

ຮາກສາໄໝ ກາໂຄທິ່ງ

Kubernetes by Example (with Rancher UI)



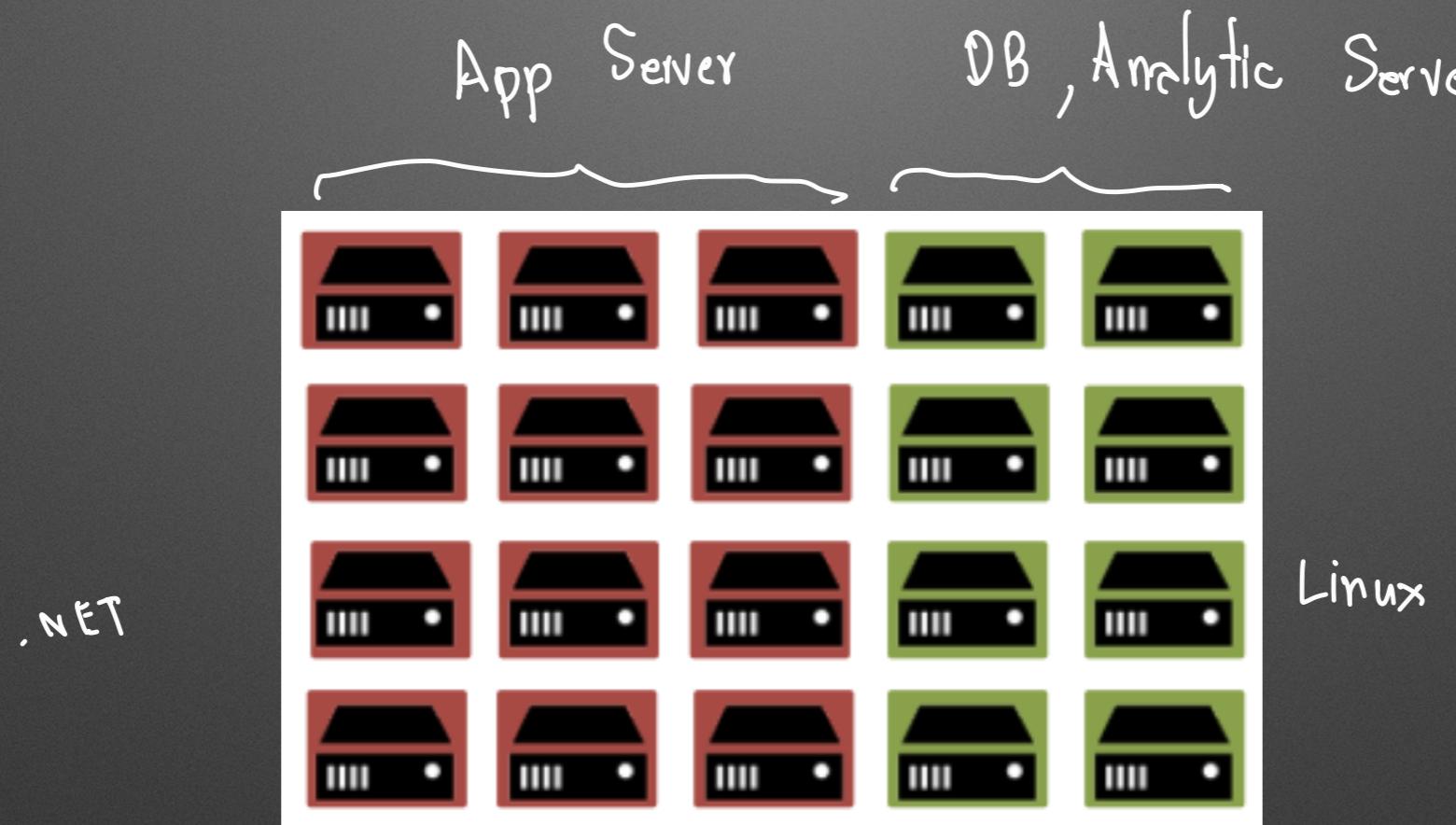
Krerk Piromsopa, Ph.D.
Computer Engineering, Chulalongkorn University

