

Microservices

Kittisak Sa-adaem

Project Manager and Senior Data Engineer

GBDi : Government Big Data Institute

Email: kittisak.sa@depa.or.th



Training : Microservices

Morning :

- Introduction 30 mins
- Cloud Technology (GCP) 30 mins
- Microservice Design 30 mins
- Restful API - Preparation 30 mins

Afternoon :

- Restful API - Lab 30 mins (Continue)
- Kong Gateway 60 mins
- Kong Gateway Lab 120 mins



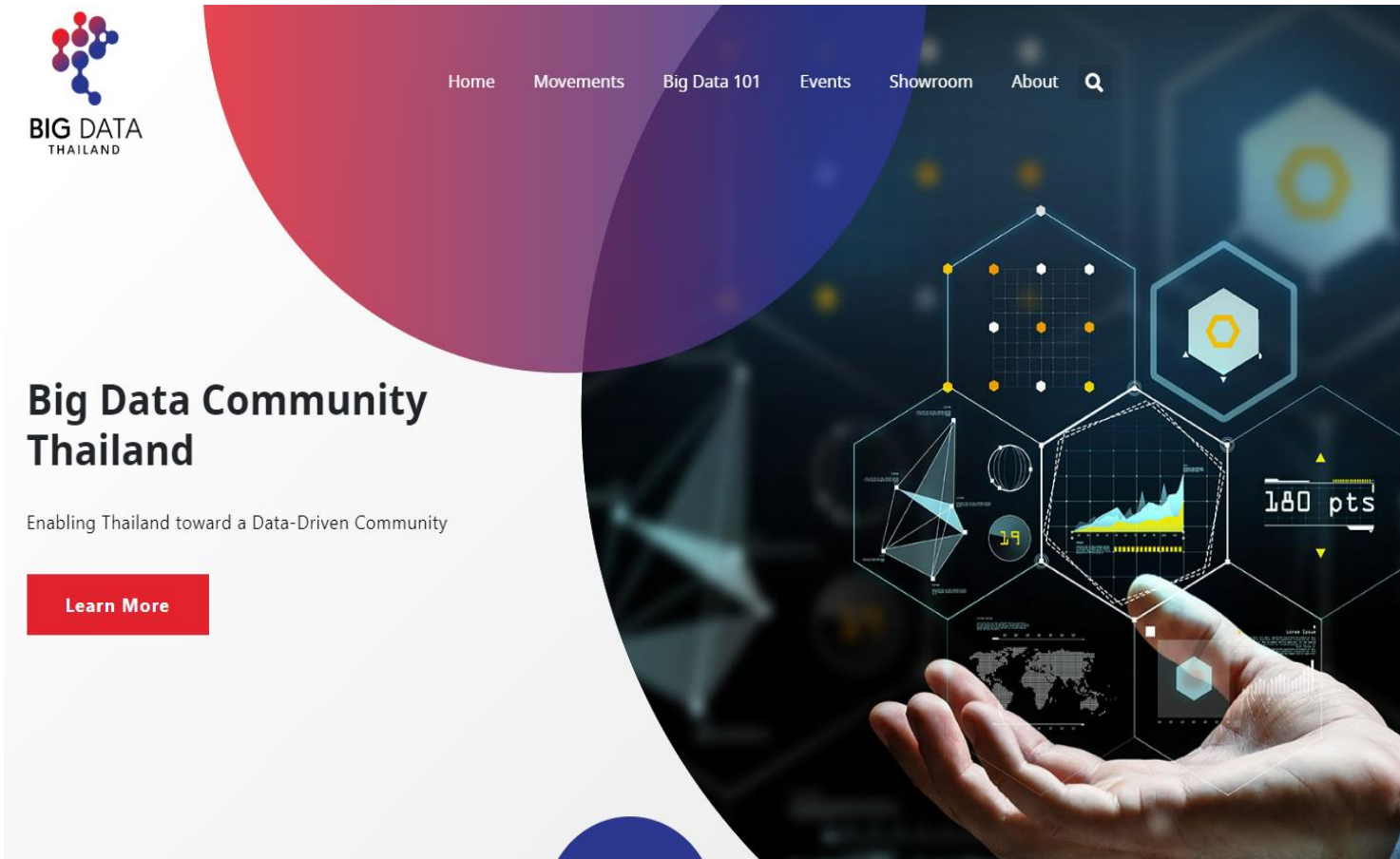
GBDi

Government Big Data Institute

สถาบันส่งเสริมการวิเคราะห์และบริหารข้อมูลขนาดใหญ่ภาครัฐ (สวช.)



<https://bigdata.go.th/>



สถาบันส่งเสริมการวิเคราะห์และ
บริหารข้อมูลขนาดใหญ่ภาครัฐ
(สวช.)

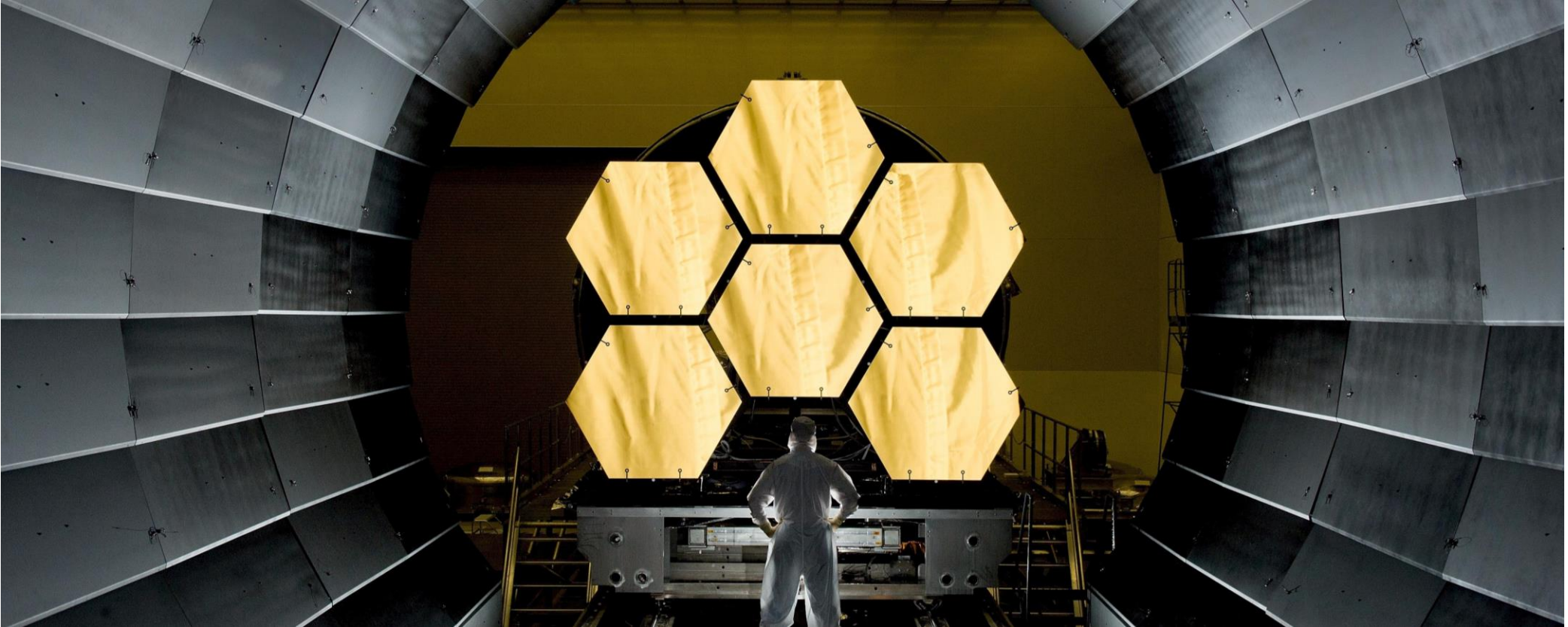
Government Big Data Institute (GBDi)

Address: 80 Lat Phrao 4 Alley, Chom Phon,
Chatuchak, Bangkok 10900

Telephone: 02 026 2333 ext. 2508, 2525, 2528

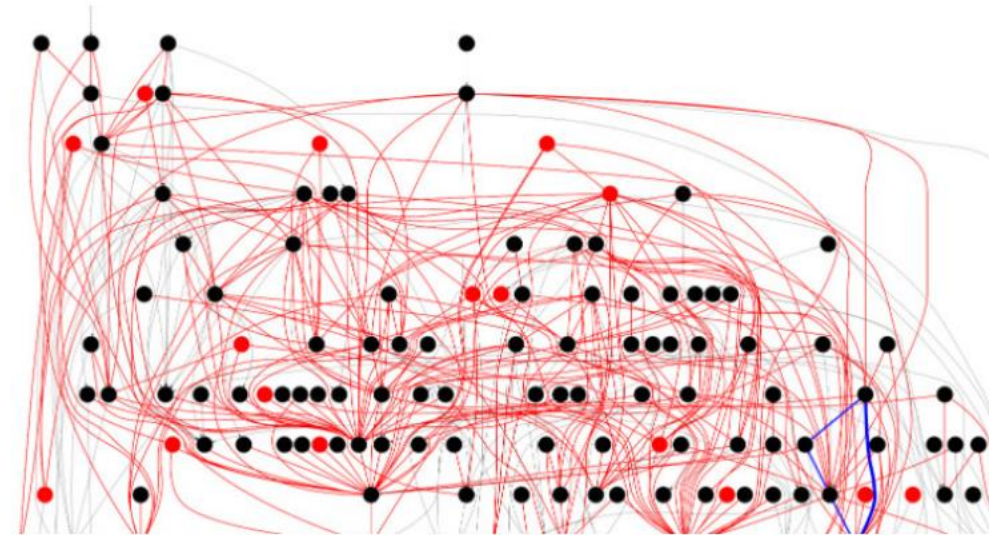
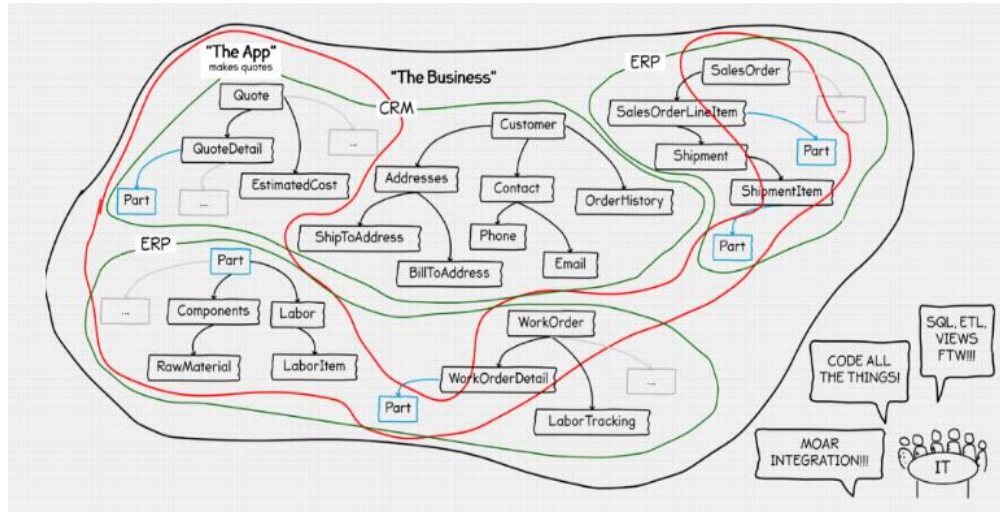
Email: gbdi-info@depa.or.th

Working hours: Mon – Fri . 9.00 – 17.00



Introduction

Architect Hell/Dependency Hell



Microservice : เป็นเทคนิคหนึ่งในการพัฒนาระบบงาน

เพื่อแยกส่วนการทำงานออกเป็น **service** ย่อย ๆ ที่มีขนาดเล็ก (คำถามคือ อะไรคือคำว่าเล็ก ?)

