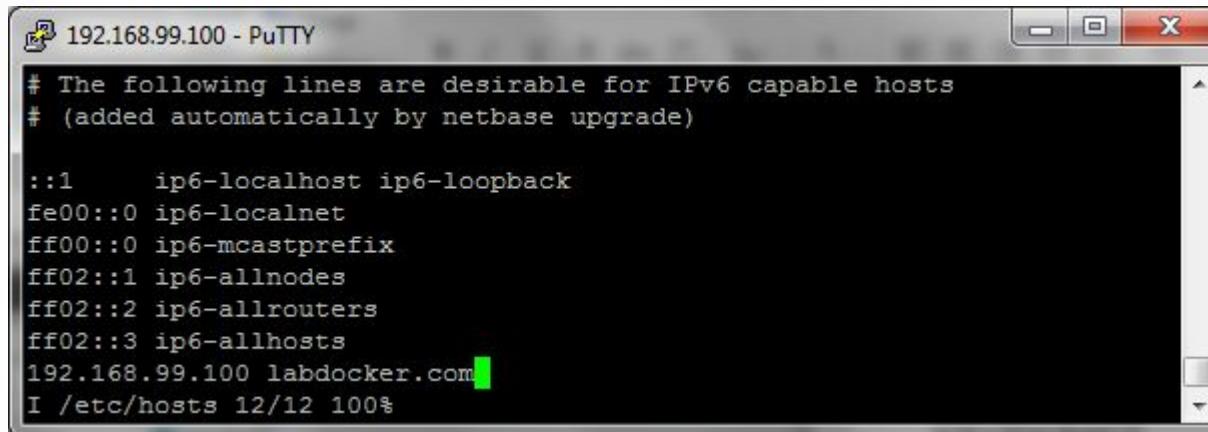
The screenshot shows a web browser window with the URL www.selfsignedcertificate.com in the address bar. The page title is "Self-Signed Certificate Generator". The main content area contains a paragraph about self-signed SSL certificates and a form with a "Server name:" input field containing "www.example.com" and a green "Generate »" button.



The sslstore logo features a blue keyhole icon above the word "sslstore". To the right, there are two overlapping rectangular boxes: one blue box with white text reading "AFFORDABLE SSL CERTIFICATES" and a larger green box below it with white text reading "ISSUED IN MINUTES*".

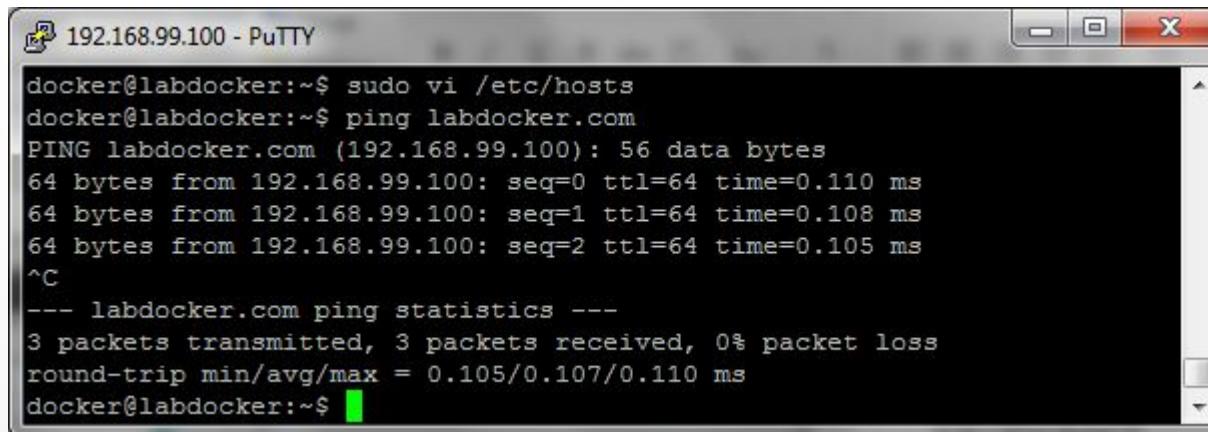
Registry on difference machine

- เพิ่ม domain “labdocker.com” ลงใน /etc/hosts (registry, all machine)



```
# 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%
```



```
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:~$
```

Registry on difference machine

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

```
sudo mkdir /usr/local/share/ca-certificates/labdocker.com:5000  
sudo cp labdocker.com.crt /usr/local/share/ca-certificates/labdocker.com:5000  
sudo update-ca-certificates  
sudo service docker restart
```

```
[ubuntu@ip-10-0-1-182:~/docker-workshop-112018-cloud/Workshop-2-3-Registry  
instruction.txt labdocker.com.crt labdocker.com.key  
[ubuntu@ip-10-0-1-182:~/docker-workshop-112018-cloud/Workshop-2-3-Registry  
[ubuntu@ip-10-0-1-182:~/docker-workshop-112018-cloud/Workshop-2-3-Registry$ sudo mkdir /usr/local/share/ca-certificates/labdocker.com:5000  
[ubuntu@ip-10-0-1-182:~/docker-workshop-112018-cloud/Workshop-2-3-Registry$ sudo cp labdocker.com.crt /usr/local/share/ca-certificates/labdocker.com:5000  
[ubuntu@ip-10-0-1-182:~/docker-workshop-112018-cloud/Workshop-2-3-Registry$ sudo update-ca-certificates  
Updating certificates in /etc/ssl/certs...  
1 added, 0 removed; done.  
Running hooks in /etc/ca-certificates/update.d...  
done.  
[ubuntu@ip-10-0-1-182:~/docker-workshop-112018-cloud/Workshop-2-3-Registry$ sudo service docker restart  
ubuntu@ip-10-0-1-182:~/docker-workshop-112018-cloud/Workshop-2-3-Registry$ ]
```

Registry on difference machine

- เริ่มใช้งาน registry โดย start container ดังนี้ (labdocker)

```
docker container run -d -p 5000:5000 \
--restart=always --name registrylab \
--mount type=bind,source=$(pwd),target=/var/lib/registry \
--mount type=bind,source=$(pwd),target=/certs \
--mount type=bind,source=$(pwd),target=/auth \
-e "REGISTRY_AUTH=hpasswd" \
-e "REGISTRY_AUTH_HTPASSWD_REALM=Registry Realm" \
-e REGISTRY_AUTH_HTPASSWD_PATH=/auth/hpasswd \
-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:2.7.1
```

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

```
docker image tag labdocker/alpine:3.13.6 labdocker.com:5000/alpine:1.0
docker login -u <username> -p <password>
docker image push labdocker.com:5000/alpine:1.0
```

Registry on difference machine

- ในการตรวจสอบ registry image file สำหรับ registry ที่มีการ enable TLS เรียนบอร์อยแล้วต้องเพิ่มพารามิเตอร์ “--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
```

Registry on difference machine

- ดึง image ผ่าน labdocker 2

