

Docker:Zero to Hero (Part 1)

By Praparn Luengphoonlap

Docker: The Next-Gen of Virtualization



Outline Part 1

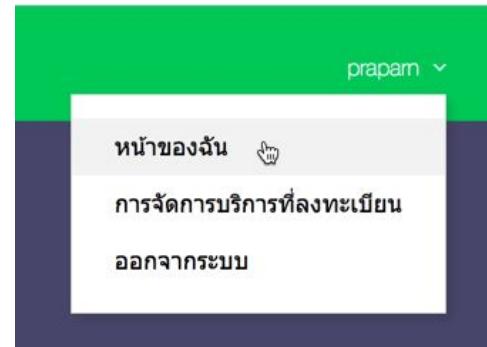
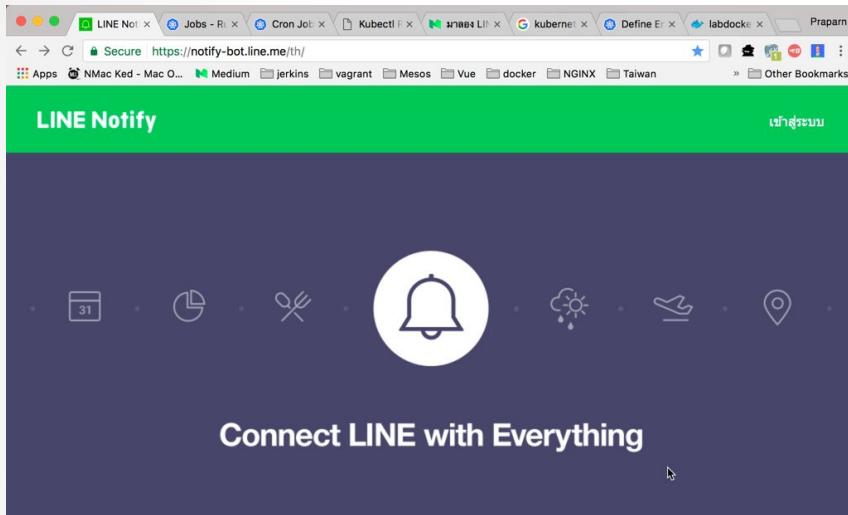
- Docker principle
- Docker machine
- Image, Repository & Tag, container
- CPU, Memory and I/O
- Network
- Volume
- Inspect and Log
- Commit
- Docker Desktop (ShowCase)

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

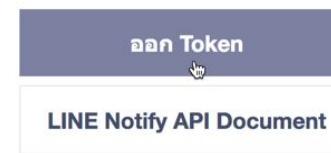
Prerequisite

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



ออก Access Token (สำหรับผู้พัฒนา)

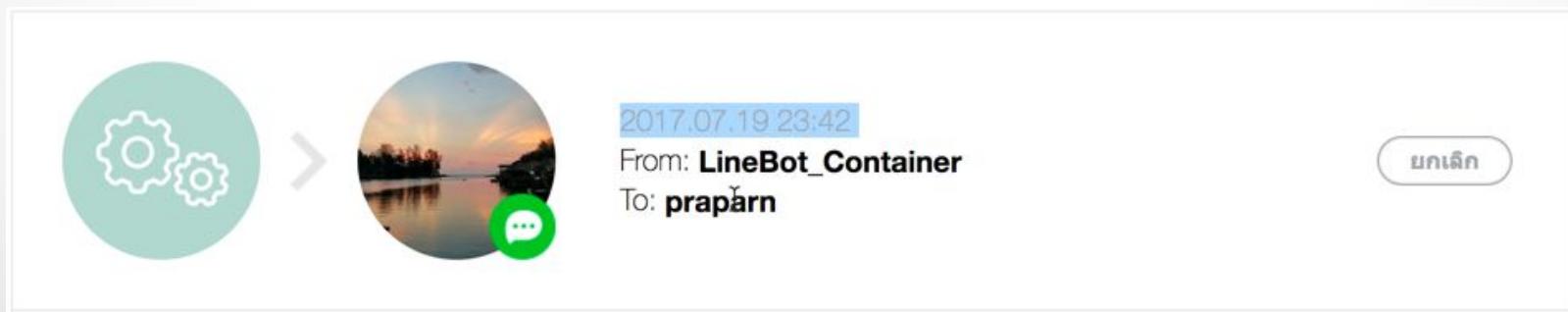
เมื่อใช้ Access Token แบบบุคคล จะสามารถตั้งค่าการแจ้งเตือนได้โดยไม่ต้องลงทะเบียนกับเว็บเซอร์วิส



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 instruction "โปรดใส่ชื่อ Token (จะแสดงเมื่อมีการแจ้งเตือน)" (Please enter the token name (will be displayed when notifications are sent)). Below this is a search bar labeled "LINEBOT". A list of groups is shown, with the first item being "รับการแจ้งเตือนแบบตัวต่อตัวจาก LINE Notify". On the right, the generated token "zHOlcJCcpIIS8mEedn" is displayed in a large redacted area. Below it, a message reads: "ถ้าออกจากหน้านี้ ระบบจะไม่แสดง Token ที่ออกใหม่แล้วต่อไป โปรดศัลล์ลอก Token ก่อนออกจากหน้านี้". At the bottom are two buttons: a green "คัดลอก" (Copy) button and a grey "ปิด" (Close) button.



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 | Status | 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)

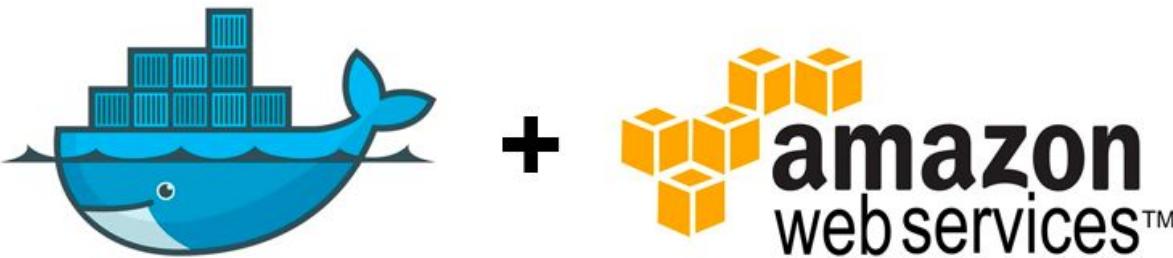
4. Incase Upgrade docker-machine. Please check PDF document (Upgrade_Docker_1.10.pdf)

Lab Resource

- Download on GitHub
 - git clone <https://github.com/praparn/docker-workshop-online-part1>



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. At the top, there's a navigation bar with links like 'NOVA', 'Infra', 'Jenkins', 'vagrant', 'Mesos', 'Vue', 'docker', 'NGINX', 'Taiwan', 'Kubernetes', and 'PWA_Pr'. Below the navigation is a large blue whale icon with shipping containers on its back, and the text 'Play with Docker'.

In the center, there's a digital clock showing '03:59:39' and a red button labeled 'CLOSE SESSION'. Below the clock are tabs for 'Instances' (selected), a wrench icon, and a gear icon. A '+ ADD NEW INSTANCE' button is also present.

A list of instances shows one entry: '192.168.0.13 node1'. To the right of this list is a terminal window with the following content:

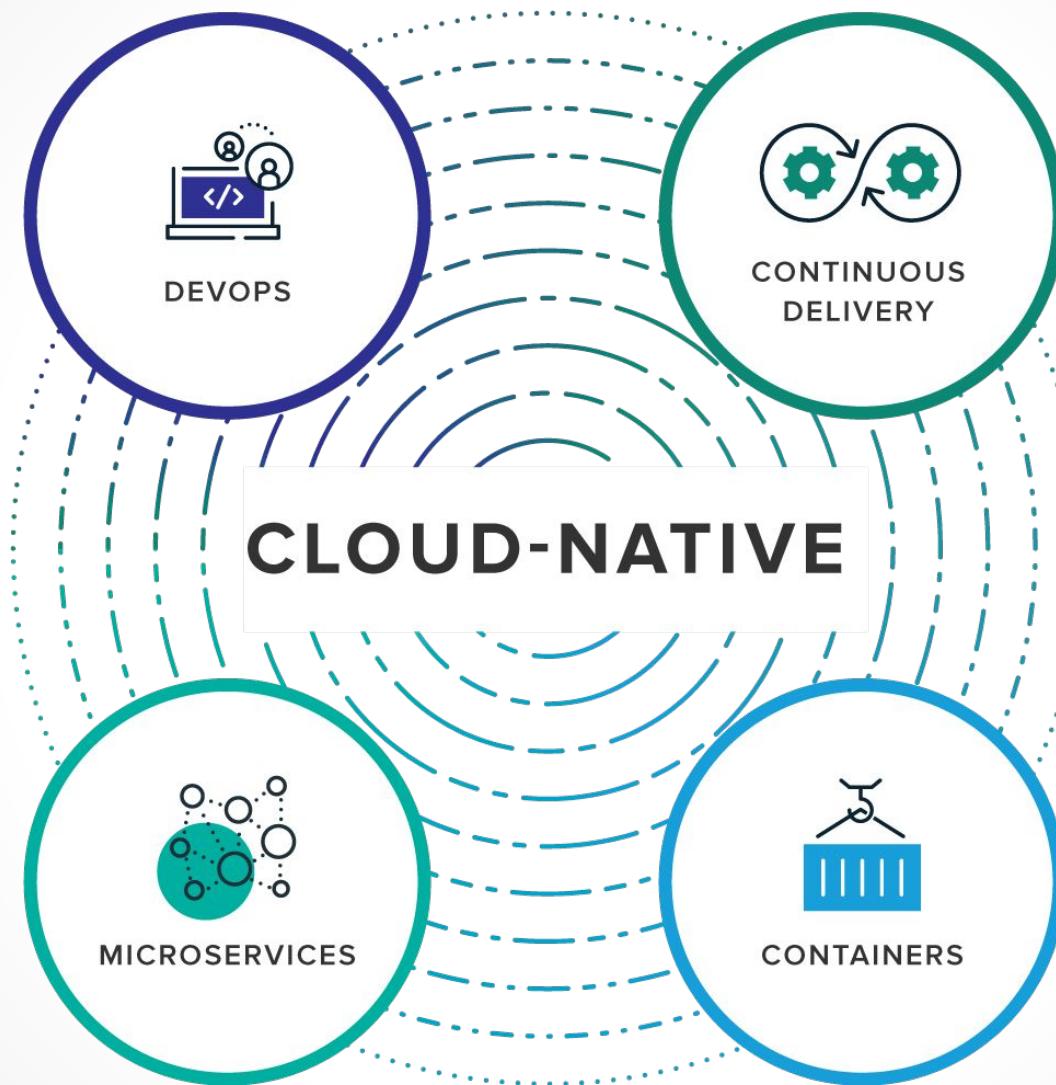
```
# completely the user's responsibilities.
#
# The PWD team.
#####
[node1] (local) root@192.168.0.13 ~
$ docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
[node1] (local) root@192.168.0.13 ~
$ docker version
Client: Docker Engine - Community
 Version:          20.10.0
 API version:     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
```

On the right side of the terminal window, there are buttons for 'IP' (set to '192.168.0.13'), 'OPEN PORT', 'Memory' (0.80% usage), 'CPU' (0.60% usage), and an 'SSH' link ('ssh ip172-18-0-54-c8ecrt5mrep00av6li0@direct.labs.play-with-docker.com'). Below the terminal are buttons for 'DELETE' and 'EDITOR'.