แต่ละ **service** มีการทำงานเพียงอย่างเดียว (Single Responsibility)

แต่ละ **service** ต้องให้ทำงานจบในตัวเอง (Self service) นั่นคือมี **data store** หรือที่จัดเก็บข้อมูลของแต่ละ **service**

ผลที่ได้คือ

Service ง่ายต่อการทำความเข้าใจ

Service ง่ายต่อการพัฒนา

Service ง่ายต่อการทดสอบ

Service ง่ายต่อการ deploy

Service ง่ายต่อการ scale

<https://www.somkiat.cc/microservices-journey/>

Benefit

Micro Services vs. Traditional Apps

Traditional Apps

- Often called "Monolithic Apps"
 - All your code is in one bundle
- Scaling issues
 - Everything or nothing approach
 - Scaling your search system also scales your admin system
 - Not very efficient
- Performance issues
 - One slow part of the code can affect the entire site
- Issues with continuous integration
 - You need to update everything to push a minor change
- Stability issues
 - One bug can bring the entire system down



Micro Services vs. Traditional Apps

Micro Services

A collection of smaller applications all working together to deliver a total experience to the end user.

Increased efficiency

- Splitting your services gives you the ability to scale only the parts of the site that is slow
 - Less wastage of service resource
 - More cost efficient
- An individual slow performing service doesn't slow all services
 - Less user frustration



Benefit

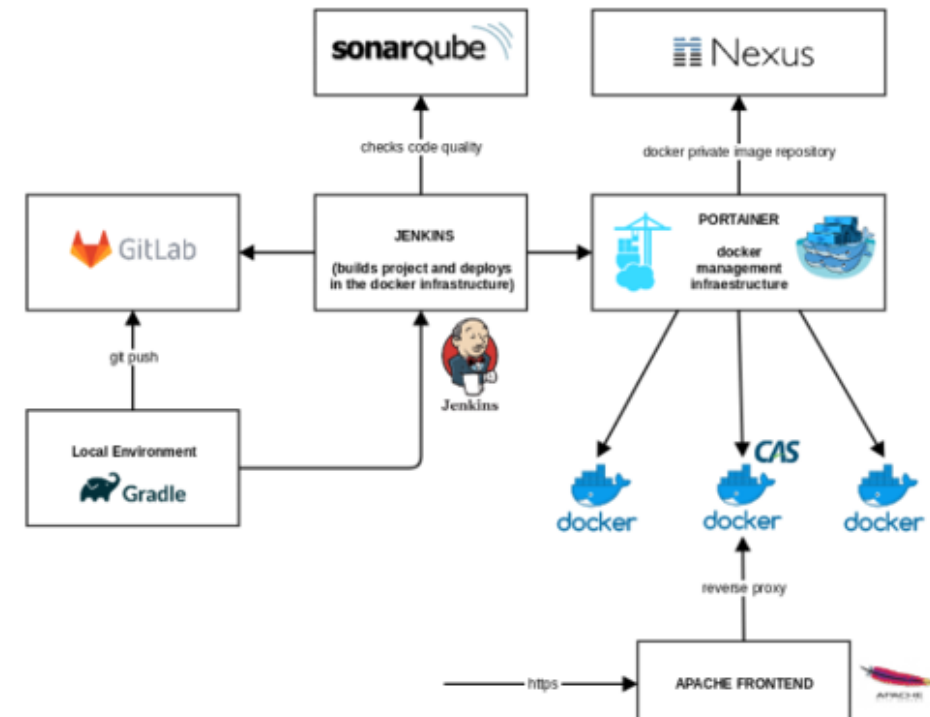
Containers + Micro Services

Why are Containers good for Micro Services?

- Designed to run one application per container
 - Natural separation of work load
- Very lightweight
 - Great for scaling quickly
- Better use of resources
 - Containers share the host OS and where appropriate Binaries and Libraries
- Standard container formats such as Docker are cross linux distro compatible
- Incredible easy to move your work load around
 - Balance your system resources better
 - Allow developers to work in mock production environment
 - Removes the "it worked on my laptop" issue



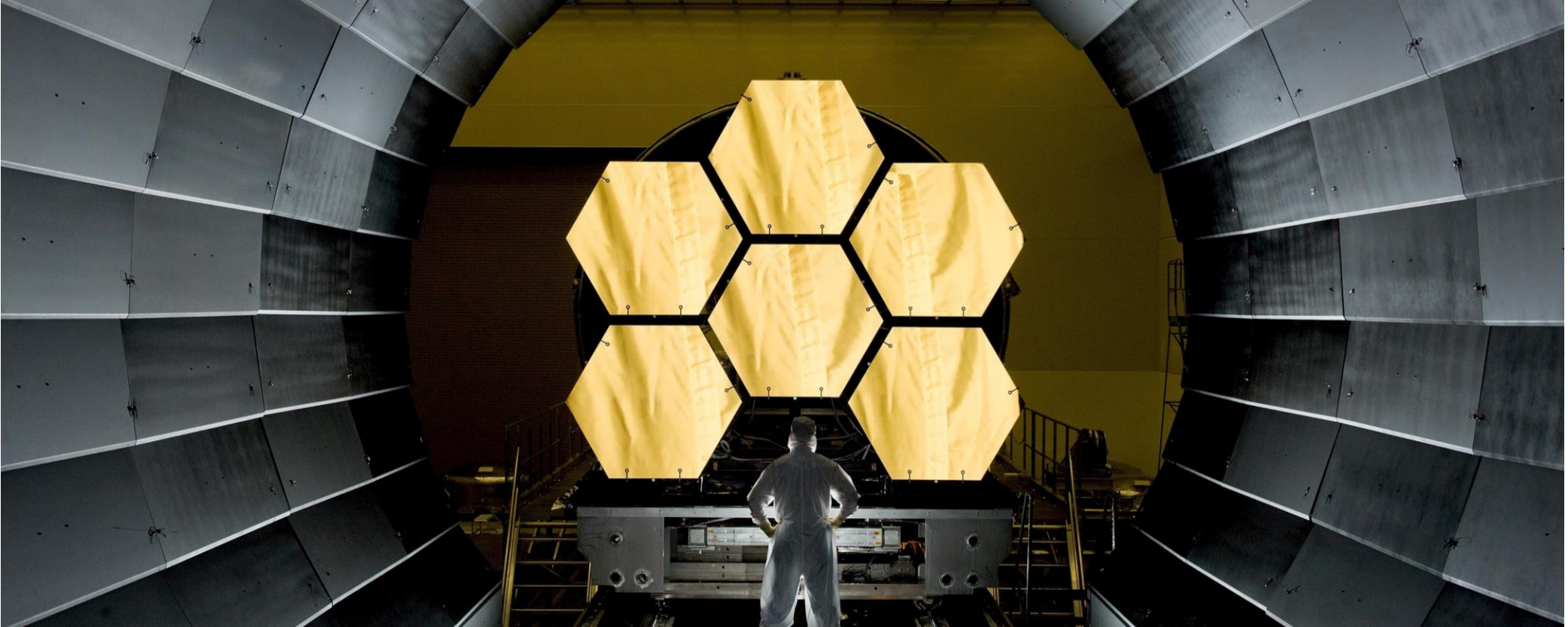
Should Apply CI/CD



Idea

- Large complex application
- Loosely Coupled
- Independent
- Easily Manage and deploy, for example case such as upgrade

<https://haristauqir.com/introduction-to-microservices/>



Cloud Technology (GCP)

Server for training



4 main platforms that can be prepared for this CKAN session, this presentation covers for only AWS EC2 and Google GCE
Please note that to register for Google Cloud, it's must have to register with your real credit card, for AWS, can use virtual card.
Just ensure that for a platform that you are using can access internet and open for SSH and port 5000 be able to connect.

Amazon AWS Register (Free 750 hours per month for 1 year with Linux on t2.micro – 1GB RAM):

Google GCP Register (\$300 for first 12 months, always Free of f1.micro – 0.6 GB RAM): <https://cloud.google.com/free>

VMWare Player download: https://my.vmware.com/en/web/vmware/free#desktop_end_user_computing/vmware_workstation_player/15_0