```
[ubuntu@ip-10-0-1-239:~/docker-workshop-112018-cloud/Workshop-2-3-Registry$ docker login labdocker.com:5000
[Username: docker
[Password:
WARNING! Your password will be stored unencrypted in /home/ubuntu/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
[ubuntu@ip-10-0-1-239:~/docker-workshop-112018-cloud/Workshop-2-3-Registry$ docker image pull labdocker.com:5000/alpine:1.0
1.0: Pulling from alpine
Digest: sha256:02892826401a9d18f0ea01f8a2f35d328ef039db4e1edcc45c630314a0457d5b
Status: Downloaded newer image for labdocker.com:5000/alpine:1.0
ubuntu@ip-10-0-1-239:~/docker-workshop-112018-cloud/Workshop-2-3-Registry$ ]
```

- 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/>

Docker: The Next-Gen of Virtualization



Docker Trust Registry (DTR)

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

The screenshot shows the Docker Trusted Registry (DTR) interface. On the left is a sidebar with navigation links: 'Repositories', 'Organizations', 'Users', 'Settings', 'Profile', 'Account', 'Logout', 'Search', and 'System'. The main area has a header 'docker trusted registry' with a search bar and a user dropdown for 'admin'. Below the header is a 'Repositories' section with a 'Filter by' dropdown set to 'All accounts' and a 'New repository' button. A 'SCAN ON IMAGE PUSH' button is also present. The repository list includes:

REPOSITORY	SCAN ON IMAGE PUSH	
payments / dev		View Details
payments / prod	<small>private</small>	View Details
mobile / dev		View Details
mobile / prod	<small>private</small>	View Details

Below this is another section titled 'admin / mirrored-images' with tabs for 'Info', 'Tags', 'Webhooks', 'Promotions' (which is selected), 'Pruning', 'Mirrors', 'Settings', and 'Activity'. Under 'Promotions', there are buttons for 'Is source' and 'Is target'. A modal window titled 'Promote To Target If...' contains a condition 'Critical Vulnerabilities equals 0' and a target configuration for 'dev' repository with tag 'approved-images'. It also lists variables for new tag names and buttons for 'Cancel', 'Save', and 'Save & Apply'.

Docker: The Next-Gen of Virtualization



Artifact Registry

- Sonatype

The screenshot shows a web browser window with the Sonatype navigation bar at the top. Below the bar, there's a search bar labeled "Search the docs...". A button "Switch to another product ▾" is visible. The main content area has a header "NEXUS REPOSITORY MANAGER 3" and a breadcrumb trail "Nexus Repository Manager 3 > Private Registry for Docker". The main title is "Private Registry for Docker". A callout box indicates that the feature is "Available in Nexus Repository OSS and Nexus Repository Pro". The page content discusses Docker containers, their usage, and the Docker Hub registry. It also mentions the support for Docker registries in Nexus Repository Manager Pro and OSS, allowing users to expose repositories as Docker registries and merge multiple repositories into one URL.

Sonatype | Documentation My Sonatype Community Guides Learn Support Who is Sonatype?

Search the docs...

Switch to another product ▾

NEXUS REPOSITORY MANAGER 3

> Download
> Release Notes

System Requirements

Upgrade Compatibility - Repository Manager 2 to 3

Repository Manager 2 to 3 Feature Equivalency

Repository Manager Feature Matrix

> Repository Manager Concepts
Supported Formats

> Installation
> Upgrading
> User Interface
> Configuration
> Backup and Restore
Cleanup Policies

> High Availability

Quick Start Guide - Proxying Maven and NPM

Staging
Tagging

Nexus Repository Manager 3 > Private Registry for Docker

Private Registry for Docker

ⓘ Available in Nexus Repository OSS and Nexus Repository Pro

Docker containers and their usage have revolutionized the way applications and the underlying operating system are packaged and deployed to development, testing and production systems. The creation of the [Open Container Initiative](#), and the involvement of a large number of stakeholders, guarantees that the ecosystem of tools around the lightweight containers and their usage will continue to flourish. Docker Hub is the original registry for Docker container images and it is being joined by more and more other publicly available registries such as the [Google Container Registry](#) and others. Nexus Repository Manager Pro and Nexus Repository Manager OSS support Docker registries as the Docker repository format for hosted and proxy repositories. You can expose these repositories to the client-side tools directly or as a repository group, which is a repository that merges and exposes the contents of multiple repositories in one convenient URL. This allows you to reduce time and bandwidth usage for accessing Docker images in a registry as well as share your images within your organization in a hosted repository. Users can then launch containers based on those images, resulting in a completely private Docker registry with all the features available in the repository manager.

Artifact Registry

- Harbor CNCF Registry (Incubator)



Harbor
Cloud Native Computing Foundation (CNCF)
Provisioning · Container Registry

An open source trusted cloud native registry project that stores, signs, and scans content.

Website	https://goharbor.io/
Repository	https://github.com/goharbor/harbor
Crunchbase	https://www.crunchbase.com/organization/cloud-native-computing-found...
LinkedIn	https://www.linkedin.com/company/cloud-native-computing-foundation
Twitter	@project_harbor
First Commit	3 years ago
Contributors	121
Headquarters	San Francisco, California
Latest Tweet	this week
Latest Commit	this week
Headcount	11-50

Cloud Native Incubating
Open Source Software
License Apache License 2.0
CI/CD Best Practices In progress: 18%
[Tweet](#) 493

Tweets by @project_harbor

 Project Harbor
@project_harbor
#currentlyreading ➡ Insight from @Maks_Postument on how he built HA Harbor with #Azure and #Rancher

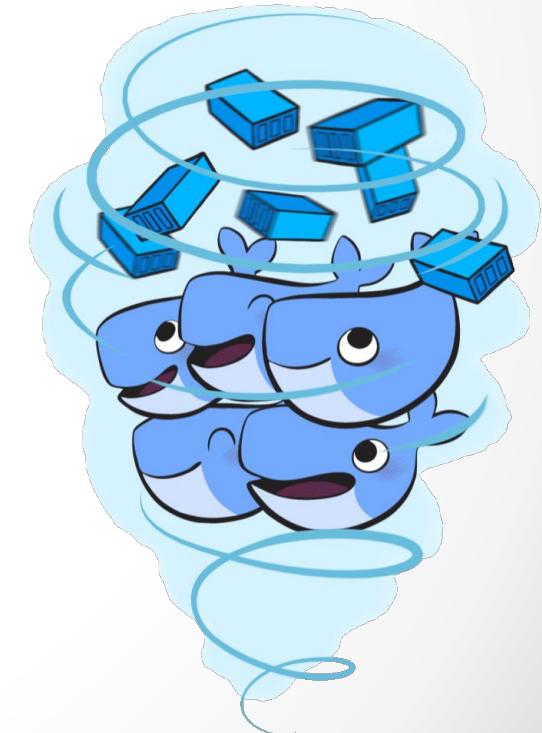
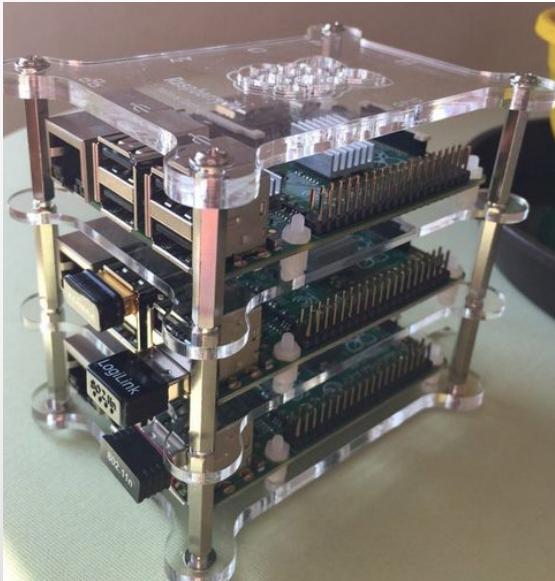


Swarm

• • •

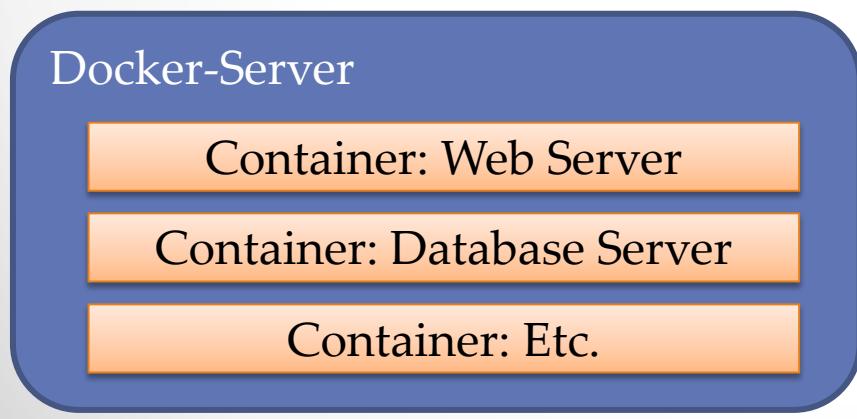
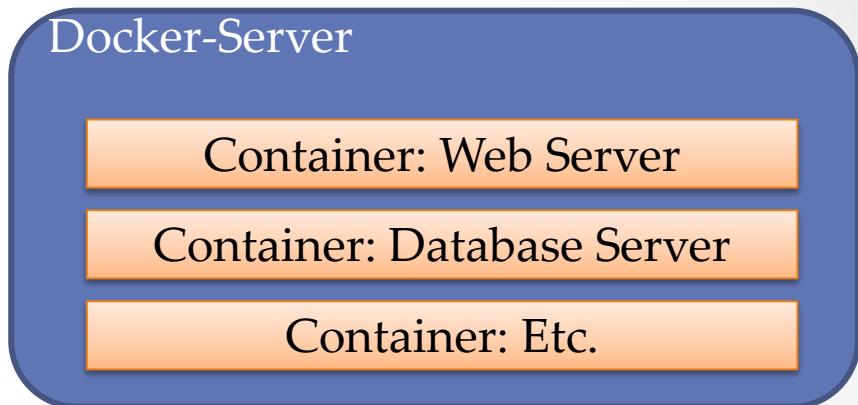
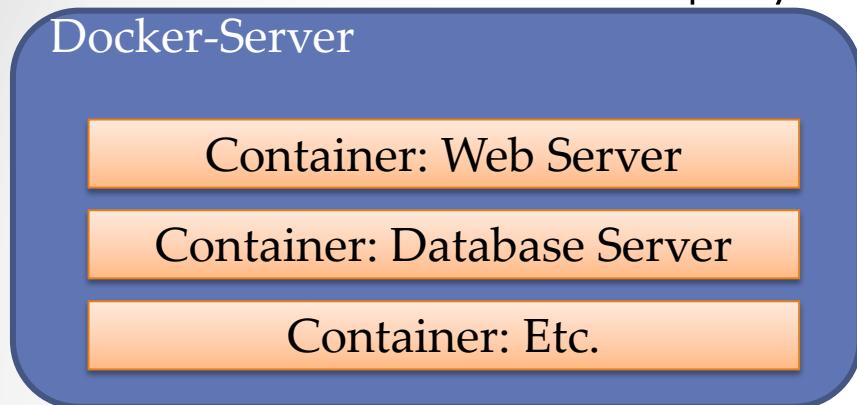
Swarm: Conceptual

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



Swarm: Conceptual

- Traditional Docker Deployment

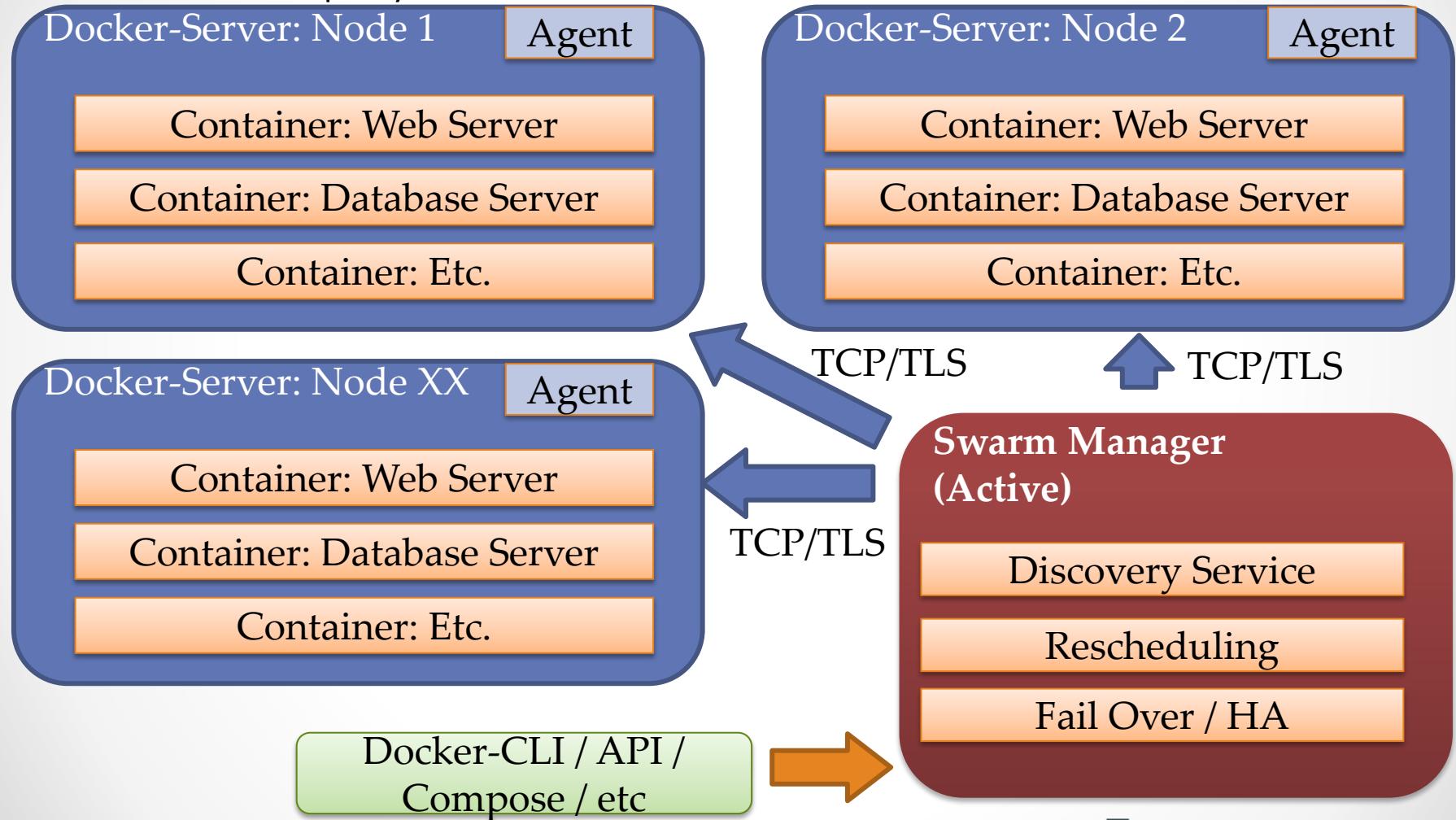


Docker: The Next-Gen of Virtualization



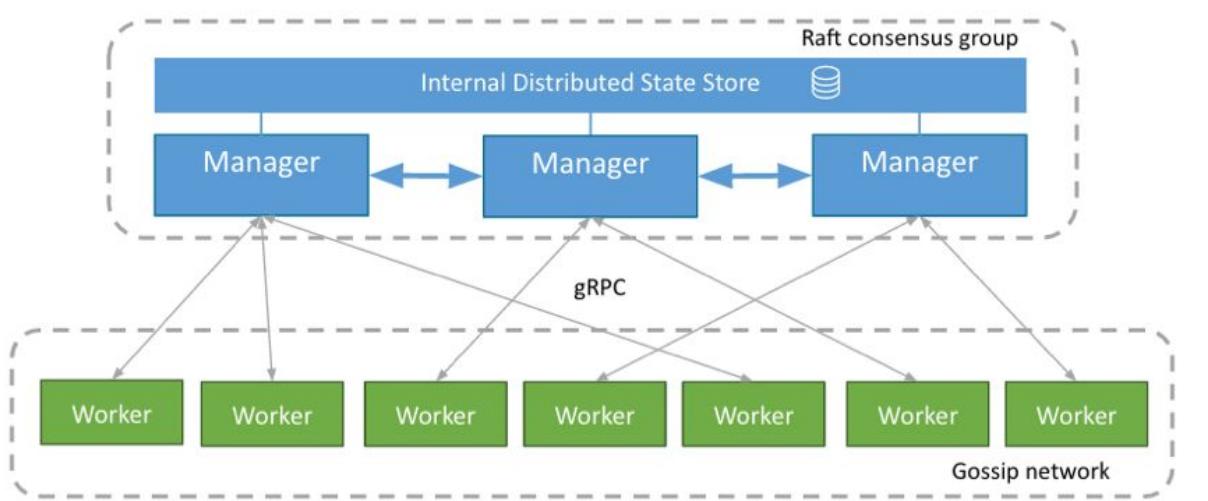
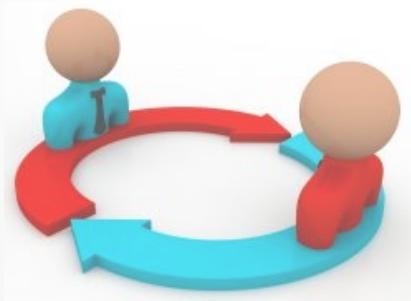
Swarm: Conceptual

- Swarm Deployment



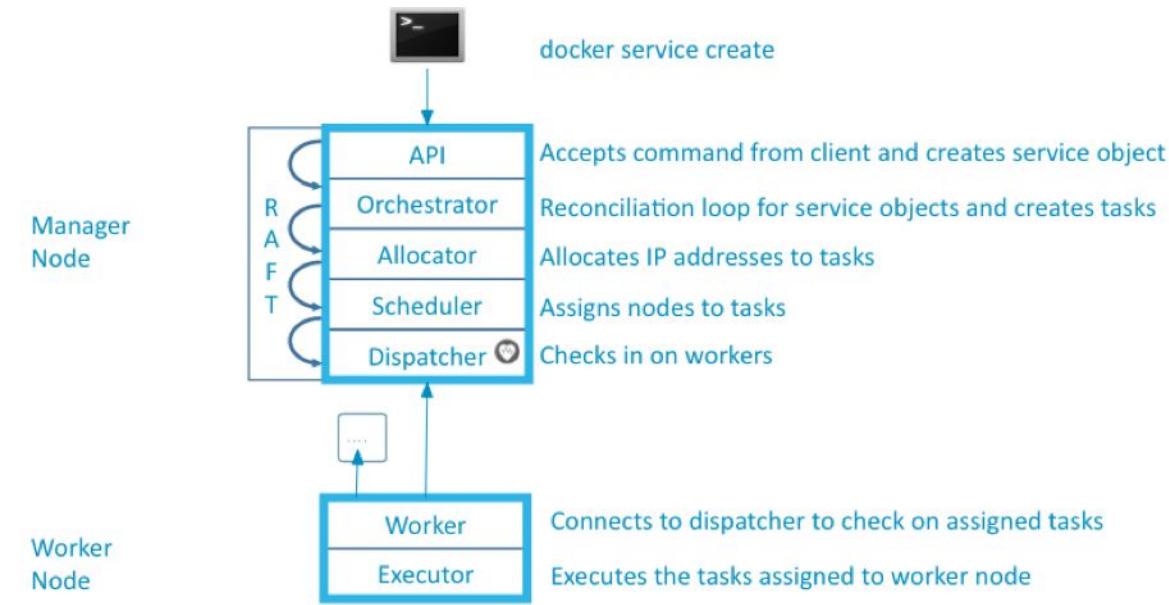
Swarm Mode Architecture

- Swarm Mode (build-in swarm) เป็นฟังก์ชันที่มาพร้อม docker-engine ตั้งแต่แรก และสามารถบริหารจัดการ swarm ได้ด้วยตัวเองรวมถึง build-in TLS certificate เพื่อใช้ทำงานระหว่าง node ทันที (Security On the Box)
- Swarm Role
 - Manager Node
 - Worker Node

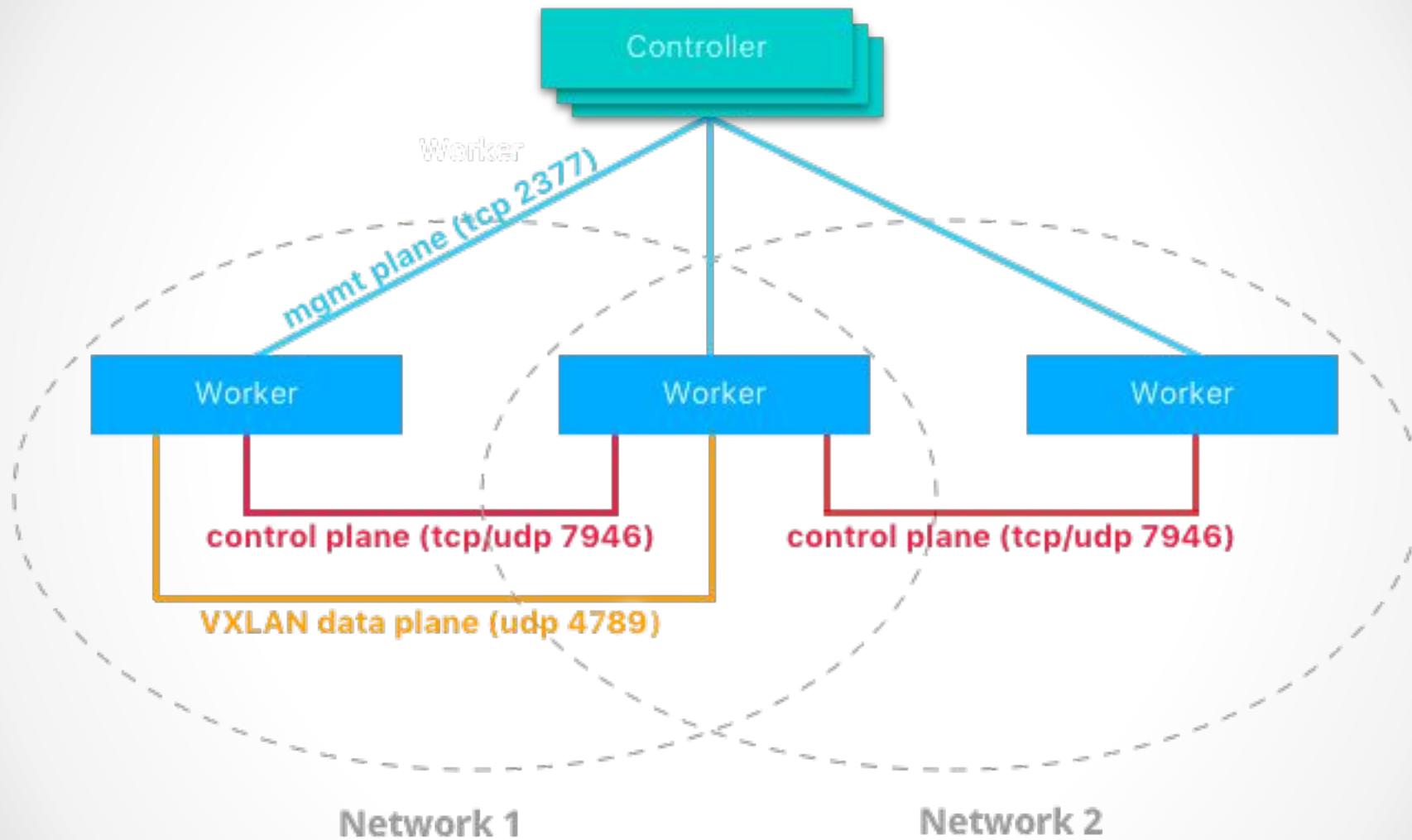


Swarm Mode Architecture

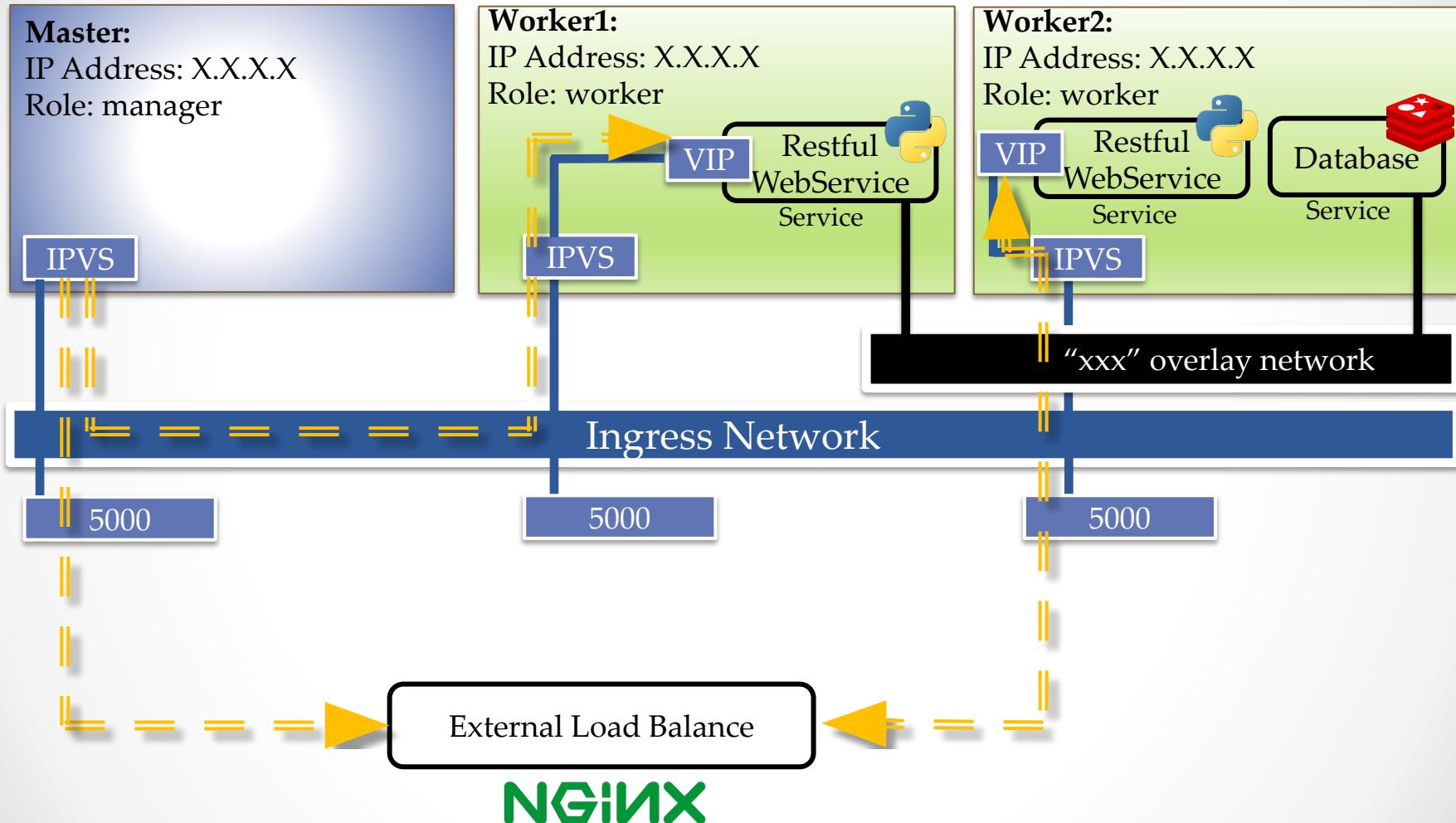
Node Breakdown



Swarm Mode Architecture



Swarm Mode Architecture



Swarm Mode Architecture

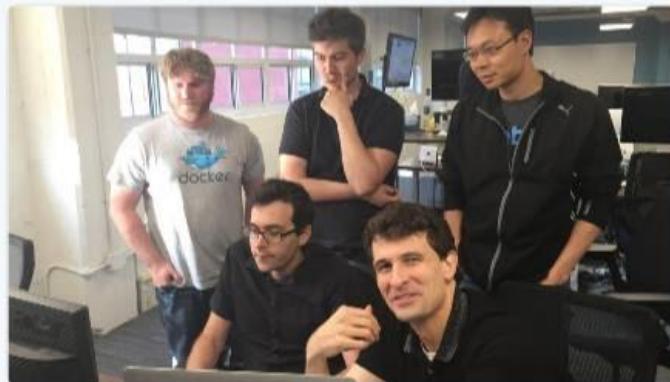
<https://blog.docker.com/2016/07/docker-built-in-orchestration-ready-for-production-docker-1-12-goes-ga/>

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.



Nathan LeClaire @upthecyberpunks 48m
@docker #swarm team forming like Voltron to inspect the #DockerSwarm2K results @stevvooe @aluzzardi @mikegoelzer



Nathan LeClaire
@upthecyberpunks

@chanwit @dongluochen

Jul 30, 2016, 7:56 AM



Docker: The Next-Gen of Virtualization

Swarm Mode Architecture

swarmzilla / swarm3k

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
@jmairehenry	PetaIMD	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_sopelsa	Personal	20
@GroupSpring3r	SPRINT3r	630
@toughIQ	Personal	30
@mmonaki	N/A	10
@zinuzoid	HotelQuickly	200
@_EthanHunt	N/A	25
@packethost	Packet	100
@ContainerizeT	ContainerizeThis: The Conference	10
@_pascalandy	FirePress	10
@lucjugger	TRAXxs	10
@alexellisuk	Personal	10
@svega	Huli	10
@BretFisher	Myself :)	20
@voodootikigod	Emerging Technology Advisors	100
@AlexPostID	Personal	20
@qianarb	ThumpFlow	50
@Rucknar	Personal	10
@lherrerabenitez	Personal	10
@abhisak	Nipa Technology	100
@djala	NexwayGroup	30



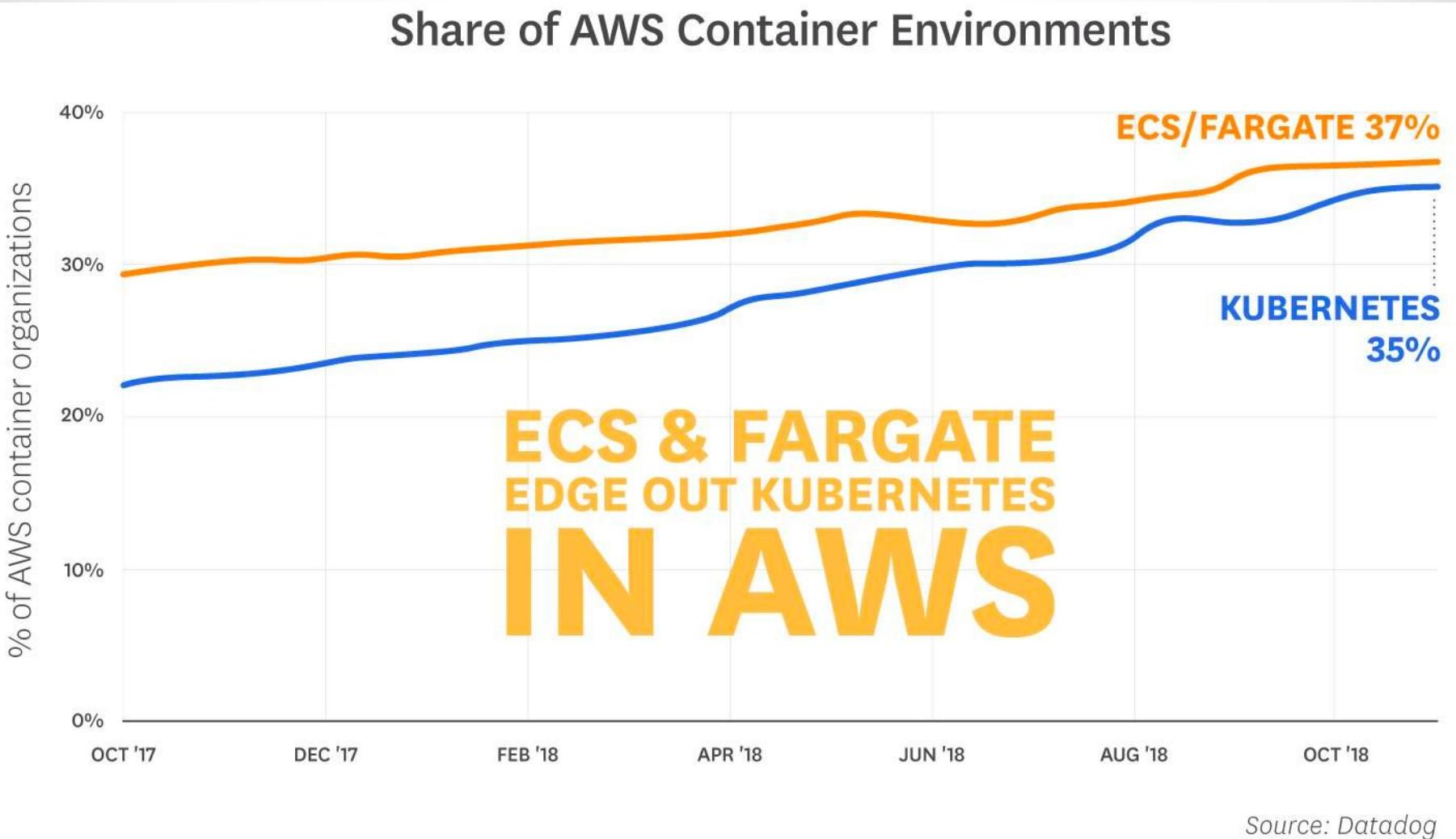
Docker: The Next-Gen of Virtualization



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 "YAML" 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

K8S vs Docker what is the difference ?



Docker: The Next-Gen of Virtualization



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 10.0.1.104:2377  
--task-history-limit 2
```

```
[ubuntu@ip-10-0-1-104:~$ docker swarm init --advertise-addr 10.0.1.104:2377 --task-history-limit 2  
Swarm initialized: current node (3tnvltyyohbekgygvsb1jjoyv) is now a manager.  
  
To add a worker to this swarm, run the following command:  
  
    docker swarm join --token SWMTKN-1-1qnpobqw0hilpc5i90sz803tlhyi1h4k84uok10y814bvhyqf2-0ag405byoqpiqqhoy6r866tv 10.0.1.104:2377  
  
To add a manager to this swarm, run 'docker swarm join-token manager' and follow the instructions.  
  
[ubuntu@ip-10-0-1-104:~$ docker swarm join-token manager  
To add a manager to this swarm, run the following command:  
  
    docker swarm join --token SWMTKN-1-1qnpobqw0hilpc5i90sz803tlhyi1h4k84uok10y814bvhyqf2-3u9rqxfwhbhw52qwqeeiewybl 10.0.1.104:2377  
ubuntu@ip-10-0-1-104:~$ ]
```