Kubernetes by Examples

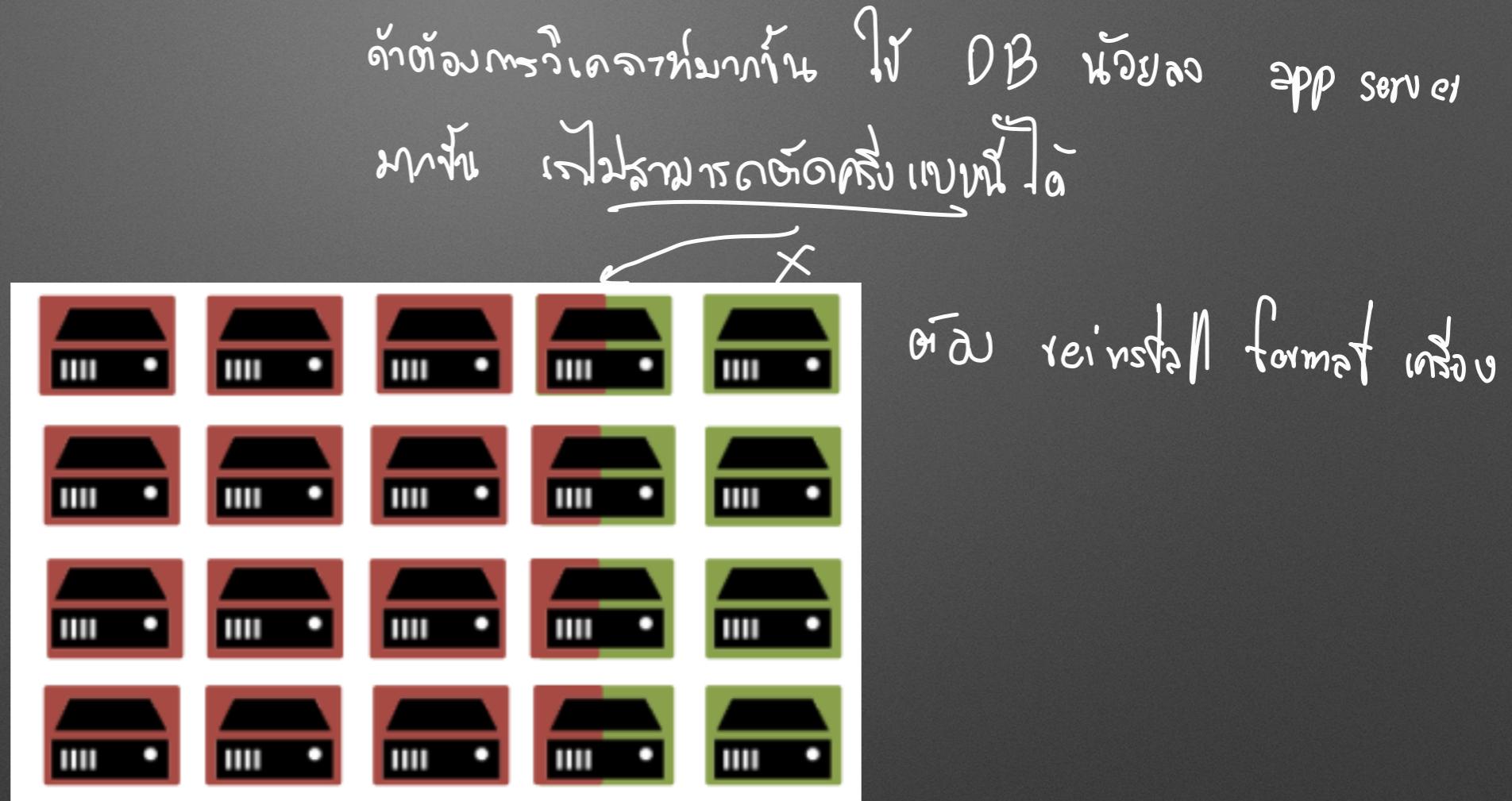
- Motivation
- Kubernetes Revisit
 - Cluster Architecture
 - Concepts
- Activities
 - Stateless Deployment
 - Stateful Deployment
 - Pod Scaling