Ubuntu 16.04 for VMWare: <https://www.linuxvmimages.com/images/ubuntu-1604/>

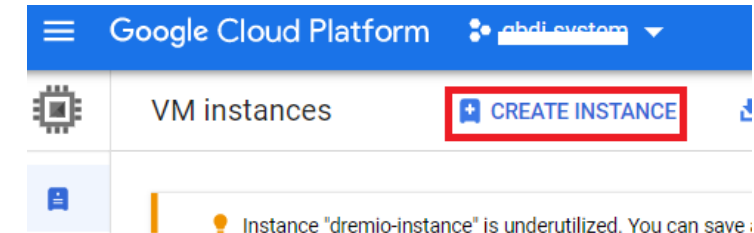
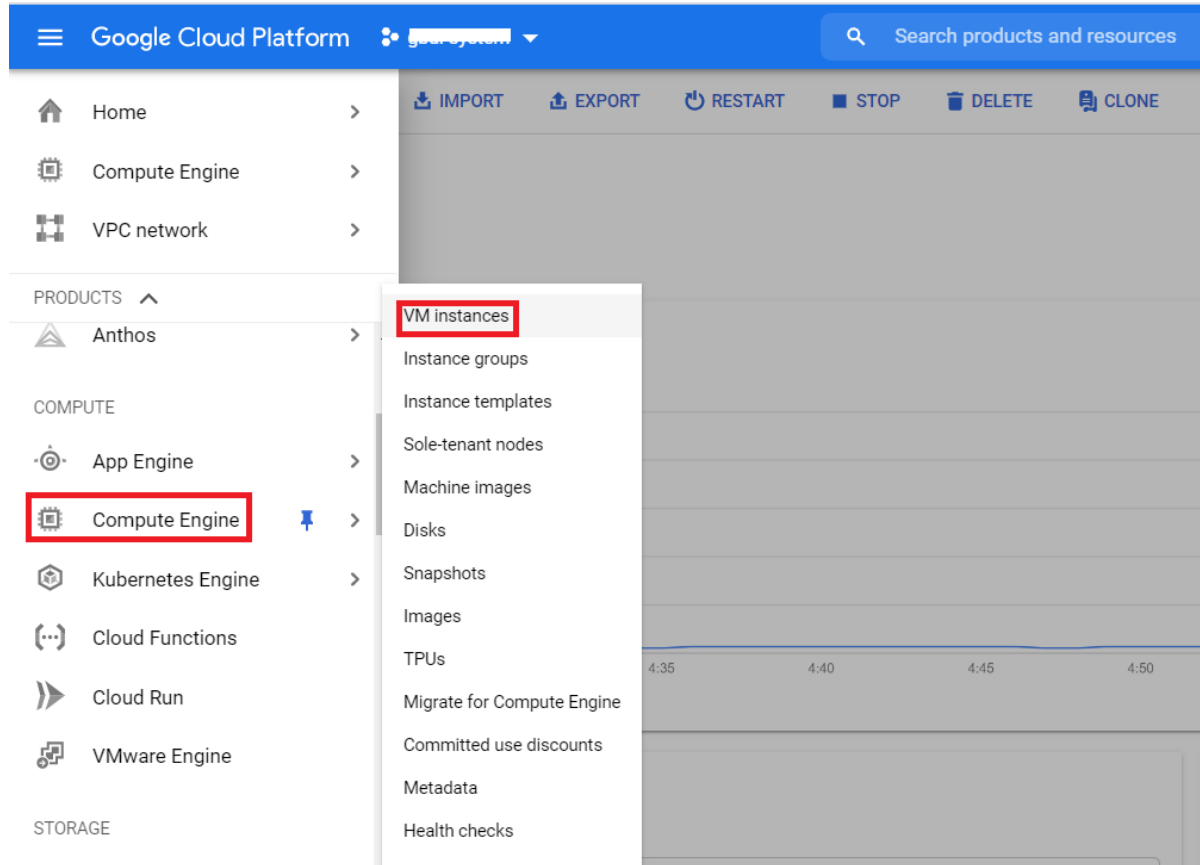
VirtualBox download: <https://www.virtualbox.org/wiki/Downloads>

Ubuntu 16.04 for VirtualBox: <https://www.linuxvmimages.com/images/ubuntu-1604/>

Reference for Free Tier comparison: <https://mytechdecisions.com/it-infrastructure/comparing-price-amazon-web-services-aws-google-cloud/>

Workshop – Compute Engine (GCE)

Open Compute Engine Screen and Click Create Instance



Workshop – Compute Engine (GCE)

Rename , select region and specify machine type

← Create an instance

To create a VM instance, select one of the options:

- New VM instance**
Create a single VM instance from scratch
- New VM instance from template**
Create a single VM instance from an existing template
- New VM instance from machine image**
Create a single VM instance from an existing machine image
- Marketplace**
Deploy a ready-to-go solution onto a VM instance

Name ⓘ
Name is permanent
instance-1

Labels ⓘ (Optional)
+ Add label

Region ⓘ
Region is permanent
us-central1 (Iowa)

Zone ⓘ
Zone is permanent
us-central1-a

Machine configuration

Machine family
General-purpose | Memory-optimized | Compute-optimized
Machine types for common workloads, optimized for cost and flexibility

Series
E2
CPU platform selection based on availability

Machine type
e2-medium (2 vCPU, 4 GB memory)

vCPU	Memory	GPUs
1 shared core	4 GB	-

☒ CPU platform and GPU

Confidential VM service ⓘ
☐ Enable the Confidential Computing service on this VM instance.

Container ⓘ
☐ Deploy a container image to this VM instance. [Learn more](#)

Custom
Select vCPU cores and memory

Shared core

- e2-micro
2 vCPU, 1 GB memory
- e2-small
2 vCPU, 2 GB memory
- ☒ e2-medium
2 vCPU, 4 GB memory

Standard

- e2-standard-2
2 vCPU, 8 GB memory
- e2-standard-4
4 vCPU, 16 GB memory
- e2-standard-8
8 vCPU, 32 GB memory
- e2-standard-16
16 vCPU, 64 GB memory
- e2-standard-32

Workshop – Compute Engine (GCE)

Select machine image (OS) and allow traffic HTTP and HTTPS

⌵ CPU platform and GPU

Confidential VM service ?

☐ Enable the Confidential Computing service on this VM instance.

Container ?

☐ Deploy a container image to this VM instance. [Learn more](#)

Boot disk ?



New 10 GB standard persistent disk

Image

Debian GNU/Linux 10 (buster)

Change

Identity and API access ?

Service account ?

Compute Engine default service account

Access scopes ?

☒ Allow default access

☐ Allow full access to all Cloud APIs

☐ Set access for each API

Firewall ?

Add tags and firewall rules to allow specific network traffic from the Internet

☒ Allow HTTP traffic

☒ Allow HTTPS traffic

⌵ Management, security, disks, networking, sole tenancy

You will be billed for this instance. [Compute Engine pricing](#)

Create

Cancel

Boot disk

Select an image or snapshot to create a boot disk; or attach an existing disk. Can't find

Public images

Custom images

Snapshots

Existing disks

Operating system

Ubuntu

Version

Ubuntu 16.04 LTS

☒ Ubuntu 16.04 LTS

amd64 xenial image built on 2020-09-16, supports Shielded VM features

Ubuntu 18.04 LTS

amd64 bionic image built on 2020-09-16, supports Shielded VM features

Ubuntu 20.04 LTS

amd64 focal image built on 2020-09-07, supports Shielded VM features

Ubuntu 16.04 LTS Minimal

amd64 xenial minimal image built on 2020-09-08, supports Shielded VM ...

Ubuntu 18.04 LTS Minimal

amd64 bionic minimal image built on 2020-09-08, supports Shielded VM ...


Ubuntu 20.04 LTS Minimal

amd64 focal minimal image built on 2020-09-07, supports Shielded VM f...

Workshop – Compute Engine (GCE)

Click Create and wait for the instance is ready with running status , click SSH to open Secure Shell

Boot disk ?



New 10 GB standard persistent disk
Image
Ubuntu 16.04 LTS

Change

Identity and API access ?

Service account ?
Compute Engine default service account

Access scopes ?

- ☒ Allow default access
- ☐ Allow full access to all Cloud APIs
- ☐ Set access for each API

Firewall ?

Add tags and firewall rules to allow specific network traffic from the Internet

- ☒ Allow HTTP traffic
- ☒ Allow HTTPS traffic

[Management, security, disks, networking, sole tenancy](#)

You will be billed for this instance. [Compute Engine pricing](#)

Create Cancel

Google Cloud Platform gbd-system Search products and resources

VM instances CREATE INSTANCE IMPORT VM REFRESH START / RESUME STOP SUSPEND RESET DELETE

Instance "dremio-instance" is underutilized. You can save an estimated \$78 per month by switching to the machine type: e2-custom (4 vCPUs, 22 GB memory). [Learn more](#)

Name	Zone	Creation time	Machine type	Recommendation	In use by	Internal IP	External IP	Connect
<input checked="" type="checkbox"/> data-engineer	us-central1-a	Sep 18, 2020, 5:41:33 AM	2 vCPUs, 1 GB			10.128.0.8 (nic0)	34.69.201.108	SSH

```
gbd@data-engineer: ~ - Google Chrome
ssh.cloud.google.com/projects/gbd-system/zones/us-central1-a/instances/data-engineer?useAdmin
Connected, host fingerprint: ssh-rsa 0 1B:1A:E5:24:0C:14:11:EB:E7:21:EE:9C:1B:24
54:E7:2F:01:52:C2:09:BD:59:28:32:36:6A:2B:80:28:61:7D
Welcome to Ubuntu 16.04.7 LTS (GNU/Linux 4.15.0-1083-gcp x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

0 packages can be updated.
0 updates are security updates.

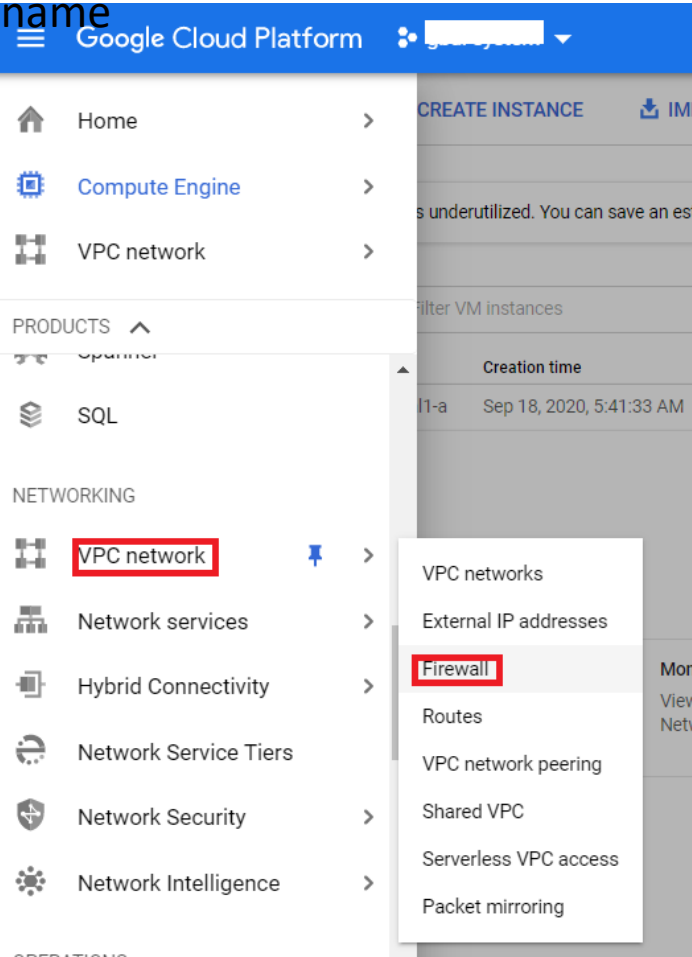
The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

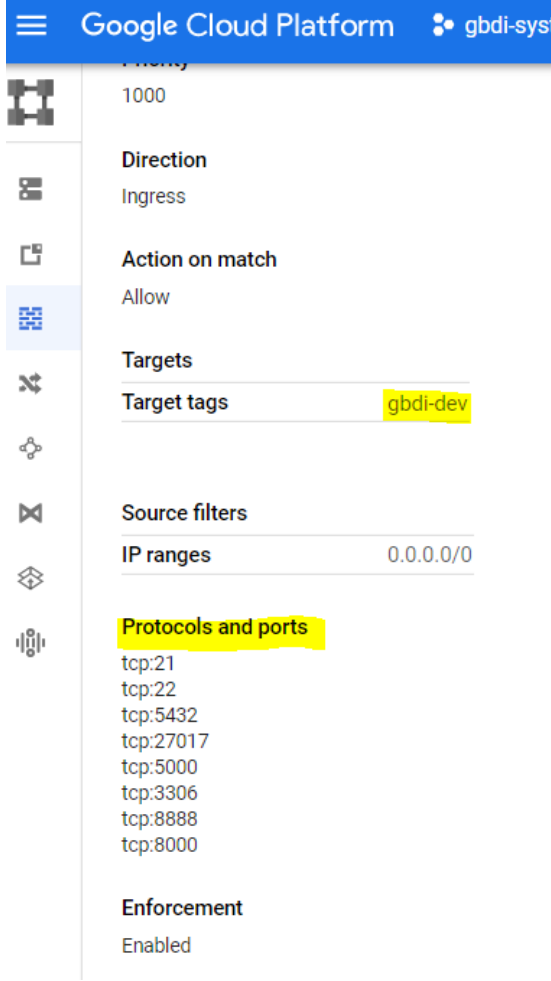
gbd@data-engineer:~$
```