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>
```

```
[...p_112018 — Terminal MAC Pro — -bash ...ssh -i k8s_lab ubuntu@13.229.126.99 ...ssh -i k8s_lab ubuntu@13.229.98.3 ...sh -i k8s_lab ubuntu@18.136.196.130 +  
[ubuntu@ip-10-0-1-163:~$ docker swarm join --token SWMTKN-1-1qnpobqw0hilpc5i90sz803t1hyi1h4k84uok10y814bvhyqf2-0ag405byoqpiqqghoy6r866tv 10.0.1.104:2377 ]  
This node joined a swarm as a worker.  
ubuntu@ip-10-0-1-163:~$ ]
```

```
[...p_112018 — Terminal MAC Pro — -bash ...ssh -i k8s_lab ubuntu@13.229.126.99 ...ssh -i k8s_lab ubuntu@13.229.98.3 ...sh -i k8s_lab ubuntu@18.136.196.130 +  
[ubuntu@ip-10-0-1-62:~$ docker swarm join --token SWMTKN-1-1qnpobqw0hilpc5i90sz803t1hyi1h4k84uok10y814bvhyqf2-0ag405byoqpiqqghoy6r866tv 10.0.1.104:2377 ]  
This node joined a swarm as a worker.  
ubuntu@ip-10-0-1-62:~$ ]
```

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>
```

```
...p_112018 — Terminal MAC Pro — -bash ... ssh -i k8s_lab ubuntu@13.229.126.99 ... ssh -i k8s_lab ubuntu@13.229.98.3 ... h -i k8s_lab ubuntu@13.229.98.3

ubuntu@ip-10-0-1-104:~$ docker swarm join-token worker
To add a worker to this swarm, run the following command:

    docker swarm join --token SWMTKN-1-1qnpobqw0hilpc5i90sz803tlhyi1h4k84uok10y814bvhyqf2-0ag405byoqpiqgqhoyle866tv 10.0.1.104:2377

ubuntu@ip-10-0-1-104:~$ docker swarm join-token manager
To add a manager to this swarm, run the following command:

    docker swarm join --token SWMTKN-1-1qnpobqw0hilpc5i90sz803tlhyi1h4k84uok10y814bvhyqf2-3u9rqxfwhbh52qwqeeiewybl 10.0.1.104:2377

ubuntu@ip-10-0-1-104:~$
```

- 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
```

ID	HOSTNAME	STATUS	AVAILABILITY	MANAGER STATUS	ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6	ip-10-0-1-62	Ready	Active		18.06.1-ce
3tnvltyohbekgygvsb1jjoyv * ua0ajfjd4d1mksqzwr80oy2ru	ip-10-0-1-104	Ready	Active	Leader	18.06.1-ce
	ip-10-0-1-163	Ready	Active		18.06.1-ce

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 ทั้งหมดภายใน docker swarm cluster
 - ps <ID>: แสดงงานทั้งหมดที่รันอยู่ภายใน 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: Swarm Mode

- ทำการตรวจสอบเครื่องใน LAB ที่ได้รับมอบหมายแต่ละกลุ่มซึ่ง

Name: Training_DockerZerotoHero_StudentG1_1
(IP: 10.0.1.X), Role: Master

Name: Training_DockerZerotoHero_StudentG1_2
(IP: 10.0.1.X), Role: Worker1

Name: Training_DockerZerotoHero_StudentG1_3
(IP: 10.0.1.X), Role: Worker2

- เริ่ม initial swarm ที่เครื่อง Master

```
docker swarm init --secret labdocker --listen-addr <private ip  
of Master>:2377
```

Workshop: Swarm Mode

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

```
docker swarm join --token
```

```
SWMTKN-1-1qnpobqw0hilpc5i90sz803tlhyi1h4k84uok10y81  
4bvhyqf2-0ag405byoqpiqgqhoy6r866tv 10.0.1.104:2377
```

- ตรวจสอบสถานะของ swarm หลังจาก join node เข้าไปเรียบร้อยแล้ว

```
docker node ls
```

ID	HOSTNAME	STATUS	AVAILABILITY	MANAGER STATUS	ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6	ip-10-0-1-62	Ready	Active		18.06.1-ce
3tnvltyohbekgygvb1jjoyv *	ip-10-0-1-104	Ready	Active	Leader	18.06.1-ce
ua0ajfjd4d1mksqzwr80oy2ru	ip-10-0-1-163	Ready	Active		18.06.1-ce

Swarm Service

- สำหรับการลั่งรัน container บน swarm ได้มีการเปลี่ยนแปลงรูปแบบใหม่ เช่นกัน 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
```

```
...018 — Terminal MAC Pro — -bash ...-i k8s_lab ubuntu@13.229.126.99 ...-i k8s_lab ubuntu@13.229.98.3 ... k8s_lab ubuntu@18.136.196.130 ...
ubuntu@ip-10-0-1-104:~$ docker service create --name nodejs -dt labdocker/alpineweb:latest node hello.js
4i4gu0o15f819jgohbgn994f7
ubuntu@ip-10-0-1-104:~$
```

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-delay duration
--restart-max-attempts uint
--restart-window duration
--rollback-delay duration
--rollback-failure-action string
--rollback-max-failure-ratio float
--rollback-monitor duration
--rollback-order string
--rollback-parallelism uint
--secret secret
--stop-grace-period duration
--stop-signal string
-t, --tty               Allocate a pseudo-TTY
--update-delay duration
--update-failure-action string
--update-max-failure-ratio float
--update-monitor duration
--update-order string
--update-parallelism uint
-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
```

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

Swarm Service

docker service scale nodejs=5

```
...shop_112018 — Terminal MAC Pro — bash      ...: ~ — ssh -i k8s_lab ubuntu@13.229.126.99      ...: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ...      ... — ssh -i k8s_lab ubuntu@18.136.196.130 ...
ubuntu@ip-10-0-1-104:~$ docker service create --name nodejs -dt labdocker/alpineweb:latest node hello.js
4i4gu0o15f819jgohbgn994f7
ubuntu@ip-10-0-1-104:~$ docker service ls
ID          NAME      MODE      REPLICAS      IMAGE
4i4gu0o15f81  nodejs    replicated  1/1        labdocker/alpineweb:latest
ubuntu@ip-10-0-1-104:~$ docker service ps nodejs
ID          NAME      IMAGE      NODE      DESIRED STATE      CURRENT STATE      ERROR      PORTS
h6u6lt7o564f  nodejs.1  labdocker/alpineweb:latest  ip-10-0-1-104  Running      Running about a minute ago
ubuntu@ip-10-0-1-104:~$ docker service scale nodejs=5
nodejs scaled to 5
overall progress: 5 out of 5 tasks
1/5: running  [=====>]
2/5: running  [=====>]
3/5: running  [=====>]
4/5: running  [=====>]
5/5: running  [=====>]
verify: Service converged
ubuntu@ip-10-0-1-104:~$ docker service ps nodejs
ID          NAME      IMAGE      NODE      DESIRED STATE      CURRENT STATE      ERROR      PORTS
h6u6lt7o564f  nodejs.1  labdocker/alpineweb:latest  ip-10-0-1-104  Running      Running 2 minutes ago
r5j8wpaew0tm  nodejs.2  labdocker/alpineweb:latest  ip-10-0-1-104  Running      Running 26 seconds ago
w66ihyd8kbs2  nodejs.3  labdocker/alpineweb:latest  ip-10-0-1-163  Running      Running 16 seconds ago
gjgkorz84g7g  nodejs.4  labdocker/alpineweb:latest  ip-10-0-1-62   Running      Running 16 seconds ago
jubxx7bup73b  nodejs.5  labdocker/alpineweb:latest  ip-10-0-1-62   Running      Running 16 seconds ago
ubuntu@ip-10-0-1-104:~$
```

Swarm Service

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

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