Docker: The Next-Gen of Virtualization



Landscape of the world now



Landscape of the world now

Sysdig 2022 Cloud-Native Security and Usage Report



Cloud Security

88% cloud roles are non-human

73% cloud accounts have public S3 buckets

73% YoY growth in Falco downloads

Container Security

75% containers running with "high" or "critical" vulnerabilities

62% detect shell in container events

76% containers running as root

Container Usage

34% unused CPU resources

51% no memory limits

60% no CPU limits

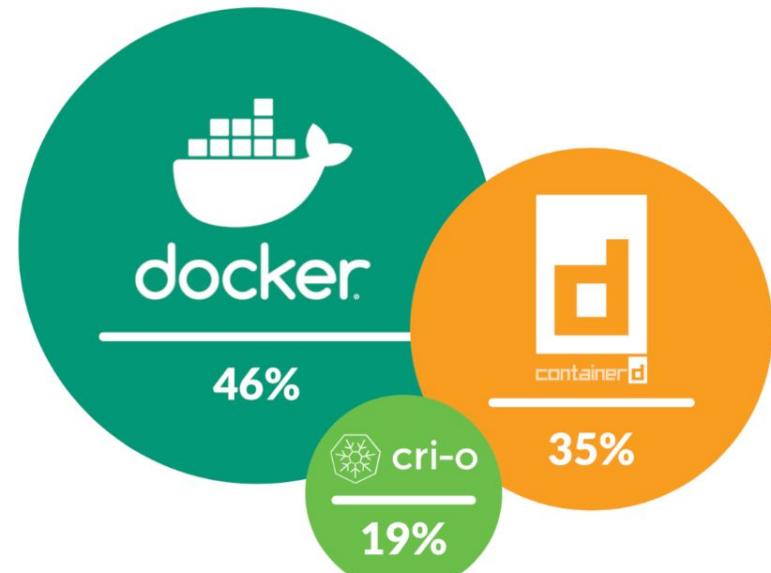
83% custom metrics are Prometheus

Ref: <https://sysdig.com/blog/2022-cloud-native-security-usage-report/>

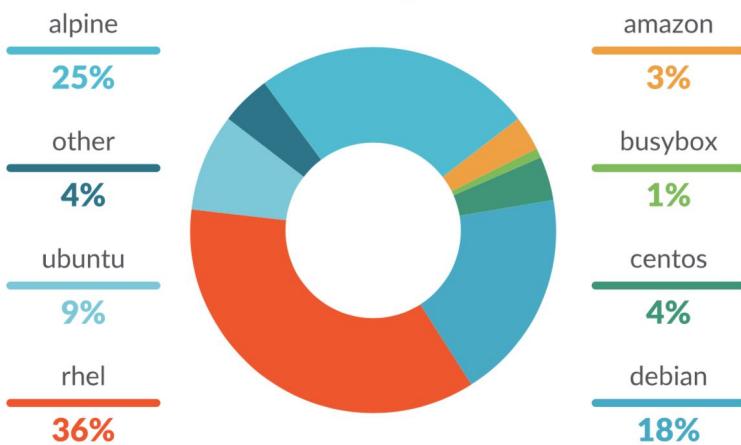


Landscape of the world now

Runtimes

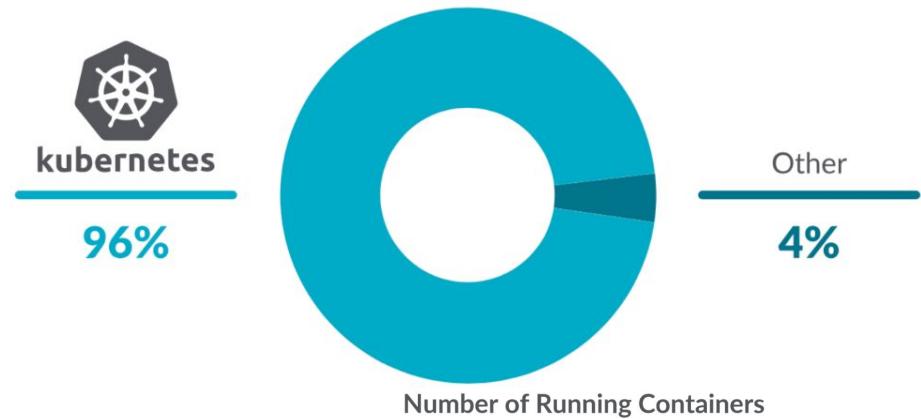


Base Image OS

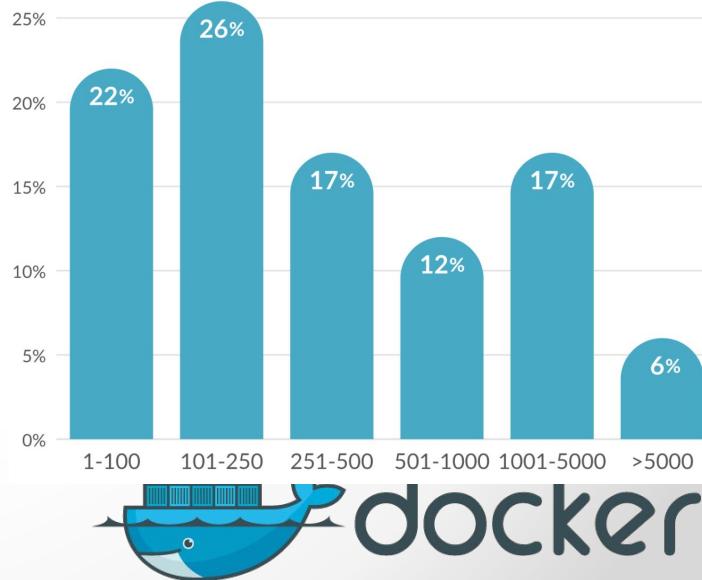


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Orchestration



Number of Running Containers

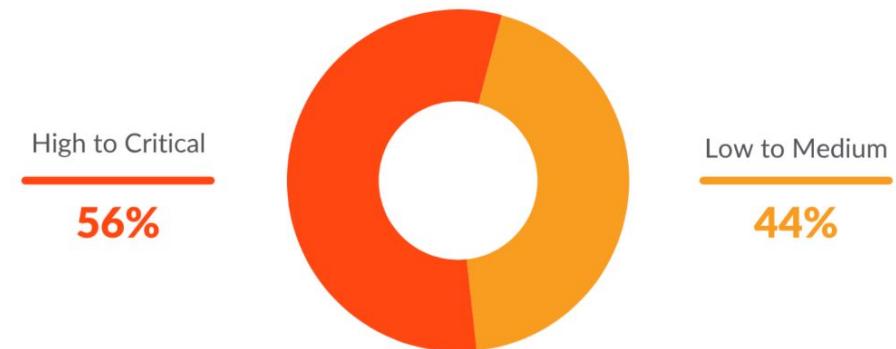


Landscape of the world now

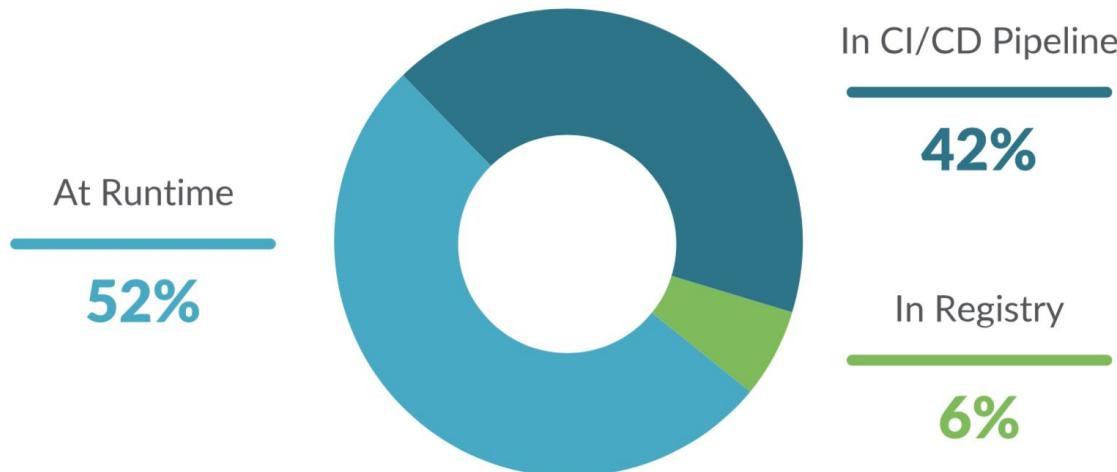
OS Vulnerabilities by Severity



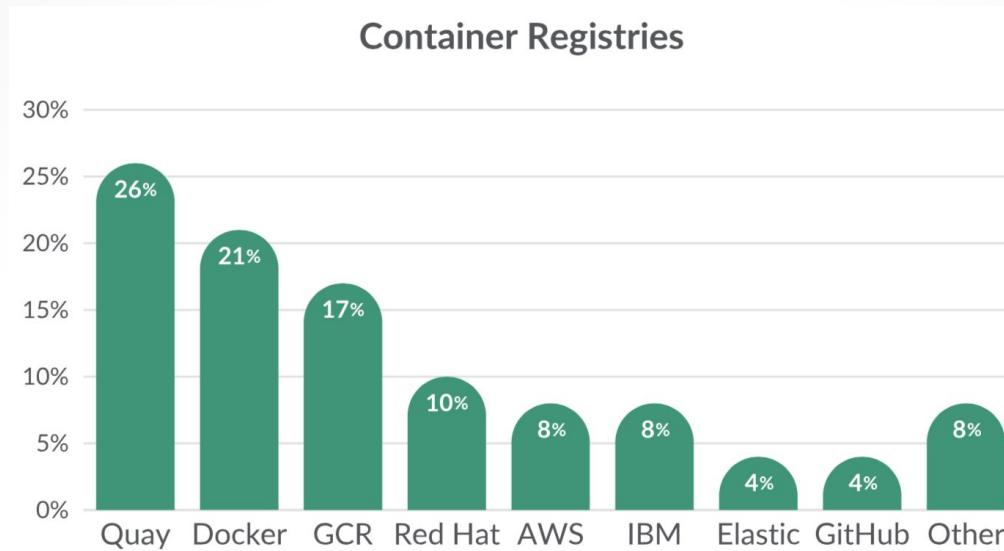
Non-OS Vulnerabilities by Severity



Where Images are Scanned



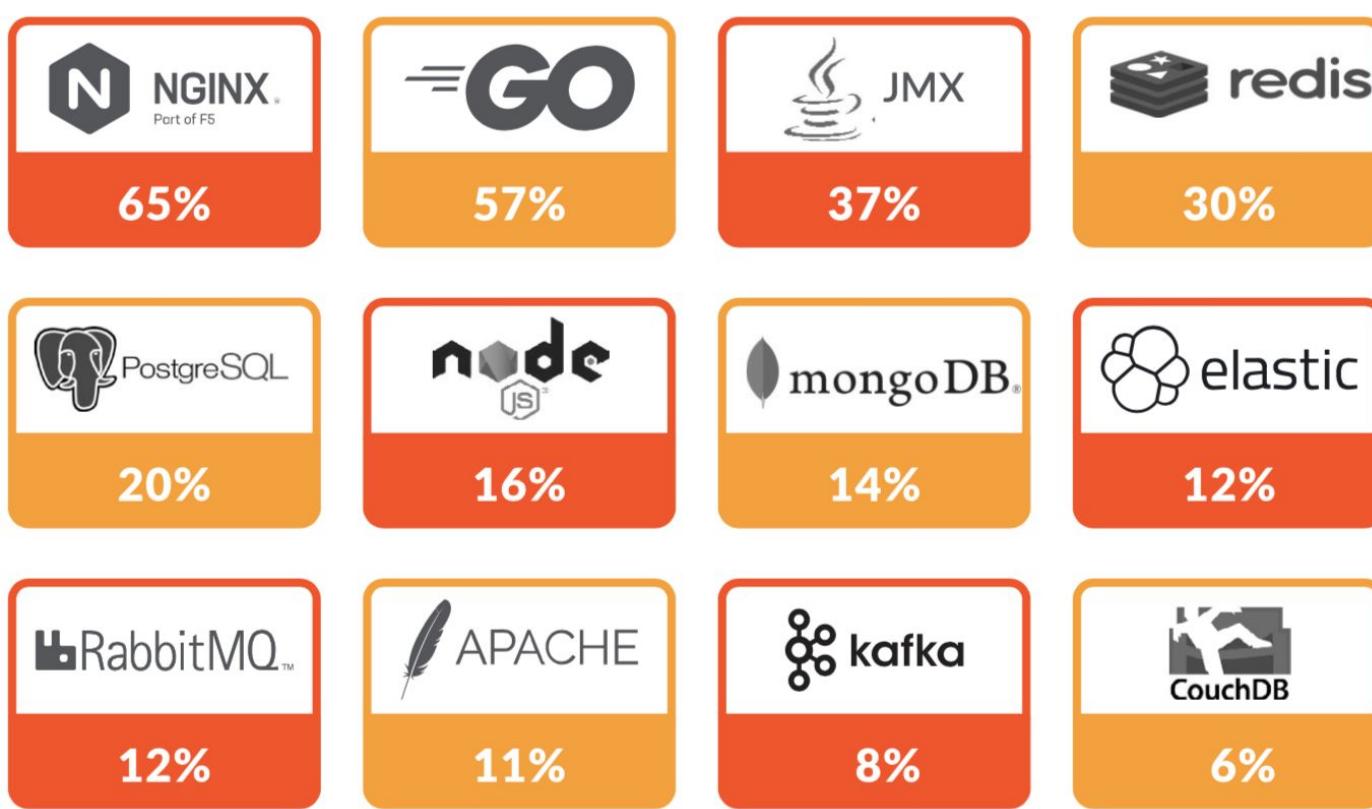
Landscape of the world now



Images Pulled from Public vs. Private Registries

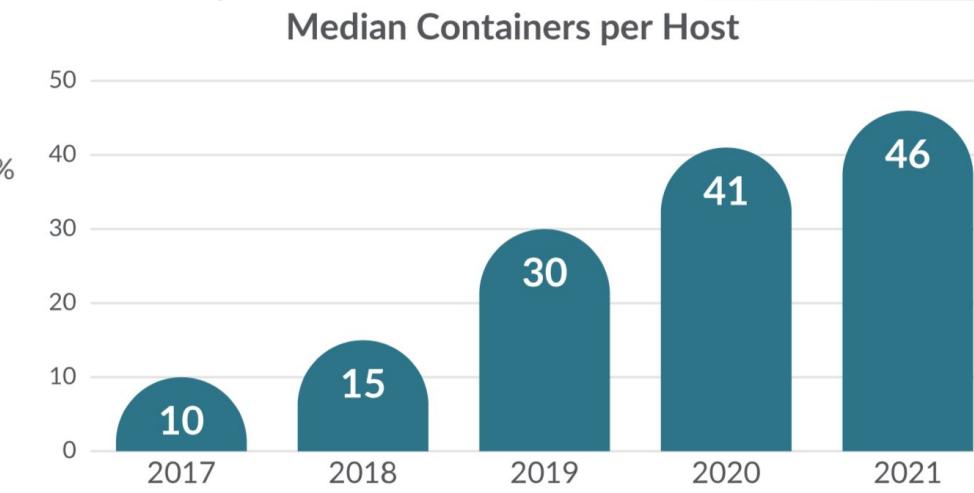
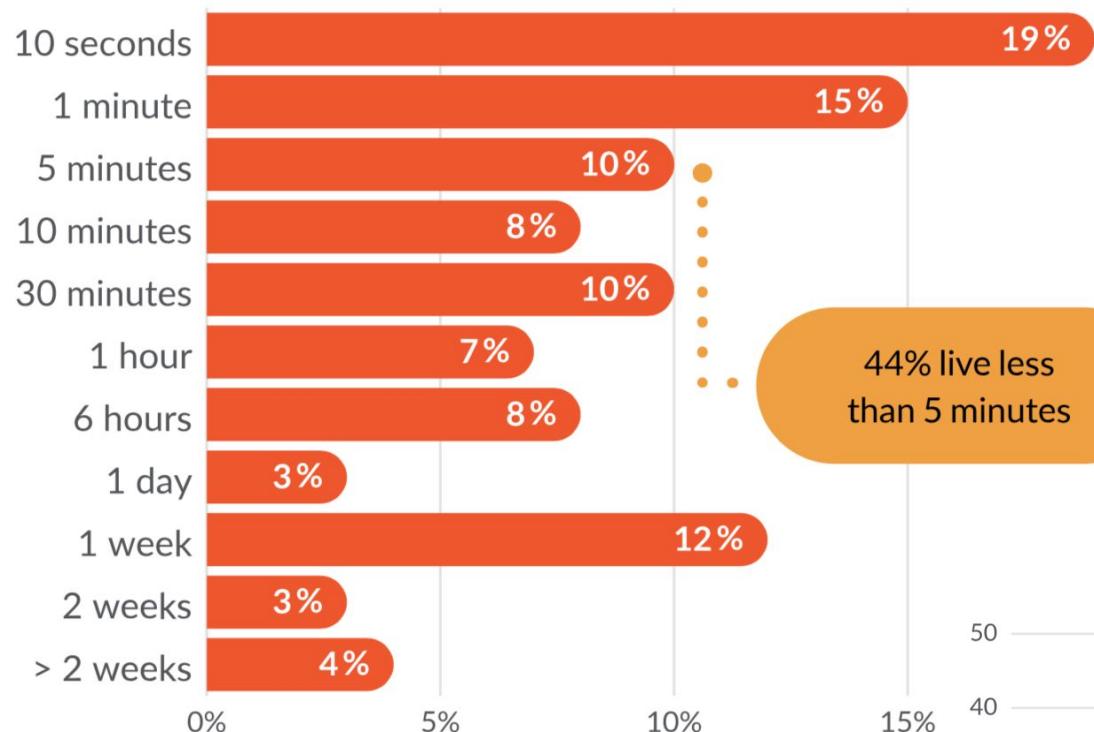


Landscape of the world now

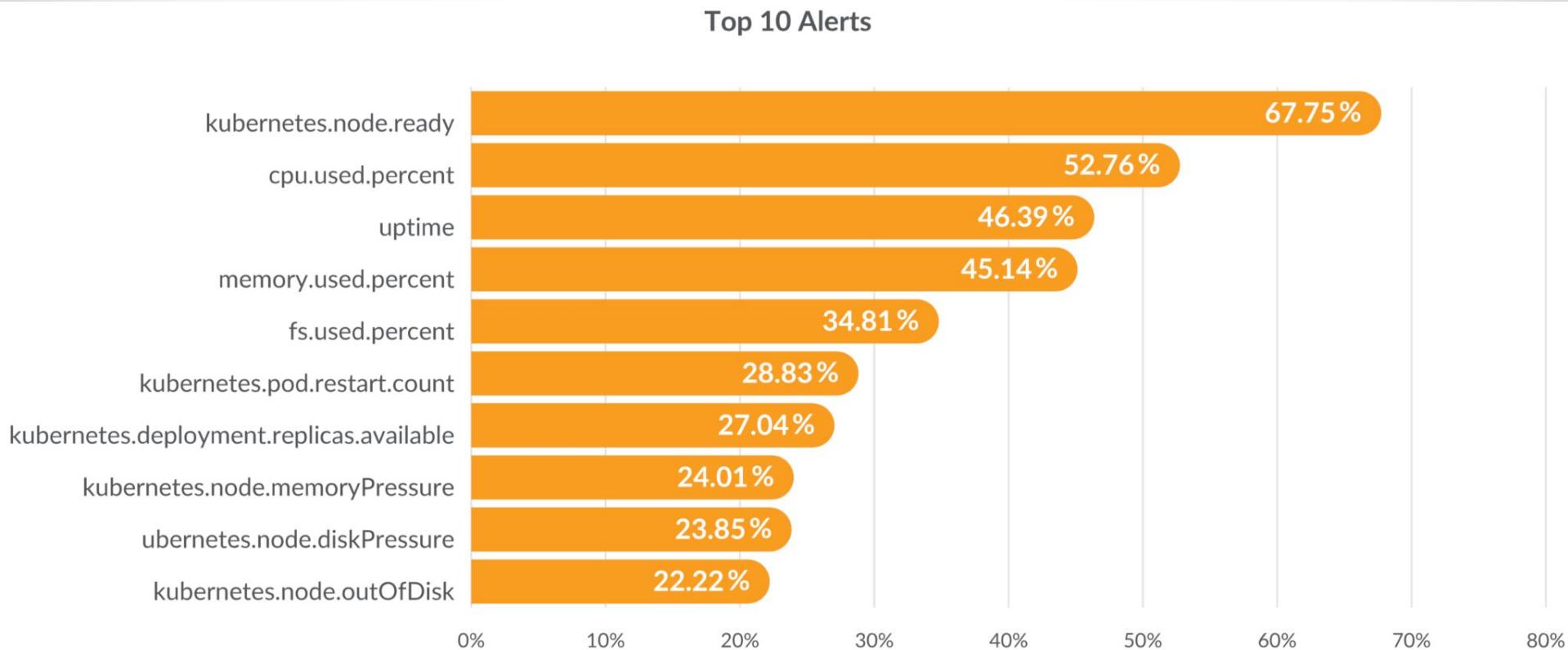


Landscape of the world now

Container Lifespans



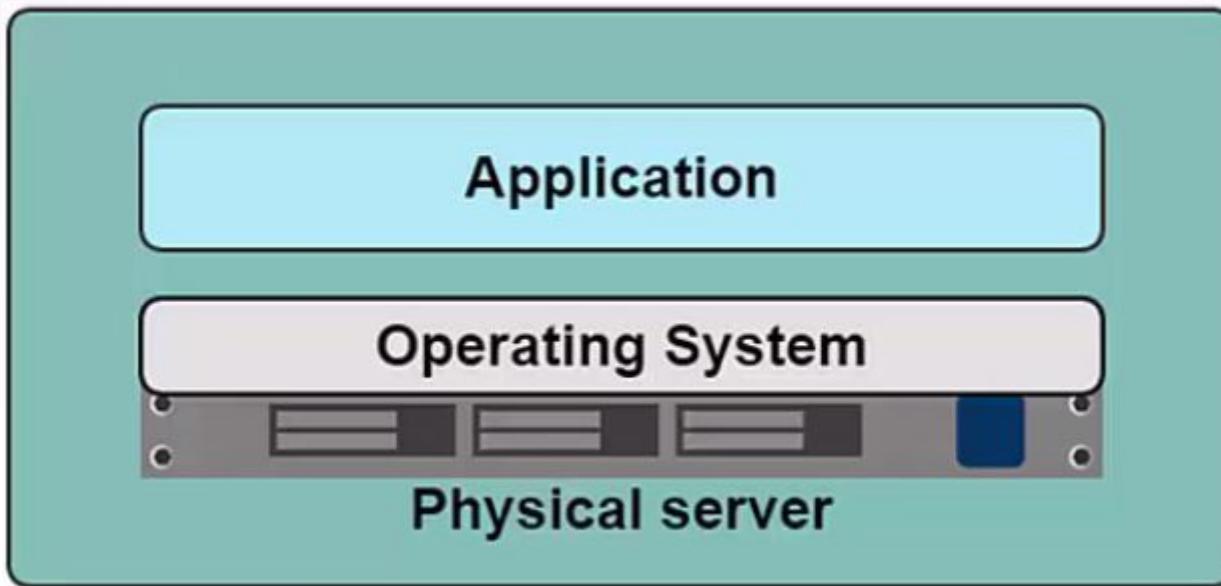
Landscape of the world now



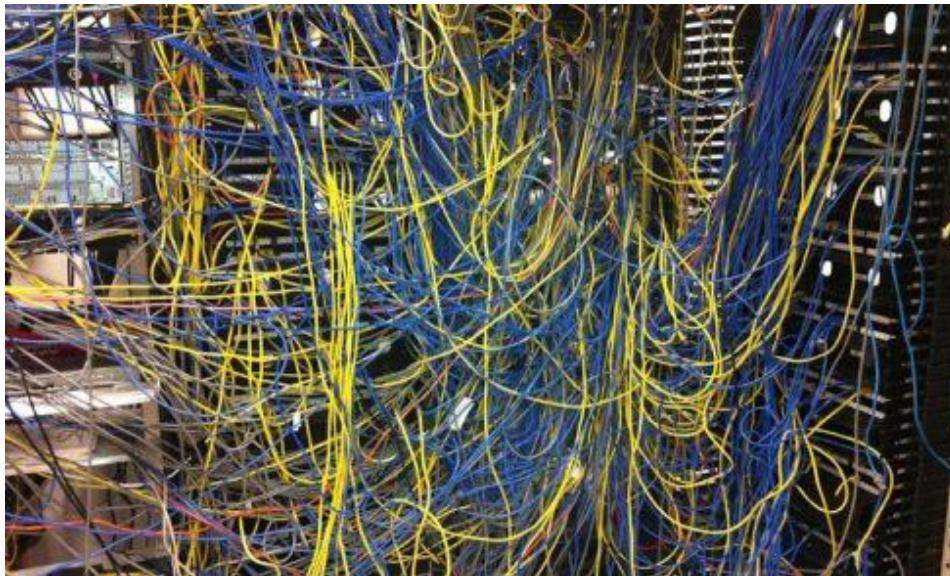
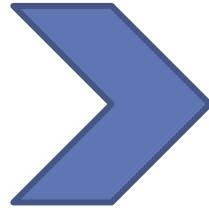
Docker Principle

• • •

What is docker ?



Existing Technology

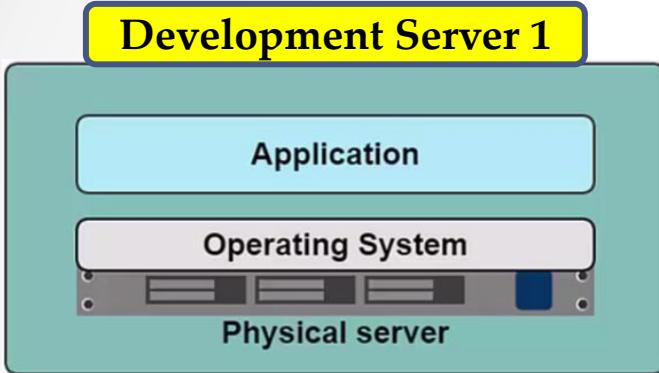


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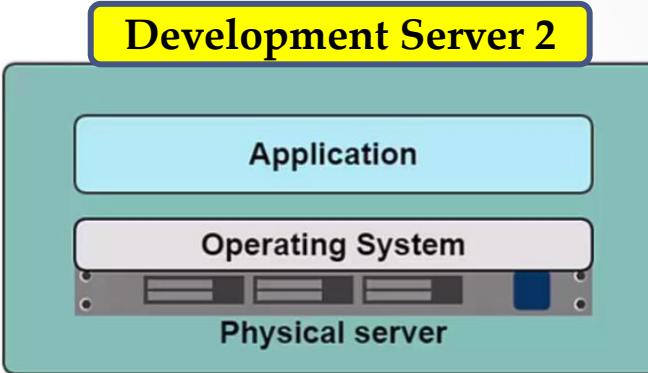


Existing Technology

- 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)

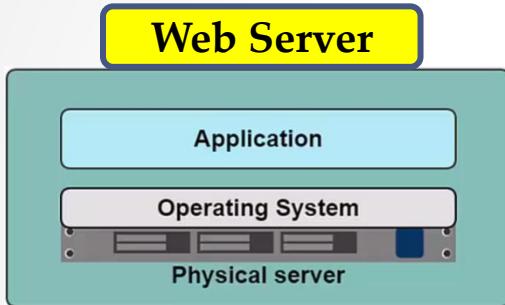


- IIS 8.0
- .Net Framework 3.5
- ASP.NET
- Etc

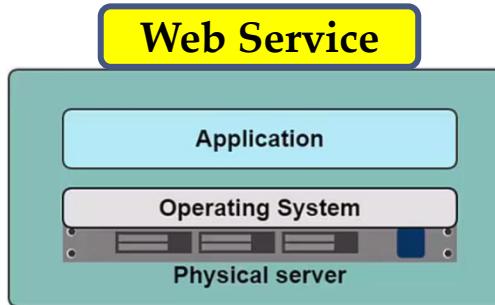
- Need concern about conflict component
- Survive among legacy dependency
- Lack for environment for fulfill develop & test (module test/integrate test/ UAT test / MOT test etc)
- Unexpected software conflict frequently occur
- Incomplete software's integrated test

Existing Technology

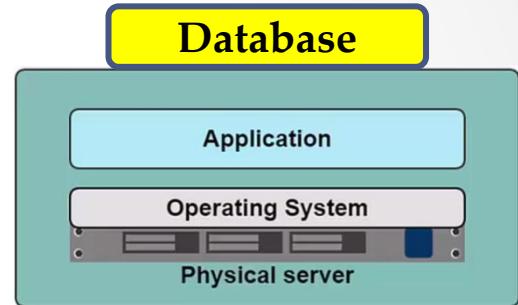
- Production Environment (Best design)
- Day 1: Application 1: Implement



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



- IIS 8
- .Net Framework 3.5



- MariaDB 5.1

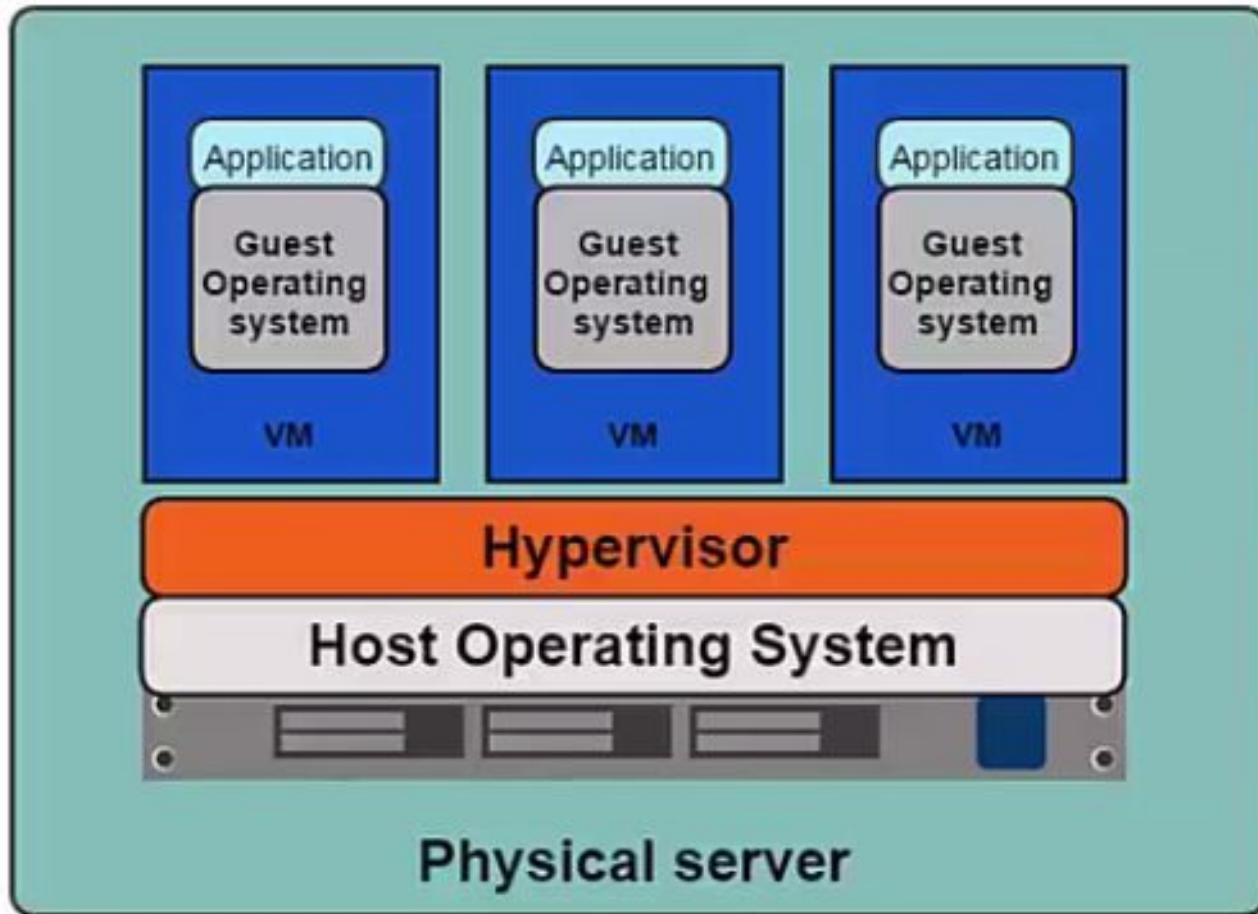
- Day 2: Application 2: Need to implement
 - Need PHP 7.0 ?
 - MariaDB 10.1.14 (Need search feature on 10.1)
- Problem ?
 - Possible to upgrade PHP to 7.0 ? / How to test existing application ?
 - What effect to MariaDB upgrade ?

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)

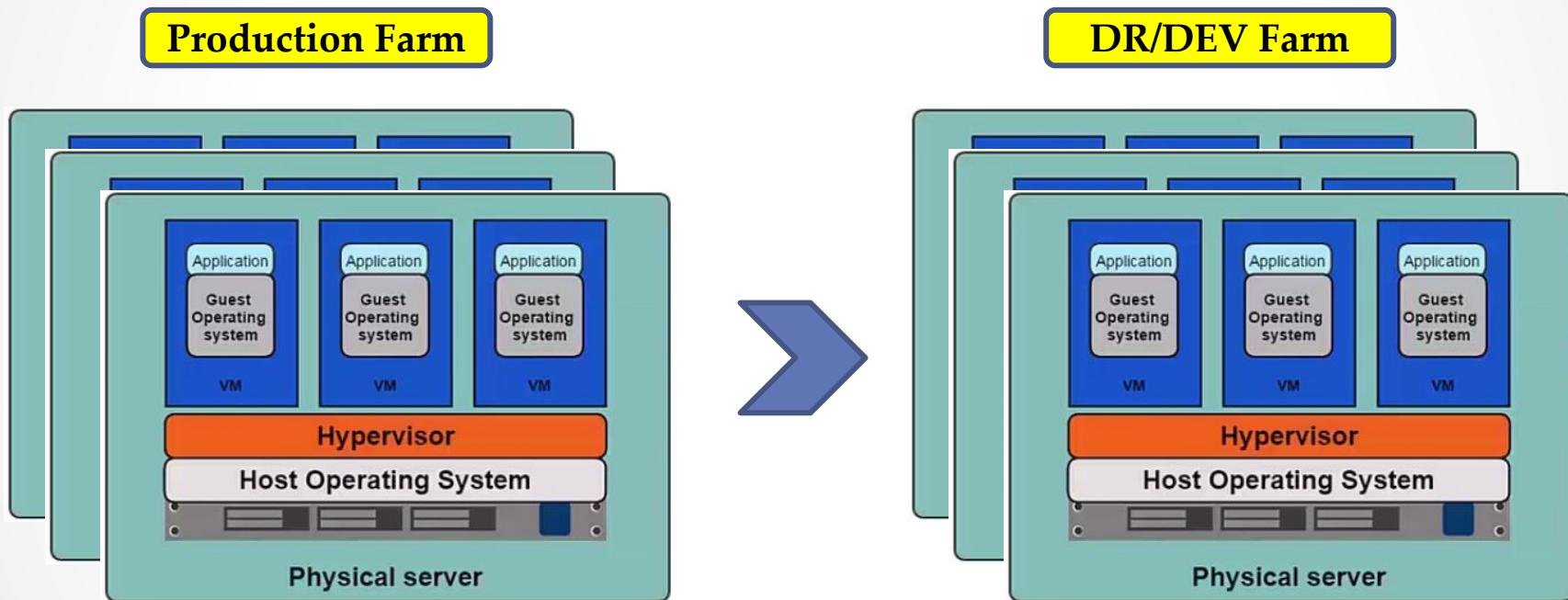


What is docker ?