Workshop – Compute Engine (GCE)

Open VPC network for configure Firewall

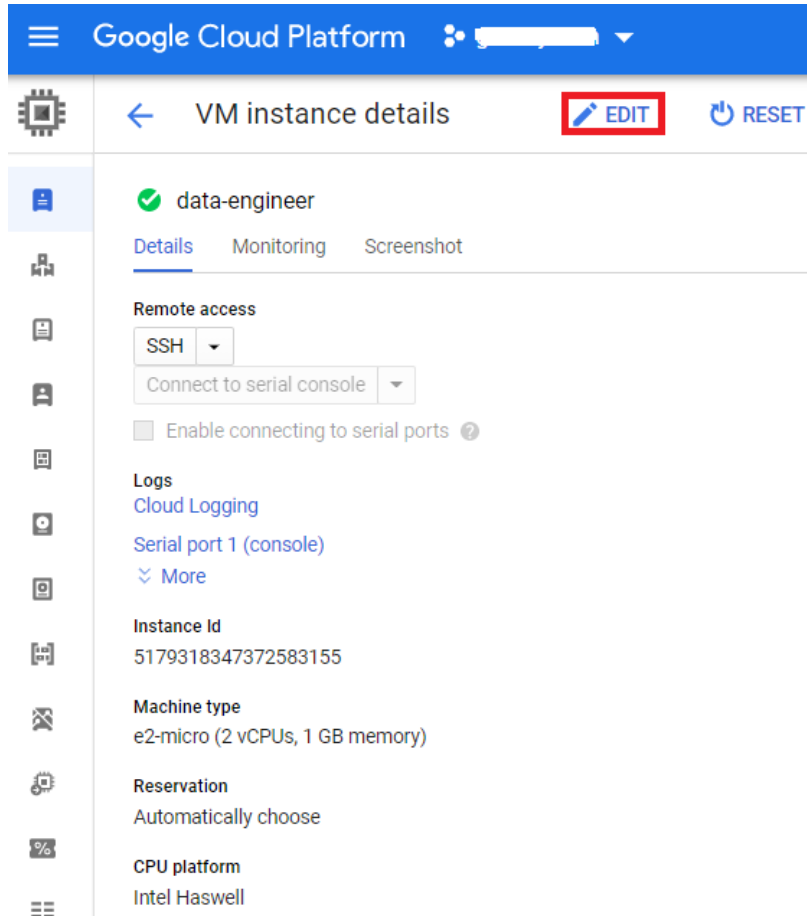


Cerate new rule for required port and give tags

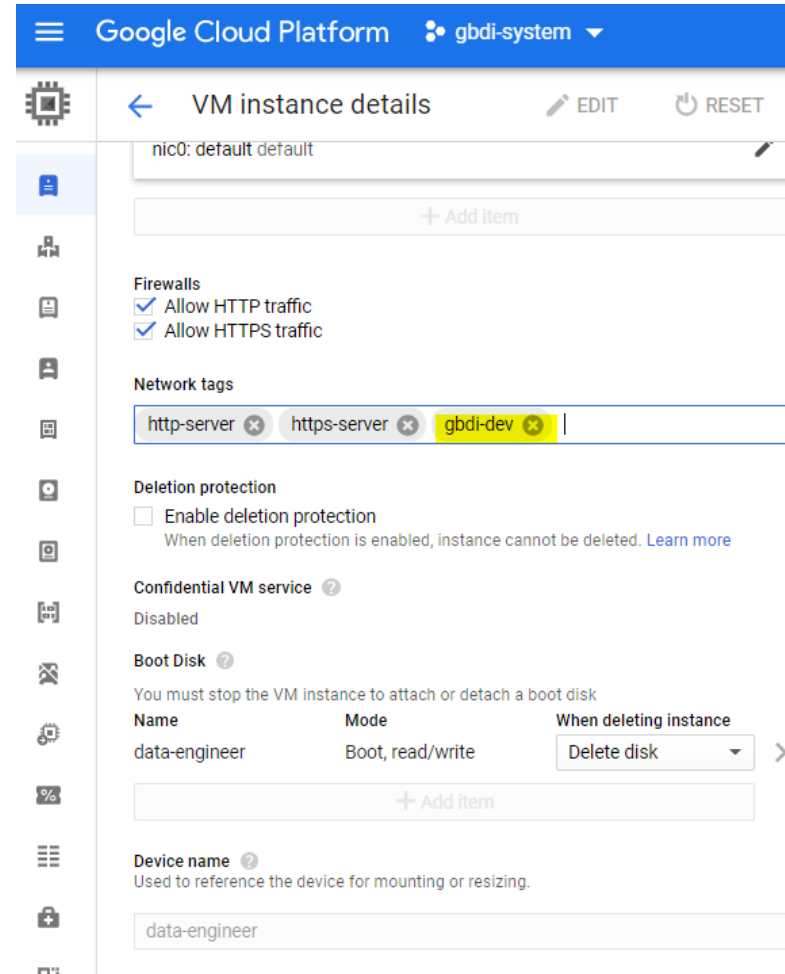


Workshop – Compute Engine (GCE)

Back to your instance and click EDIT



Add tag of the new firewall rule that just crated and save



Workshop – Compute Engine (GCE)

For STOP, SUSPEND, RESET and DELETE instance

Google Cloud Platform

VM instances

CREATE INSTANCE IMPORT VM REFRESH START / RESUME STOP SUSPEND RESET DELETE

Instance "dremio-instance" is underutilized. You can save an estimated \$78 per month by switching to the machine type: e2-custom (4 vCPUs, 22 GB memory). [Learn more](#)


Filter VM instances


Name ^	Zone	Creation time	Machine type	Recommendation	In use by	Internal IP	External IP	Connect
data-engineer	us-central1-a	Sep 18, 2020, 5:41:33 AM	2 vCPUs, 1 GB			10.128.0.8 (nic0)	34.69.201.108	SSH


Workshop – Compute Engine (GCE)


How to calculate price : <https://cloud.google.com/products/calculator>


Google Cloud Pricing Calculator
Prices are up to date. Last update: 17 September 2020



COMPUTE ENGINE



APP ENGINE



KUBERNETES ENGINE



CLOUD RUN


VMWARE ENGINE


CLOUD STORAGE


NETWORKING EGRESS


CLOUD LOAD BALANCING


INTELLIGENT CLOUD

Search for a product you are interested in.

Instances

Number of instances *

What are these instances for?

Operating System / Software

Free: Debian, CentOS, CoreOS, Ubuntu, or other User Provided OS

Machine Class

Regular

Machine Family

General purpose

Series

N1

Machine type

Estimate

Compute Engine

1 x

730 total hours per month

VM class: regular

Instance type: e2-micro

Region: Iowa

Estimated Component Cost: USD 6.11 per 1 month

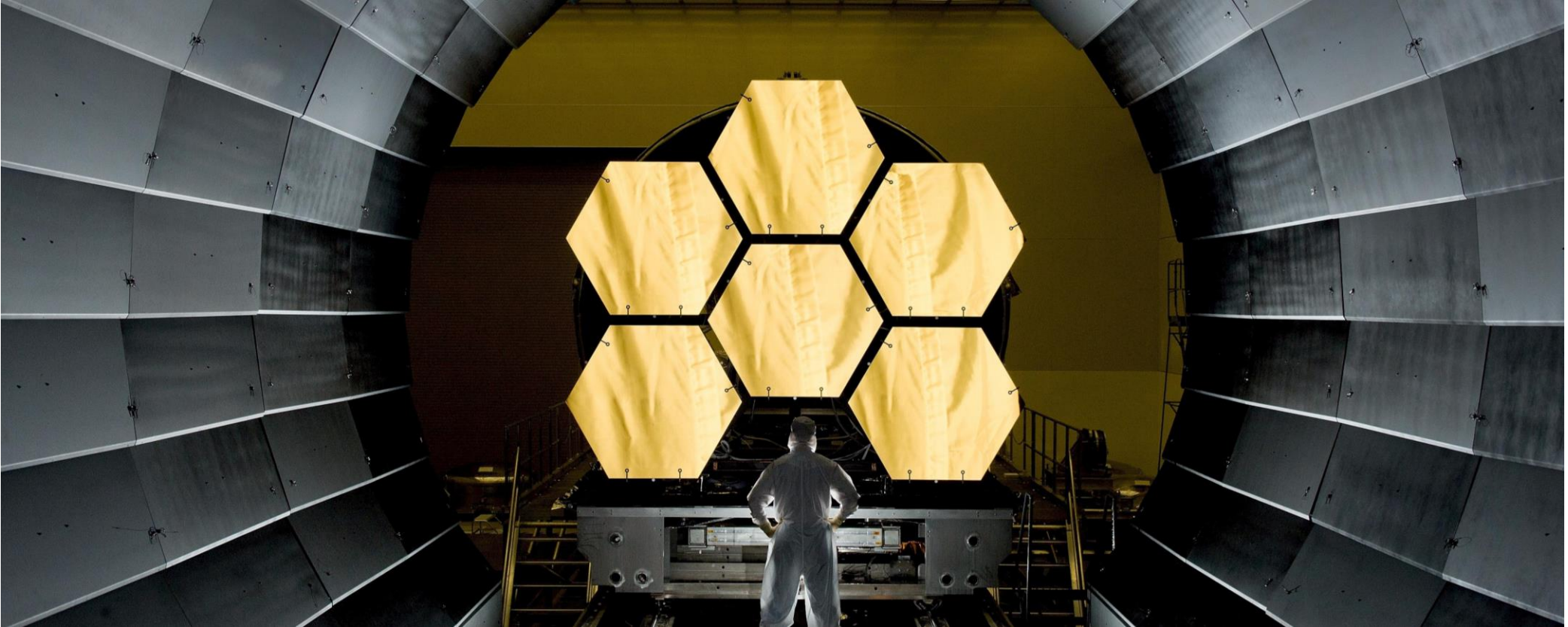
Total Estimated Cost: USD 6.11 per 1 month