```
...shop_112018 — Terminal MAC Pro — -bash | ...: ~ — ssh -i k8s_lab ubuntu@13.229.126.99 | ...: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ... — ssh
[ubuntu@ip-10-0-1-104:~$ docker service update -dt --reserve-cpu 1 --limit-cpu 1 nodejs
nodejs
[ubuntu@ip-10-0-1-104:~$ docker service inspect nodejs | more
[
  {
    "ID": "4i4gu0o15f819jgohbgn994f7",
    "Version": {
      "Index": 44
    },
    "CreatedAt": "2018-10-21T16:25:07.16972436Z",
    "UpdatedAt": "2018-10-21T16:29:50.119830764Z",
    "Spec": {
      "Name": "nodejs",
      "Labels": {},
      "TaskTemplate": {
        "ContainerSpec": {
          "Image": "labdocker/alpineweb:latest@sha256:a7aa70c78120ed126487aecbf49db1054f1ff131858516c91137c3accbb4a333",
          "Args": [
            "node",
            "hello.js"
          ],
          "Init": false,
          "TTY": true,
          "StopGracePeriod": 10000000000,
          "DNSConfig": {}
        }
      }
    }
  }
]
```

Swarm Service

```
        Spec . if
    },
    "UpdateStatus": {
        "State": "updating",
        "StartedAt": "2018-10-21T16:29:50.119815453Z",
        "Message": "update in progress"
    }
}
ubuntu@ip-10-0-1-104:~$ █
```

```
...shop_112018 — Terminal MAC Pro — -bash      ...: ~ — ssh -i k8s_lab ubuntu@13.229.126.99      ...: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ...
[ubuntu@ip-10-0-1-104:~$ docker service inspect nodejs | grep update
    "Message": "update completed"
ubuntu@ip-10-0-1-104:~$ █
```

Swarm Service

docker service ps nodejs

```
...shop_112018 — Terminal MAC Pro — -bash      ...: ~ — ssh -i k8s_lab ubuntu@13.229.126.99      ...: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ...      ... — ssh -i k8s_lab ubuntu@18.136.196.130 ...
[ubuntu@ip-10-0-1-104:~$ docker service ps nodejs
ID          NAME        IMAGE           NODE        DESIRED STATE   CURRENT STATE    ERROR          PORTS
lchljj6puie2  nodejs.1  labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running about a minute ago
h6u6lt7o564f  \_ nodejs.1  labdocker/alpineweb:latest  ip-10-0-1-104  Shutdown       Shutdown about a minute ago
ubuntu@ip-10-0-1-104:~$ ]
```

docker service rm nodejs

```
...shop_112018 — Terminal MAC Pro — -bash      ...: ~ — ssh -i k8s_lab ubuntu@13.229.126.99      ...: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ...      ... — ssh -i k8s_lab ubuntu@18.136.196.130 ...
[ubuntu@ip-10-0-1-104:~$ docker service ps nodejs
ID          NAME        IMAGE           NODE        DESIRED STATE   CURRENT STATE    ERROR          PORTS
lchljj6puie2  nodejs.1  labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running 2 minutes ago
h6u6lt7o564f  \_ nodejs.1  labdocker/alpineweb:latest  ip-10-0-1-104  Shutdown       Shutdown 2 minutes ago
[ubuntu@ip-10-0-1-104:~$ docker service rm nodejs
nodejs
[ubuntu@ip-10-0-1-104:~$ docker service ps nodejs
no such service: nodejs
ubuntu@ip-10-0-1-104:~$ ]
```

Swarm Service

```
Usage: docker service update [OPTIONS] SERVICE

Update a service

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

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

Workshop: 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
```

```
...shop_112018 — Terminal MAC Pro — -bash | ... — ssh -i k8s_lab ubuntu@13.229.126.99 | ...: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ... | ...— ssh -i k8s_lab ubuntu@18.136.196.130 ...

ubuntu@ip-10-0-1-104:~$ docker service create -dt --name nodejs \
> labdocker/alpineweb:latest node hello.js
sm7d6yzuedh7kpv4o3zv8tyx1
ubuntu@ip-10-0-1-104:~$ 
[ubuntu@ip-10-0-1-104:~$ docker service ls
ID           NAME      MODE      REPLICAS      IMAGE
sm7d6yzuedh7   nodejs    replicated    1/1        labdocker/alpineweb:latest
[ubuntu@ip-10-0-1-104:~$ docker service ps nodejs
ID           NAME      IMAGE          NODE      DESIRED STATE     CURRENT STATE          ERROR          PORTS
pq53791w4q8a   nodejs.1  labdocker/alpineweb:latest  ip-10-0-1-104  Running   Running 7 seconds ago
ubuntu@ip-10-0-1-104:~$ 
```

Orchestrator Assignment

- Swarm สามารถควบคุมการจ่ายงานให้จาก manager ไปยัง worker ได้หลากหลายเทคนิค เพื่อตอบสนองความต้องการของผู้ใช้งาน
- Docker stack deploy (Compose version 3.4)
 - Replicated (Specific number of container by manual)
 - Global (1 container per node in swarm)
- Assign by default node constrain (--constraint)
 - 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

```
...shop_112018 — Terminal MAC Pro — bash          .ssh — ubuntu@ip-10-0-1-104: ~ — ssh -i k8s_lab ubuntu@13.229.126.99 — 165x16
...shop_112018 — Terminal MAC Pro — bash          ...: ~ — ssh -i k8s_lab ubuntu@13.229.126.99          ...: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ...          ...— ssh -i k8s_lab ubuntu@18.136.196.130 ...
[ubuntu@ip-10-0-1-104:~$ docker node ls
ID           HOSTNAME   STATUS    AVAILABILITY  MANAGER STATUS      ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6  ip-10-0-1-62  Ready     Active        18.06.1-ce
3tnvltyyohbekgygvsb1jjovy * ip-10-0-1-104 Ready     Active        Leader
ua0ajfjd4d1mksqzwr80oy2ru ip-10-0-1-163 Ready     Active
ubuntu@ip-10-0-1-104:~$ docker service create --dt --constraint 'node.id==3tnvltyyohbekgygvsb1jjovy' \
> --name nodejs --replicas=5 labdocker/alpineweb:latest node hello.js
v52nswafowr62xq6ib9rpzu7r
[ubuntu@ip-10-0-1-104:~$ docker service ps nodejs
ID           NAME      IMAGE      NODE      DESIRED STATE   CURRENT STATE      ERROR      PORTS
TS
k1jt8r2sfahw  nodejs.1  labdocker/alpineweb:latest  ip-10-0-1-104  Running
p6rwlezip0i8  nodejs.2  labdocker/alpineweb:latest  ip-10-0-1-104  Running
17z39pfjyb5f  nodejs.3  labdocker/alpineweb:latest  ip-10-0-1-104  Running
oadfa4hqb5q5  nodejs.4  labdocker/alpineweb:latest  ip-10-0-1-104  Running
i2g4d3bkkc70  nodejs.5  labdocker/alpineweb:latest  ip-10-0-1-104  Running
```

Orchestrator Assignment

- Remove constrain/Add constrain
 - node.hostname

```
...orkshop_112018 — Terminal MAC Pro — -bash ...04: ~ — ssh -i k8s_lab ubuntu@13.229.126.99 ...63: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ... ...~ — ssh -i k8s_lab ubuntu@18.136.196.130 ...+  
[ubuntu@ip-10-0-1-104:~$ docker service update --constraint-rm 'node.id==3tnvltyyohbekgvgvsb1jjovy' --constraint-add 'node.hostname!=ip-10-0-1-104' nodejs  
nodejs  
[ubuntu@ip-10-0-1-104:~$ docker service ps nodejs  
ID          NAME      IMAGE          NODE      DESIRED STATE     CURRENT STATE      ERROR      PORTS  
K1jt8r2sfahw  nodejs.1    labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running 3 minutes ago  
or0dudbrhex2  nodejs.2    labdocker/alpineweb:latest  ip-10-0-1-163  Running        Running 2 seconds ago  
p6rwlezix0i8  \_ nodejs.2   labdocker/alpineweb:latest  ip-10-0-1-104  Shutdown       Shutdown 3 seconds ago  
n9kxw9v7efno   nodejs.3    labdocker/alpineweb:latest  ip-10-0-1-62   Ready         Ready 2 seconds ago  
17z39pfjyb5f   \_ nodejs.3   labdocker/alpineweb:latest  ip-10-0-1-104  Shutdown       Running 2 seconds ago  
oadfa4hqb5q5   nodejs.4    labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running 3 minutes ago  
i2g4d3bkkc70   nodejs.5    labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running 3 minutes ago  
  
...orkshop_112018 — Terminal MAC Pro — -bash ...04: ~ — ssh -i k8s_lab ubuntu@13.229.126.99 ...63: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ... ...~ — ssh -i k8s_lab ubuntu@18.136.196.130 ...+  
[ubuntu@ip-10-0-1-104:~$ docker service inspect nodejs |grep update  
  "Message": "update completed"  
[ubuntu@ip-10-0-1-104:~$ docker service ps nodejs  
ID          NAME      IMAGE          NODE      DESIRED STATE     CURRENT STATE      ERROR      PORTS  
77m2kx4lvs8  nodejs.1    labdocker/alpineweb:latest  ip-10-0-1-62   Running        Running 24 seconds ago  
K1jt8r2sfahw  \_ nodejs.1   labdocker/alpineweb:latest  ip-10-0-1-104  Shutdown       Shutdown 24 seconds ago  
or0dudbrhex2  nodejs.2    labdocker/alpineweb:latest  ip-10-0-1-163  Running        Running about a minute ago  
p6rwlezix0i8  \_ nodejs.2   labdocker/alpineweb:latest  ip-10-0-1-104  Shutdown       Shutdown about a minute ago  
n9kxw9v7efno   nodejs.3    labdocker/alpineweb:latest  ip-10-0-1-62   Running        Running 48 seconds ago  
17z39pfjyb5f   \_ nodejs.3   labdocker/alpineweb:latest  ip-10-0-1-104  Shutdown       Shutdown 48 seconds ago  
p7iek0f77pji  nodejs.4    labdocker/alpineweb:latest  ip-10-0-1-163  Running        Running 12 seconds ago  
oadfa4hqb5q5   \_ nodejs.4   labdocker/alpineweb:latest  ip-10-0-1-104  Shutdown       Shutdown 13 seconds ago  
0rcd8ppge4ex  nodejs.5    labdocker/alpineweb:latest  ip-10-0-1-163  Running        Running 36 seconds ago  
i2g4d3bkkc70   \_ nodejs.5   labdocker/alpineweb:latest  ip-10-0-1-104  Shutdown       Shutdown 36 seconds ago  
ubuntu@ip-10-0-1-104:~$ ]
```

Workshop: 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
```

```
...shop_112018 — Terminal MAC Pro — bash          .ssh — ubuntu@ip-10-0-1-104: ~ — ssh -i k8s_lab ubuntu@13.229.126.99 — 165x16
...: ~ — ssh -i k8s_lab ubuntu@13.229.126.99      ...: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ...    ... — ssh -i k8s_lab ubuntu@18.136.196.130 ...
[ubuntu@ip-10-0-1-104:~$ docker node ls
ID           HOSTNAME   STATUS        AVAILABILITY   MANAGER STATUS   ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6 ip-10-0-1-62 Ready       Active
3tnvltyyohbekgygvb1jjovy * ip-10-0-1-104 Ready       Active       Leader
ua0ajfjd4d1mksqzwr80oy2ru ip-10-0-1-163 Ready       Active
[ubuntu@ip-10-0-1-104:~$ docker service create -dt --constraint 'node.id==3tnvltyyohbekgygvb1jjovy' \
-> --name nodejs --replicas=5 labdocker/alpineweb:latest node hello.js
v52nswafowr62xq6ib9rpzu7r
[ubuntu@ip-10-0-1-104:~$ docker service ps nodejs
ID           NAME      IMAGE             NODE        DESIRED STATE   CURRENT STATE          ERROR          PORTS
TS
k1jt8r2sfahw  nodejs.1  labdocker/alpineweb:latest  ip-10-0-1-104  Running
p6rwlezix0i8  nodejs.2  labdocker/alpineweb:latest  ip-10-0-1-104  Running
17z39pfjyb5f  nodejs.3  labdocker/alpineweb:latest  ip-10-0-1-104  Running
oadfa4hq5q5   nodejs.4  labdocker/alpineweb:latest  ip-10-0-1-104  Running
i2g4d3bkcc70  nodejs.5  labdocker/alpineweb:latest  ip-10-0-1-104  Running
```

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
```

```
...orkshop_112018 — Terminal MAC Pro — -bash ...04: ~ — ssh -i k8s_lab ubuntu@13.229.126.99 ...63: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ...  
[ubuntu@ip-10-0-1-104:~$ docker node ls  
ID HOSTNAME STATUS AVAILABILITY MANAGER STATUS ENGINE VERSION  
4g6pqogaae5co8zxe8w6pxfd6 ip-10-0-1-62 Ready Active  
3tnvltyyohbekgygvbs1jjovy * ip-10-0-1-104 Ready Active Leader 18.06.1-ce  
ua0ajfjd4d1mksqzwr80oy2ru ip-10-0-1-163 Ready Active 18.06.1-ce  
[ubuntu@ip-10-0-1-104:~$ docker node update --label-add 'storage=sas' ip-10-0-1-104  
ip-10-0-1-104  
[ubuntu@ip-10-0-1-104:~$ docker node update --label-add 'storage=nvdim' ip-10-0-1-163  
ip-10-0-1-163  
[ubuntu@ip-10-0-1-104:~$ docker node update --label-add 'storage=sata' ip-10-0-1-62  
ip-10-0-1-62  
[ubuntu@ip-10-0-1-104:~$ docker node inspect ip-10-0-1-104|grep storage  
"storage": "sas"  
[ubuntu@ip-10-0-1-104:~$ docker node inspect ip-10-0-1-163|grep storage  
"storage": "nvdim"  
[ubuntu@ip-10-0-1-104:~$ docker node inspect ip-10-0-1-62|grep storage  
"storage": "sata"  
ubuntu@ip-10-0-1-104:~$ ]
```

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
```

```
...orkshop_112018 — Terminal MAC Pro — bash | ...04: ~ — ssh -i k8s_lab ubuntu@13.229.126.99 | ...63: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ... | ...~ — ssh -i k8s_lab ubuntu@18.136  
[ubuntu@ip-10-0-1-104:~$ docker service create -dt --constraint 'node.labels.storage==sas' --name nodejs --replicas=5 labdocker/alpineweb:latest node hello.js  
pl6f8550yokx23bgm3l2txo91  
[ubuntu@ip-10-0-1-104:~$ docker service ps nodejs  
ID          NAME        IMAGE          NODE          DESIRED STATE    CURRENT STATE      ERROR          PORTS  
vkh4tyggb2z1  nodejs.1  labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running  7 seconds ago  
7hko49pz2o3a  nodejs.2  labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running  6 seconds ago  
sl1cqvqdnitn  nodejs.3  labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running  6 seconds ago  
3axgwaukkmgt  nodejs.4  labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running  7 seconds ago  
i2cwhj6qmcbu  nodejs.5  labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running  7 seconds ago  
ubuntu@ip-10-0-1-104:~$
```