Existing Technology

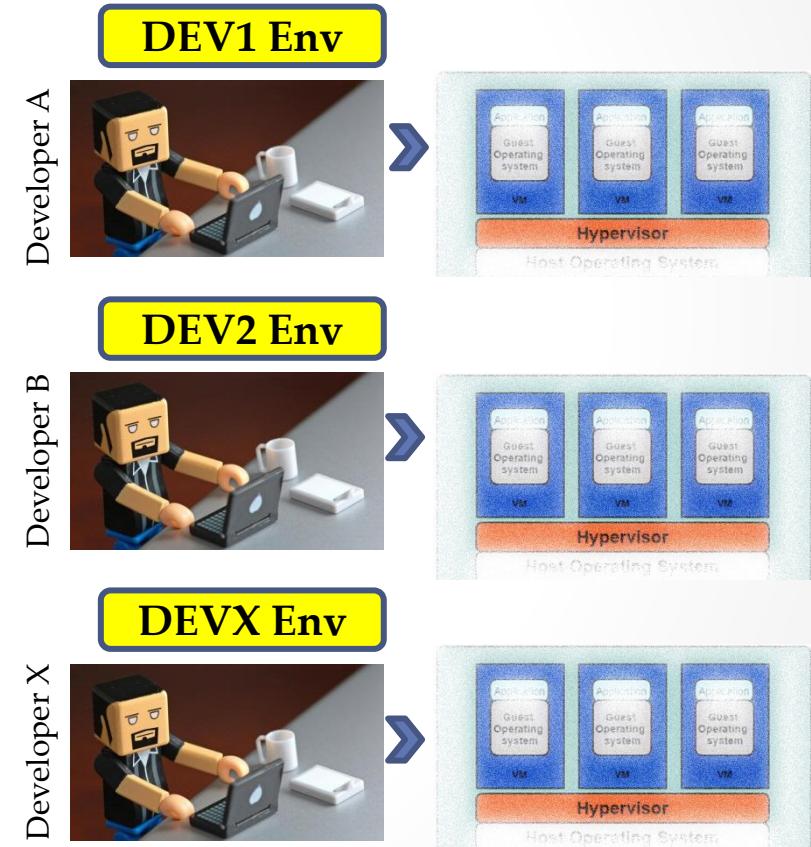
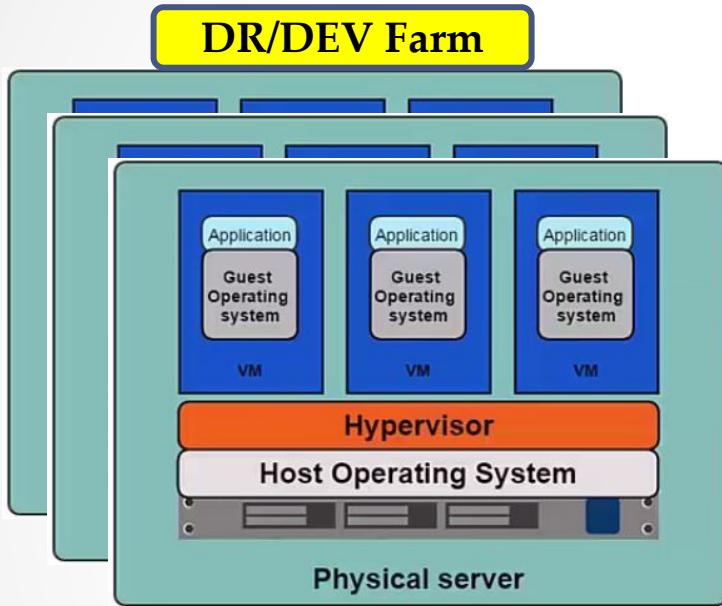
- 1 Physical server : 1 – N VMWare (&OS)
- Virtualize Hardware (CPU, Memory, Disk, Network etc)



- 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

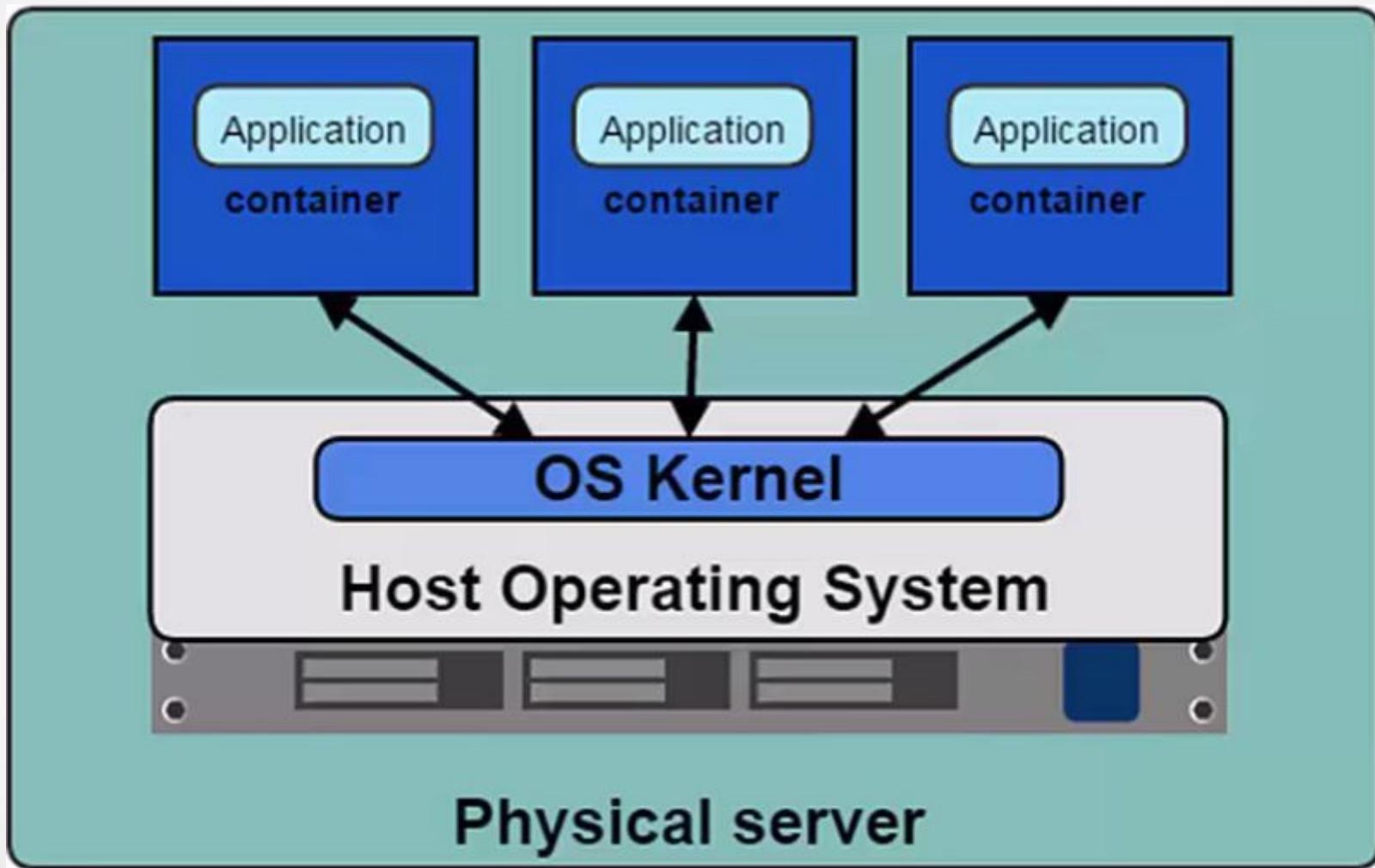


- Apache 2.20 Web Server
 - PHP 5.5 Engine
 - Laravel 4.1 Framework
- IIS 8
 - .Net FrameWork 3.5

- MariaDB 5.1

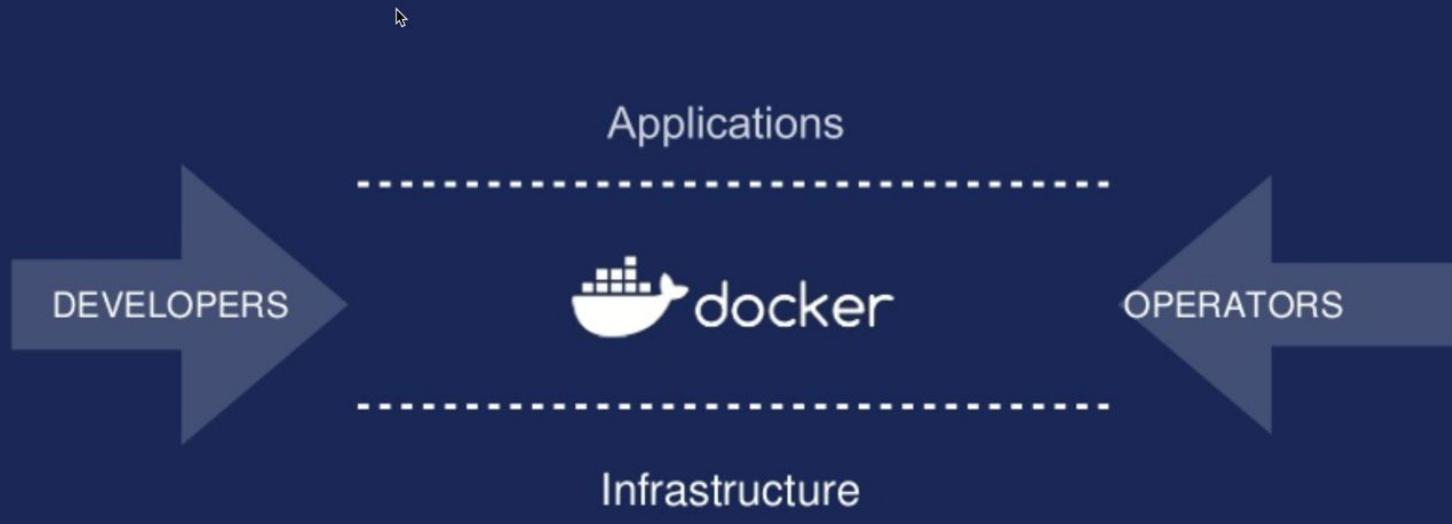
- Day 2: Application 2: Need to implement
 - Need PHP 7.0 ?
 - MariaDB 10.1.14 (Need search feature on 10.1)
- So... The problem still exist.

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

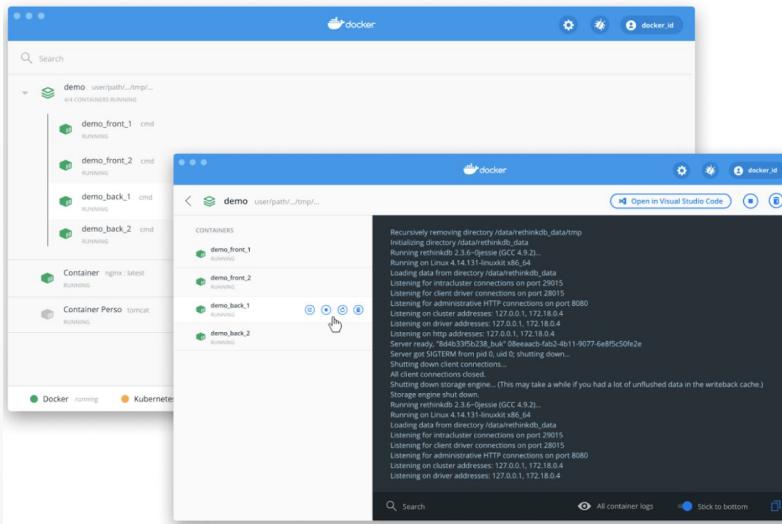
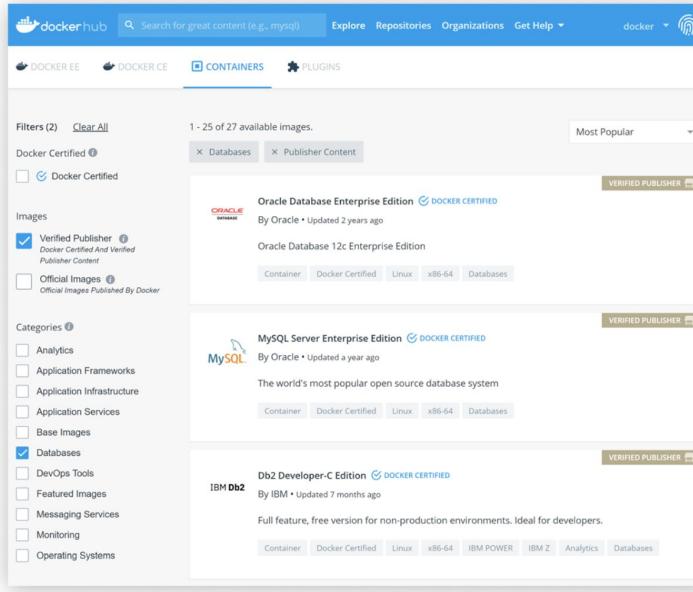
Docker's product

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](#)

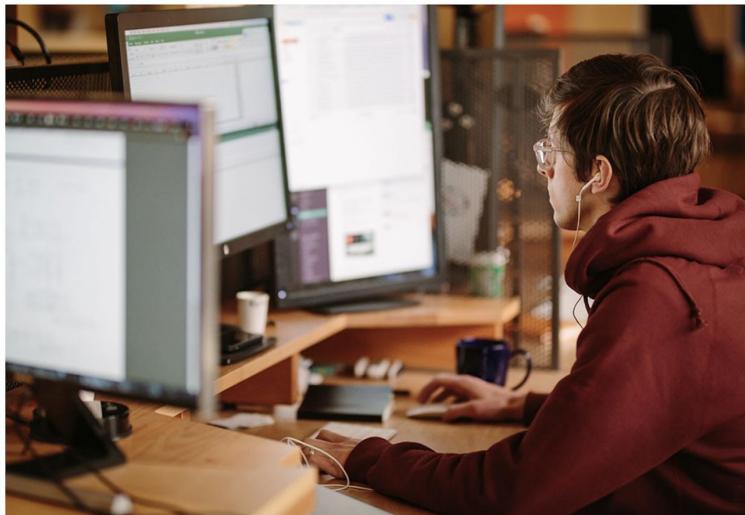
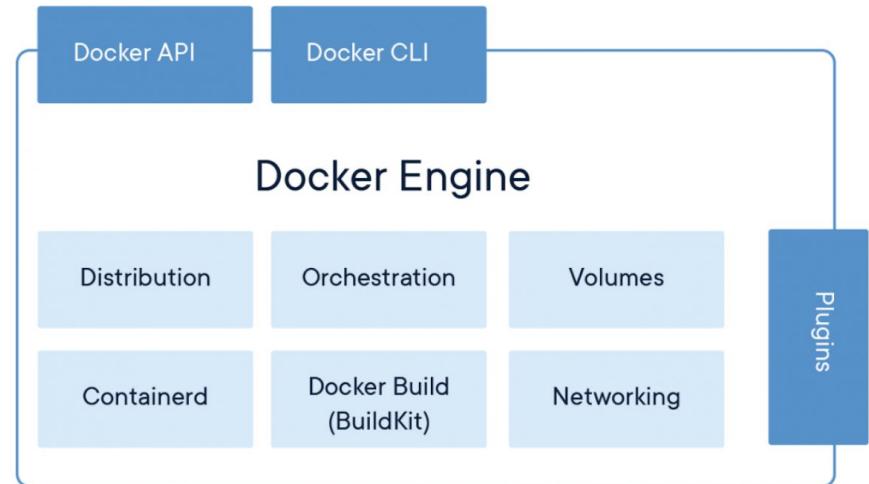


Docker's feature

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](#)

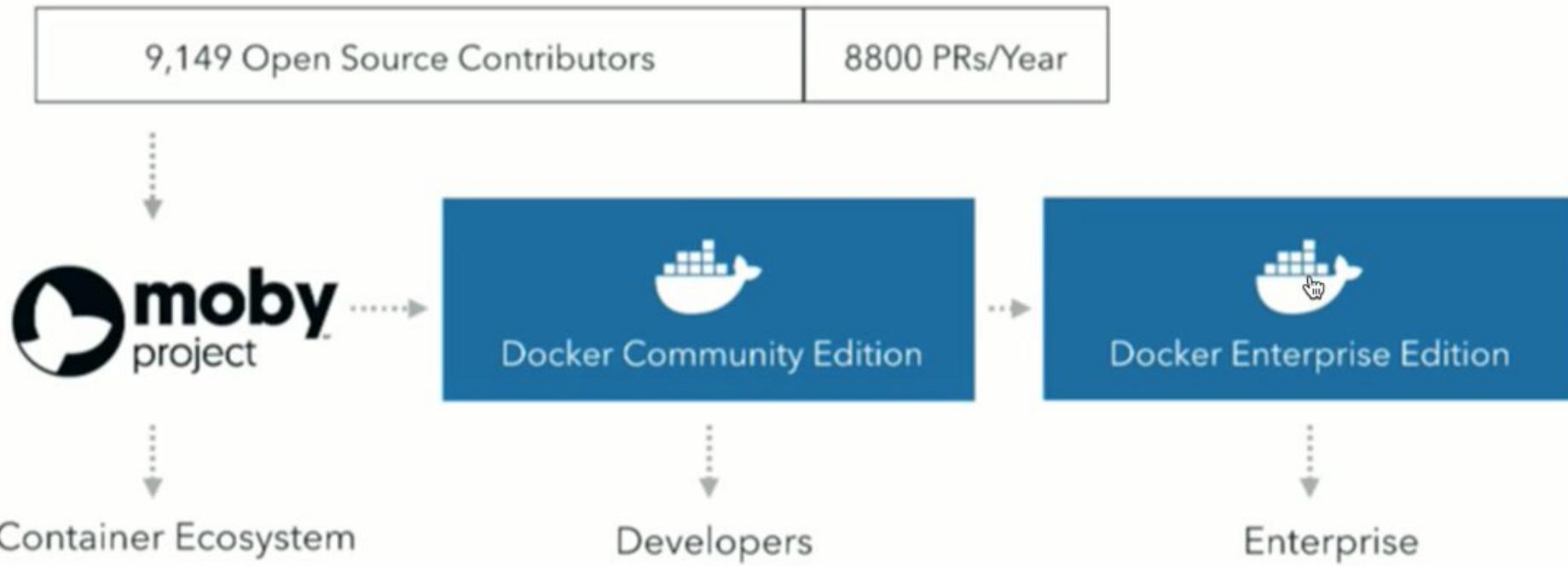


Docker: The Next-Gen of Virtualization



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



OEM: Direct L2 / L2 Support Included



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/>

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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



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

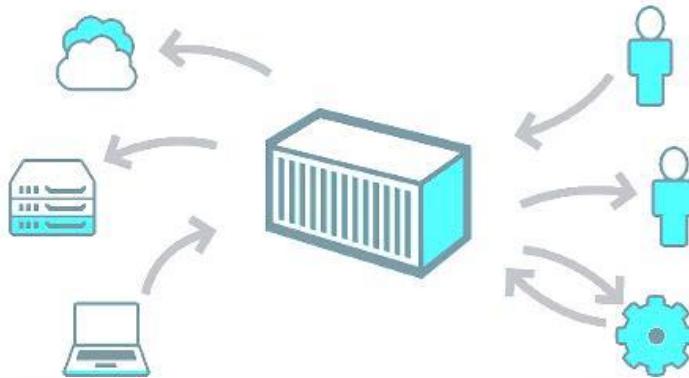
700+ apps

18 months

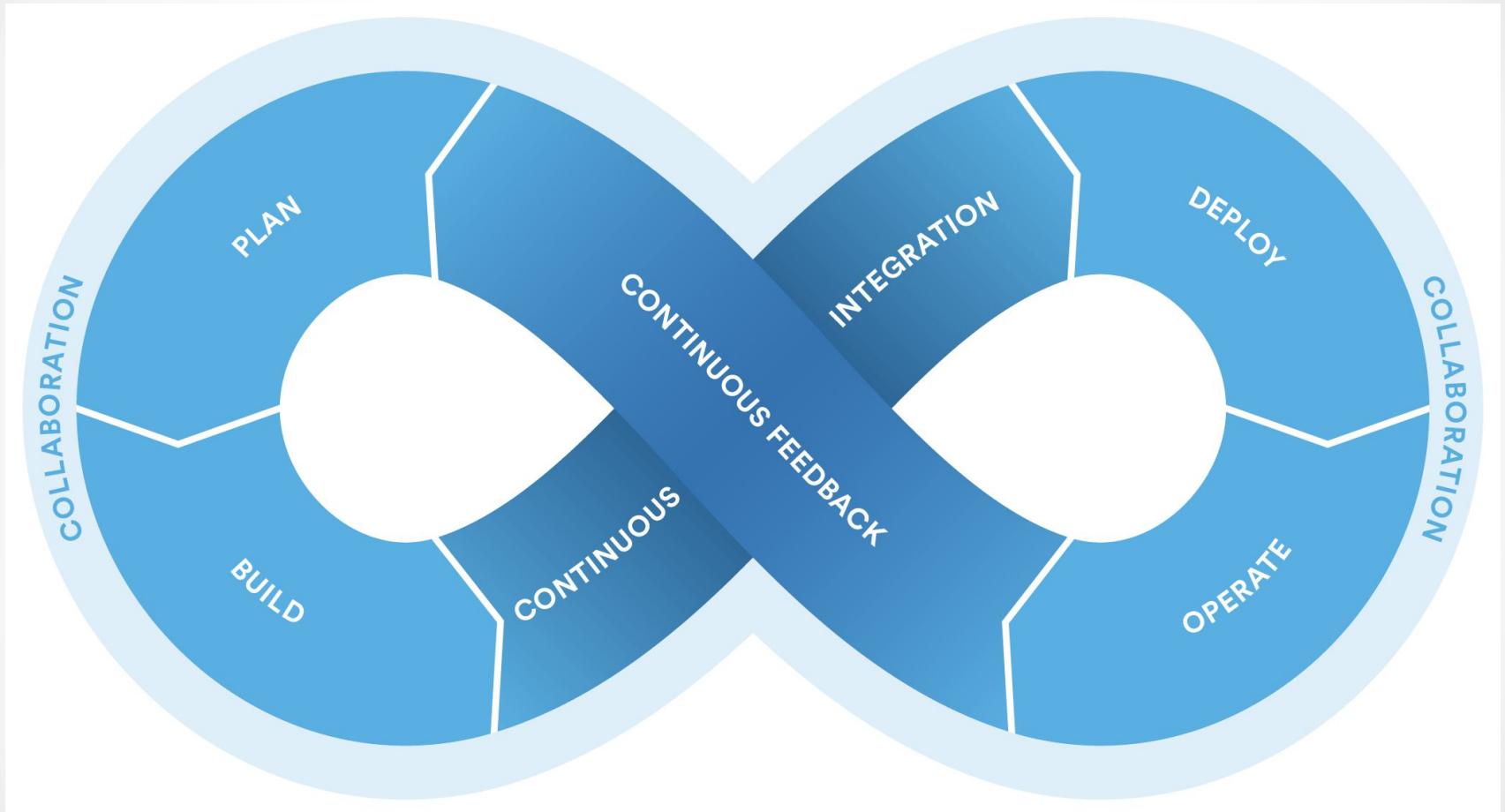
0 code changes

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 !!!