Problem with data center

Static Partitioning

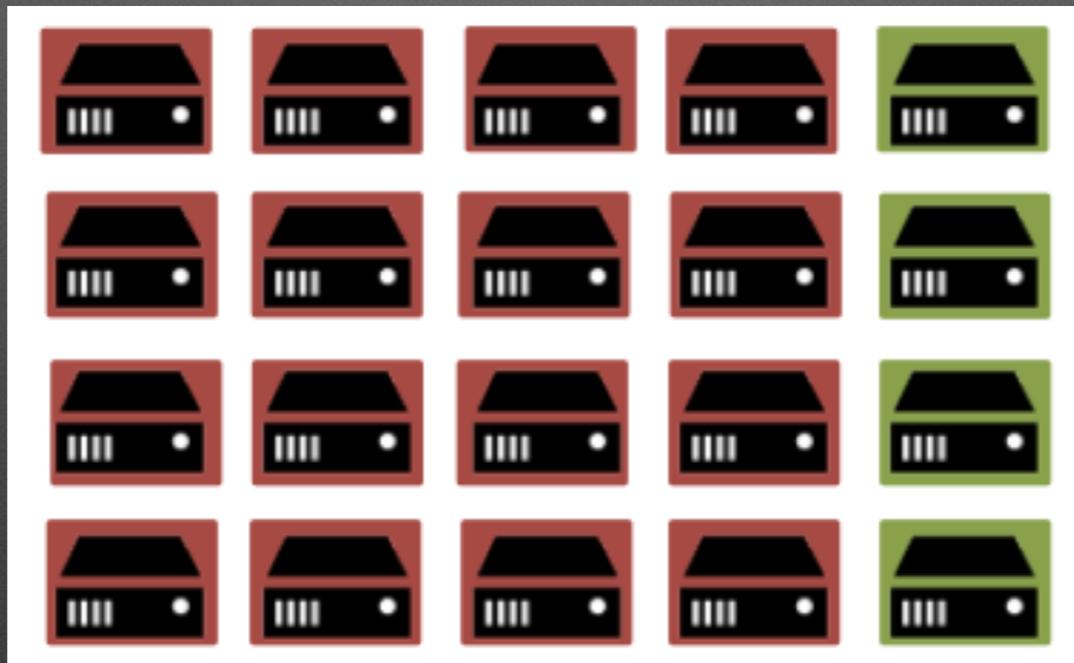


Static Partitioning is Bad



hard to utilize machines
(i.e., X GB RAM and Y CPUs)

Static Partitioning does NOT scale

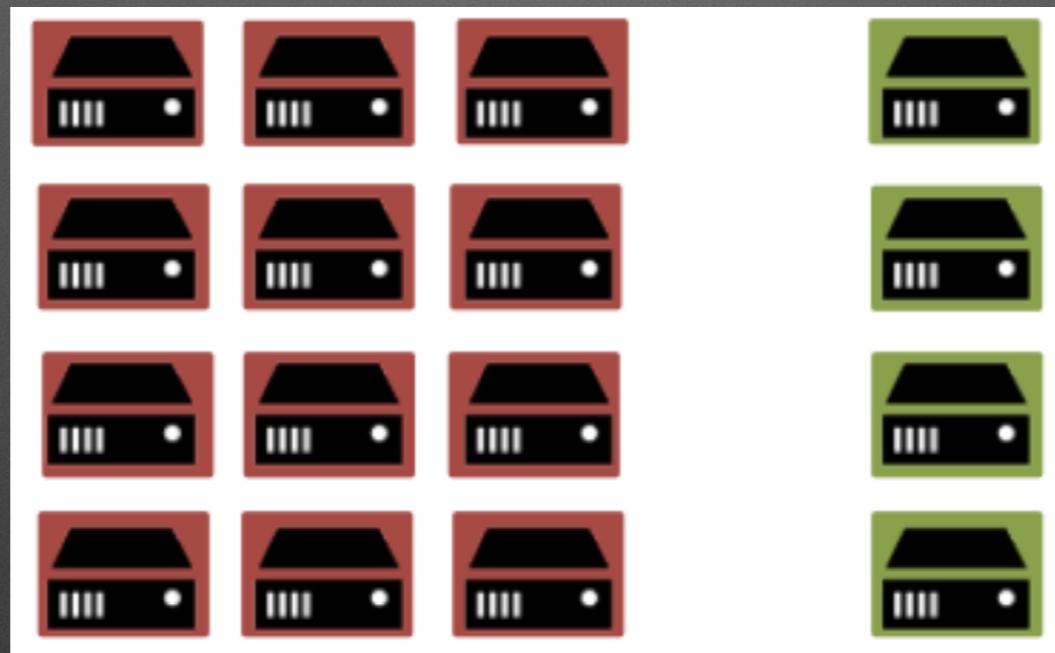


ក្នុងការរំលែកខ្លោះ

hard to scale elastically
(to take advantage of
statistical multiplexing)