Estimate Currency

USD - US Dollar

EMAIL ESTIMATE

SAVE ESTIMATE

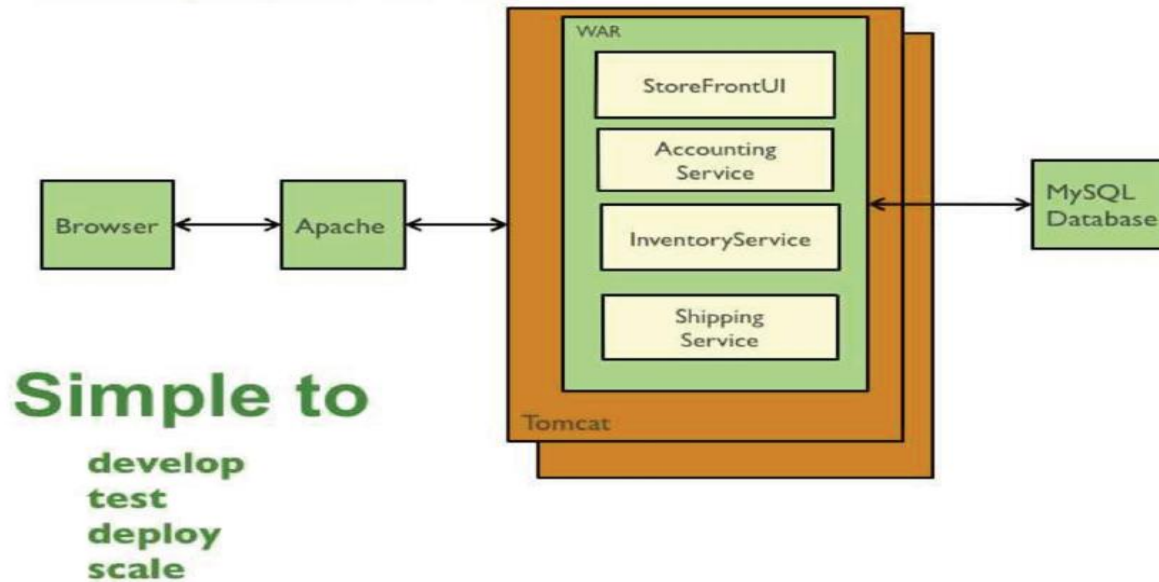


Microservices Design

Monolithic Application

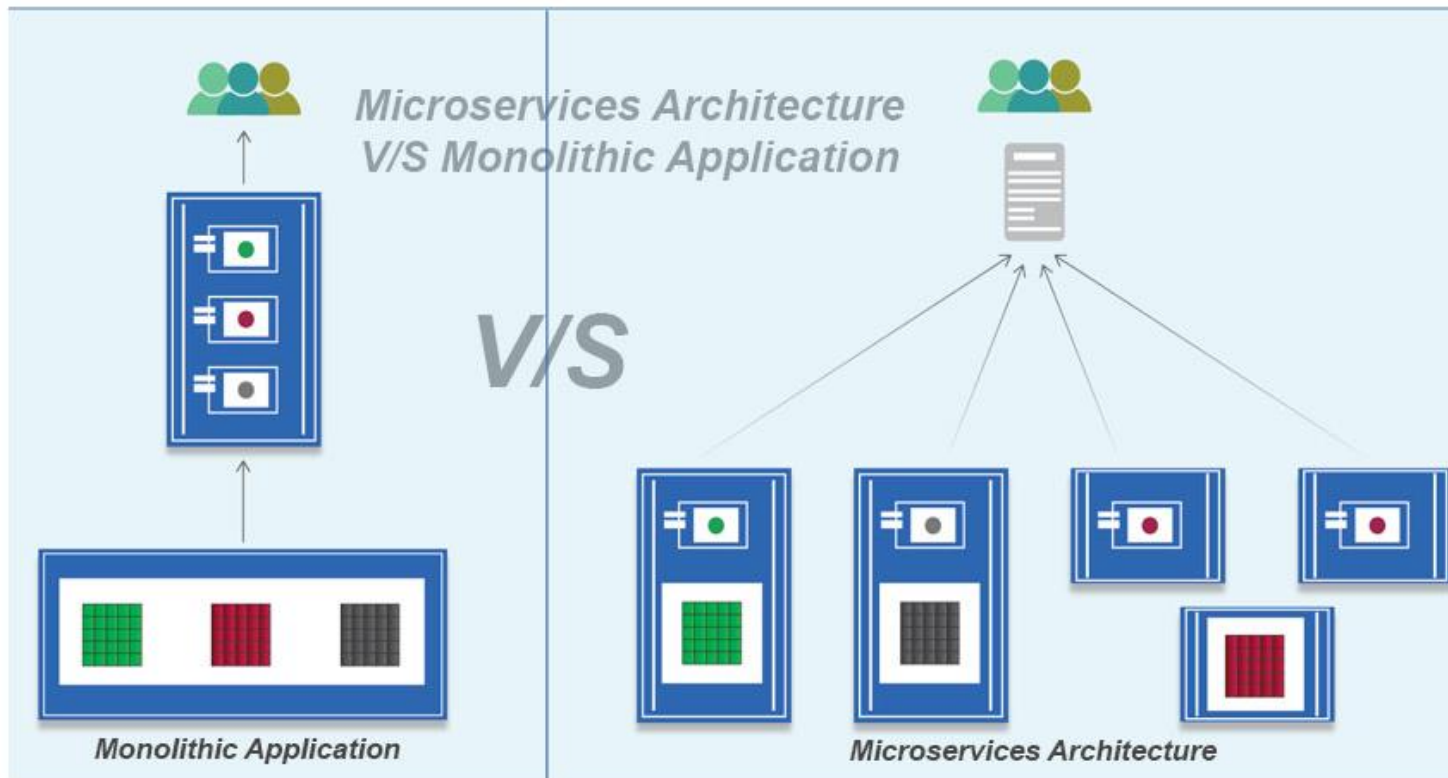
Monolithic Architecture

Traditional web application architecture



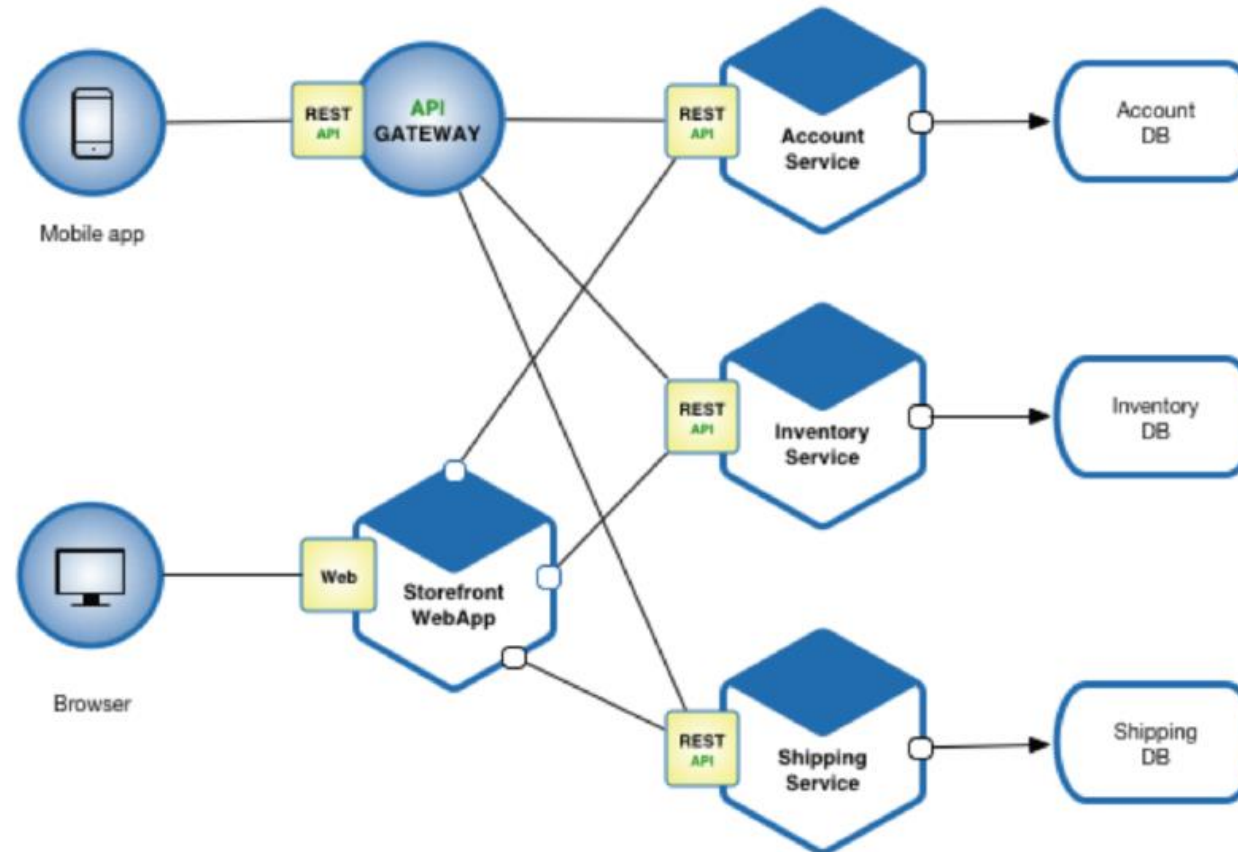
<https://haristauqir.com/introduction-to-microservices/>

Transition From Monolith to Microservices



Service ง่ายต่อการทำความเข้าใจ
 Service ง่ายต่อการพัฒนา
 Service ง่ายต่อการทดสอบ
 Service ง่ายต่อการ deploy
 Service ง่ายต่อการ scale

Microservice Architecture



Why Microservices ?

1. Code can be broken out into smaller microservices that are easier to learn, release and update.
 2. Individual microservices can be written using the best tools for the job.
 3. Releasing a new service doesn't require synchronization across a whole company.
 4. New technology stacks have lower risk since the service is relatively small.
 5. Developers can run containers locally, rebuilding and verifying after each commit on a system that mirrors production.
 6. Both Docker and Kubernetes are open source and free to use.
 7. Access to Docker hub leverages the work of the opensource community.
 8. Service isolation without the heavyweight VM. Adding a service to a server does not affect other services on the server.
 9. Services can be more easily run on a large cluster of nodes making it more reliable.
 10. Some clients will only host in private and not on public clouds.
- There is a cost for running microservices - the build and runtime becomes more complex. This is part of the price to pay and if you've made the right decision in your context, then benefits will exceed the costs.

Trade off

Monitoring, logging, tracing, infrastructure, testing, deployment, etc.

Team topologies

Team cognitive load

Complexity

Organizational culture

Decomposition application

- ● Decompose by business capability
 - Mapping from business boundaries, User journey
- ● Decompose by subdomain
 - Use Domain driven design
- ● Self-contained service
 - Design a service that can respond to synchronous request
 - Collaborate with other using CQRS
- ● Service per team
 - Each service owned by a team, sole responsibility for making changes

Microservice Thai Guru

คำถามต่อมาคือ ขนาดของ service จะมีขนาดเล็ก มันต้องเล็กเพียงใด ?