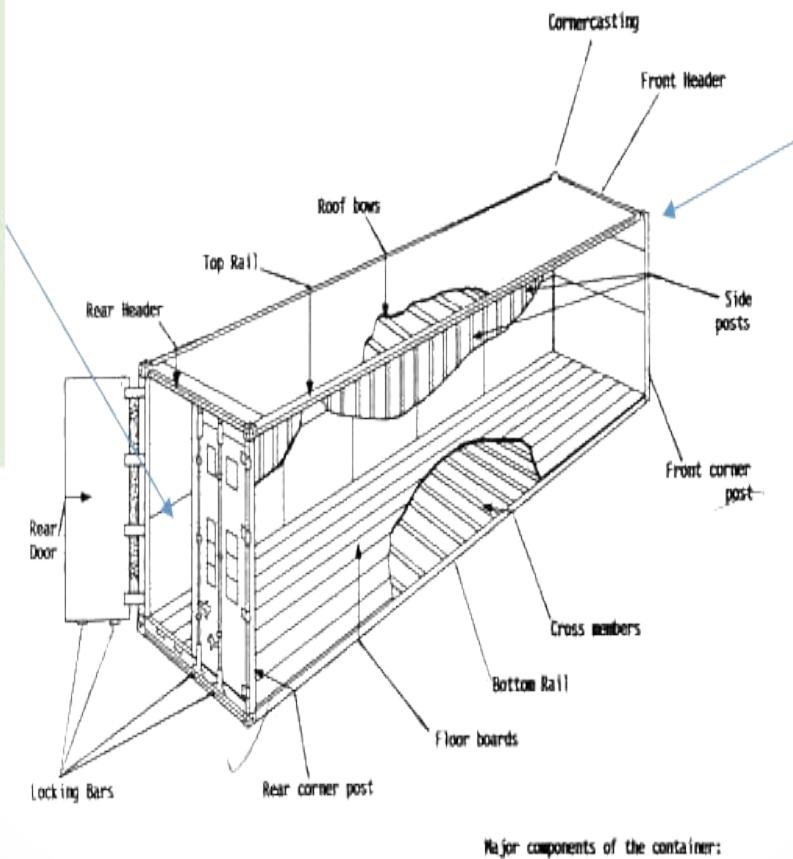
Separate of Concern

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

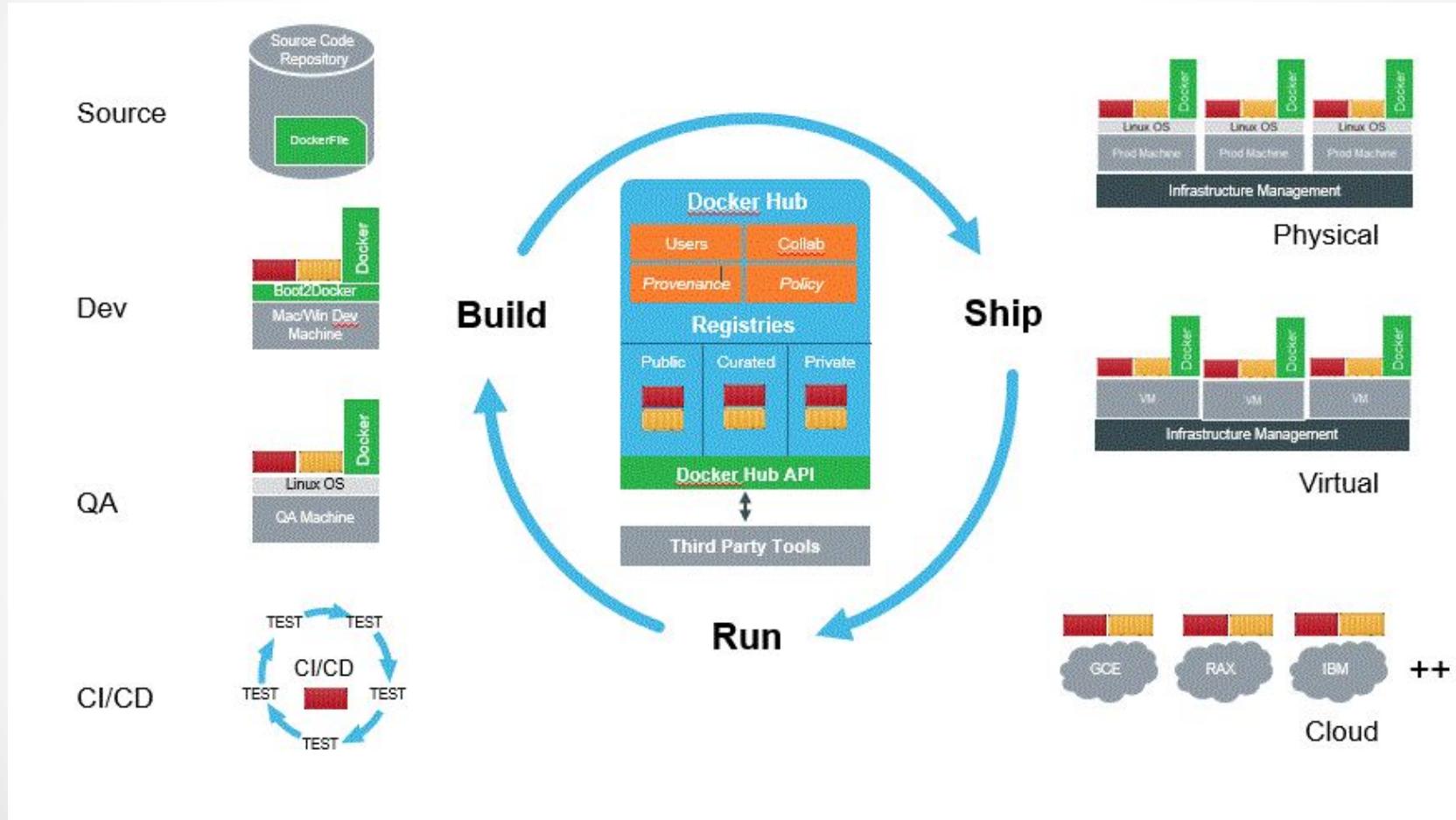
Oscar the Ops Guy

- 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-10-21-1-93:~$ docker version
```

```
Client: Docker Engine - Community
```

```
Version: 20.10.12
```

```
API version: 1.41
```

```
Go version: go1.16.12
```

```
Git commit: e91ed57
```

```
Built: Mon Dec 13 11:45:33 2021
```

```
OS/Arch: linux/amd64
```

```
Context: default
```

```
Experimental: true
```

```
Server: Docker Engine - Community
```

```
Engine:
```

```
Version: 20.10.12
```

```
API version: 1.41 (minimum version 1.12)
```

```
Go version: go1.16.12
```

```
Git commit: 459d0df
```

```
Built: Mon Dec 13 11:43:42 2021
```

```
OS/Arch: linux/amd64
```

```
Experimental: false
```

```
containerd:
```

```
Version: 1.4.12
```

```
GitCommit: 7b11cfaabd73bb80907dd23182b9347b4245eb5d
```

```
runc:
```

```
Version: 1.0.2
```

```
GitCommit: v1.0.2-0-g52b36a2
```

```
docker-init:
```

```
Version: 0.19.0
```

```
GitCommit: de40ad0
```

```
ubuntu@ip-10-21-1-93:~$ █
```

```
[ubuntu@ip-10-21-1-93:~$ docker info
```

```
Client:
```

```
Context: default
```

```
Debug Mode: false
```

```
Plugins:
```

```
app: Docker App (Docker Inc., v0.9.1-beta3)
```

```
buildx: Docker Buildx (Docker Inc., v0.7.1-docker)
```

```
scan: Docker Scan (Docker Inc., v0.12.0)
```

```
Server:
```

```
Containers: 0
```

```
Running: 0
```

```
Paused: 0
```

```
Stopped: 0
```

```
Images: 0
```

```
Server Version: 20.10.12
```

```
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 journald 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: 7b11cfaabd73bb80907dd23182b9347b4245eb5d
```

```
runc version: v1.0.2-0-g52b36a2
```

```
init version: de40ad0
```

```
Security Options:
```

```
apparmor
```

```
seccomp
```

```
Profile: default
```

```
Kernel Version: 5.11.0-1022-aws
```

```
Operating System: Ubuntu 20.04.3 LTS
```

```
OSType: linux
```

```
Architecture: x86_64
```

```
CPUs: 2
```

```
Total Memory: 1.901GiB
```

```
Name: ip-10-21-1-93
```

```
ID: DD7D:NCAA:PHHS:VXT0:YVE5:BEG4:GLZ3:TVTG:OR4E:PQTU:BOUM:UTE5
```

```
Docker Root Dir: /var/lib/docker
```

```
Debug Mode: false
```

```
Registry: https://index.docker.io/v1/
```

```
Labels:
```

```
Experimental: false
```

```
Insecure Registries:
```

```
127.0.0.0/8
```

```
Live Restore Enabled: false
```

```
ubuntu@ip-10-21-1-93:~$ █
```

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

20.10.12

2021-12-13

This release of Docker Engine contains changes in packaging only, and provides updates to the `docker scan` and `docker buildx` commands. Versions of `docker scan` before v0.11.0 are not able to detect the Log4j 2 CVE-2021-44228. We are shipping an updated version of `docker scan` in this release to help you scan your images for this vulnerability.

Note

The `docker scan` command on Linux is currently only supported on x86 platforms. We do not yet provide a package for other hardware architectures on Linux.

The `docker scan` feature is provided as a separate package and, depending on your upgrade or installation method, 'docker scan' may not be updated automatically to the latest version. Use the instructions below to update `docker scan` to the latest version. You can also use these instructions to install, or upgrade the `docker scan` package without upgrading the Docker Engine:

Log4j CVE-2021-44228



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Apache Log4j 2 CVE-2021-44228



JUSTIN CORMACK

Dec 11 2021

Update: 13 December 2021

As an update to [CVE-2021-44228](#), the fix made in version 2.15.0 was incomplete in certain non-default configurations. An additional issue was identified and is tracked with [CVE-2021-45046](#). For a more complete fix to this vulnerability, it's recommended to update to Log4j2 [2.16.0](#).

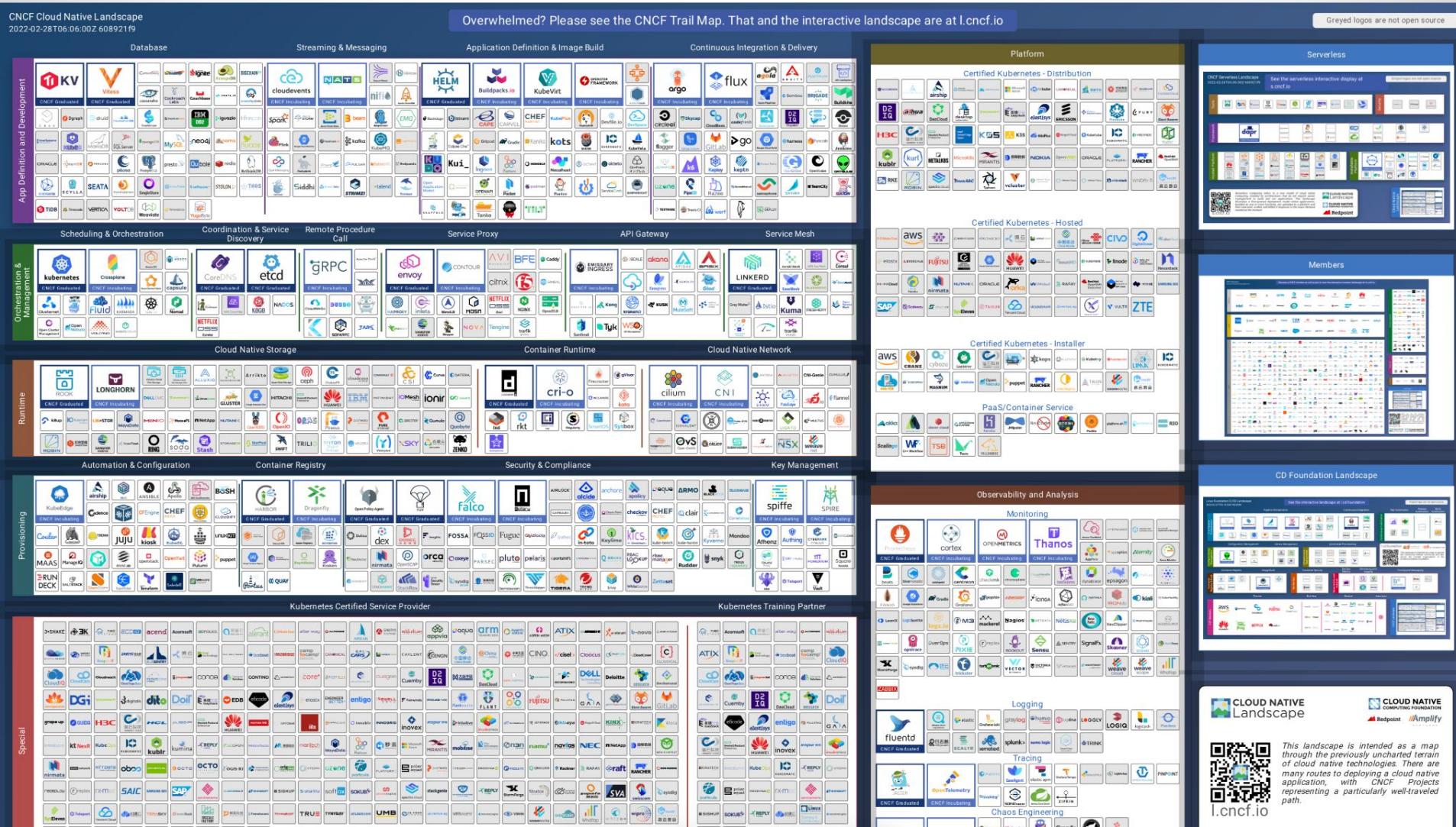
Original post below has now been updated:

Ref:<https://www.docker.com/blog/apache-log4j-2-cve-2021-44228/>

Docker: The Next-Gen of Virtualization



Cloud Native Computing Foundation



Kubernetes: Production Workload Orchestration



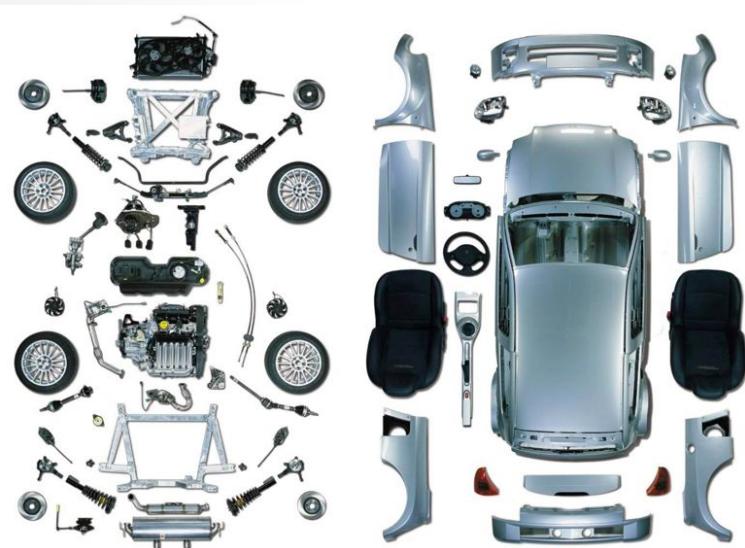
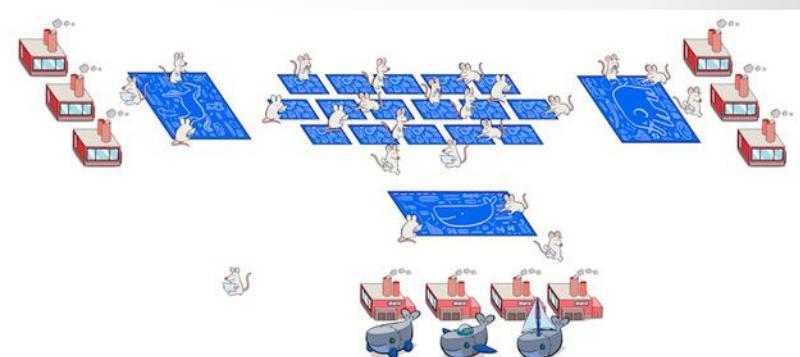
What's New

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



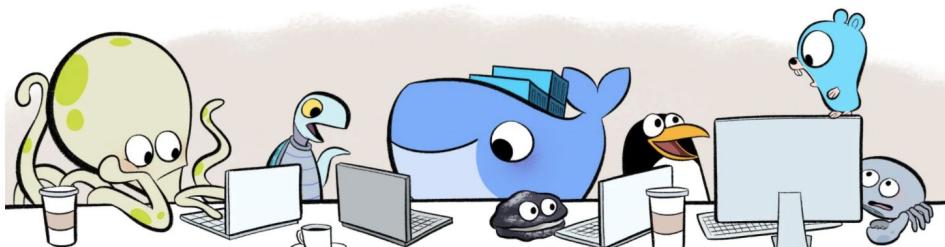
What's New

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 |
|--|---|--|---|
| <p>\$0</p> <p>Includes Docker Desktop</p> | <p>\$5 /month</p> <p>Includes Docker Desktop</p> | <p>\$7 /user/month minimum 5 seats</p> <p>Includes Docker Desktop</p> | <p>\$21 /user/month 50+</p> <p>Includes Docker Desktop</p> |



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: 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: 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 |

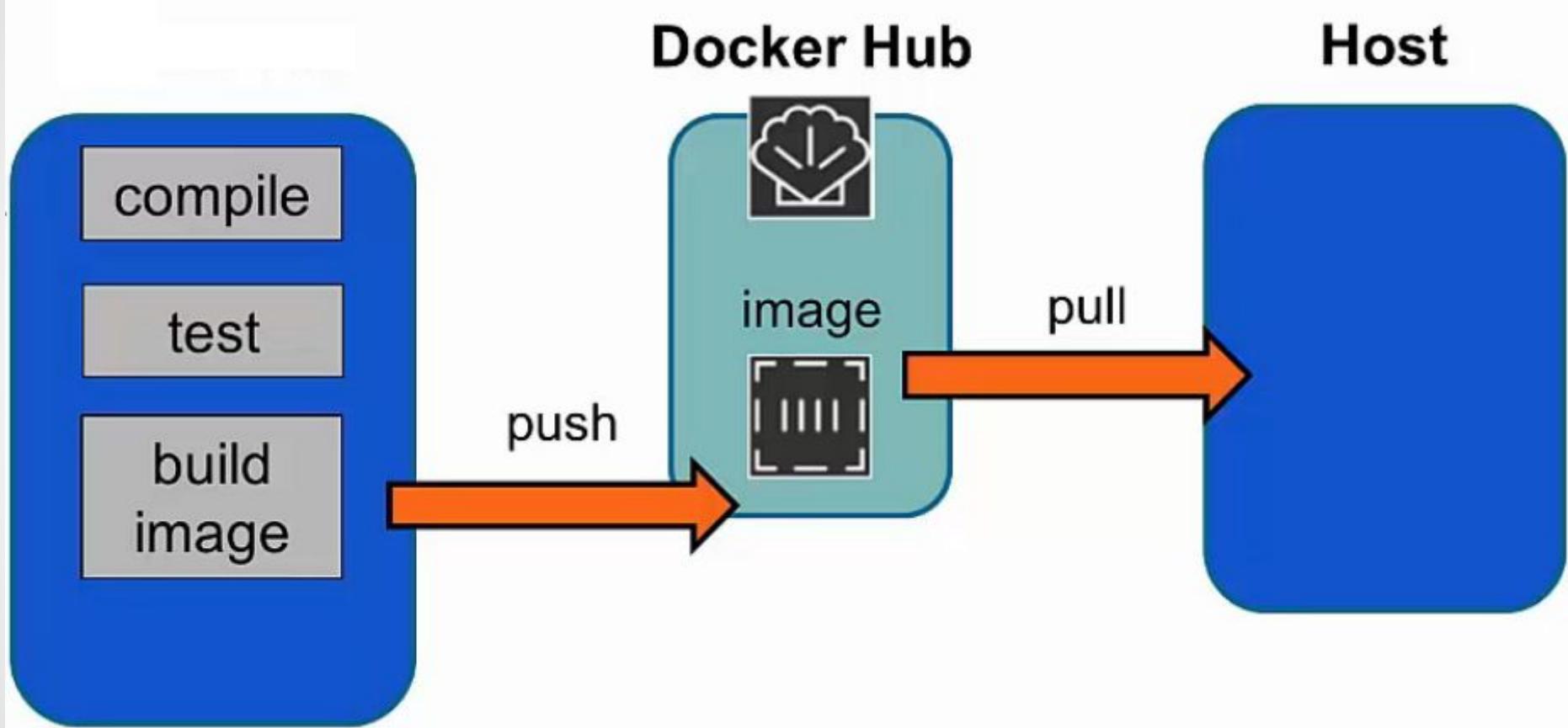
General Command in Docker

| | |
|----------------|--|
| 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

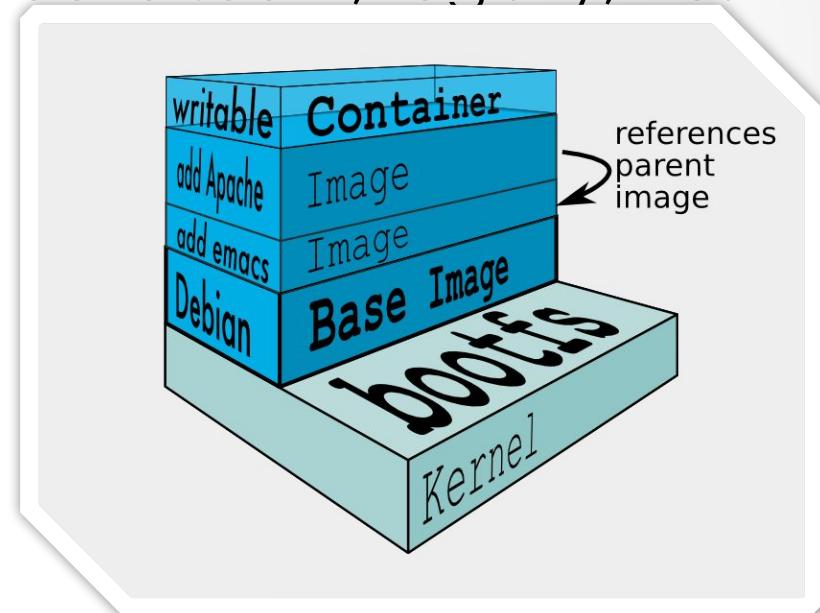
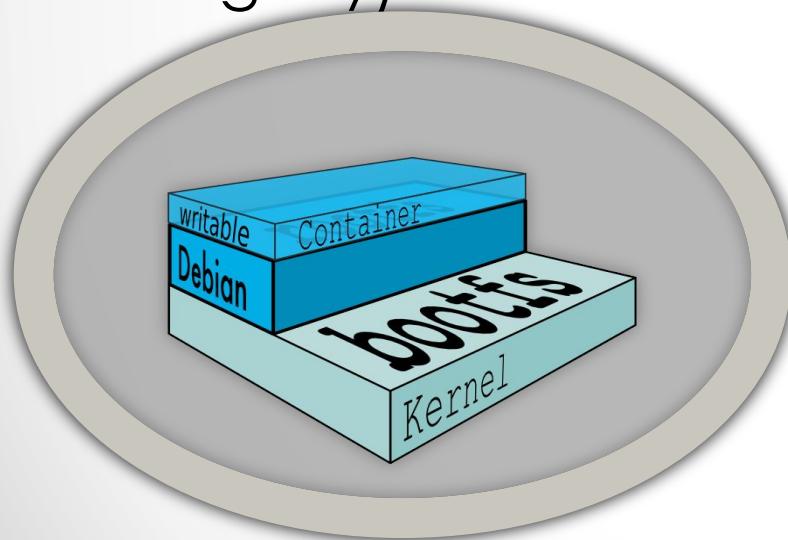
• • •

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](#)

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

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Official Images



Docker: The Next-Gen of Virtualization



Repository (Registry)

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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: 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 'labdocketerthailand' and a text input for 'Repository Name' set to 'alpineweb'. A 'Pro tip' box contains the command: `docker tag local-image:tagname new-repo:tagname
docker push new-repo:tagname`. Below this, under 'Visibility', there are two options: 'Public' (selected) and 'Private'. The 'Public' option says 'Public repositories appear in Docker Hub search results'. The 'Private' option says '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 or Bitbucket account re-linking. At the bottom, there are three buttons: 'Cancel', 'Create' (highlighted in blue), and 'Create & Build'.

Workshop: 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: 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)

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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)

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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

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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



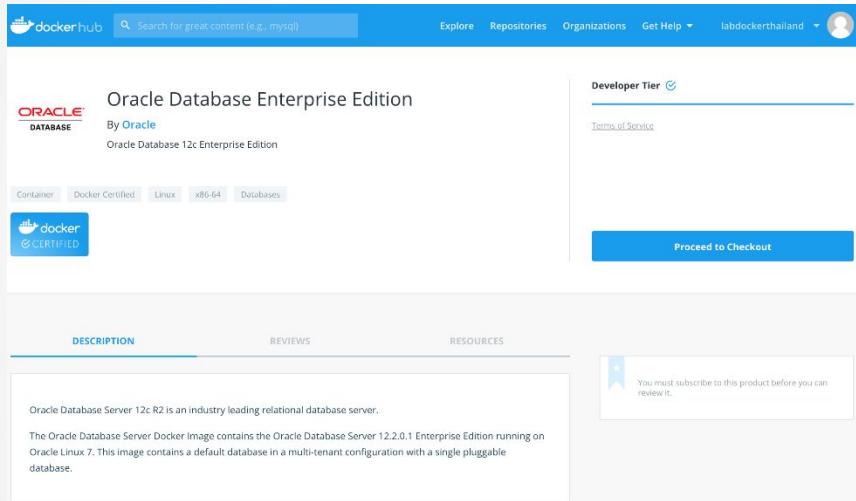
Other service in hub.docker.com



Docker Certified:
Trusted & Supported Products

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- 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

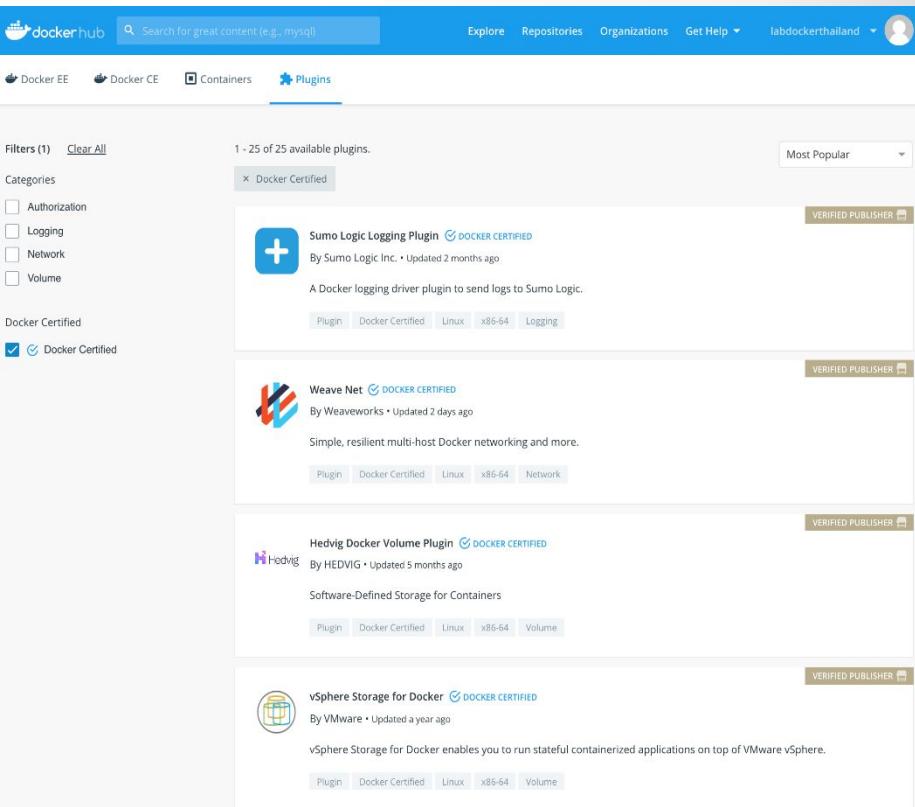
Container Docker Certified Linux x86-64 Databases

[@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 labdockeythailand

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

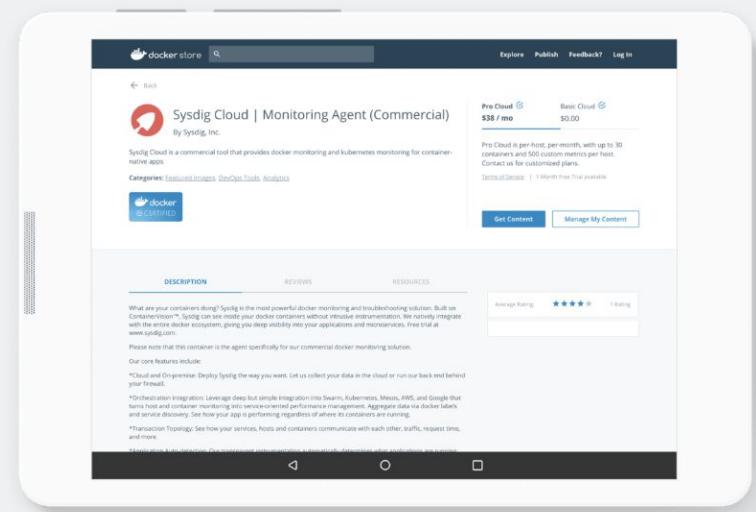
PUBLISHER PROGRAM

Deliver your business through Docker Hub

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 **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



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DESCRIPTION **REVIEWS** **RESOURCES**

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

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 **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

500.71MS



Metrics

Today Week Month

DOCKER HUB API RESPONSE TIME

500.71MS



DOCKER HUB API UPTIME

100.00%



DOCKER REGISTRY HUB API RESPONSE TIME

504.03MS



DOCKER REGISTRY HUB API UPTIME

100.00%



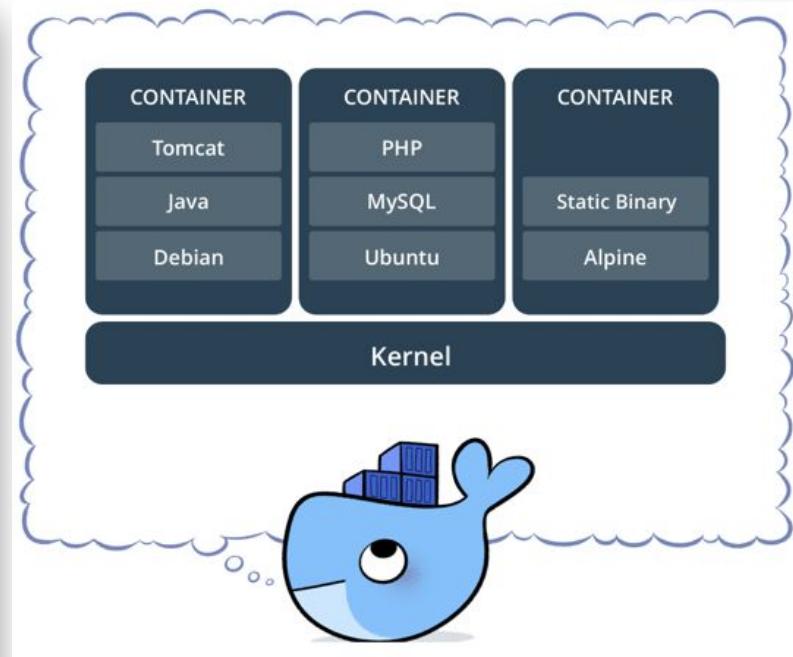
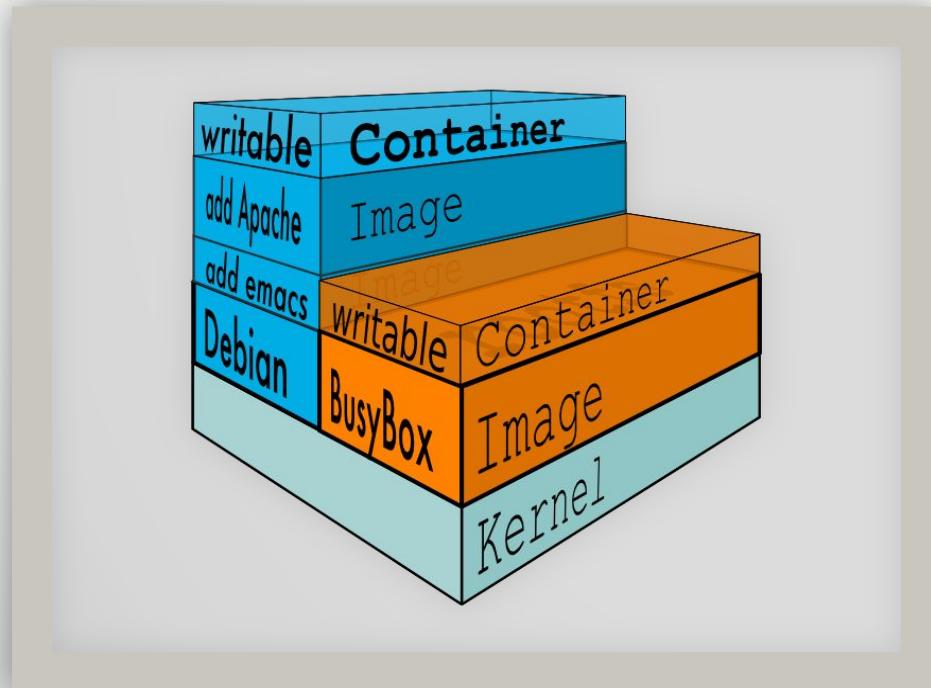
<https://status.docker.com/>

Docker: 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)



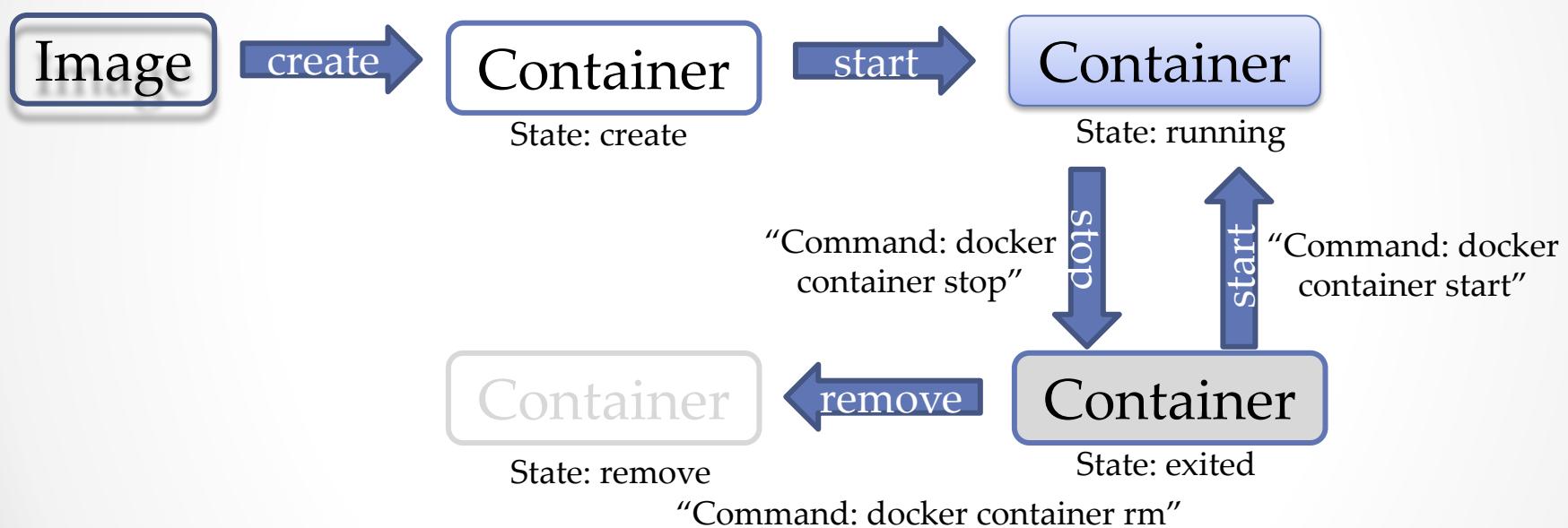
Docker Container

- 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 |
| ^C | | | | | | | |
| ubuntu@ip-10-0-1-58:~\$ | docker container top nodejs | | | | | | |
| 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 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

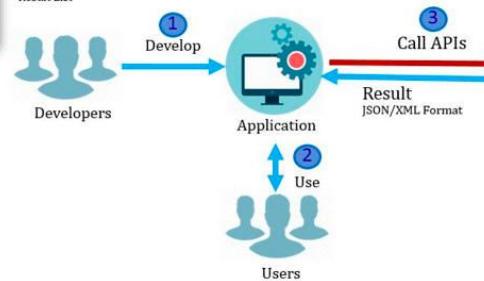
| ชื่อ | ประเภท | ค่าอธิบาย |
|-----------------------|--------|---------------------------|
| report_name_eng | String | ชื่อรายงาน ภาษาอังกฤษ |
| rereport_name_th | String | ชื่อรายงาน ภาษาไทย |
| report_uoq_name_eng | String | หน่วย ภาษาอังกฤษ |
| report_uoq_name_th | String | หน่วย ภาษาไทย |
| report_source_of_data | 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
```