Failures === Downtime

ຕົວ down ເກົ່າງໄລຍະປັດໄຈ ສຳລັບ / stop



hard to deal with failures

It doesn't have to be that way

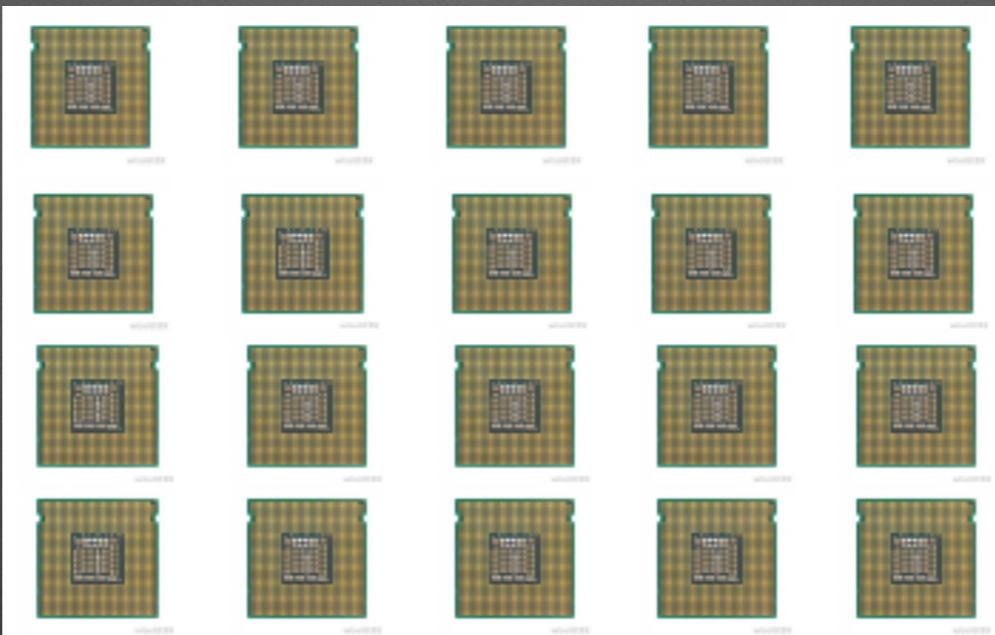
Map Reduce, Hadoop, and many others



កិច្ចិនទ្ទៃ
Kubernetes ==> project ទាំង Google