จากข้างต้นบอกว่า แต่ละ service ต้องมีทีมที่ดูแล เรียกว่า Cross-functional team
ดังนั้นขนาดของ service จะใหญ่เพียงใดนั้น
ตอบได้ง่าย ๆ คือ ทีมนั้น ๆ สามารถดูแล service ได้หรือไม่ ? (You build it, You run it)
ระบบงานที่เราสร้างมานั้น ไม่ได้เน้นไปที่จำนวน feature ให้ใช้งาน
แต่เน้นไปที่คุณค่าของระบบงานที่ให้ทางผู้ใช้งานและ business
รวมทั้งขนาดของ service ที่เล็ก จะยิ่งช่วยให้
ทีมพัฒนาและผู้ใช้งาน รวมทั้ง business ใกล้ชิดกันมากขึ้น
ซึ่งมันส่งผลดีต่อทุกฝ่าย

ต้อง Balance ทีมและการแยก Microservices ดีๆ

จะจัดการการตรวจสอบปัญหาได้ยากเมื่อข้ามระบบฐานข้อมูลได้

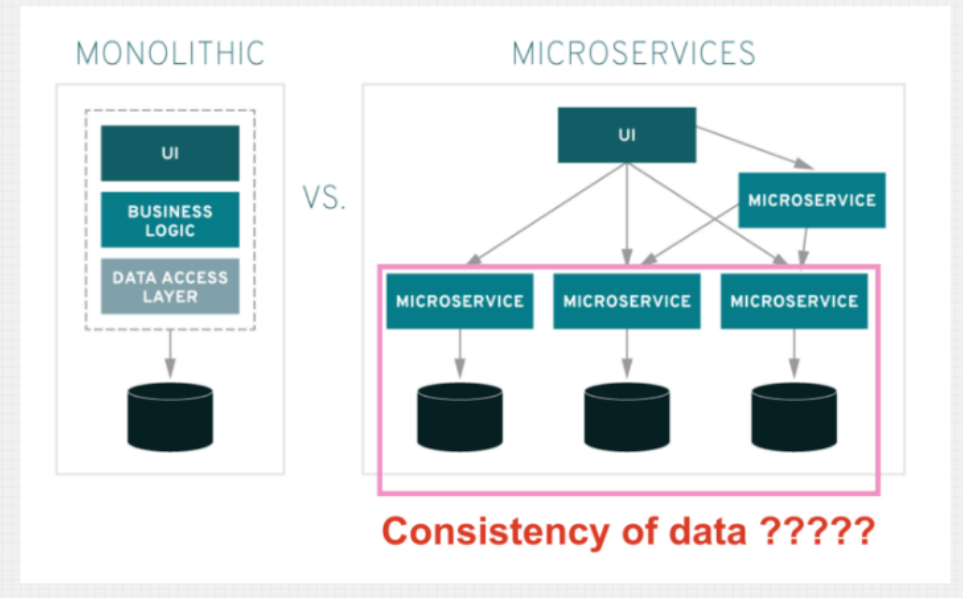
<https://www.somkiat.cc/microservices-journey/>

เนื่องจากแต่ละ service นั้นต้องมี data store หรือที่จะเก็บข้อมูลเป็นของตัวเอง

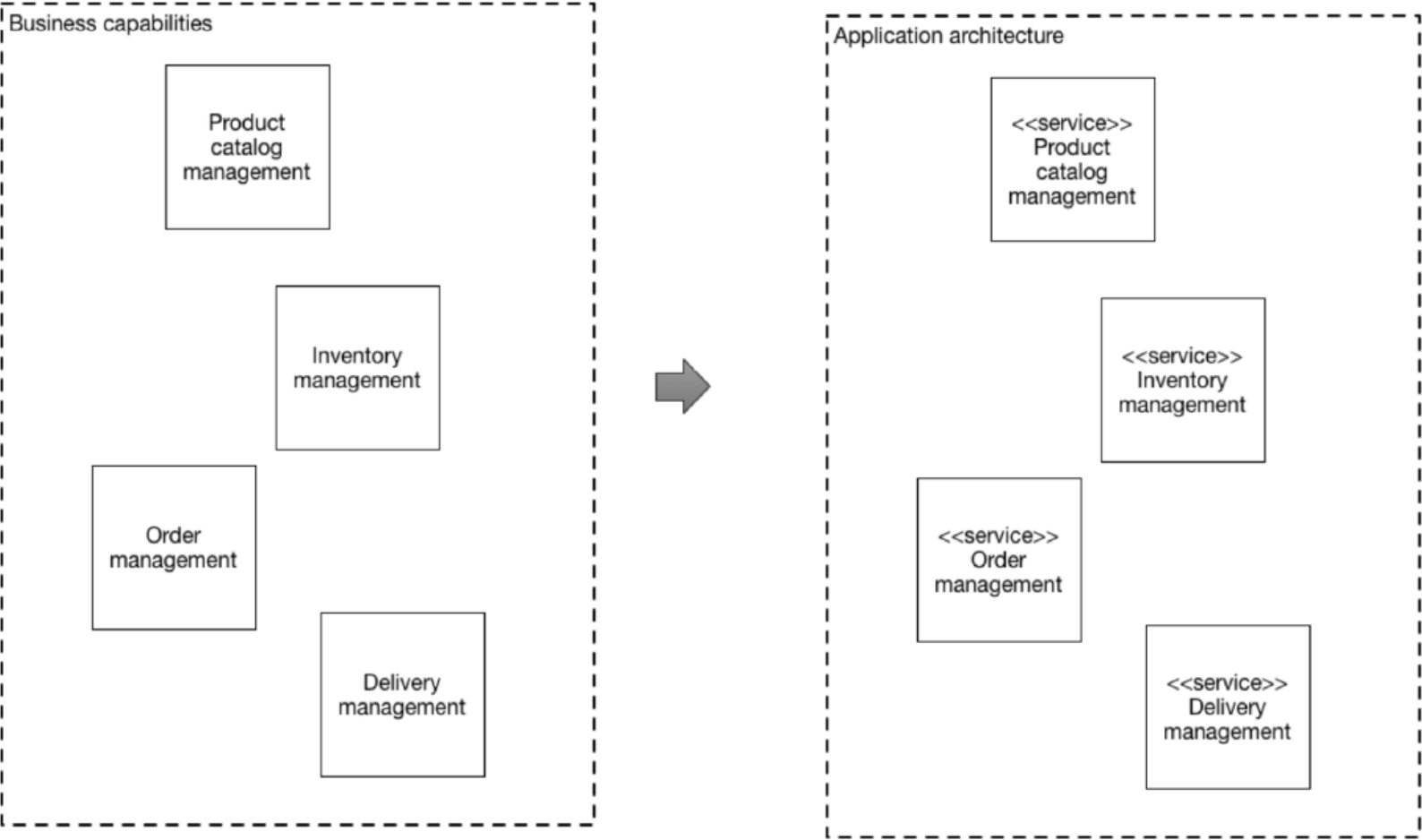
มันทำให้เกิดคำถามหนึ่งขึ้นมาคือ
เราจัดการความถูกต้องของข้อมูลกันอย่างไร
ถ้าข้อมูลเหล่านั้นถูกใช้งานข้าม service ?