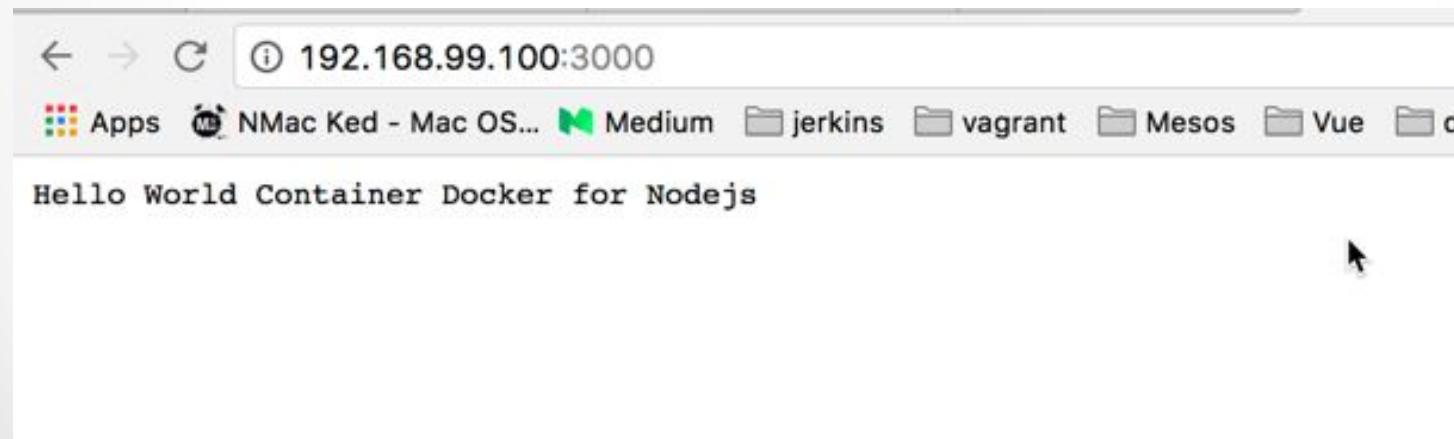
Workshop: Run Container

- 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

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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) (CFS scheduler)
`--cpu-period=100000 --cpu-quota=500000`

CPU

- Default container จะมองเห็น CPU resource ทั้งหมดในเครื่องระหว่าง runtime และ share เวลาการทำงานให้ทุก container เท่ากัน
- NUMA (non-uniform memory access) architecture

```
--cpuset-mems="1,3"
```

- กำหนด cpu real-time runtime (ms) (nice system call)

```
--cap-add=sys_nice --cpu-rt-runtime=<value>
```

- กำหนด cpu run-time priority (0-99) (nice system call)

```
--cap-add=sys_nice --ulimit rtprio=xx
```

NVIDIA GPU

- Docker สามารถใช้งาน GPU ของ NVIDIA ในการนำมาประมวลผลได้โดยต้องทำการติดตั้ง nvidia-container-runtime เพิ่มเติมดังนี้ (Need restart)

```
apt-get install nvidia-container-runtime  
which nvidia-container-runtime-hook
```

- Check gpu available for use in system by command

```
docker run -it --rm --gpus all ubuntu nvidia-smi
```

- Run docker container with gpu:

```
docker run -it --rm --gpus device=xxxx ubuntu nvidia-smi
```

Ref:<https://github.com/NVIDIA/nvidia-docker>

Docker: The Next-Gen of Virtualization



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
```

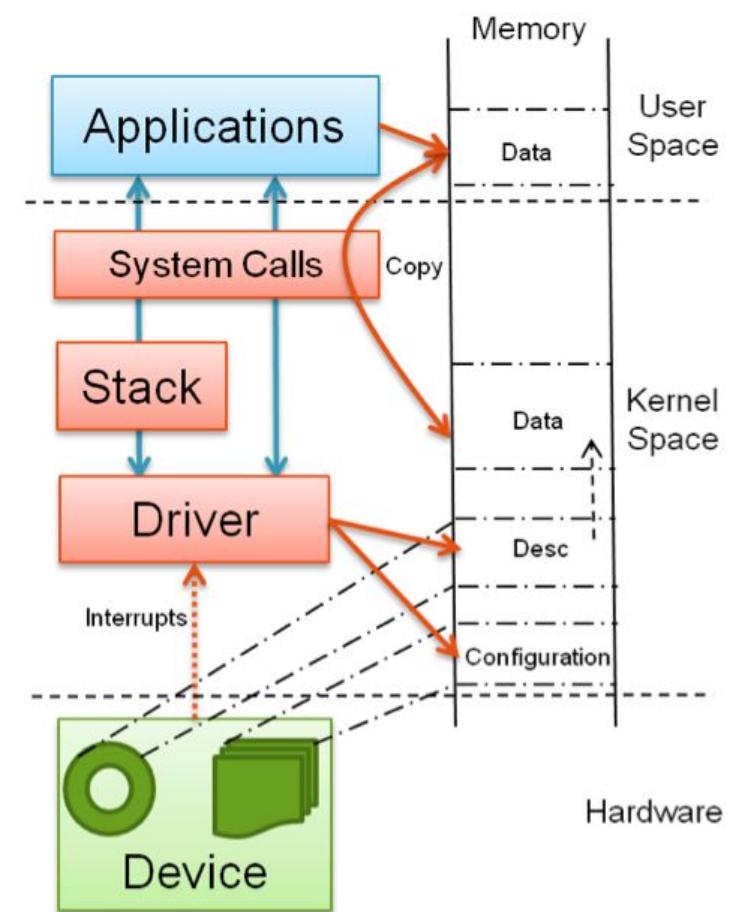
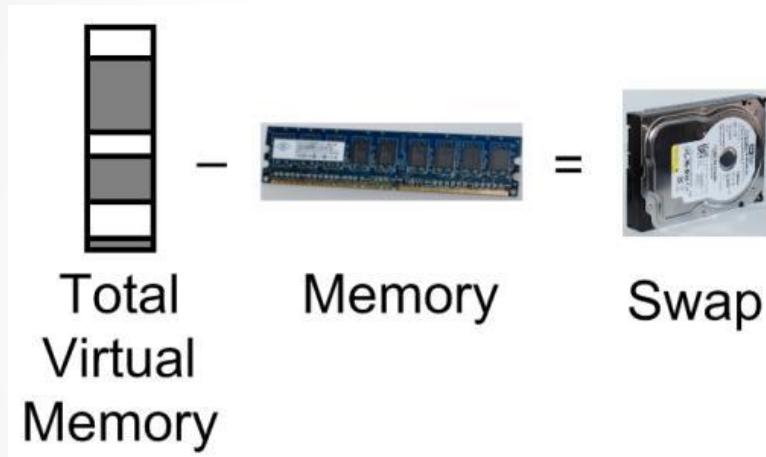
Workshop: CPU Configure

- Result



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
```