Datacenter

DCOS(Mesos) ==> Datacenter

នវាន OS គុមារកែវិន DC
↳ Berkley University និងរំពោះ marathorn



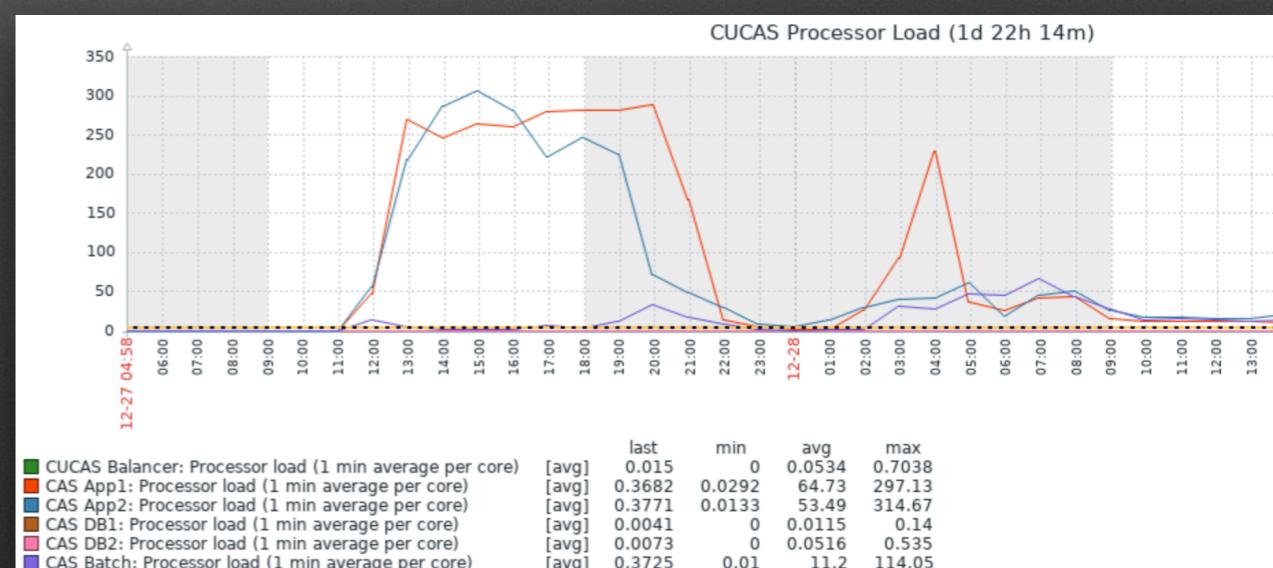
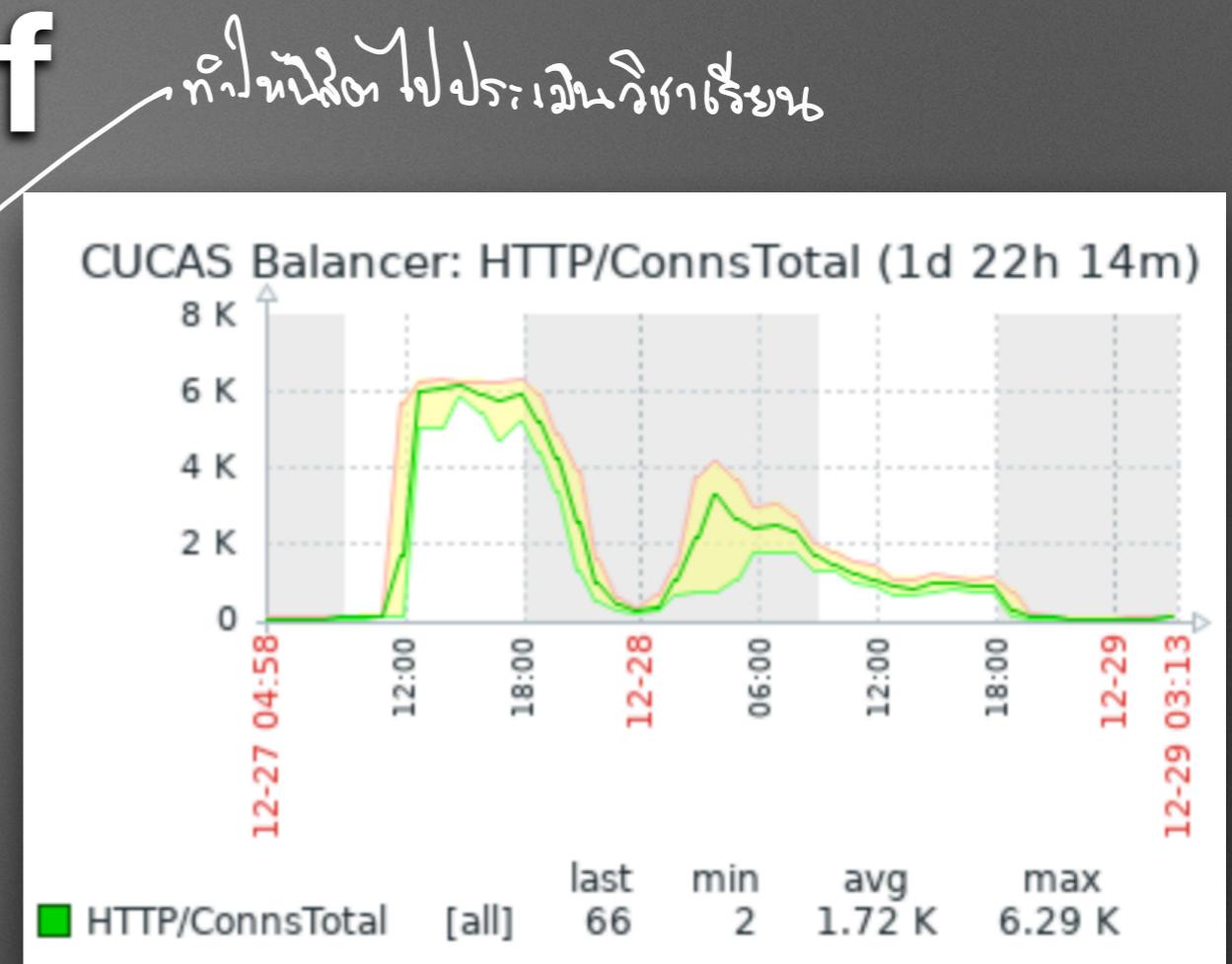
Twitter
Analytic
Service
(Tweed ពេញ)