ปล. ปัญหานี้จะไม่เกิดในระบบ Monolithic อย่างแน่นอน

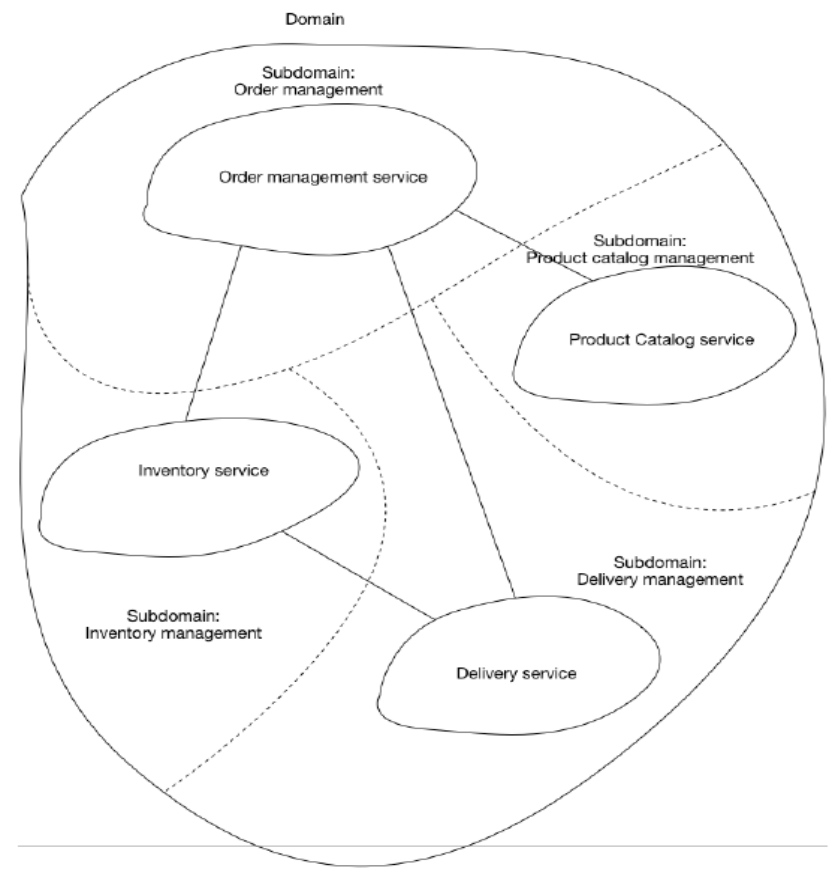
แสดงดังรูป



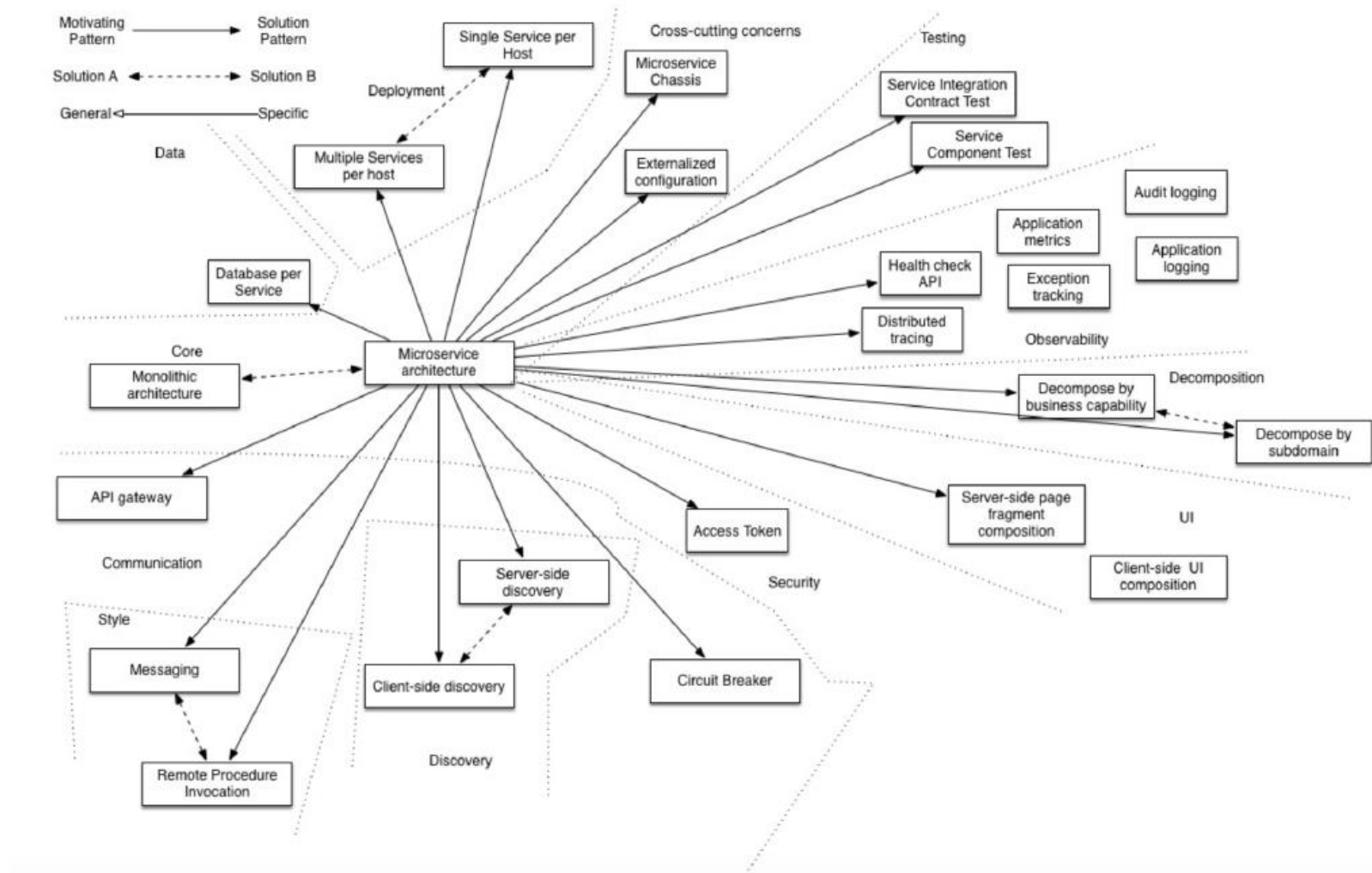
Decompose by business capability

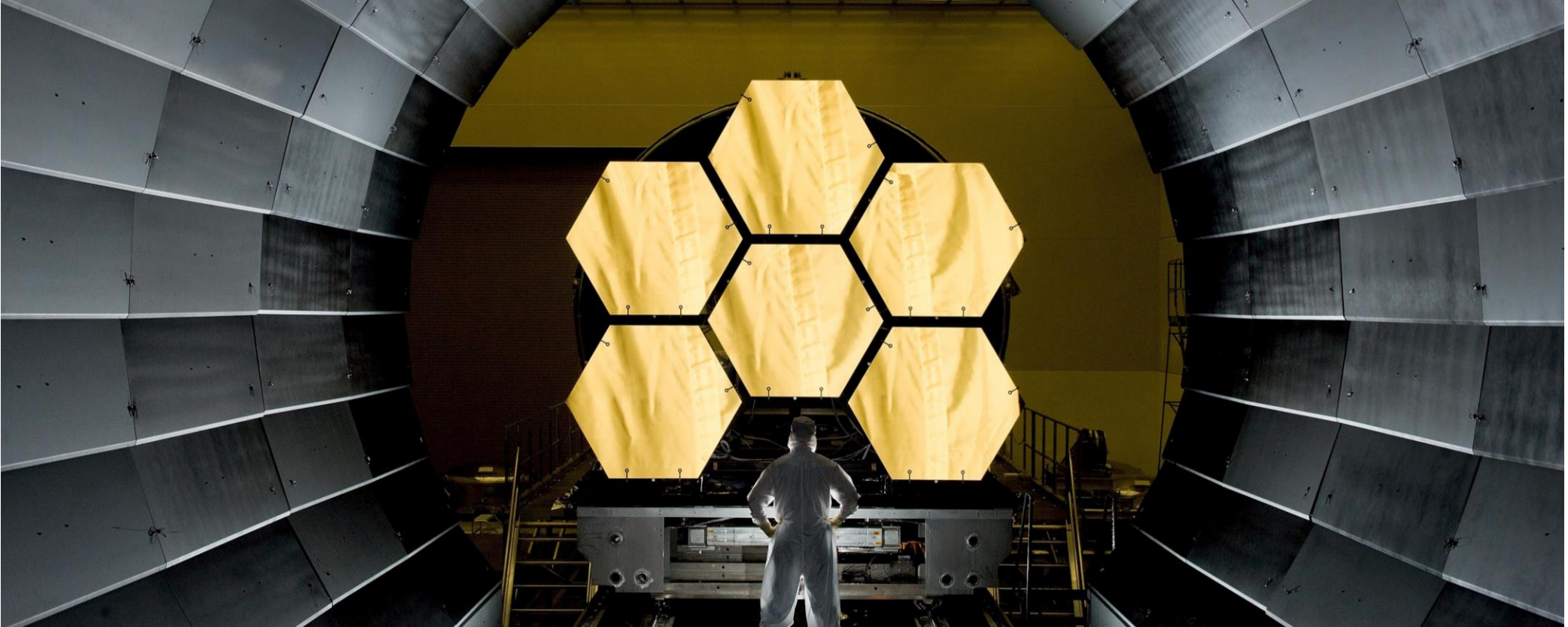


Decompose by domain-driven design subdomain



Related patterns





Restful API

Request / Responses

<https://reqres.in/>

GET	LIST USERS
GET	SINGLE USER
GET	SINGLE USER NOT FOUND
GET	LIST <RESOURCE>
GET	SINGLE <RESOURCE>
GET	SINGLE <RESOURCE> NOT FOUND
POST	CREATE
PUT	UPDATE
PATCH	UPDATE
DELETE	DELETE

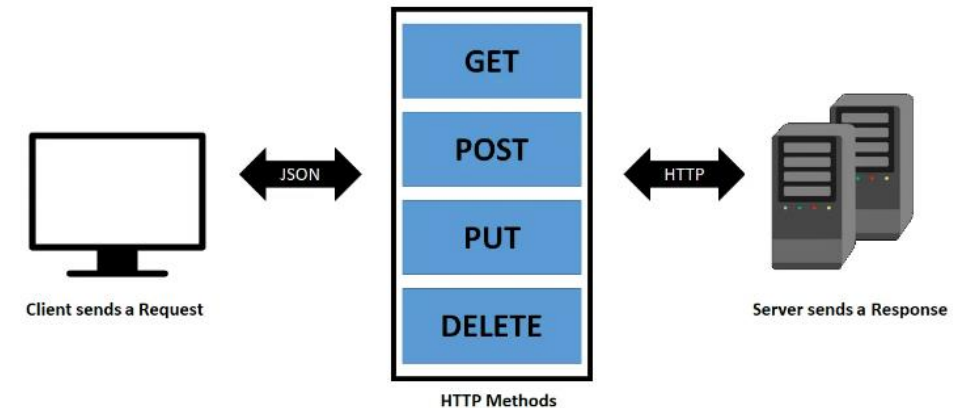
Request
[/api/users?page=2](https://reqres.in/api/users?page=2)

Response
200

```

{
  "page": 2,
  "per_page": 6,
  "total": 12,
  "total_pages": 2,
  "data": [
    {
      "id": 7,
      "email": "michael.lawson@reqres.",
      "first_name": "Michael",
      "last_name": "Lawson",
      "avatar": "https://reqres.in/img"
    },
    {
      "id": 8,
      "email": "lindsay.ferguson@reqre",
      "first_name": "Lindsay",
      "last_name": "Ferguson",
      "avatar": "https://reqres.in/img"
    },
    {
      "id": 9,
      "email": "tobias.funke@reqres.in",
      "first_name": "Tobias",
      "last_name": "Funke",
      "avatar": "https://reqres.in/img"
    }
  ]
}

```



What is REST

As stated earlier, REST stands for Representational State Transfer. It is a simple way of sending and receiving data between client and server. It doesn't require any software or standards to transfer data. It has a predefined structure to do the API call. Developers just need to use the predefined way and pass their data as JSON payload.

FastAPI 0.1.0 OAS3

/openapi.json

default

GET	/	Read Root	▼
GET	/items/{item_id}	Read Item	▼
PUT	/items/{item_id}	Update Item	▼
PUT	/service1/{item_id}	Update Item	▼
PUT	/service2/{item_id}	Update Item	▼

Schemas

HTTPValidationError >

Item >

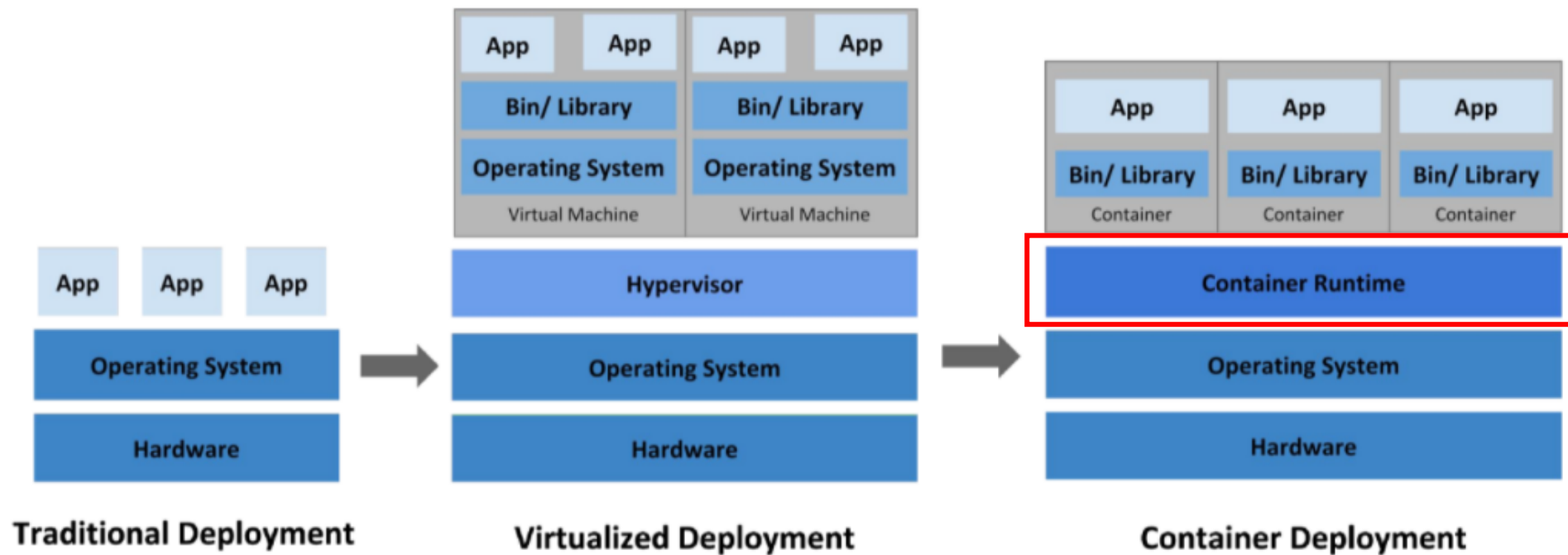
ValidationError >

Modern Infrastructure

Docker “Software Container”