Workshop: 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
```

```
...orkshop_112018 — Terminal MAC Pro — bash      ...04: ~ — ssh -i k8s_lab ubuntu@13.229.126.99      ...63: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ...      ...~ — ssh -i k8s_lab ubuntu@18.136.196.  
[ubuntu@ip-10-0-1-104:~$ docker service create -dt  --constraint 'node.labels.storage==sas'  --name nodejs --replicas=5 labdocker/alpineweb:latest node hello.js  
pl6f8550yokx23bgm3l2txo91  
[ubuntu@ip-10-0-1-104:~$ docker service ps nodejs  
ID          NAME        IMAGE          NODE          DESIRED STATE     CURRENT STATE      ERROR          PORTS  
vkh4tyggb2z1  nodejs.1    labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running 7 seconds ago  
7hko49pz2o3a  nodejs.2    labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running 6 seconds ago  
s11cqvldnlt  nodejs.3    labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running 6 seconds ago  
3axgwaukkmg  nodejs.4    labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running 7 seconds ago  
i2cwhj6qmbcu nodejs.5    labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running 7 seconds ago  
[ubuntu@ip-10-0-1-104:~$ docker node ls  
ID          HOSTNAME   STATUS          AVAILABILITY  MANAGER STATUS      ENGINE VERSION  
4g6pqogaae5co8zxe8wópxfd6  ip-10-0-1-62  Ready        Active           Leader          18.06.1-ce  
3tnvltyyohbekgygvb1jjovy *  ip-10-0-1-104  Ready        Active           Active          18.06.1-ce  
ua0ajfjd4d1mksqzwr80oy2ru  ip-10-0-1-163  Ready        Active           Active          18.06.1-ce  
[ubuntu@ip-10-0-1-104:~$ ]
```

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
```

```
...orkshop_112018 — Terminal MAC Pro — -bash ...04: ~ — ssh -i k8s_lab ubuntu@13.229.126.99 ...63: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ...  
[ubuntu@ip-10-0-1-104:~$ docker node ls  
ID HOSTNAME STATUS AVAILABILITY MANAGER STATUS ENGINE VERSION  
4g6pqogaae5co8zxe8w6pxfd6 ip-10-0-1-62 Ready Active  
3tnvltyyohbekgygvbs1bjjoyv * ip-10-0-1-104 Ready Active Leader 18.06.1-ce  
ua0ajfjd4d1mksqzwr80oy2ru ip-10-0-1-163 Ready Active 18.06.1-ce  
[ubuntu@ip-10-0-1-104:~$ docker node update --label-add 'physical=DELLPE820' ip-10-0-1-104  
ip-10-0-1-104  
[ubuntu@ip-10-0-1-104:~$ docker node update --label-add 'physical=DELLPE820' ip-10-0-1-163  
ip-10-0-1-163  
[ubuntu@ip-10-0-1-104:~$ docker node update --label-add 'physical=HP' ip-10-0-1-62  
ip-10-0-1-62  
[ubuntu@ip-10-0-1-104:~$ docker node inspect ip-10-0-1-104|grep physical  
"physical": "DELLPE820",  
[ubuntu@ip-10-0-1-104:~$ docker node inspect ip-10-0-1-163|grep physical  
"physical": "DELLPE820",  
[ubuntu@ip-10-0-1-104:~$ docker node inspect ip-10-0-1-62|grep physical  
"physical": "HP",  
ubuntu@ip-10-0-1-104:~$
```

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
```

```
...orkshop_112018 — Terminal MAC Pro — bash  ...04: ~ — ssh -i k8s_lab ubuntu@13.229.126.99  ...63: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ...  ...~ — ssh -i k8s_lab ubuntu@18.136.112.104

ubuntu@ip-10-0-1-104:~$ docker service create -dt --placement-pref 'spread=node.labels.physical' \
[> --name nodejs --replicas=10 labdocker/alpineweb:latest node hello.js
n36z17qwvkj2euas95qxcxwpt
[ubuntu@ip-10-0-1-104:~$ docker service ps nodejs
ID          NAME        IMAGE          NODE          DESIRED STATE   CURRENT STATE      ERROR      PORTS
zlp6rgo1p7o8  nodejs.1  labdocker/alpineweb:latest  ip-10-0-1-62  Running        Running  2 seconds ago
pyvgye34w7b1  nodejs.2  labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running  2 seconds ago
w4vwxvqflz1x  nodejs.3  labdocker/alpineweb:latest  ip-10-0-1-62  Running        Running  2 seconds ago
w5isypf10p51  nodejs.4  labdocker/alpineweb:latest  ip-10-0-1-62  Running        Running  2 seconds ago
tf2bwqa7bj1q  nodejs.5  labdocker/alpineweb:latest  ip-10-0-1-62  Running        Running  2 seconds ago
6f8tjnlyyyrs  nodejs.6  labdocker/alpineweb:latest  ip-10-0-1-163  Running        Running  3 seconds ago
7jidk3fa3opc  nodejs.7  labdocker/alpineweb:latest  ip-10-0-1-62  Running        Running  2 seconds ago
kg2bqew9g4o9  nodejs.8  labdocker/alpineweb:latest  ip-10-0-1-163  Running        Running  2 seconds ago
nlziswaf4p92  nodejs.9  labdocker/alpineweb:latest  ip-10-0-1-163  Running        Running  2 seconds ago
ozm25d536exf  nodejs.10 labdocker/alpineweb:latest  ip-10-0-1-104  Running        Running  2 seconds ago
[ubuntu@ip-10-0-1-104:~$ docker service rm nodejs
nodejs
ubuntu@ip-10-0-1-104:~$
```

Workshop: 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
```

```
...orkshop_112018 — Terminal MAC Pro — -bash ...04: ~ — ssh -i k8s_lab ubuntu@13.229.126.99 ...63: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ... ... — ssh -i k8s_lab ubuntu@18.136.112.104 ...  
ubuntu@ip-10-0-1-104:~$ docker service create -dt --placement-pref 'spread=node.labels.physical' \  
[> --name nodejs --replicas=10 labdocker/alpineweb:latest node hello.js  
n36z17qwvkj2euas95qxcxwpt  
[ubuntu@ip-10-0-1-104:~$ docker service ps nodejs  
ID NAME IMAGE NODE DESIRED STATE CURRENT STATE ERROR PORTS  
zlp6rgo1p7o8 nodejs.1 labdocker/alpineweb:latest ip-10-0-1-62 Running Running 2 seconds ago  
pyvgye34w7b1 nodejs.2 labdocker/alpineweb:latest ip-10-0-1-104 Running Running 2 seconds ago  
w4vwvxvqflz1x nodejs.3 labdocker/alpineweb:latest ip-10-0-1-62 Running Running 2 seconds ago  
w5isypf10p51 nodejs.4 labdocker/alpineweb:latest ip-10-0-1-62 Running Running 2 seconds ago  
tf2bwqa7bj1q nodejs.5 labdocker/alpineweb:latest ip-10-0-1-62 Running Running 2 seconds ago  
6f8tjnlyyrs nodejs.6 labdocker/alpineweb:latest ip-10-0-1-163 Running Running 3 seconds ago  
7jidk3fa3opc nodejs.7 labdocker/alpineweb:latest ip-10-0-1-62 Running Running 2 seconds ago  
kg2bqew9g4o9 nodejs.8 labdocker/alpineweb:latest ip-10-0-1-163 Running Running 2 seconds ago  
nlziswaf4p92 nodejs.9 labdocker/alpineweb:latest ip-10-0-1-163 Running Running 2 seconds ago  
ozm25d536exf nodejs.10 labdocker/alpineweb:latest ip-10-0-1-104 Running Running 2 seconds ago  
[ubuntu@ip-10-0-1-104:~$ docker service rm nodejs  
nodejs  
ubuntu@ip-10-0-1-104:~$
```

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

```
docker service <rm/ --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 --secret/update --secret-add> <secret name>
```

```
docker service <rm /update --secret-rm> source=<secret name>
```

Workshop: 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
```

```
...orkshop_112018 — Terminal MAC Pro — bash ...04: ~ — ssh -i k8s_lab ubuntu@13.229.126.99 ...63: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ...

[ubuntu@ip-10-0-1-104:~$ docker config create nginx.conf ~/docker_workshop_112018/Workshop-2-4-Swarm/nginx.conf
bni17w6tmbks39l1ri3ryvvxz
[ubuntu@ip-10-0-1-104:~$ docker config ls
ID                  NAME          CREATED             UPDATED
bni17w6tmbks39l1ri3ryvvxz  nginx.conf    3 seconds ago      3 seconds ago
ubuntu@ip-10-0-1-104:~$ docker secret create labdocker.com.crt ~/docker_workshop_112018/Workshop-2-4-Swarm/labdocker.com.crt
pt2dhhjiqroqd7gb6ig9bv62n
ubuntu@ip-10-0-1-104:~$ docker secret create labdocker.com.key ~/docker_workshop_112018/Workshop-2-4-Swarm/labdocker.com.key
nu11fusm2zbl815l12s8pe6nb
[ubuntu@ip-10-0-1-104:~$ docker secret ls
ID                  NAME          DRIVER          CREATED             UPDATED
pt2dhhjiqroqd7gb6ig9bv62n  labdocker.com.crt   Less than a second ago  Less than a second ago
nu11fusm2zbl815l12s8pe6nb  labdocker.com.key    Less than a second ago  Less than a second ago
ubuntu@ip-10-0-1-104:~$ docker service create -dt \
```

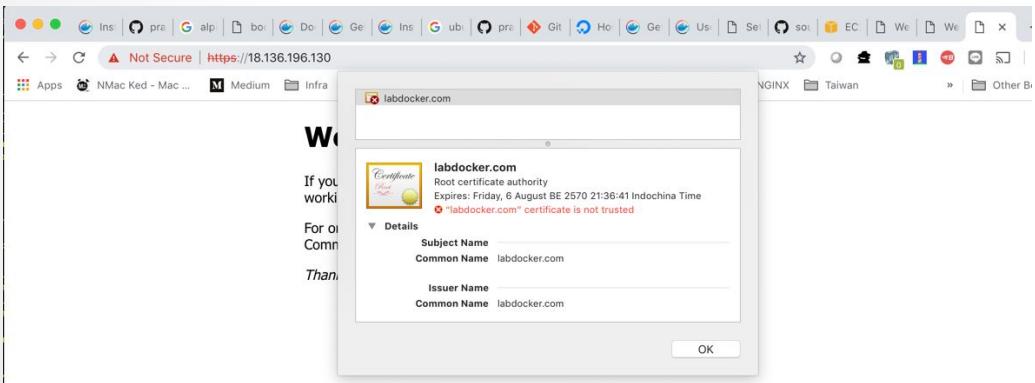
Workshop: Config and Secret

- 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: Config and Secret

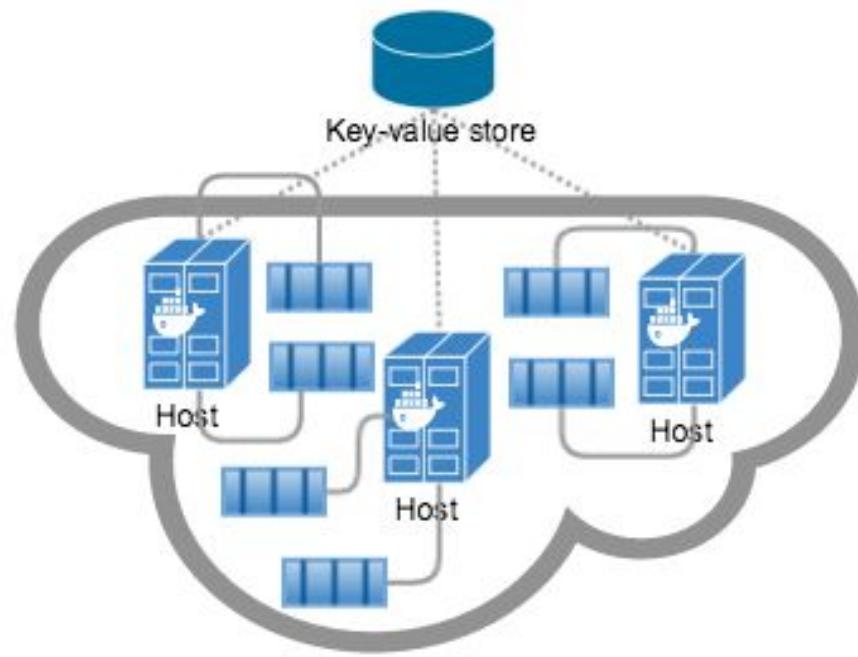
```
docker service -dt create \
--name nginx \
--secret labdocker.com.key \
--secret labdocker.com.crt \
--config source=nginx.conf,target=/etc/nginx/nginx.conf \
-p 443:443 labdocker/nginx:HTTP2
```



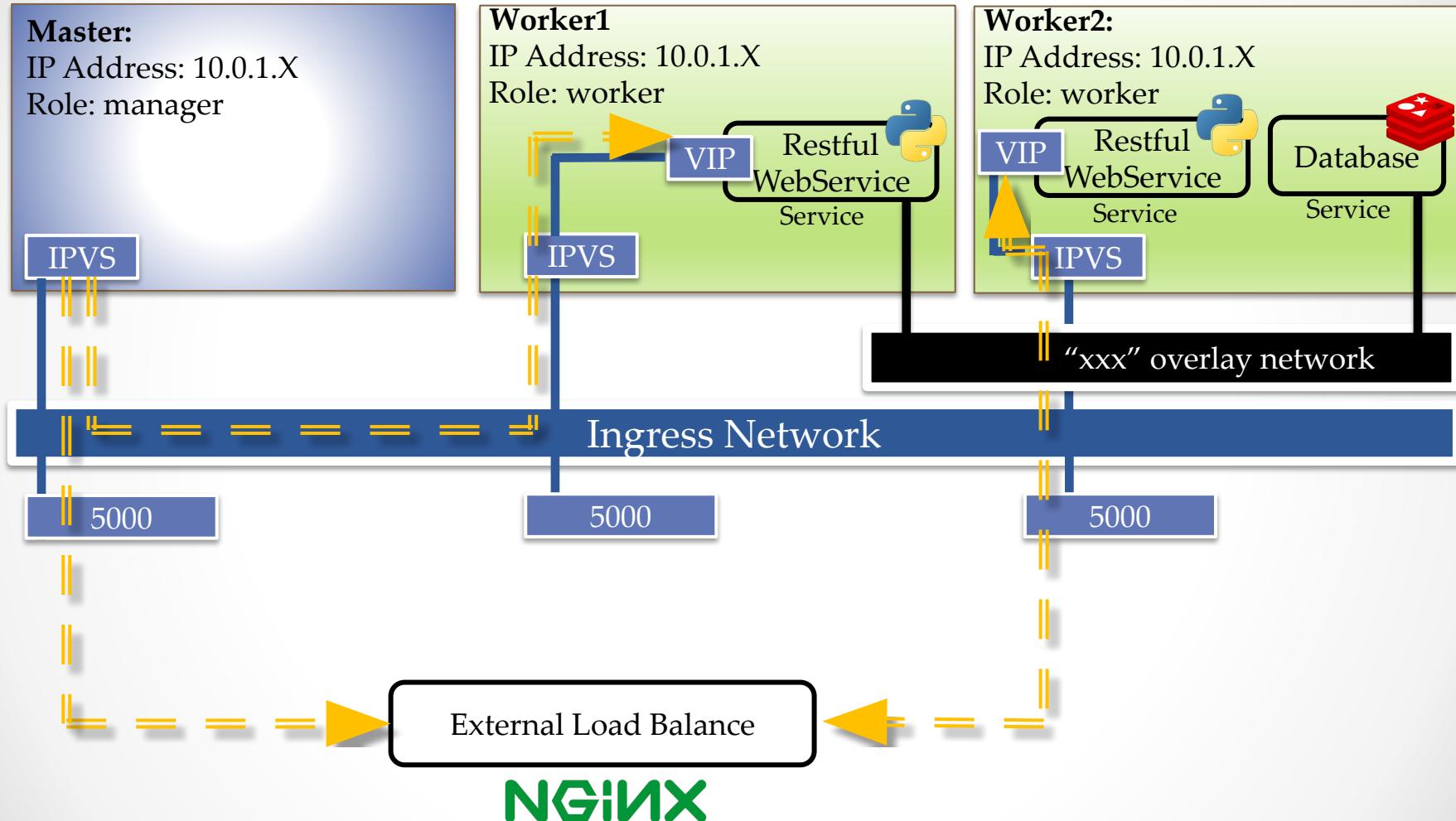
```
praparns-MacBook-Pro:docker_workshop_112018 praparn$ curl -k https://18.136.196.130
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
body {
    width: 35em;
    margin: 0 auto;
    font-family: Tahoma, Verdana, Arial, sans-serif;
}
</style>
</head>
<body>
<h1>Welcome to nginx!</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:docker_workshop_112018 praparn$
```

Overlay and Ingress Network

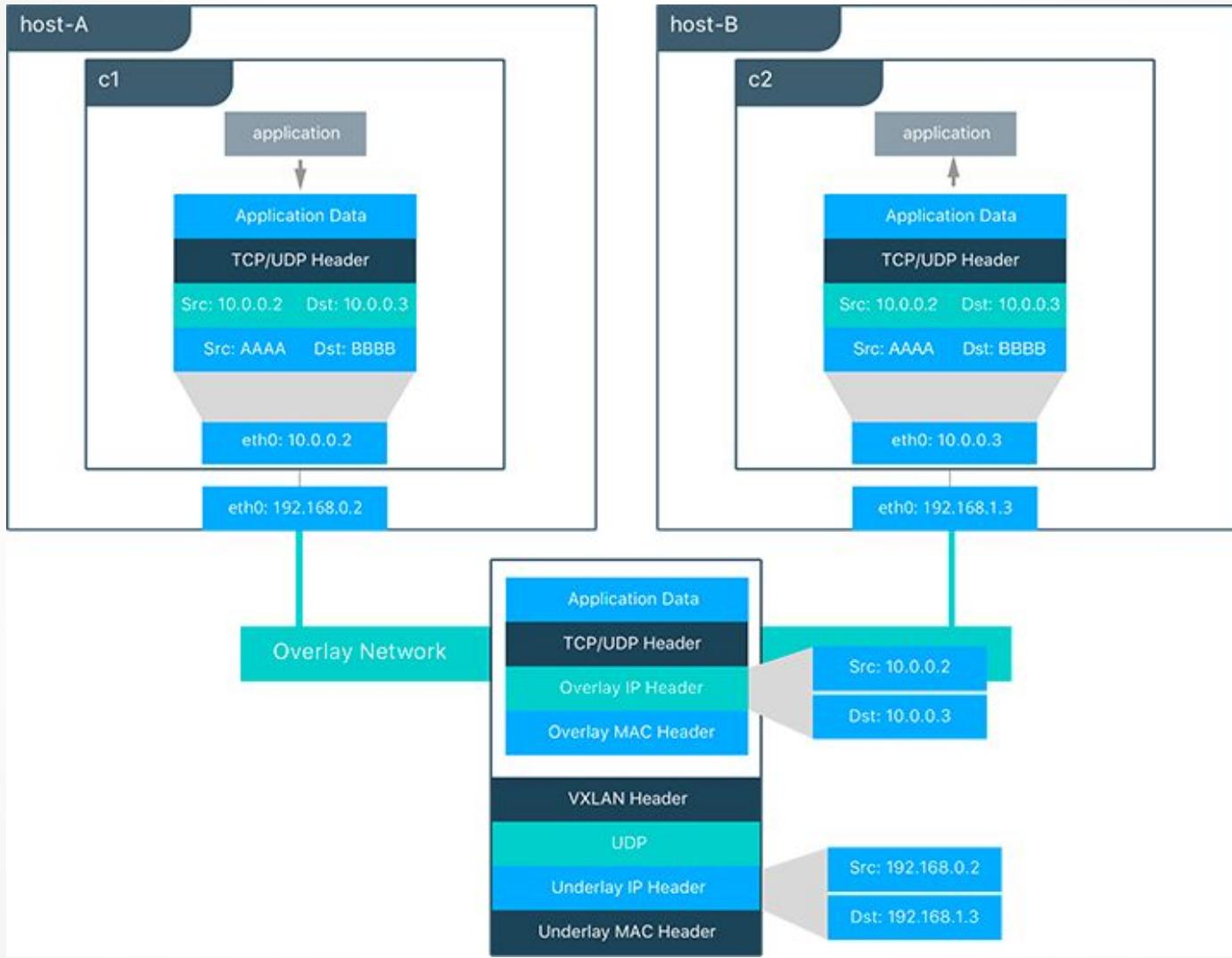
- เพื่อให้ทุกๆ node ภายในได้ swarm cluster สามารถมองเห็นกันได้ docker ได้เตรียมระบบ network แบบ overlay
- การทำงานของ overlay จะอาศัยกลไกของ key value store เป็นหลักในการตรวจสอบ (Discovery / Network status / IP Address etc)
- Default swarm จะสร้าง overlay network ชื่อ “ingress” เพื่อรับรองการใช้งาน service



Overlay and Ingress Network



Overlay and Ingress Network



Workshop: Overlay and Ingress

- สร้าง overlay network บน swarm manager

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