- disable oom kill

```
--oom-kill-disable =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

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Network

- Software define network by design (virtual switch) (Support IPv4/6)
- default docker จะจัดเตรียม network มาให้สามรูปแบบ

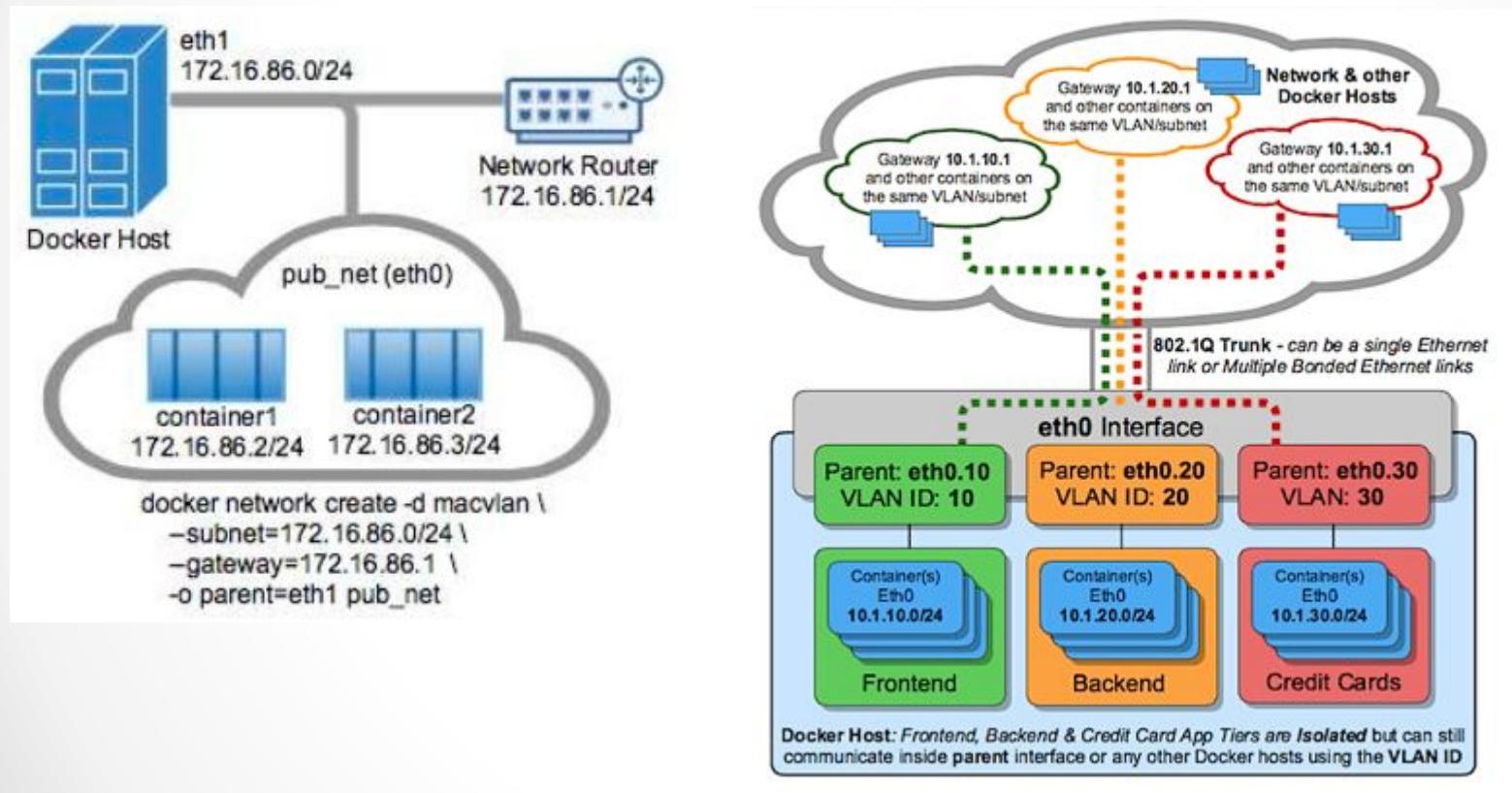
```
[docker@labdocker:~$ docker network ls
NETWORK ID      NAME      DRIVER      SCOPE
0dc1bbf00498    bridge    bridge      local
91d6dd4056a9    host      host       local
fa786a00adda    none     null       local
docker@labdocker:~$ ]
```

- **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)

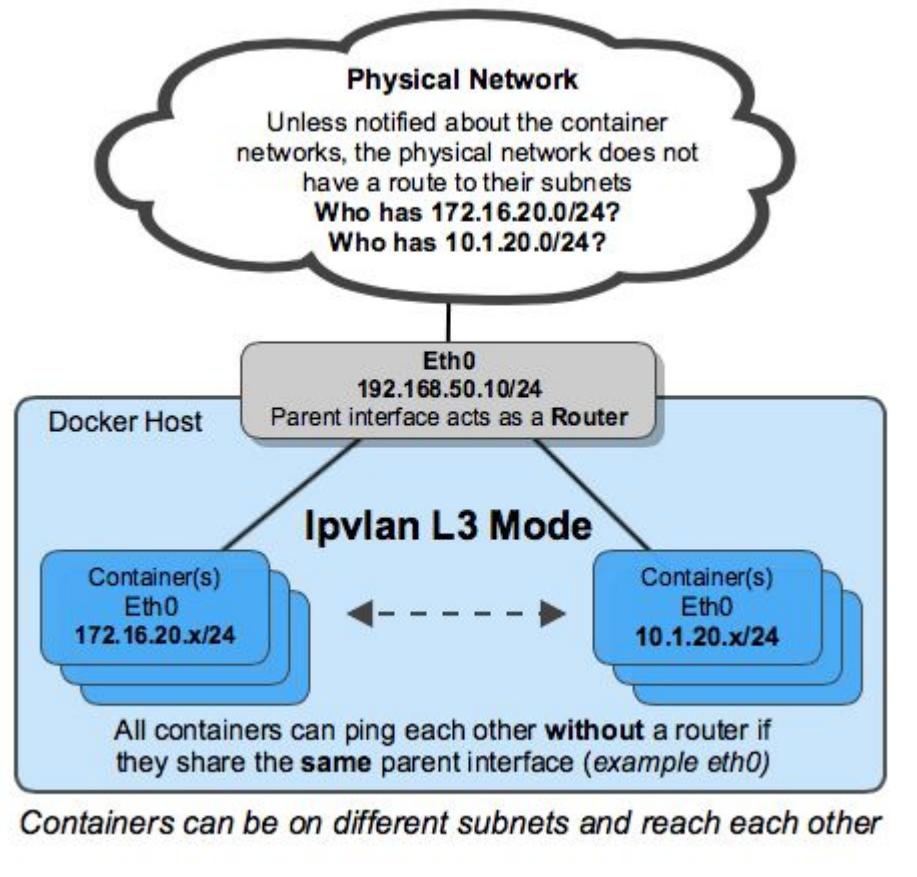
Network

- Additional network type
- **MACVLAN/IPVLAN (L2)**



Network

- Additional network type
- **IPVLAN (L3 Mode)**



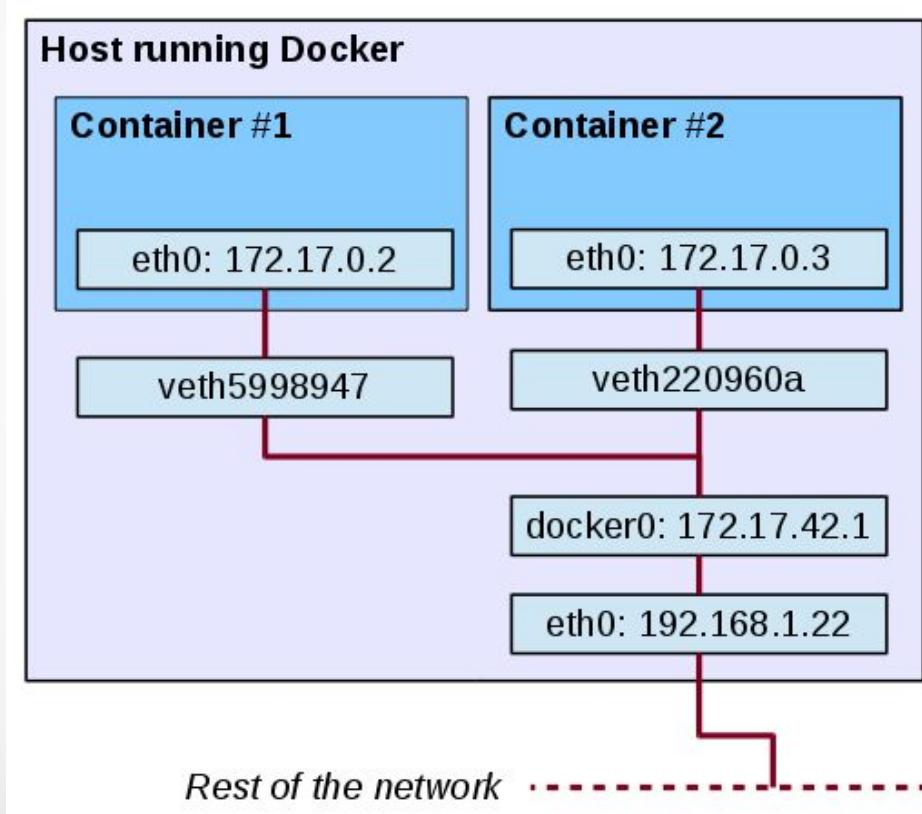
- **Overlay (Swarm Mode)**
- **3rd Party Network Plugin (Swarm Mode)**

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.

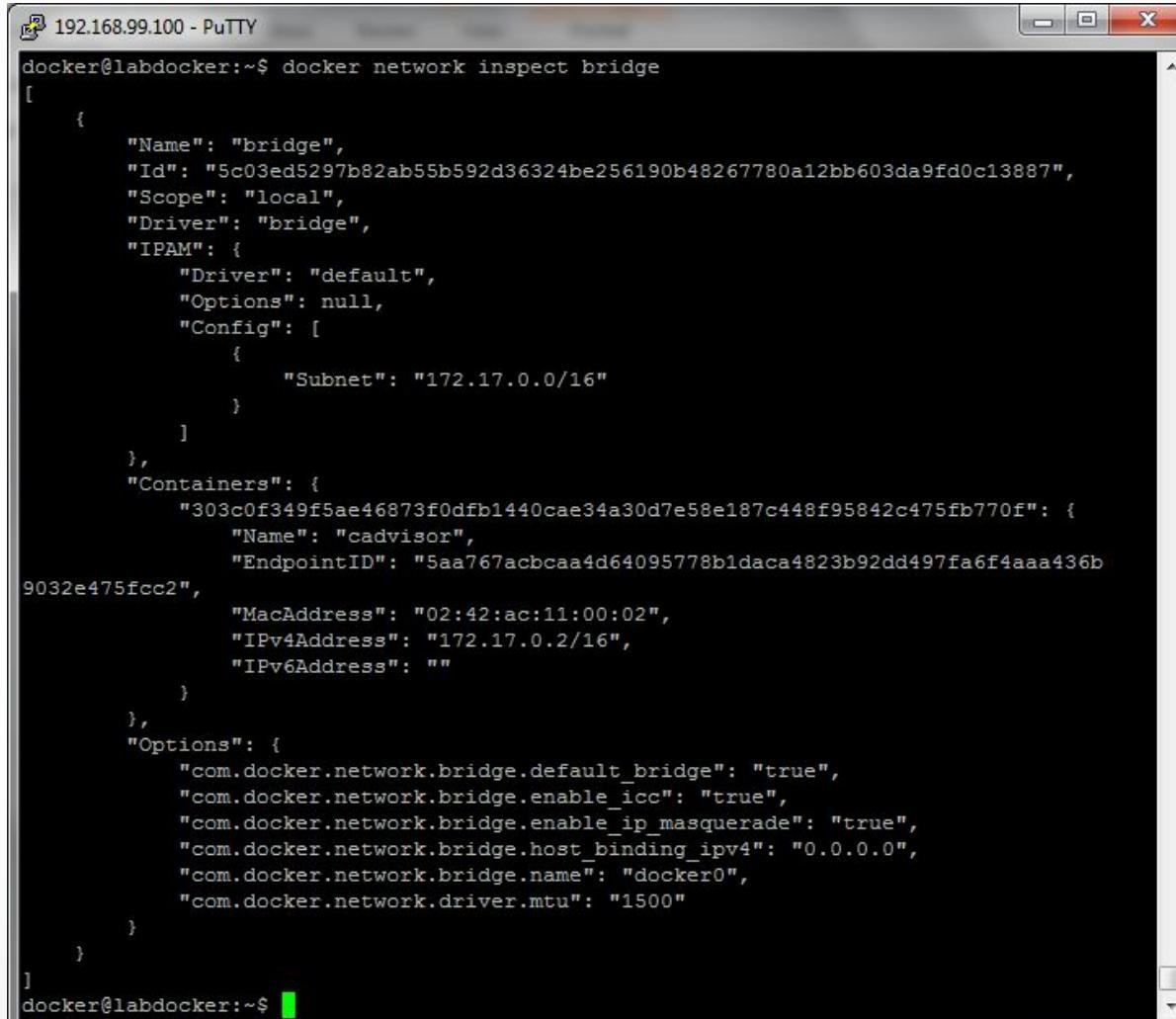
Network

- 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)  
--network="<bridge/none/host/custom>"  
--network-alias = "xxxx"  
--add-host="xxxx"  
--mac-address="xx:xx:xx:xx"  
--ip="x.x.x.x"  
--ipv6="xx:xx:xx:xx"  
-link-local-ip="x.x.x.x"  
-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
```

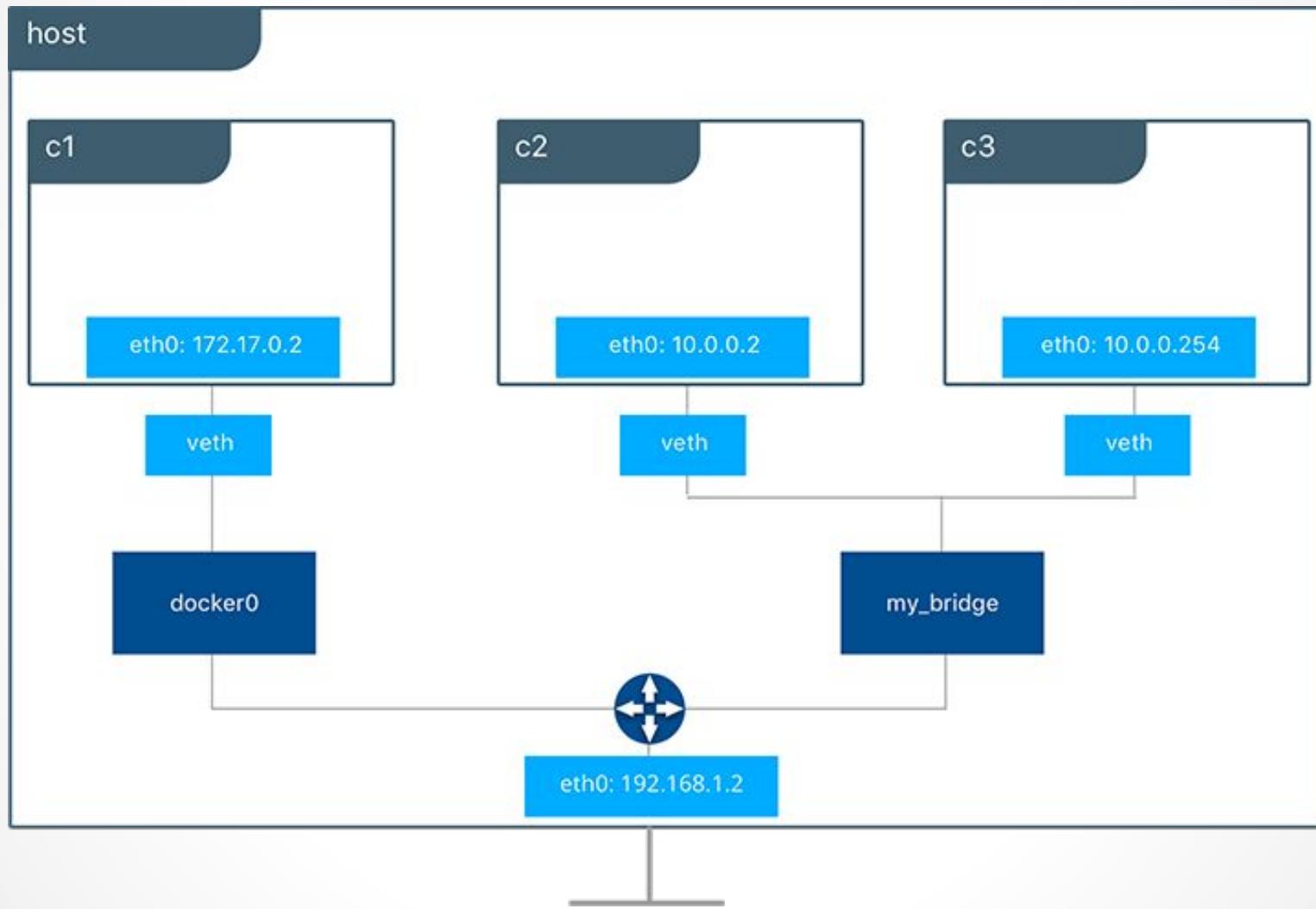
```
Ex: docker network rm netweb
```

- สามารถเพิ่มเติม option ในการสร้าง virtual switch เพิ่มเติม
 - attachable = กำหนดให้สามารถต่อ container เข้ามาในเน็ตเวิร์คได้แบบ manual
 - aux-address = กำหนด ip address (v4/v6) สำหรับ network driver
 - config-from= copy configuration จาก virtual switch อื่นๆ
 - driver, -d = driver ในการใช้งาน virtual switch (bridge, none, macvlan etc)
 - ingress = สร้างเพื่อใช้บน switch เพื่อทำ service routeing-mesh
 - internal = สร้างใช้ภายใน docker เท่านั้น
 - scope = กำหนด scope การใช้งาน (host,cluster)

Network

- สามารถเพิ่มเติม option ในการสร้าง virtual switch เพิ่มเติม
 - 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)

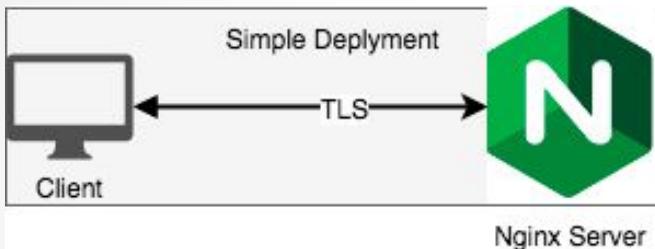
Workshop: Network Configure

- 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

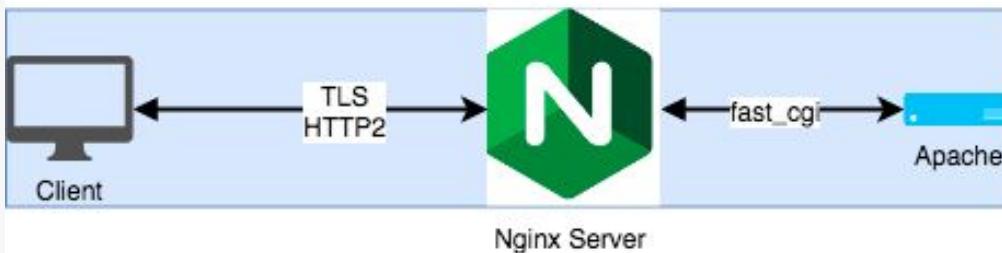
Workshop: Network Configure



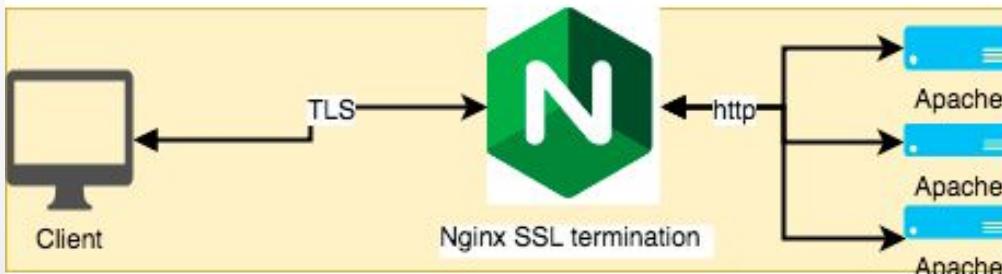
Workshop: Network Configure



Nginx Server A
Plain Deployment

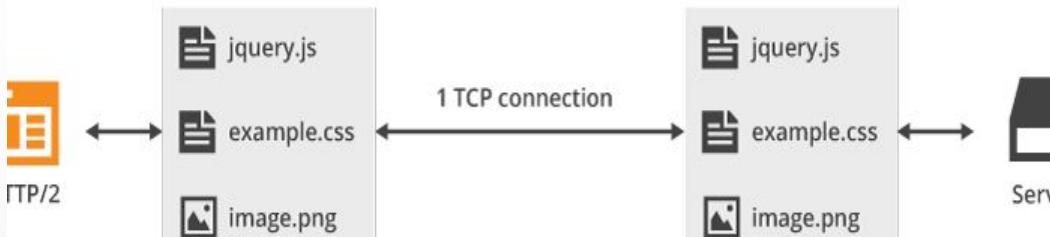
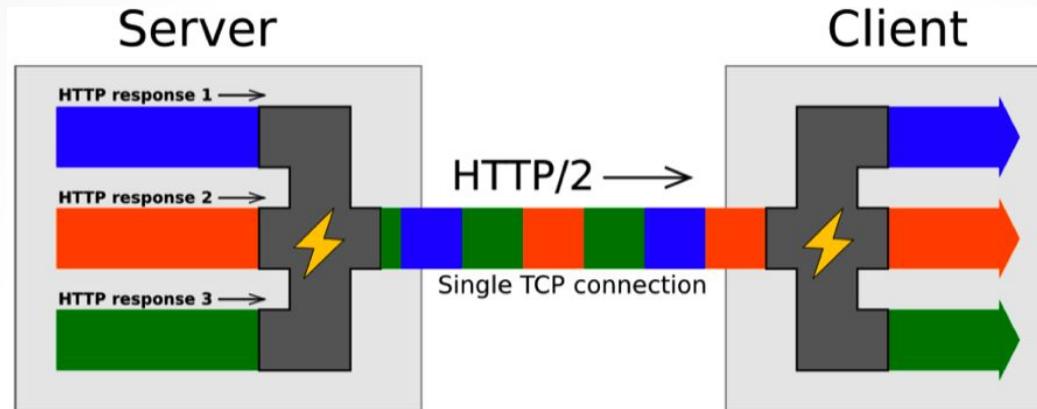