Borg → Google

Twitter
(Twitter)
នវាន Yun អតិថជន

A case study of Chula CUCAS

- 40,000 users throughout the campus every semesters.
- Human behaviors is a poison distribution.
(Students tend to do it on the last few days.)
- few user through the year.
Peak at 6K users in a day.
- Limited resources
(only 5 servers with the total of 42 cores, 80 GB RAM)



Case Study

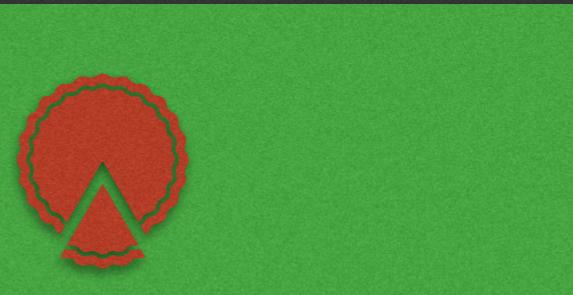
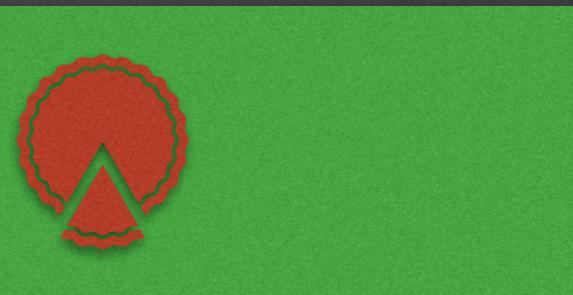
ເຝລື່ນ 6 ວມ ປັນ
Kube ແຮງໄອາ ດັບ ມີ 2 VM

[ຈຸບປະເທິດ]

Normal Workload

ຕົວແຈ່ງການ

Load Balancer
Proxy

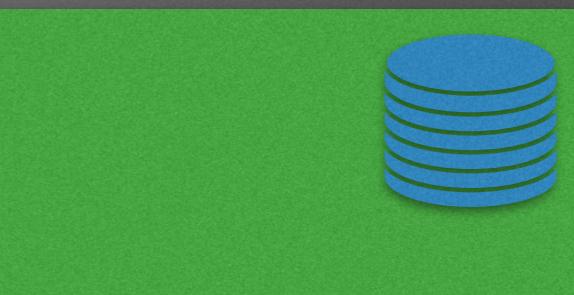


Case Study

[Two Peak]

Average Workload

Load Balancer
Proxy



Case Study

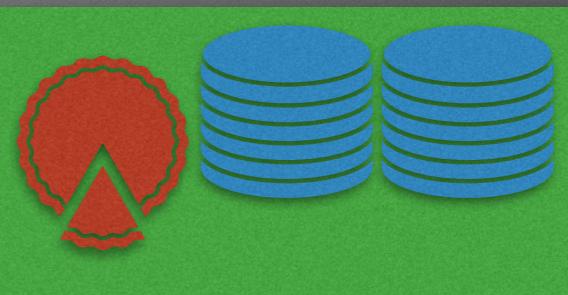
High Workload

[Peak តែង]