```
...orkshop_112018 — Terminal MAC Pro — -bash ...04: ~ — ssh -i k8s_lab ubuntu@13.229.126.99 ...63: ~ — ssh -  
[ubuntu@ip-10-0-1-104:~$ docker network create --driver overlay --subnet=192.168.100.0/24 swarmnet  
lwxhyfrildn83atwsqxdb9ior  
[ubuntu@ip-10-0-1-104:~$ docker network ls  
NETWORK ID      NAME      DRIVER      SCOPE  
cdb776996466    bridge    bridge      local  
7f907ae7a4c9    docker_gwbridge    bridge      local  
d44f5d624dd1    host      host      local  
hd63tliqe10s    ingress    overlay      swarm  
a1ef67647608    none      null      local  
lwxhyfrildn8    swarmnet    overlay      swarm  
ubuntu@ip-10-0-1-104:~$
```

Workshop: 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
```

```
[...orkshop_112018 — Terminal MAC Pro — bash] ...04: ~ — ssh -i k8s_lab ubuntu@13.229.126.99] ...63: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ...] ...~ — ssh -i k8s_lab ubuntu@18.136.198.159  
ubuntu@ip-10-0-1-104:~$ docker service create -dt --name nodejs \  
> --replicas=2 --network swarmnet -p 3000:3000 \  
[> labdocker/alpineweb:latest node hello.js  
4zw4z04vcxgu0k819q1ms1ar6  
[ubuntu@ip-10-0-1-104:~$ docker service ps nodejs  
ID NAME IMAGE NODE DESIRED STATE CURRENT STATE ERROR PORTS  
t1022pjovfjs nodejs.1 labdocker/alpineweb:latest ip-10-0-1-104 Running Preparing 1 second ago  
51tldbd8z00y nodejs.2 labdocker/alpineweb:latest ip-10-0-1-163 Running Preparing 1 second ago  
ubuntu@ip-10-0-1-104:~$ [REDACTED]  
  
[ubuntu@ip-10-0-1-104:~$ docker ps  
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES  
bfc3f7a2e264 labdocker/alpineweb:latest "node hello.js node ..." About a minute ago Up About a minute 3000/tcp nodejs.1.t1022pjovfjsrxgtfficvr9mf  
[ubuntu@ip-10-0-1-104:~$ docker inspect nodejs.1.t1022pjovfjsrxgtfficvr9mf|grep IPAddress  
"SecondaryIPAddresses": null,  
"IPAddress": "",  
"IPAddress": "10.255.0.8",  
"IPAddress": "192.168.100.6",  
ubuntu@ip-10-0-1-104:~$ [REDACTED]  
  
[ubuntu@ip-10-0-1-163:~$ docker ps  
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES  
cf75d3a7074b labdocker/alpineweb:latest "node hello.js node ..." 2 minutes ago Up 2 minutes 3000/tcp nodejs.2.51tldbd8z00yaq761ac6ozpy0  
[ubuntu@ip-10-0-1-163:~$ docker inspect nodejs.2.51tldbd8z00yaq761ac6ozpy0|grep IPAddress  
"SecondaryIPAddresses": null,  
"IPAddress": "",  
"IPAddress": "10.255.0.9",  
"IPAddress": "192.168.100.7",  
ubuntu@ip-10-0-1-163:~$ [REDACTED]
```

Workshop: Overlay and Ingress

- ตรวจสอบ IP Address ของ service และทดสอบ Ping ข้าม node
docker service inspect nodejs |more

```
...orkshop_112018 — Terminal MAC Pro — -bash ...04: ~ — ssh -i k8s_lab ubuntu@13.229.126.99 ...63: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ...~ — s
ubuntu@ip-10-0-1-104:~$ docker service inspect nodejs |more
[{"id": "4zw4z04vcxgu0k819q1ms1ar6", "version": {"index": 233}, "CreatedAt": "2018-10-21T17:12:30.830220563Z", "UpdatedAt": "2018-10-21T17:12:30.831796908Z", "spec": {"name": "nodejs", "labels": {}, "taskTemplate": {"containerSpec": {"image": "labdocker/alpineweb:latest@sha256:a7aa70c78120ed126487aecbf49db1054f1ff131858516c91137c3accbb4a333", "args": ["node", "hello.js"], "init": false, "tty": true, "stopGracePeriod": 10000000000, "dnsConfig": {}, "isolation": "default"}}, "virtualIPs": [{"networkID": "hd63tliqe10s27mu9w4ilckui", "addr": "10.255.0.7/16"}, {"networkID": "lwxyhyfrildn83atwsqxdb9ior", "addr": "192.168.100.5/24"}]}]
```

```
...orkshop_112018 — Terminal MAC Pro — -bash ...04: ~ — ssh -i k8s_lab ubuntu@13.229.126.99 ...63: ~ — ssh -i k8s_lab u
        }
    ],
    "virtualIPs": [
        {
            "NetworkID": "hd63tliqe10s27mu9w4ilckui",
            "Addr": "10.255.0.7/16"
        },
        {
            "NetworkID": "lwxyhyfrildn83atwsqxdb9ior",
            "Addr": "192.168.100.5/24"
        }
    ]
}
ubuntu@ip-10-0-1-104:~$
```

Workshop: Overlay and Ingress

- ตรวจสอบ IP Address ของ service และทดสอบ Ping ข้าม node

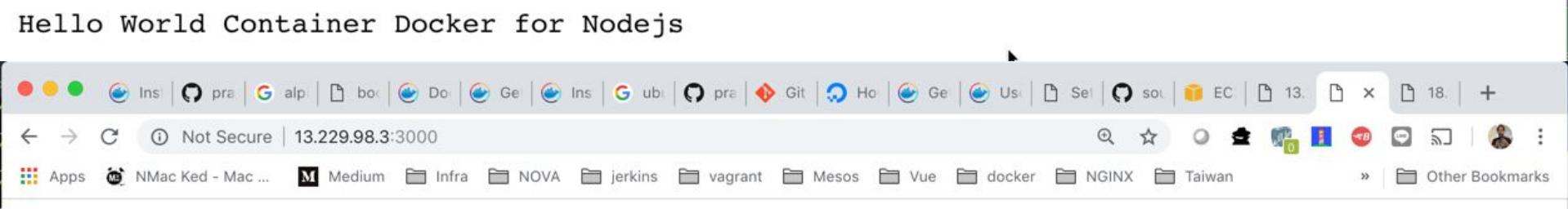
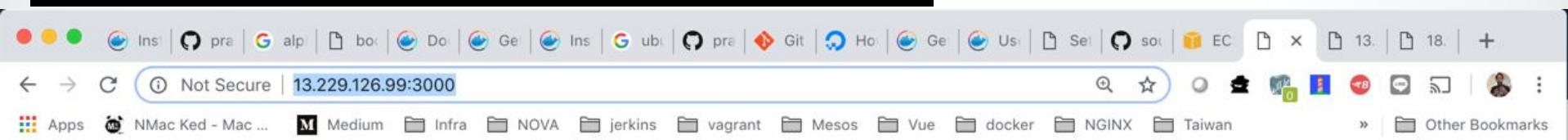
```
[ubuntu@ip-10-0-1-104:~$ docker ps
CONTAINER ID        IMAGE               COMMAND                  CREATED             STATUS              PORTS               NAMES
bfcc3f7a2e264      labdocker/alpineweb:latest "node hello.js node ..."   4 minutes ago    Up 4 minutes     3000/tcp            nodejs.1.t1022pjovfjsrxgtfficvr9mf
[ubuntu@ip-10-0-1-104:~$ docker exec -it nodejs.1.t1022pjovfjsrxgtfficvr9mf ping 192.168.100.5
PING 192.168.100.5 (192.168.100.5): 56 data bytes
64 bytes from 192.168.100.5: seq=0 ttl=64 time=0.116 ms
64 bytes from 192.168.100.5: seq=1 ttl=64 time=0.076 ms
^C
--- 192.168.100.5 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 0.076/0.096/0.116 ms
[ubuntu@ip-10-0-1-104:~$ docker exec -it nodejs.1.t1022pjovfjsrxgtfficvr9mf ping 192.168.100.7
PING 192.168.100.7 (192.168.100.7): 56 data bytes
64 bytes from 192.168.100.7: seq=0 ttl=64 time=1.114 ms
64 bytes from 192.168.100.7: seq=1 ttl=64 time=0.226 ms
^C
--- 192.168.100.7 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 0.226/0.670/1.114 ms
ubuntu@ip-10-0-1-104:~$ 

[ubuntu@ip-10-0-1-163:~$ docker ps
CONTAINER ID        IMAGE               COMMAND                  CREATED             STATUS              PORTS               NAMES
cf75d3a7074b      labdocker/alpineweb:latest "node hello.js node ..."   7 minutes ago    Up 7 minutes     3000/tcp            nodejs.2.51t1dbd8z00yaq761ac6ozpy0
[ubuntu@ip-10-0-1-163:~$ docker exec -it nodejs.2.51t1dbd8z00yaq761ac6ozpy0 ping 192.168.100.5
PING 192.168.100.5 (192.168.100.5): 56 data bytes
64 bytes from 192.168.100.5: seq=0 ttl=64 time=0.100 ms
64 bytes from 192.168.100.5: seq=1 ttl=64 time=0.062 ms
^C
--- 192.168.100.5 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 0.062/0.081/0.100 ms
[ubuntu@ip-10-0-1-163:~$ docker exec -it nodejs.2.51t1dbd8z00yaq761ac6ozpy0 ping 192.168.100.6
PING 192.168.100.6 (192.168.100.6): 56 data bytes
64 bytes from 192.168.100.6: seq=0 ttl=64 time=0.244 ms
64 bytes from 192.168.100.6: seq=1 ttl=64 time=0.237 ms
^C
--- 192.168.100.6 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 0.237/0.240/0.244 ms
ubuntu@ip-10-0-1-163:~$ 
```

Workshop: Overlay and Ingress

- เรียกใช้บริการผ่าน http port ด้วย browser/curl

```
praparns-MacBook-Pro:docker_workshop_112018 praparn$ curl http://18.136.196.130:3000
Hello World Container Docker for Nodejs
praparns-MacBook-Pro:docker_workshop_112018 praparn$ curl http://13.229.126.99:3000
Hello World Container Docker for Nodejs
praparns-MacBook-Pro:docker_workshop_112018 praparn$ curl http://13.229.98.3:3000
Hello World Container Docker for Nodejs
praparns-MacBook-Pro:docker_workshop_112018 praparn$
```