Nginx Reverse Proxy

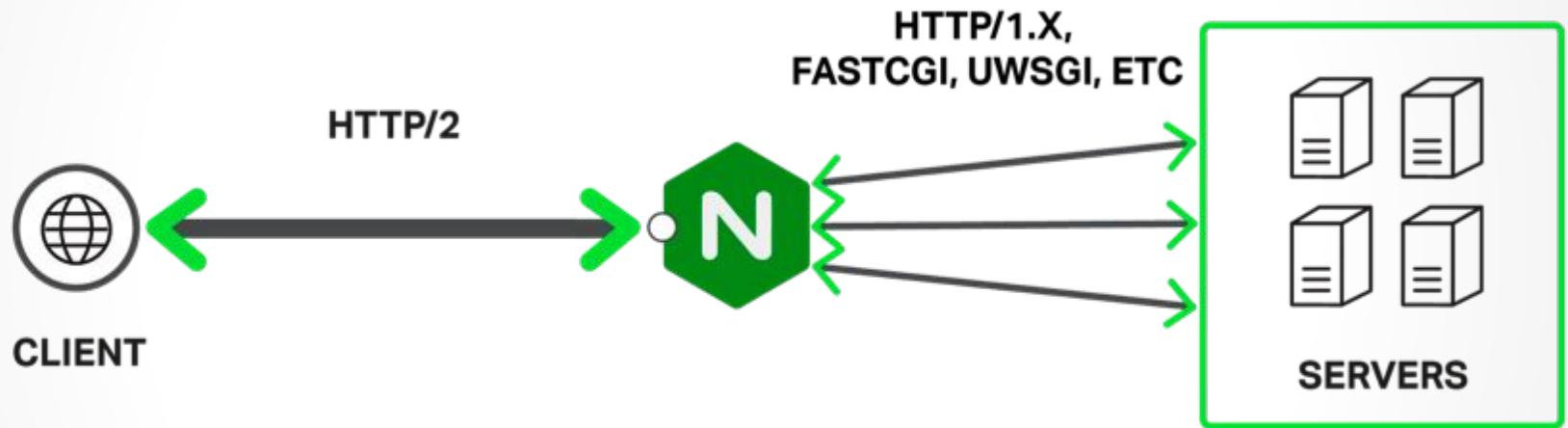


Nginx SSL Offloading

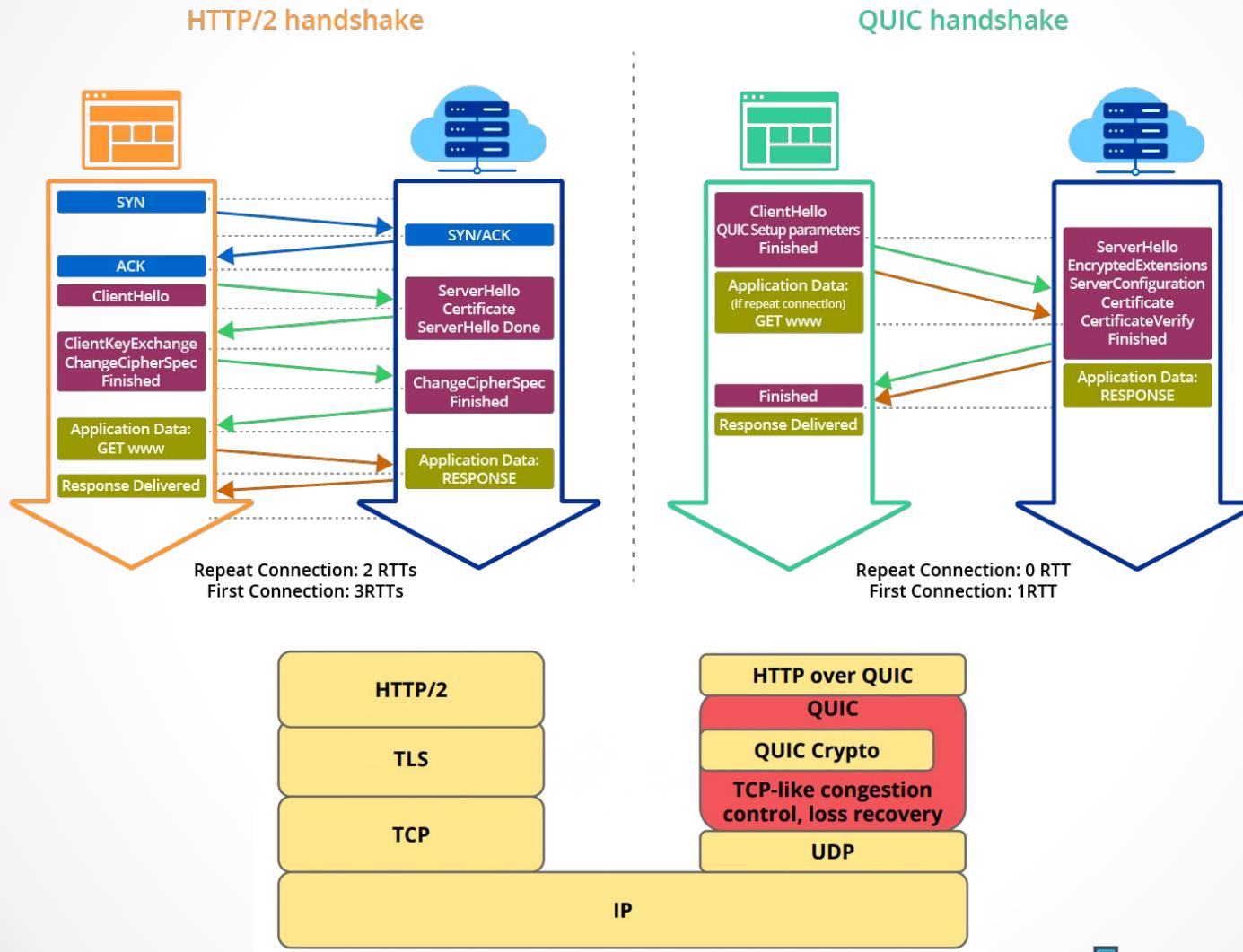
Workshop: Network Configure



Workshop: Network Configure

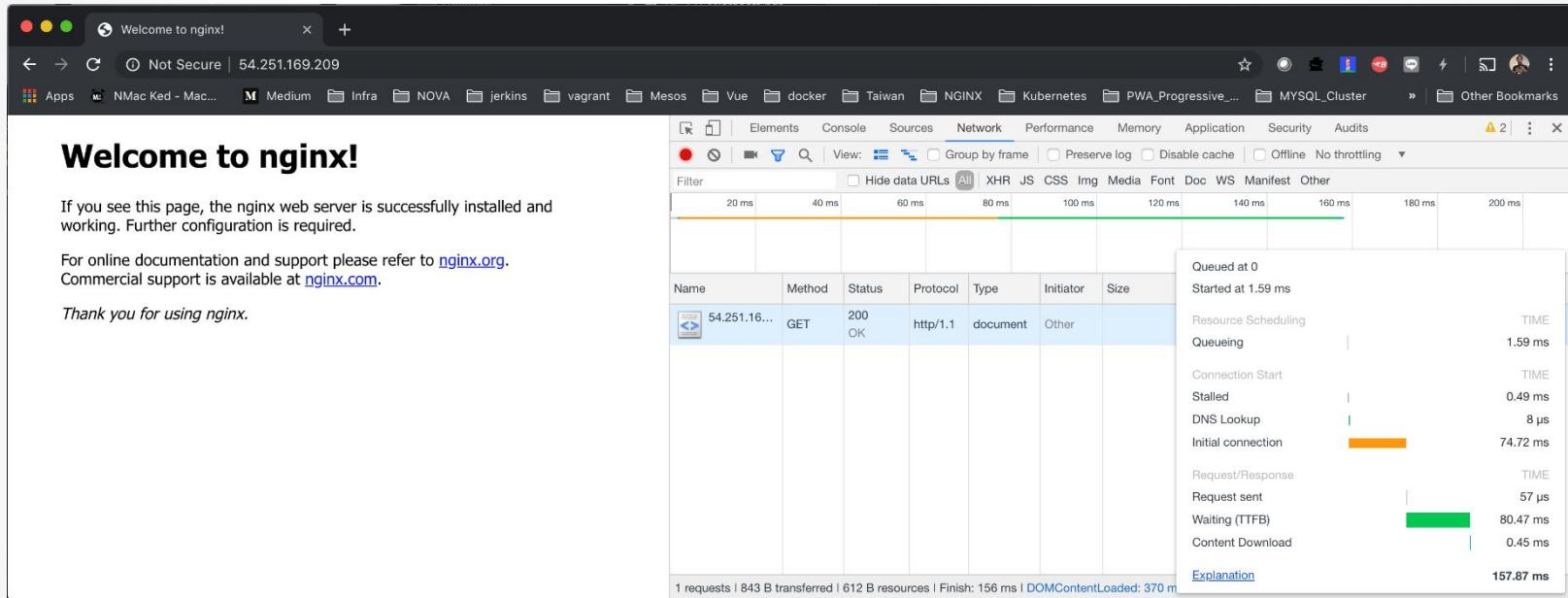


Workshop: Network Configure



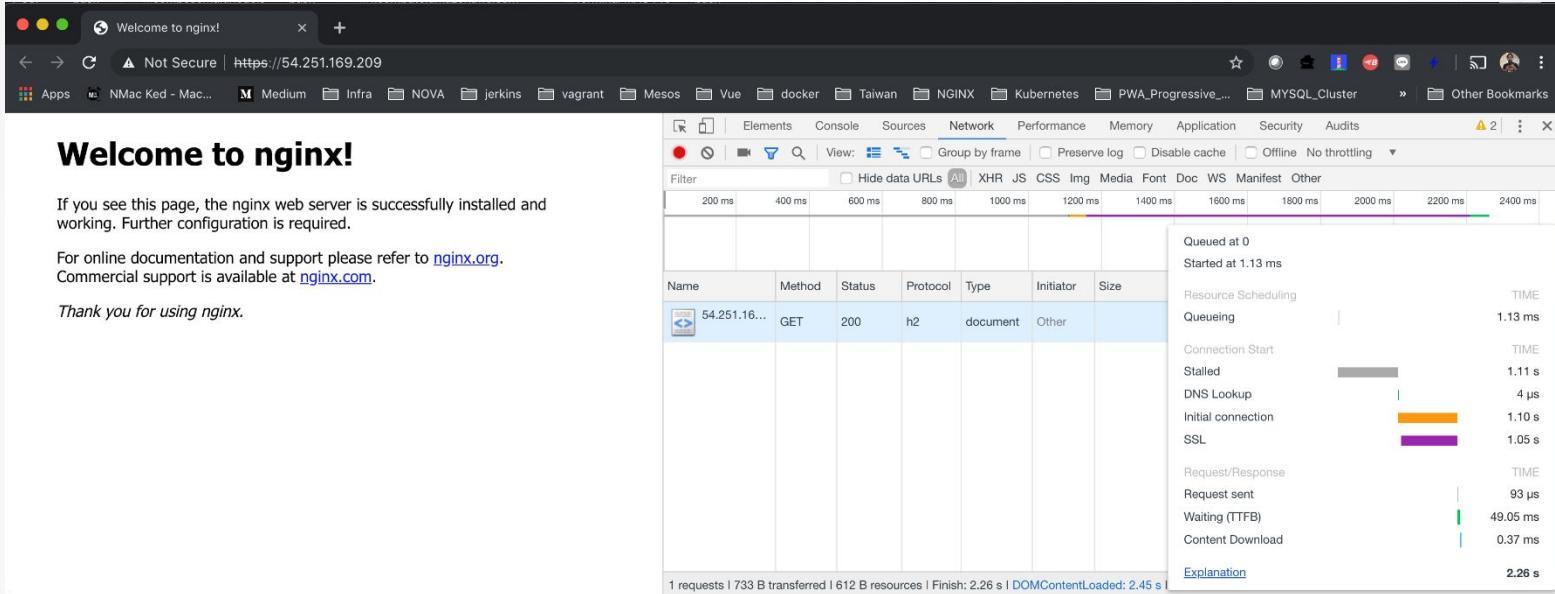
Workshop: Network Configure

- 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

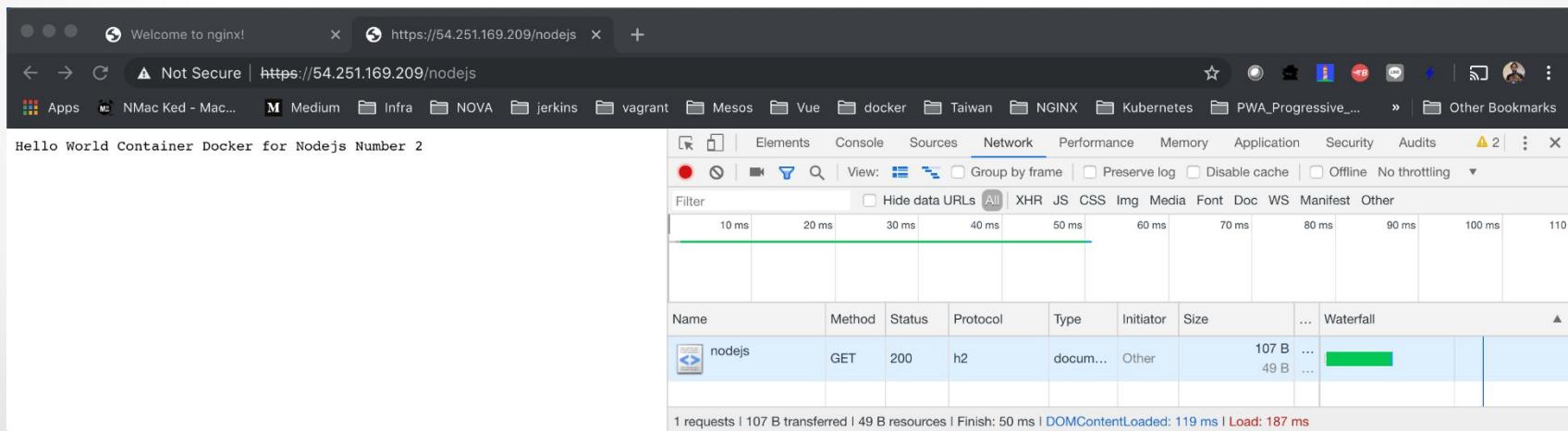
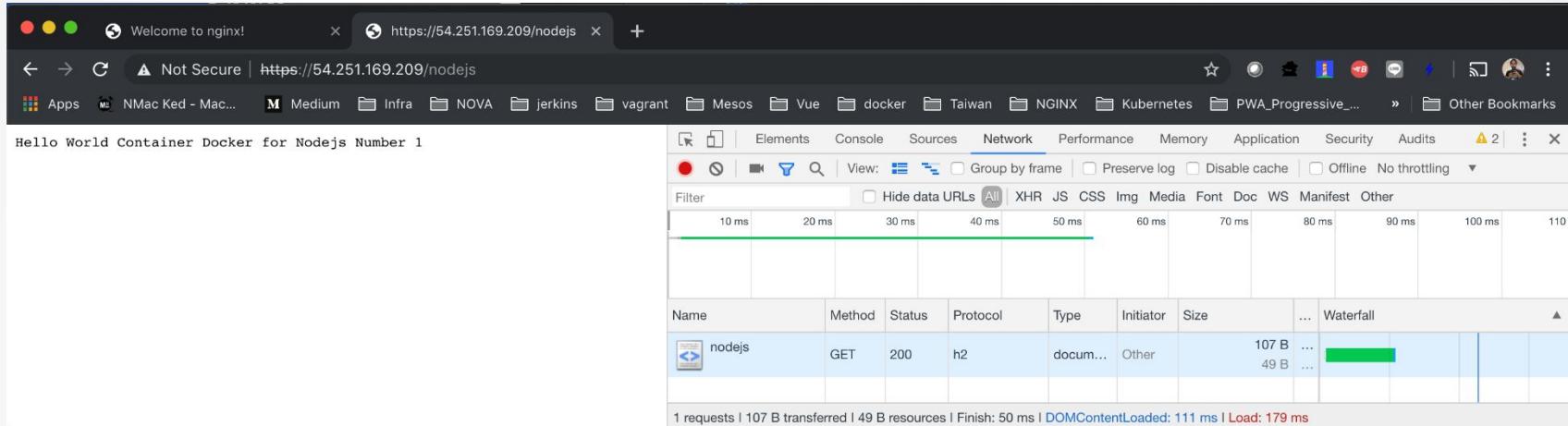
- ทำการสร้าง Switch สำหรับเชื่อมต่อ Private / Public Network
 - docker network create --driver bridge \
--subnet=192.168.100.0/24 --ip-range=192.168.100.128/25 \
--gateway=192.168.100.5 --opt="com.docker.network.mtu"="1500"
webpublic
 - docker network create --driver bridge \
--subnet=192.168.101.0/24 --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 # █
```

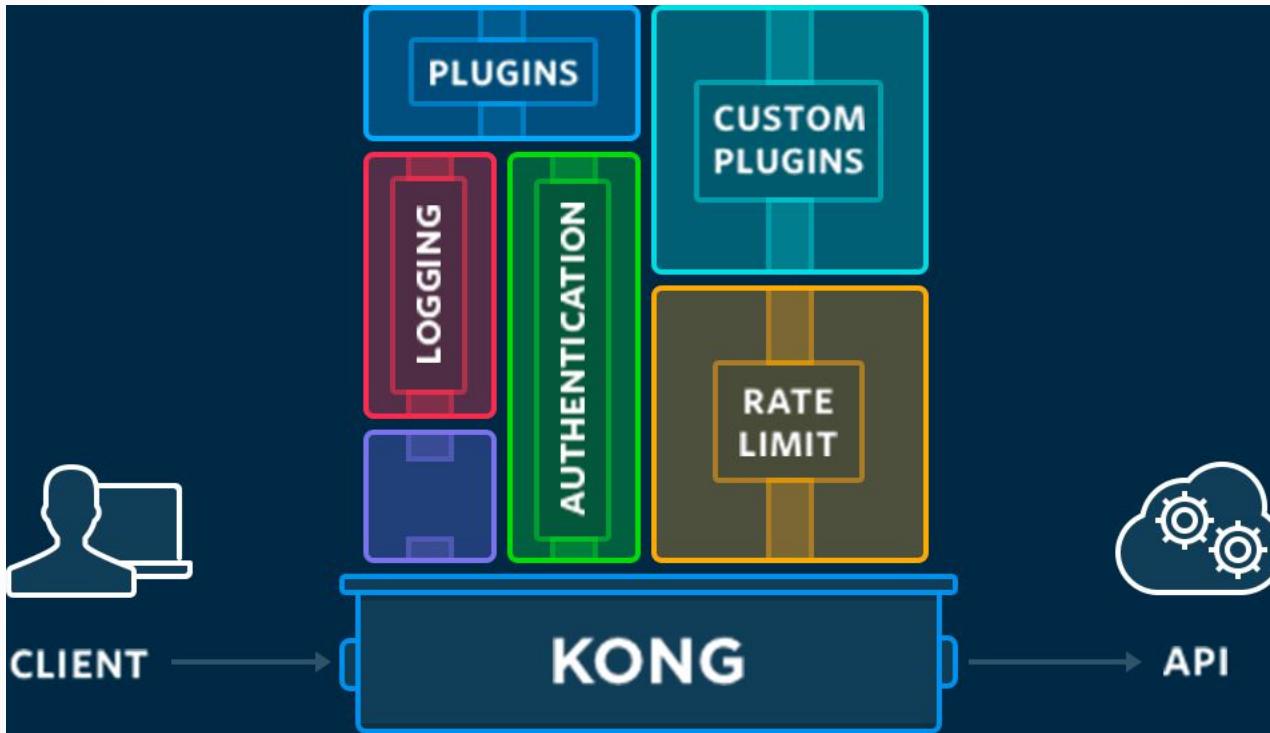
Workshop: Network Configure

- 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;  
    }  
}
```

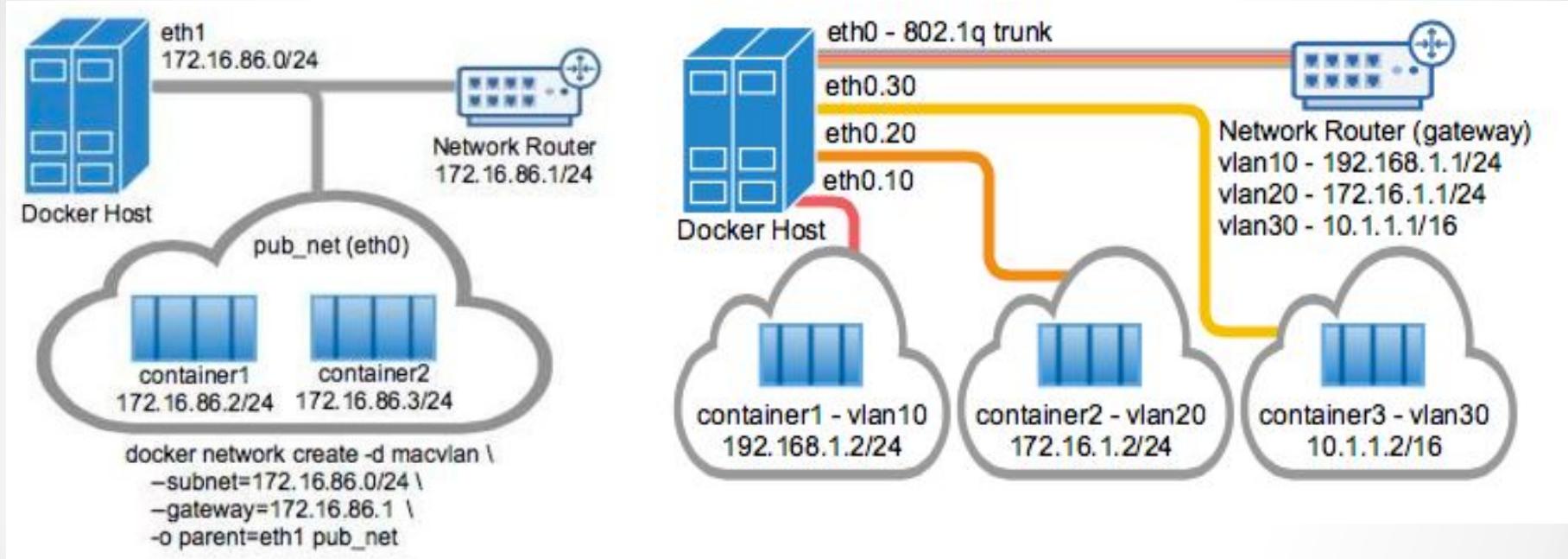
Workshop: Network Configure

- 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: 192.168.57.193

DNS Name: web1

Service Port: 3000

WEB2:

IP Address: 192.168.57.194

DNS Name: web2

Service Port: 3000

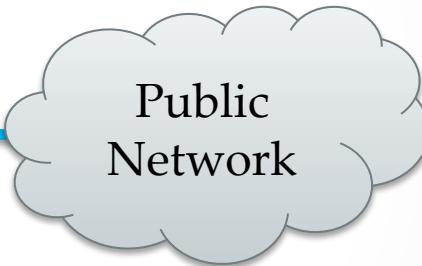
NGINX:

IP Address: 192.168.57.195

DNS Name: nginx

Service Port: 8080

Network Card: Eth1
IP Address: 192.168.57.100



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

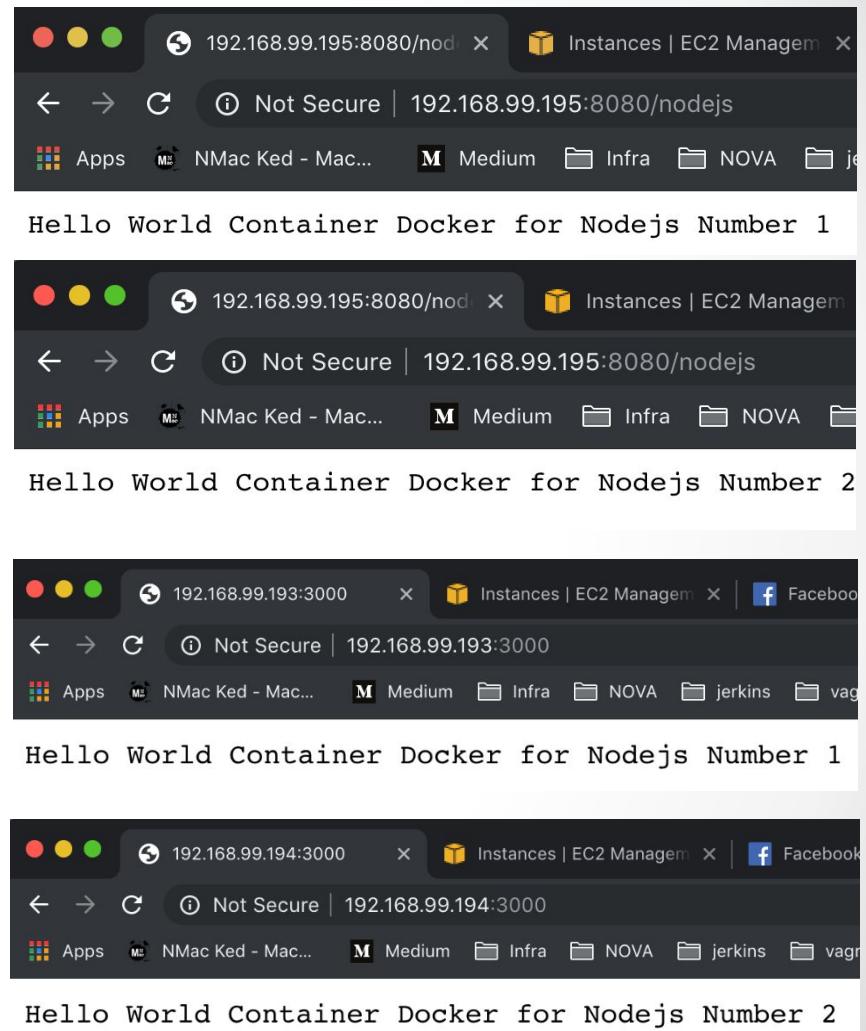
[docker@labdocker:~$ docker container exec -it nginx curl http://web2:3000
Hello World Container Docker for Nodejs Number 2
[docker@labdocker:~$ docker container exec -it nginx curl http://web2:3000 -I
HTTP/1.1 200 OK
Content-Type: text/plain
Date: Sat, 22 Jun 2019 03:39:13 GMT
Connection: keep-alive

[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

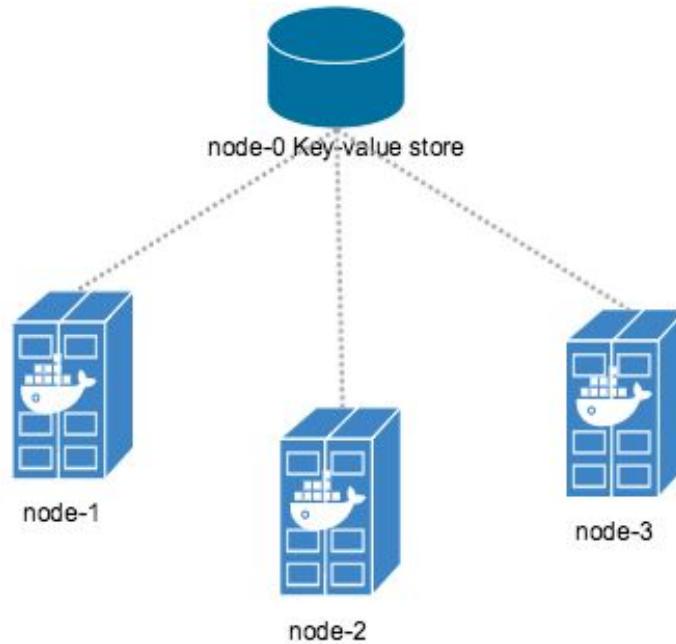
- External Test:

```
...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

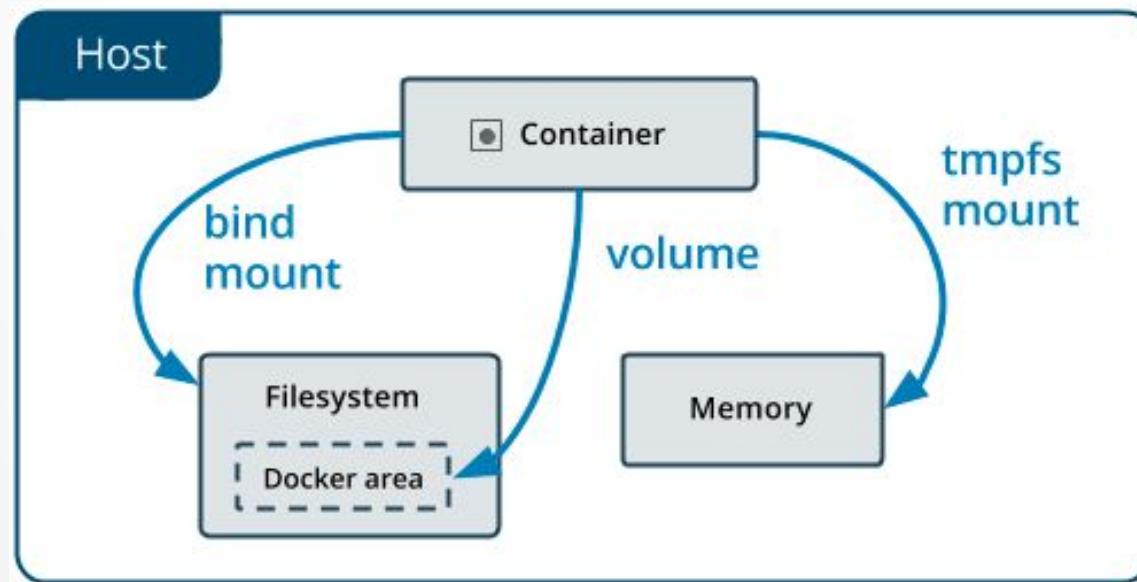
• • •

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