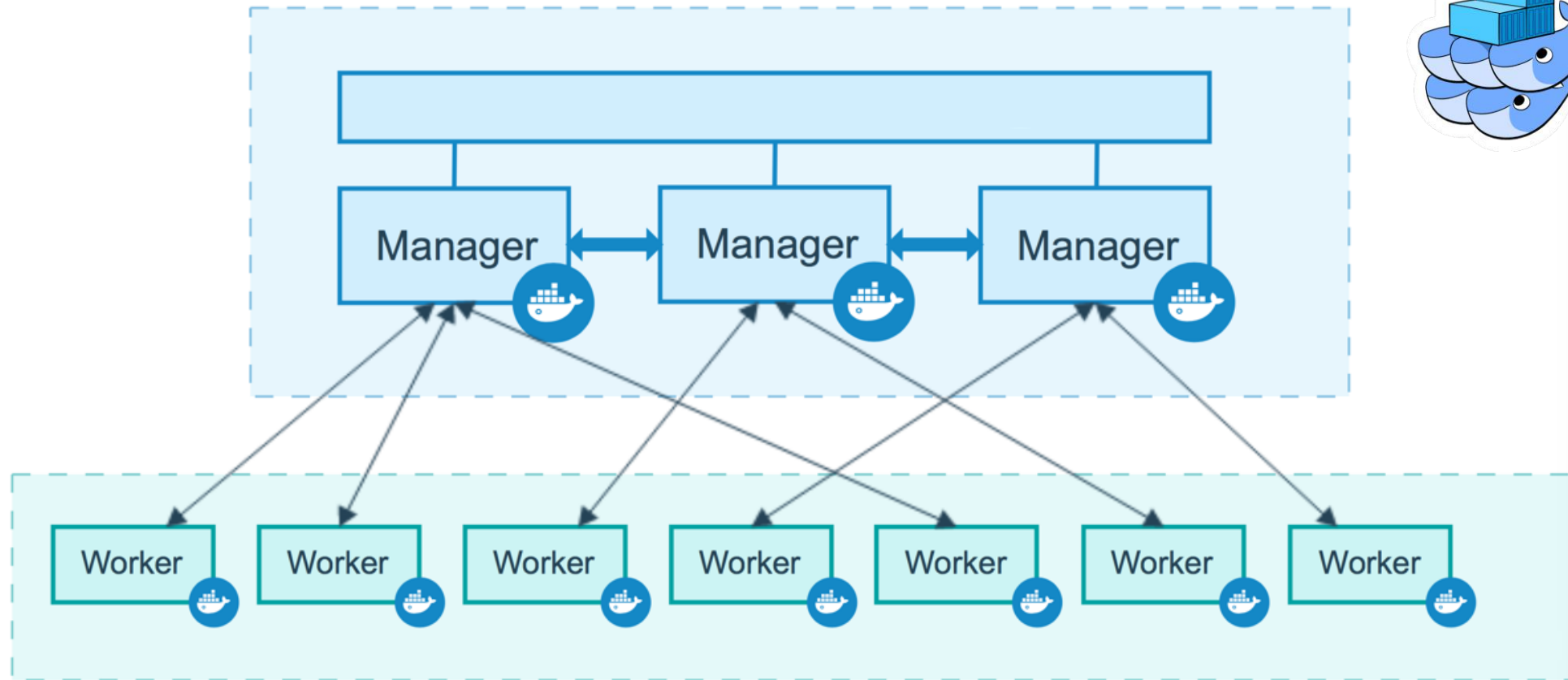
ช่วยสร้าง ทดสอบ และติดตั้งแอปพลิเคชัน ได้อย่างรวดเร็ว

“ Build - Ship - Run ”



Docker Swarm

: Container-Orchestration





portainer.io

Home

PRIMARY

Dashboard

App Templates

Stacks

Services

Containers

Images

Networks

Volumes

Configs

Secrets

Swarm

SETTINGS

Users

Environments

Registries

Authentication logs

Settings

Dashboard

Environment summary

hie_admin

my account

log out

Cluster information

Nodes in the cluster

8

Go to cluster visualizer

5 Stacks

18 Services

52 Containers

5 healthy

0 unhealthy

52 running

0 stopped

72 Images

16.7 GB

56 Volumes

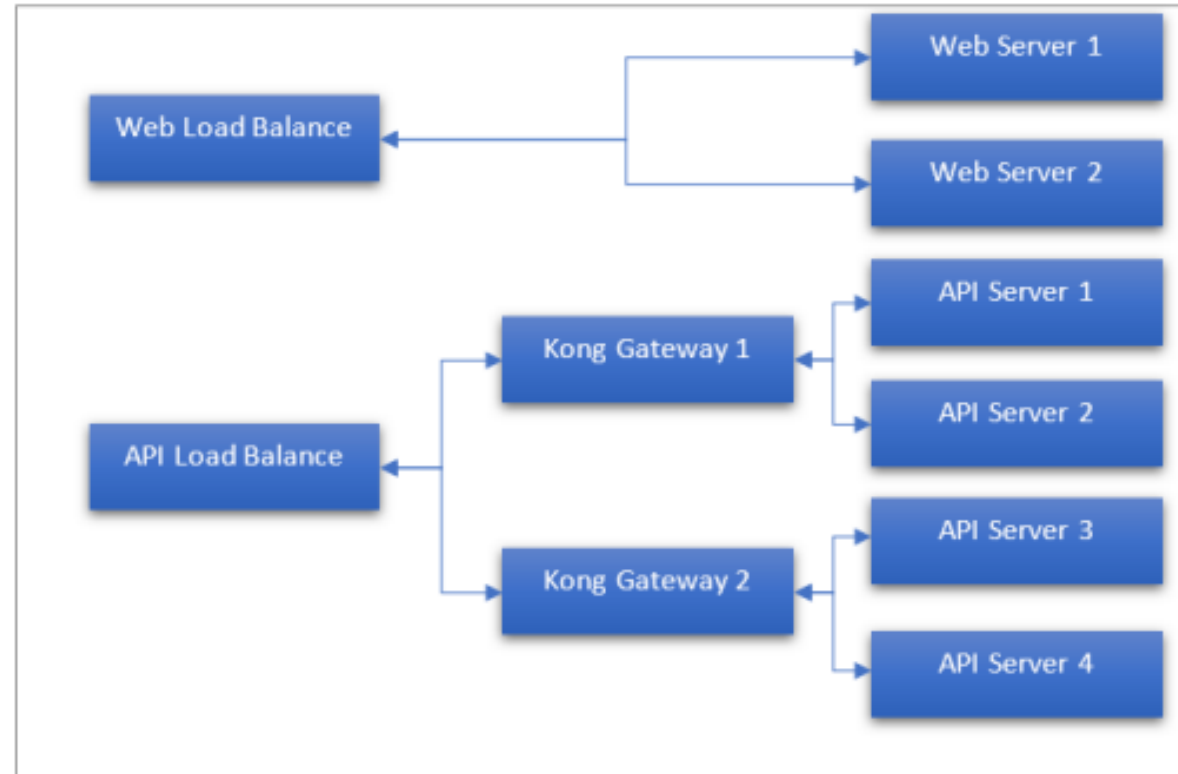
68 Networks

Settings

Scheduling Mode	Published Ports	Last Update	Ownership
cheduled 4 / 4	Scale 58000:8000	2021-09-29 15:53:31	admin

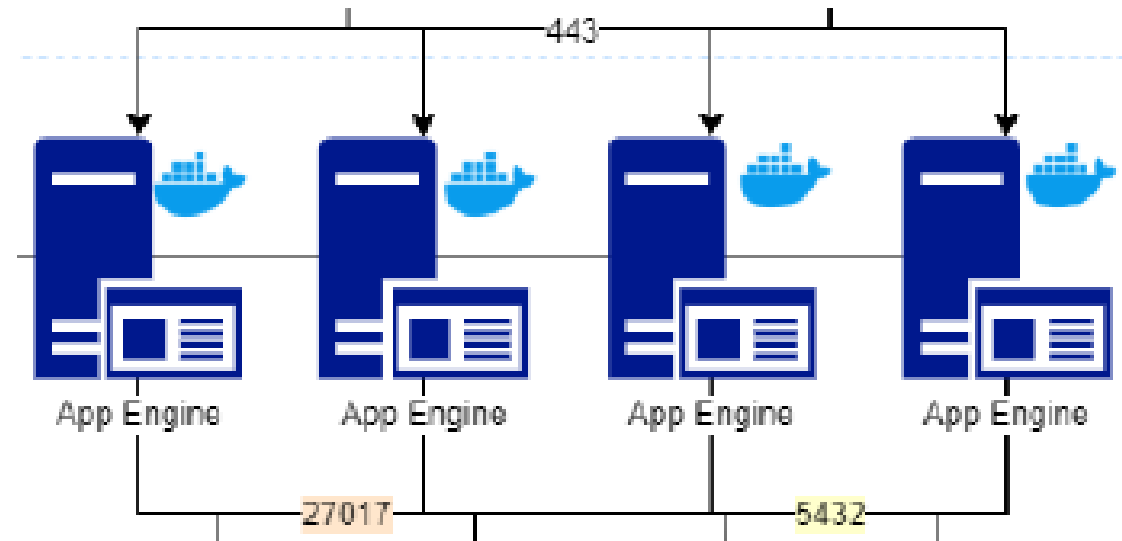
Status	Filter	Task	Actions	Slot	Node	Last Update
running		bztmvevg6h5s0kmudr5yf123d		1	CLII000092-03	2021-09-29 15:53:26
running		ccbvco95xq81fwmy081g91z14		6	CLII000092-04	2021-09-29 15:52:55
running		jje77tn9esc41up7e1poqfnei		4	CLII000092-01	2021-09-29 15:52:39
running		ujtj8ypts8brneb1218ngxn7p		2	CLII000092-02	2021-09-29 15:53:11

Loadbalance Architecture








FastAPI




FastAPI Lab

<https://fastapi.tiangolo.com/>

 **FastAPI**

 **tiangolo/fastapi**
🔗 0.80.0 ☆ 48.5k 🗨️ 3.9k

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FastAPI



FastAPI framework, high performance, easy to learn, fast to code, ready for production

 Test **passing**  coverage **100%**  pypi package **v0.80.0**  python **3.6 | 3.7 | 3.8 | 3.9 | 3.10**

Documentation: <https://fastapi.tiangolo.com>

Source Code: <https://github.com/tiangolo/fastapi>

FastAPI is a modern, fast (high-performance), web framework for building APIs with Python 3.6+ based on standard Python type hints.

The key features are:

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Thank You