HA Manager Role

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

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

```
...orkshop_112018 — Terminal MAC Pro — -bash ...04: ~ — ssh -i k8s_lab ubuntu@13.229.126.99 ...63: ~ — ssh -i k8s_lab ubuntu@13.229.98.3

[ubuntu@ip-10-0-1-104:~$ docker node ls
ID                      HOSTNAME        STATUS        AVAILABILITY      MANAGER STATUS      ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6  ip-10-0-1-62  Ready       Active           Leader            18.06.1-ce
3tnvltyyohbekgygvsb1jjovy * ip-10-0-1-104  Ready       Active           Leader            18.06.1-ce
ua0ajfjd4d1mksqzwr80oy2ru ip-10-0-1-163  Ready       Active           Reachable         18.06.1-ce
[ubuntu@ip-10-0-1-104:~$ docker node update --role manager ip-10-0-1-163
ip-10-0-1-163
[ubuntu@ip-10-0-1-104:~$ docker node ls
ID                      HOSTNAME        STATUS        AVAILABILITY      MANAGER STATUS      ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6  ip-10-0-1-62  Ready       Active           Leader            18.06.1-ce
3tnvltyyohbekgygvsb1jjovy * ip-10-0-1-104  Ready       Active           Leader            18.06.1-ce
ua0ajfjd4d1mksqzwr80oy2ru ip-10-0-1-163  Ready       Active           Reachable         18.06.1-ce
[ubuntu@ip-10-0-1-104:~$ docker node update --role manager ip-10-0-1-62
ip-10-0-1-62
[ubuntu@ip-10-0-1-104:~$ docker node ls
ID                      HOSTNAME        STATUS        AVAILABILITY      MANAGER STATUS      ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6  ip-10-0-1-62  Ready       Active           Reachable         18.06.1-ce
3tnvltyyohbekgygvsb1jjovy * ip-10-0-1-104  Ready       Active           Leader            18.06.1-ce
ua0ajfjd4d1mksqzwr80oy2ru ip-10-0-1-163  Ready       Active           Reachable         18.06.1-ce
ubuntu@ip-10-0-1-104:~$
```

HA Manager Role

- Add redundancy swarm manager in swarm cluster
 - Restart major manager

```
[ubuntu@ip-10-0-1-104:~$ docker node ls
ID          HOSTNAME  STATUS  AVAILABILITY  MANAGER STATUS  ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6  ip-10-0-1-62  Ready   Active        Reachable      18.06.1-ce
3tnvltyyohbekgygvsb1jjovy * ip-10-0-1-104  Ready   Active        Leader        18.06.1-ce
ua0ajfjd4d1mksqzwr80oy2ru  ip-10-0-1-163  Ready   Active        Reachable      18.06.1-ce
[ubuntu@ip-10-0-1-104:~$ sudo shutdown -r now
Connection to 13.229.224.202 closed by remote host.
Connection to 13.229.224.202 closed.
praparns-MacBook-Pro:~ ssh praparn$
```

- Other will take role for manager within 5 min.

```
[ubuntu@ip-10-0-1-163:~$ docker node ls
ID          HOSTNAME  STATUS  AVAILABILITY  MANAGER STATUS  ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6  ip-10-0-1-62  Ready   Active        Reachable      18.06.1-ce
3tnvltyyohbekgygvsb1jjovy  ip-10-0-1-104  Ready   Active        Leader        18.06.1-ce
ua0ajfjd4d1mksqzwr80oy2ru * ip-10-0-1-163  Ready   Active        Reachable      18.06.1-ce
[ubuntu@ip-10-0-1-163:~$ docker node ls
ID          HOSTNAME  STATUS  AVAILABILITY  MANAGER STATUS  ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6  ip-10-0-1-62  Ready   Active        Reachable      18.06.1-ce
3tnvltyyohbekgygvsb1jjovy  ip-10-0-1-104  Unknown  Active        Unreachable    18.06.1-ce
ua0ajfjd4d1mksqzwr80oy2ru * ip-10-0-1-163  Ready   Active        Leader        18.06.1-ce
ubuntu@ip-10-0-1-163:~$
```

HA Manager Role

- Remove
 - Update node to worker2 and set “Drain” to node

```
[ubuntu@ip-10-0-1-104:~$ docker node ls
ID          HOSTNAME        STATUS      AVAILABILITY  MANAGER STATUS      ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6  ip-10-0-1-62  Ready       Active        Reachable           18.06.1-ce
3tnvltyyohbekgygvbs1jjovy * ip-10-0-1-104  Ready       Active        Reachable           18.06.1-ce
ua0ajfjd4d1mksqzwr80oy2ru  ip-10-0-1-163  Ready       Active        Leader              18.06.1-ce
[ubuntu@ip-10-0-1-104:~$ docker node update --role worker ip-10-0-1-62
ip-10-0-1-62
[ubuntu@ip-10-0-1-104:~$ docker node update --availability drain ip-10-0-1-62
ip-10-0-1-62
[ubuntu@ip-10-0-1-104:~$ docker node ls
ID          HOSTNAME        STATUS      AVAILABILITY  MANAGER STATUS      ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6  ip-10-0-1-62  Ready       Drain         Reachable           18.06.1-ce
3tnvltyyohbekgygvbs1jjovy * ip-10-0-1-104  Ready       Active        Reachable           18.06.1-ce
ua0ajfjd4d1mksqzwr80oy2ru  ip-10-0-1-163  Ready       Active        Leader              18.06.1-ce
ubuntu@ip-10-0-1-104:~$ ]
```

- Leave swarm on node “labdocker”

```
[...orkshop_112018 — Terminal MAC Pro — -bash] ...4: ~
[ubuntu@ip-10-0-1-62:~$ docker swarm leave
Node left the swarm.
ubuntu@ip-10-0-1-62:~$ ]
```

```
[ubuntu@ip-10-0-1-104:~$ docker node ls
ID          HOSTNAME        STATUS      AVAILABILITY  MANAGER STATUS      ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6  ip-10-0-1-62  Down        Drain        Reachable           18.06.1-ce
3tnvltyyohbekgygvbs1jjovy * ip-10-0-1-104  Ready       Active        Leader              18.06.1-ce
ua0ajfjd4d1mksqzwr80oy2ru  ip-10-0-1-163  Ready       Active        Leader              18.06.1-ce
[ubuntu@ip-10-0-1-104:~$ docker node rm ip-10-0-1-62
ip-10-0-1-62
[ubuntu@ip-10-0-1-104:~$ docker node ls
ID          HOSTNAME        STATUS      AVAILABILITY  MANAGER STATUS      ENGINE VERSION
3tnvltyyohbekgygvbs1jjovy * ip-10-0-1-104  Ready       Active        Reachable           18.06.1-ce
ua0ajfjd4d1mksqzwr80oy2ru  ip-10-0-1-163  Ready       Active        Leader              18.06.1-ce
ubuntu@ip-10-0-1-104:~$ ]
```

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>

```
...orkshop_112018 — Terminal MAC Pro — -bash ...4: ~ — ssh -i k8s_lab ubuntu@13.229.224.202 ...63: ~ — ssh -i k8s_lab ubuntu@13.229.98.3 ...~ — ssh -i k8s_lab ubuntu@18.136.196.154  
[ubuntu@ip-10-0-1-62:~$ docker swarm leave  
Node left the swarm.  
[ubuntu@ip-10-0-1-62:~$ docker swarm join --token SwMTKN-1-1qnpobqw0hilpc5i90sz803tlhyi1h4k84uok10y814bvhqf2-3u9rqxfwhbhw52qwqeeiewybl 10.0.1.104:2377  
This node joined a swarm as a manager.  
[ubuntu@ip-10-0-1-62:~$ docker node ls  
ID HOSTNAME STATUS AVAILABILITY MANAGER STATUS ENGINE VERSION  
mydkcrgwkurxyjjb1kf14odl7 * ip-10-0-1-62 Ready Active Reachable 18.06.1-ce  
3tnvltyyohbekgygvbs1jjoyv ip-10-0-1-104 Ready Active Reachable 18.06.1-ce  
ua0ajfjd4d1mksqzwr80oy2ru ip-10-0-1-163 Ready Active Leader 18.06.1-ce  
ubuntu@ip-10-0-1-62:~$
```

- ตรวจสอบค่า token เพื่อ join swarm

```
[ubuntu@ip-10-0-1-62:~$ docker swarm join-token manager  
To add a manager to this swarm, run the following command:  
  
    docker swarm join --token SwMTKN-1-1qnpobqw0hilpc5i90sz803tlhyi1h4k84uok10y814bvhqf2-3u9rqxfwhbhw52qwqeeiewybl 10.0.1.62:2377  
ubuntu@ip-10-0-1-62:~$
```

Workshop: HA Manager Role

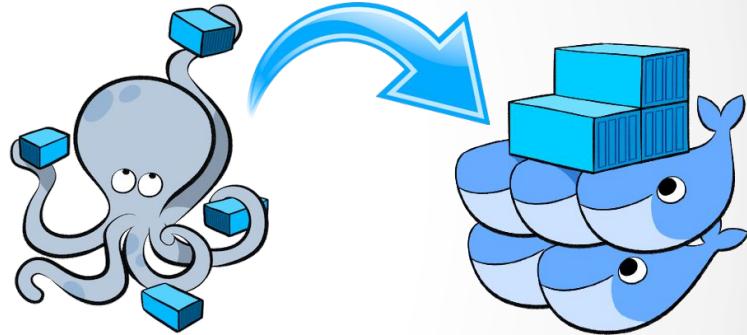
- ทำการ join new manager เข้าสู่ swarm cluster/update/drain

```
[ubuntu@ip-10-0-1-104:~$ docker node ls
ID                      HOSTNAME        STATUS        AVAILABILITY  MANAGER STATUS      ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6  ip-10-0-1-62  Ready       Active        Reachable      18.06.1-ce
3tnvltyyohbekgygvsb1jjovy *  ip-10-0-1-104  Ready       Active        Leader        18.06.1-ce
ua0ajfjd4d1mksqzwr80oy2ru  ip-10-0-1-163  Ready       Active        Reachable      18.06.1-ce
ubuntu@ip-10-0-1-104:~$ ]
```

```
[ubuntu@ip-10-0-1-104:~$ docker node ls
ID                      HOSTNAME        STATUS        AVAILABILITY  MANAGER STATUS      ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6  ip-10-0-1-62  Ready       Active        Reachable      18.06.1-ce
3tnvltyyohbekgygvsb1jjovy *  ip-10-0-1-104  Ready       Active        Reachable      18.06.1-ce
ua0ajfjd4d1mksqzwr80oy2ru  ip-10-0-1-163  Ready       Active        Leader        18.06.1-ce
[ubuntu@ip-10-0-1-104:~$ docker node update --role worker ip-10-0-1-62
ip-10-0-1-62
[ubuntu@ip-10-0-1-104:~$ docker node update --availability drain ip-10-0-1-62
ip-10-0-1-62
[ubuntu@ip-10-0-1-104:~$ docker node ls
ID                      HOSTNAME        STATUS        AVAILABILITY  MANAGER STATUS      ENGINE VERSION
4g6pqogaae5co8zxe8w6pxfd6  ip-10-0-1-62  Ready       Drain        Reachable      18.06.1-ce
3tnvltyyohbekgygvsb1jjovy *  ip-10-0-1-104  Ready       Active        Leader        18.06.1-ce
ua0ajfjd4d1mksqzwr80oy2ru  ip-10-0-1-163  Ready       Active        ]
```

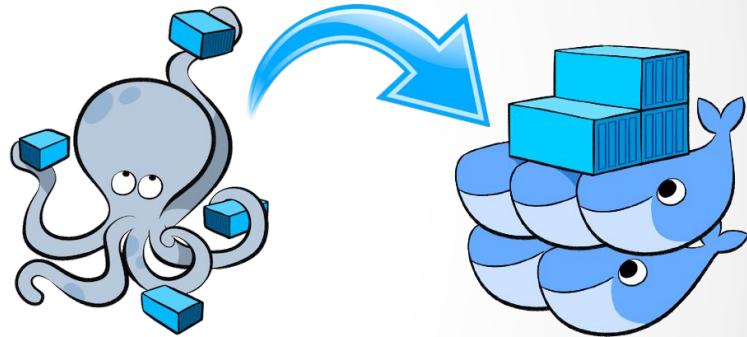
Docker Stack Deploy (Compose)

- 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
```

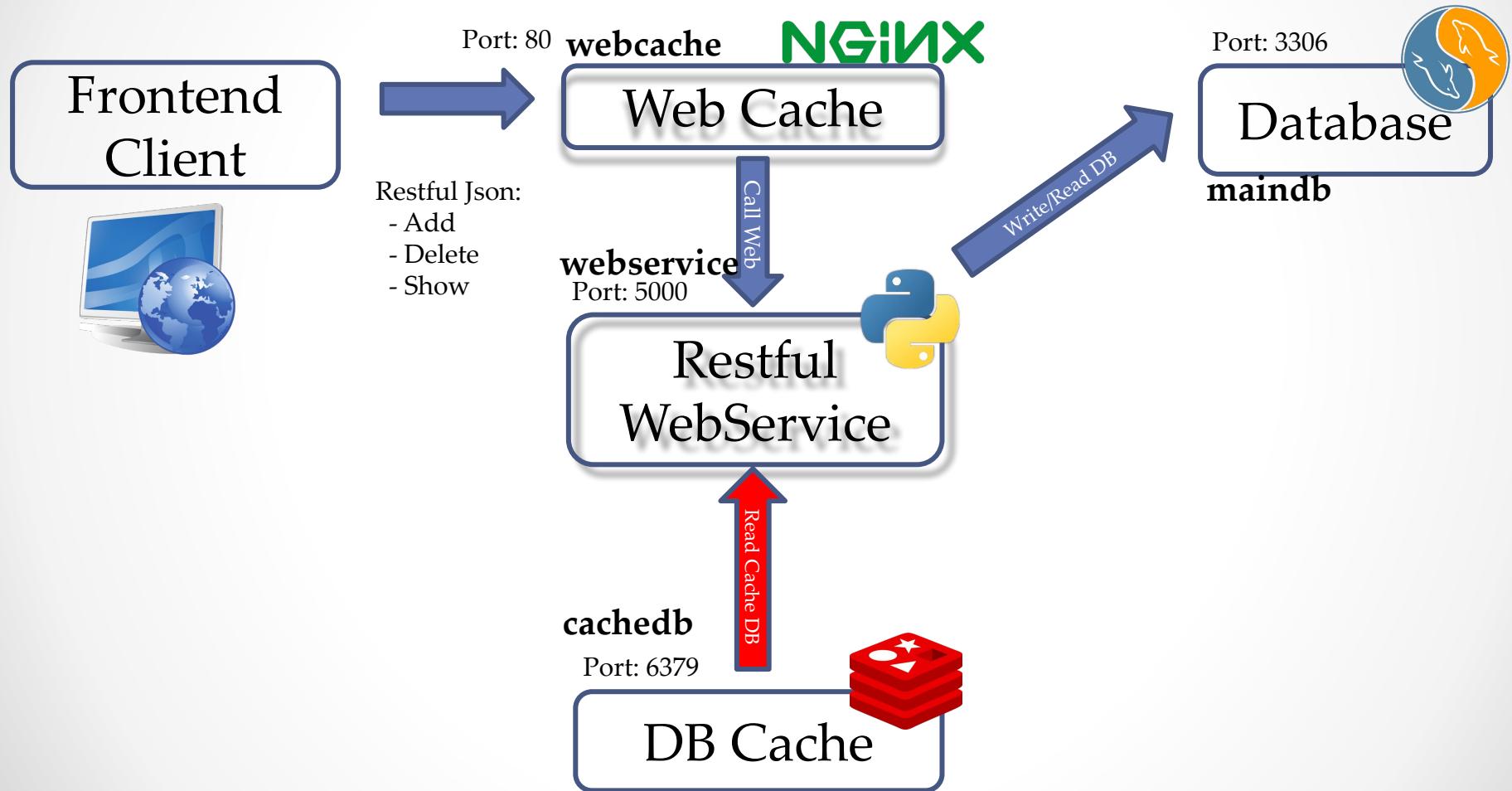
```
docker stack ps <stack name>
```

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

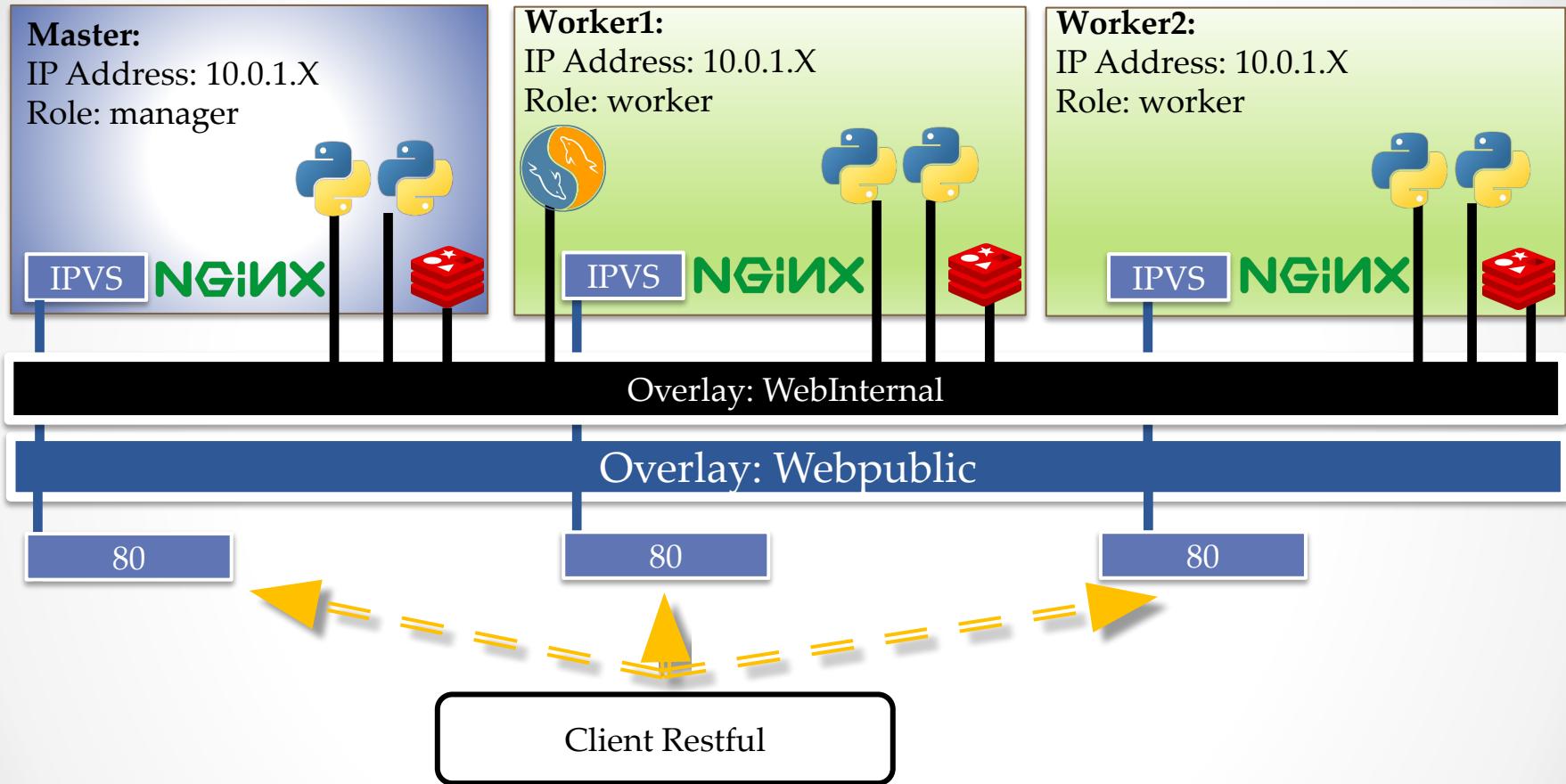
```
docker stack rm <stack name>
```

Workshop: Swarm Compose

- Optimize for WorkLoad



Workshop: Swarm Compose



Workshop: Swarm Compose