```
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

- NFS3:

```
docker service create -d \
--name nfs-service \
--mount
'type=volume,source=nfsvolume,target=/app,volume-driver=local,volume-
opt=type=nfs,volume-opt=device=:/var/docker-nfs,volume-opt=o=addr=10.
0.0.10' nginx:latest
```

- NFS4:

```
docker service create -d \
--name nfs-service \
--mount
'type=volume,source=nfsvolume,target=/app,volume-driver=local,volume-
opt=type=nfs,volume-opt=device=:/var/docker-nfs,"volume-opt=o=addr=10
.0.0.10,rw,nfsvers=4,async"' nginx:latest
```

Volume

- CIFS/SAMBA:

```
docker volume create \
--driver local \
--opt type=cifs \
--opt device=//uxxxxx.your-server.de/backup --opt
o=addr=uxxxxx.your-server.de,username=uxxxxxxx,password=*****,file_m
ode=0777,dir_mode=0777 --name cif-volume
```

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 environment |

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>
```

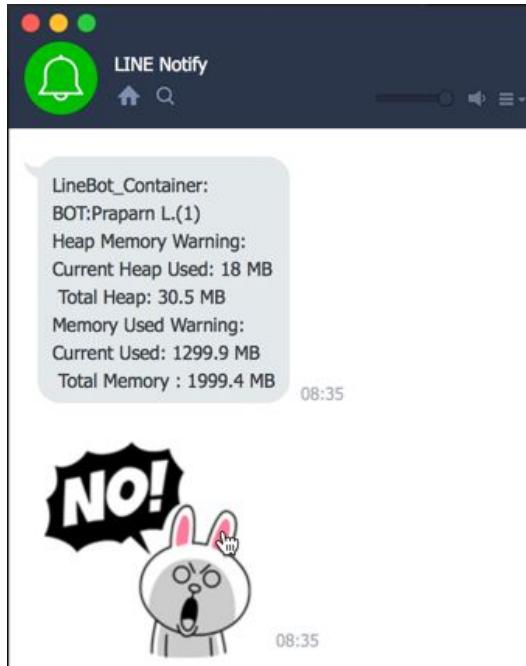
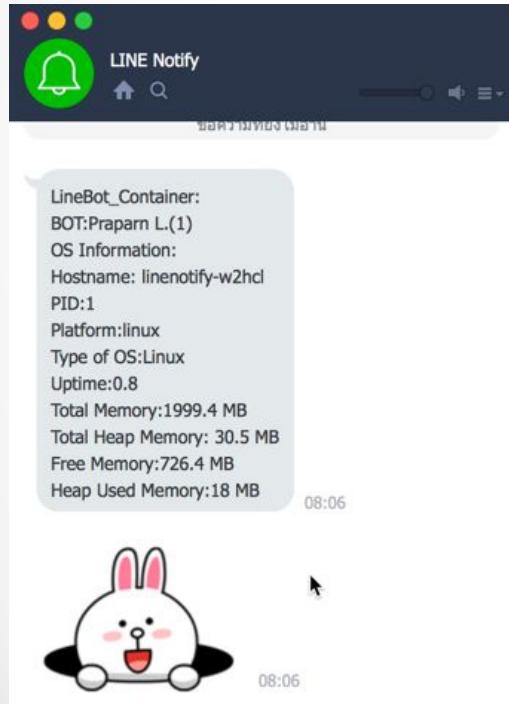
Ex: docker volume create --driver local --opt type=tmpfs \ --opt device=tmpfs --opt o=size=100m,uid=1000 tmptest

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

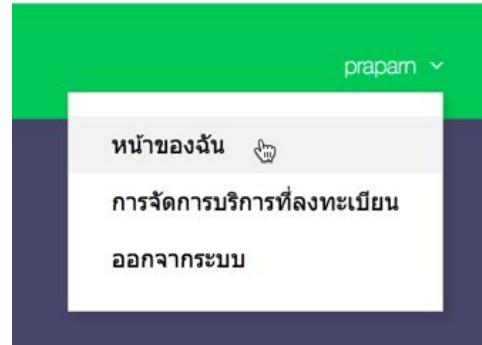
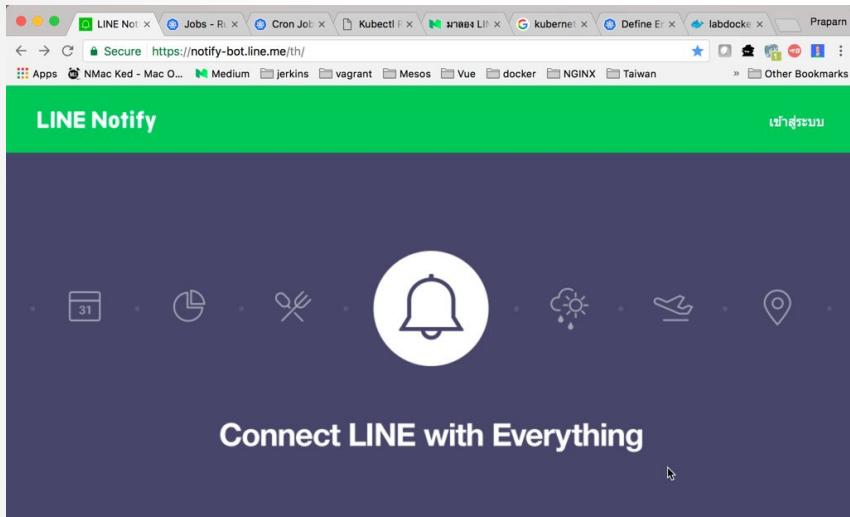
- Part 1: Host Path debug program
- Purpose: ทำการ Map volume เพื่อนำ source code เข้าไปทำการ debug/run บน container
- Example on WorkShop: "Monitor and LINE notify container"



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

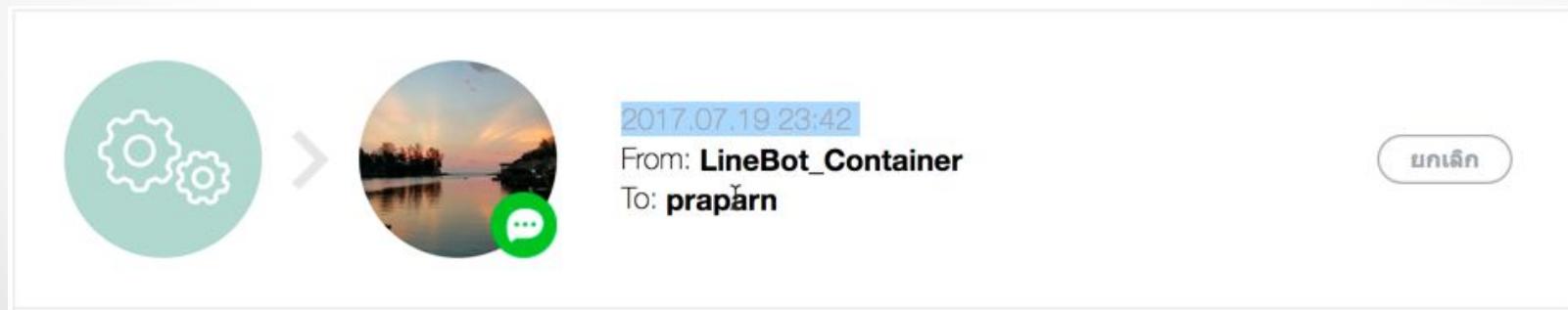
 รับการแจ้งเตือนแบบตัวต่อตัวจาก LINE Notify

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 freeMem = processMonitor.get('freemem');
28   freeMem=Number(((freeMem/1024)/1024).toFixed(1));
29   var usedMem = totalMem-freeMem;
30   usedMem=Number(usedMem.toFixed(1)); //Convert to MB
31   if(MEM_HIGH<((usedMem/totalMem)*100)){memoryWarning="Y";}
32   //collect memory information
33   var hostName = processMonitor.get('hostname');
34   var pID = processMonitor.get('pid');
35   var platForm = processMonitor.get('platform');
36   var upTime = processMonitor.get('uptime');
37   var type = processMonitor.get('type');
38   var totalMem = processMonitor.get('totalmem');
39   totalMem=Number(((totalMem/1024)/1024).toFixed(1)); //Convert to MB
40   var heapTotal = processMonitor.get('heapTotal');
41   heapTotal=Number(((heapTotal/1024)/1024).toFixed(1)); //Convert to MB
42   var titleMSG="\n"+TITLE+"("+pID+")";
43   var osMSG="";
44   var warnMSG="";
45   //collect OS information
46   //collect memory information
47   var heapUsed = processMonitor.get('heapUsed');
48   heapUsed=Number(((heapUsed/1024)/1024).toFixed(1)); //Convert to MB
49   if(HEAP_HIGH<((heapUsed/heapTotal)*100)){heapWarning="Y";}
```

```
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
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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
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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.

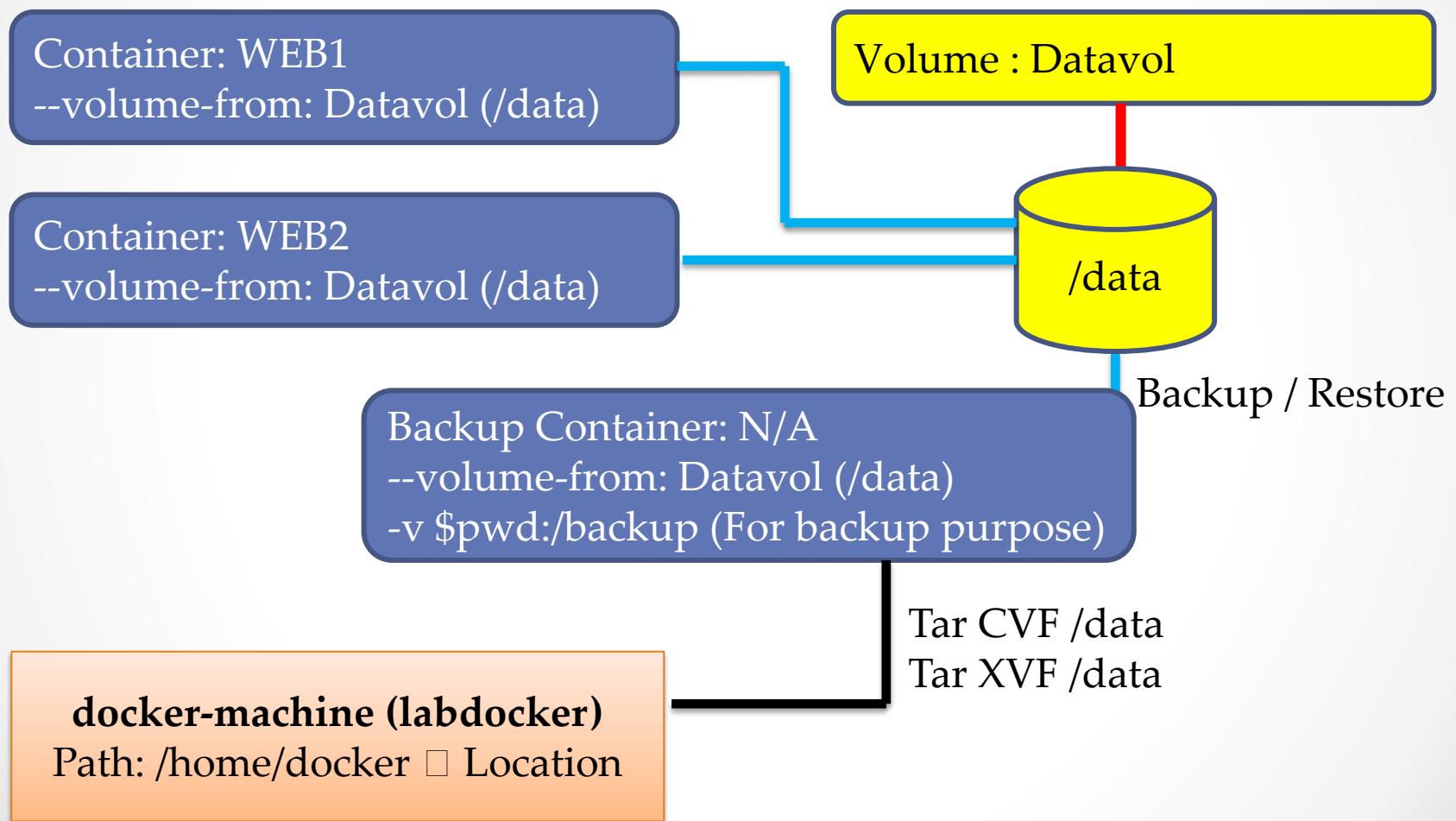
Terminal 2: Shows a node.js command (node index.js) which outputs a similar JSON response object with a statusCode of 200, a body with a status of 200 and a message of "ok", and various headers.

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.

Image: A cartoon rabbit character with a speech bubble containing the word "NO!".

Workshop: Share Volume

- Part 2: Container Volume



Log and Inspect

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Log

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

```
docker container logs <options> <container name>
```

- options ในการดูล็อกไฟล์
 - f, --follow เพื่อตรวจสอบล็อกไฟล์ใหม่ตลอดเวลา
 - t, --timestamps กำหนดให้ใส่วันและเวลาในล็อกไฟล์
 - since= <unix timestamps> กำหนดเวลาเริ่มตรวจสอบล็อกไฟล์ 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

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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

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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 selected. A dropdown menu shows "labdocker". The main table lists Docker images with columns: TAGS, OS, VULNERABILITIES, LAST PUSHED, and SIZE. The first section, under "labdocker", contains three entries:

| TAGS | OS | VULNERABILITIES | LAST PUSHED | SIZE |
|--------|----|-----------------|------------------|----------|
| latest | | Not available | 1 day ago | 24.41 MB |
| web7 | | Not available | over 4 years ago | 9.27 MB |
| lua | | Not available | over 3 years ago | 18.56 MB |

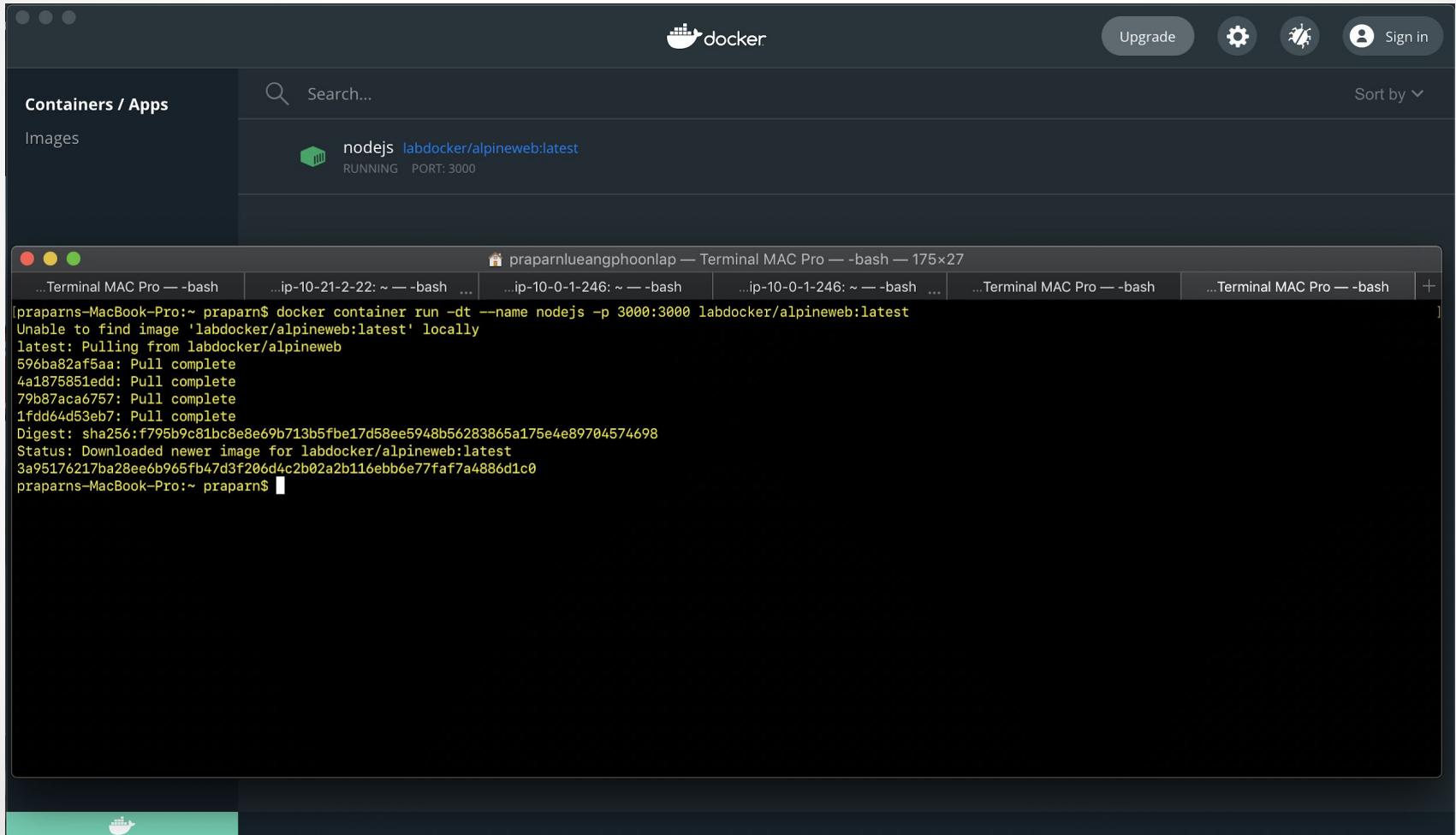
Below this, there is a "See more" link. The second section, under "labdocker/cluster", contains three entries:

| TAGS | OS | VULNERABILITIES | LAST PUSHED | SIZE |
|------------------|----|-----------------|------------------|-----------|
| webservicev2set2 | | Not available | over 1 year ago | 146.88 MB |
| webservicev2 | | Not available | over 1 year ago | 146.45 MB |
| webcache2 | | Not available | over 2 years ago | 3.69 MB |

Below this, there is another "See more" link.

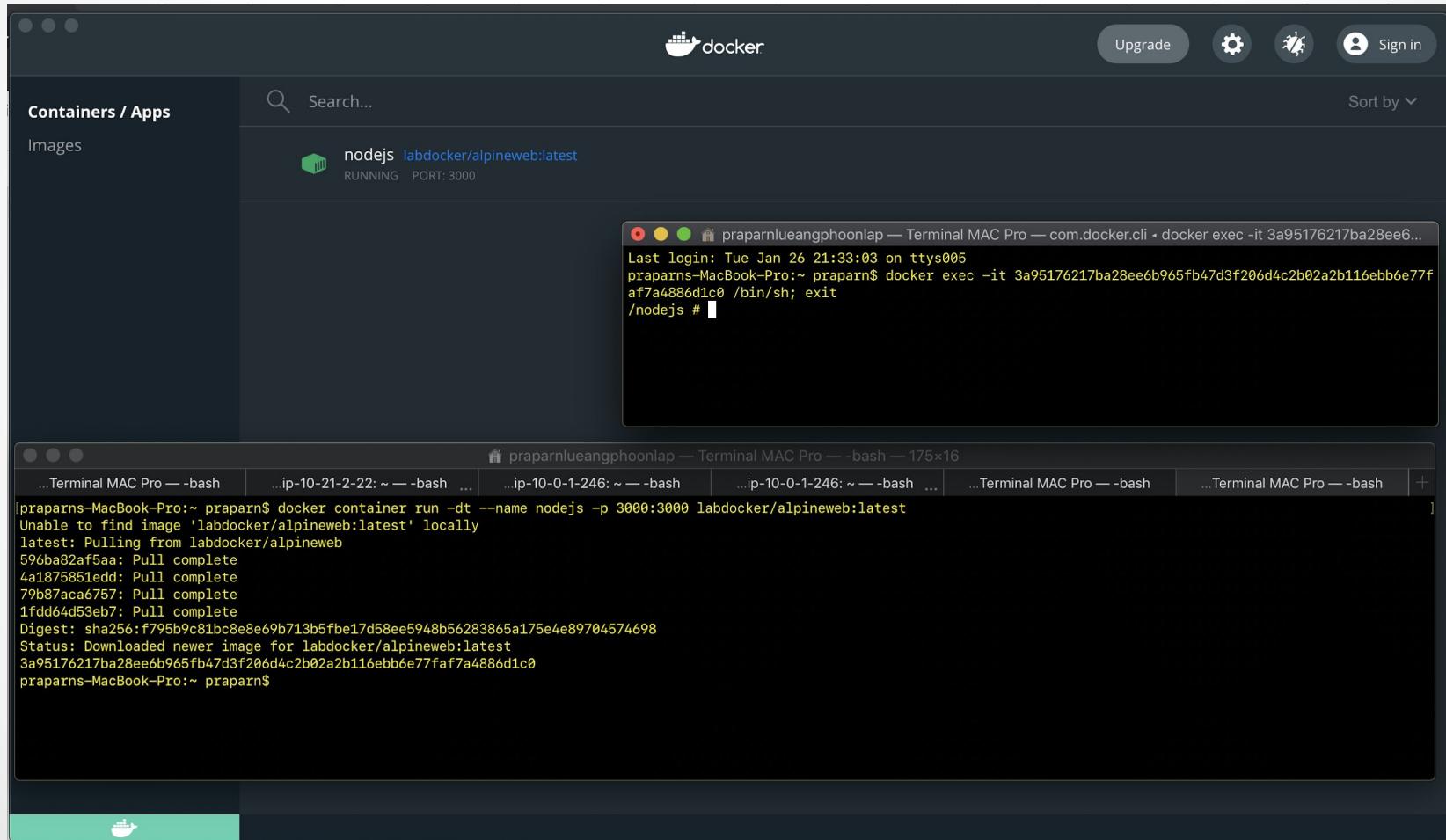
Docker Desktop

- GUI tool for developer/devops on your machine



Docker Desktop

- GUI tool for developer/devops on your machine



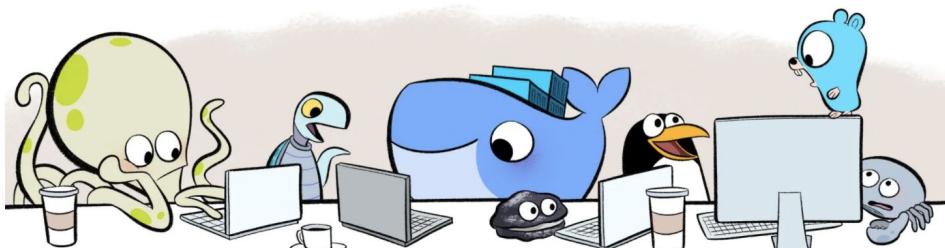
Docker Desktop

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 Part 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

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Outline Part 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