```
1  version: '3.3'
2  services:
3    webcache:
4      image: labdocker/cluster:webcache
5      container_name: nginx
6      deploy:
7        mode: global
8        update_config:
9          parallelism: 1
10       delay: 10s
11       restart_policy:
12         condition: on-failure
13         delay: 30s
14         max_attempts: 5
15         window: 60s
16         endpoint_mode: vip
17       depends_on:
18         - webservice
19         - cachedb
20         - maindb
21     networks:
22       webpublic:
23         aliases:
24           - webcache
25       webinternal:
26         aliases:
27           - webcache
28     ports:
29       - "80:80"
30
```

```
31   webservice:
32     image: labdocker/cluster:webservice
33     container_name: webservice
34     deploy:
35       mode: replicated
36       replicas: 6
37       update_config:
38         parallelism: 2
39         delay: 10s
40       restart_policy:
41         condition: on-failure
42         delay: 30s
43         max_attempts: 3
44         window: 60s
45         endpoint_mode: vip
46     depends_on:
47       - cachedb
48       - maindb
49   networks:
50     webinternal:
51       aliases:
52         - webservice
53     ports:
54       - "5000:5000"
```

Workshop: Swarm Compose

```
57
58     maindb:
59         image: labdocker/mariadb:latest
60         container_name: maindb
61         deploy:
62             mode: replicated
63             replicas: 1
64             endpoint_mode: vip
65         environment:
66             - MYSQL_ROOT_PASSWORD=password
67         networks:
68             webinternal:
69                 aliases:
70                     - maindb
71
72     cachedb:
73         image: labdocker/redis:latest
74         container_name: cachedb
75         deploy:
76             mode: global
77             endpoint_mode: vip
78         networks:
79             webinternal:
80                 aliases:
81                     - cachedb
82
```

```
81     networks:
82         webpublic:
83             driver: overlay
84             ipam:
85                 driver: default
86                 config:
87                     - subnet: 192.168.100.0/24
88         webinternal:
89             driver: overlay
90             ipam:
91                 driver: default
92                 config:
93                     - subnet: 192.168.101.0/24
```

Workshop: Swarm Compose

```
[ubuntu@ip-10-0-1-104:~/docker_workshop_112018/Workshop-2-4-Swarm/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_webcache
Creating service webservice_webservice
Creating service webservice_maindb
Creating service webservice_cachedb
ubuntu@ip-10-0-1-104:~/docker_workshop_112018/Workshop-2-4-Swarm/python_restfulset$ ]
```

Workshop: Swarm Compose

ID	NAME	IMAGE	NODE	DESIRED STATE	CURRENT STATE
	PORTS				
mcj0ux4x25uv o ol223n2c2htp o fj0qu565u8mt o kw8oprgn8b3v ago a4foun5hzks3 ago horm2noczrvt ago vhutislnb7np ago ktjzx8thiq6k ago 7siaoo4hnvmh ago axdh6t2ua971 e ago t8jc8aopm6wu e ago 32d2fao3cjcu e ago mtbhxlkuwjg7 o nw2jky8drn42 ago ivhofu5u9kxe	webservice_webcache.wwzx60rvl5res39v0lxir2gfh webservice_webcache.0k95omm28xfef22thummpz3uf webservice_webcache.q814dhi3bz14sze4zmjpiy3qa webservice_webcache.wwzx60rvl5res39v0lxir2gfh webservice_webcache.0k95omm28xfef22thummpz3uf webservice_webcache.q814dhi3bz14sze4zmjpiy3qa webservice_webcache.wwzx60rvl5res39v0lxir2gfh webservice_webcache.0k95omm28xfef22thummpz3uf webservice_webcache.0k95omm28xfef22thummpz3uf webservice_cachedb.wwzx60rvl5res39v0lxir2gfh webservice_cachedb.q814dhi3bz14sze4zmjpiy3qa webservice_cachedb.0k95omm28xfef22thummpz3uf webservice_webservice.1 _ webservice_webservice.1 webservice_maindb.1	labdocker/cluster:webcache labdocker/cluster:webcache labdocker/cluster:webcache labdocker/cluster:webcache labdocker/cluster:webcache labdocker/cluster:webcache labdocker/cluster:webcache labdocker/cluster:webcache labdocker/cluster:webcache labdocker/redis:latest labdocker/redis:latest labdocker/redis:latest labdocker/cluster:webservice labdocker/cluster:webservice labdocker/mysql:latest	swarm-node2 swarm-mng swarm-node1 swarm-node2 swarm-mng swarm-node1 swarm-node2 swarm-mng swarm-node1 swarm-node2 swarm-node1 swarm-mng swarm-node1 swarm-node2 swarm-mng swarm-node1 swarm-node2	Running Running Running Shutdown Shutdown Shutdown Shutdown Shutdown Shutdown Running Running Running Running Shutdown Running	Running 46 seconds ag Running 49 seconds ag Running 50 seconds ag Failed about a minute Failed about a minute Running about a minut Running about a minut Running about a minut Running 39 seconds ag Failed about a minute Running about a minut

Workshop: Swarm Compose

```
praparns-MacBook-Pro:~ praparn$ docker-machine ls
NAME      ACTIVE   DRIVER    STATE     URL
labdocker - virtualbox Running  tcp://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
swarm-node1 - virtualbox Running  tcp://192.168.99.105:2376
swarm-node2 - virtualbox Running  tcp://192.168.99.106:2376
PRAPARN$ docker-machine env
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
```

The screenshot shows the Postman application interface. At the top, there's a header bar with a URL input field containing "http://192.168.99.104", a red circular button, and three small icons. To the right are dropdown menus for "No Environment", "eye" (visibility), and "gear" (settings). Below the header, there are buttons for "GET" (selected), "Params", "Send" (blue button), and "Save". A "Code" tab is also visible. The main workspace has tabs for "Authorization", "Headers", "Body", "Pre-request Script", and "Tests". Under "Authorization", "Type" is set to "No Auth". The "Body" tab is selected, showing options for "Pretty", "Raw", "Preview", and "HTML". The "Headers" tab shows six items. On the right side, status information is displayed: "Status: 200 OK" and "Time: 24 ms". Below the status, the response body is shown in a code block: "*i 1* <H1> Welcome Page from Container Python Lab </H1>Checkpoint Date/Time: Sun Aug 13 17:29:12 2017".

Workshop: Swarm Compose

The screenshot shows two separate API requests in the Postman application.

Request 1: POST http://192.168.99.104/users/insertuser

- Method: POST
- URL: http://192.168.99.104/users/insertuser
- Body (JSON):

```
{"uid": "1", "user": "Praparn Luangphoonlap", "desribe": "Slave"}
```
- Response Status: 200 OK, Time: 49 ms
- Response Body:

```
#####
# Record was added #####
#####
```

Request 2: GET http://192.168.99.104/users/1

- Method: GET
- URL: http://192.168.99.104/users/1
- Authorization: No Auth
- Response Status: 200 OK, Time: 49 ms
- Response Body:

```
Praparn Luangphoonlap(Database Direct)
```

Workshop: Swarm Compose

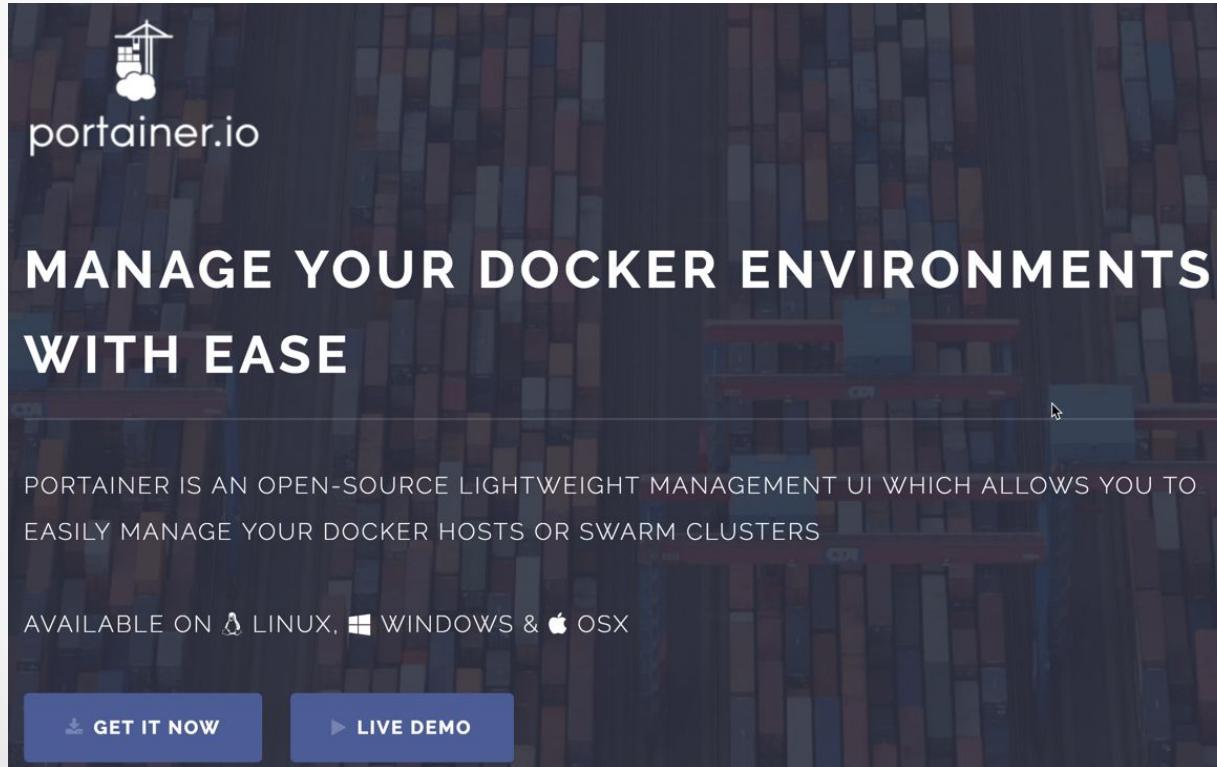
The screenshot shows a Postman collection interface. At the top, there are five tabs labeled with the URL `http://192.168.99.1`. Below them, a main request card is displayed for a `GET` request to `http://192.168.99.104/users/removeuser/1`. The `Authorization` tab is selected. The response status is `200 OK` with a time of `33 ms`. The response body is a single line of text: `##### 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)



Docker: The Next-Gen of Virtualization



portainer for Docker



portainer.io

Please create the initial administrator user.

Username

Password

Confirm password ✓

✓ The password must be at least 8 characters long

[Create user](#)



portainer.io

Connect Portainer to the Docker environment you want to manage.

✓ Local Manage the Docker environment where Portainer is running

↗ Remote Manage a remote Docker environment

⚠ This feature is not yet available for native Docker Windows containers.
Please ensure that you have started the Portainer container with the following Docker flag `-v "/var/run/docker.sock:/var/run/docker.sock"` in order to connect to the local Docker environment.

[Connect](#)

Docker: The Next-Gen of Virtualization



portainer for Docker

portainer.io

ACTIVE ENDPOINT: local

ENDPOINT ACTIONS: Dashboard, App Templates, Containers, Images, Networks, Volumes, Events, Engine

PORAINER SETTINGS: User management, Endpoints, Registries, Settings

Home Dashboard

Node info:

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

Containers: 1 running, 0 stopped

Images: 31

Volumes: 5

Networks: 4

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	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: The Next-Gen of Virtualization



portainer for Docker

portainer.io

ACTIVE ENDPOINT
local

ENDPOINT ACTIONS

Dashboard

App Templates

Containers

Images

Networks

Volumes

Events

Engine

PORAINER SETTINGS

User management

Endpoints

Registries

Settings

Create container
Containers > Add container

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

Advanced container settings

portainer.io 1.16.2

Docker: The Next-Gen of Virtualization



portainer for Docker

192.168.99.100

NMac Ked - Mac OS... M Medium jenkins 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

<input type="checkbox"/> Name	State <small>Filter</small>	Quick actions	Stack	Image	IP Address	Published Ports	Ownership
<input type="checkbox"/> nginx	running	Start Stop Kill Restart Pause Resume Remove	-	labdocke/nginx:latest	172.17.0.3	80:80	administrators
<input type="checkbox"/> vigilant_pare	running	Start Stop Kill Restart Pause Resume Remove	-	portainer/portainer	172.17.0.2	9000:9000	public

Items per page 10

Docker: The Next-Gen of Virtualization



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

Container statistics
Containers > nginx > Stats

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

UID	PID	PPID	C	STIME	TTY	TIME	CMD

Q Search

portainer.io

ACTIVE ENDPOINT local

ENDPOINT ACTIONS

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

PORTAINER SETTINGS

Container console
Containers > nginx > Console

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      cron        dnsd       fbset       httpd      loadfont   nandwrite  ntpd       rdev       remove-shell  setfont   setlogcons
adduser     chpasswd   delgroup   ether-wake  fdformat   inetd      lspci     nbd-client powertop  readahead  rfkill      setlogons
/usr/sbin #
```

Docker: The Next-Gen of Virtualization



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



By Praparn Luengphoonlap
Email: eva10409@gmail.com

Q&A

Docker: The Next-Gen of Virtualization