រប ុបក វីសាខ ទ ល់ល

Load Balancer
Proxy

រាប ព ក ក ម ន ន ន ិ ប ស ច រ វ យ ទ ល ់ ស ែ ប

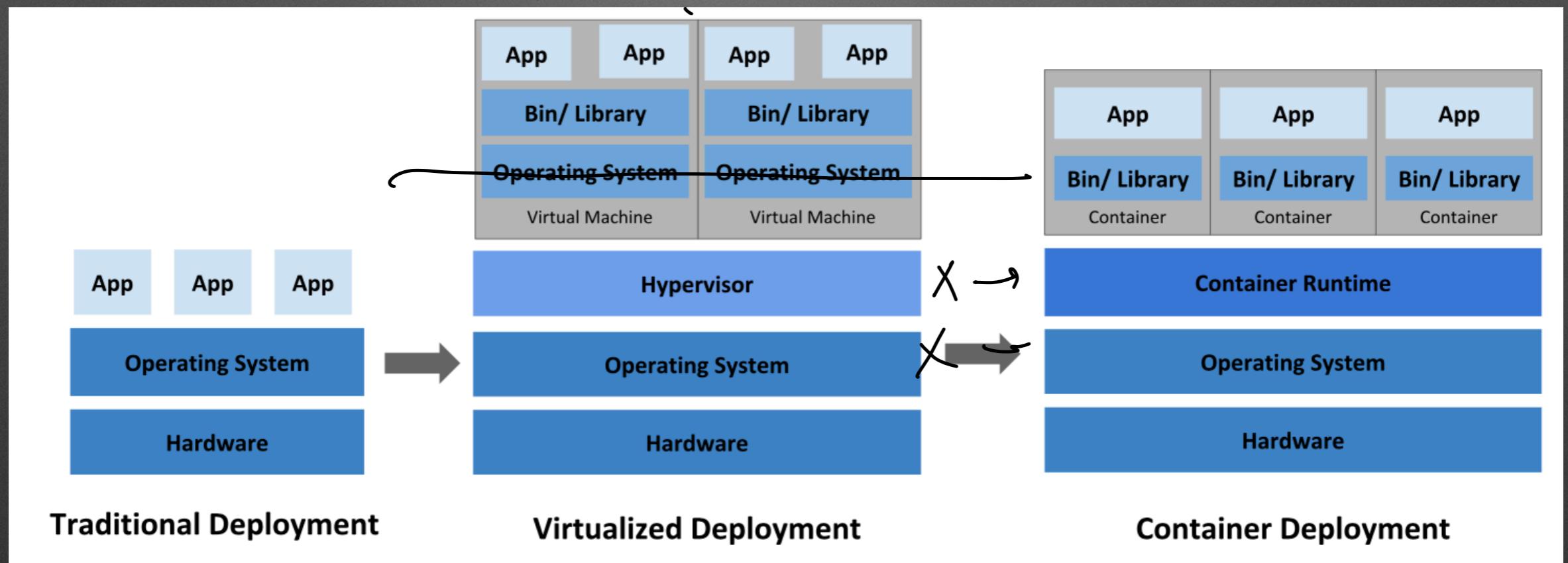


Life before Kubernetes

ເກີດປາໂຈນມີເລື່ອງທີ່

ເກີດປາໂຈນມີເລື່ອງທີ່

ໃນ DC
ກົດ container deploy ອີເຕັມຈຸກມວ່າບັນຍັງ.



Kubernetes Concepts (Revisit)

ນេះ Container គឺជាកំណត់

- Cluster Architecture

Container

- Workloads

• Pod នូយក្រសួងនៃ Kube
និត្តន៍ container

- A set of containers

• Controllers ដែល config ផែនការរបៀប

• Deployments ពាណិជ្ជកម្ម 3-4 Pods

សម្រេច

• ReplicaSet ផ្ទាល់ជាអ្នកដំឡើង

ត្រូវបានដំឡើង នៅ 5 pod

• DaemonSet

ត្រូវបានដំឡើង 2 ក្នុងមេរបៀប 5

1 daemonset 1 daemon 1 per machine, មួយ machine មួយ daemon

Orchestration គឺជាកំណត់
គ្រប់គ្រងគ្រប់គ្រង container នៅក្នុង cluster

- StatefulSets

ក្នុង db
បង្កើតរុញ ពាយឃន្តា នៅ 0:00 backup

- CronJob

ក្នុងការគ្រប់គ្រងគ្រប់គ្រង
និង set up របៀប , install db

• Services ជីវ នៃ port នូវ pod ការដោនឡើងវិញ

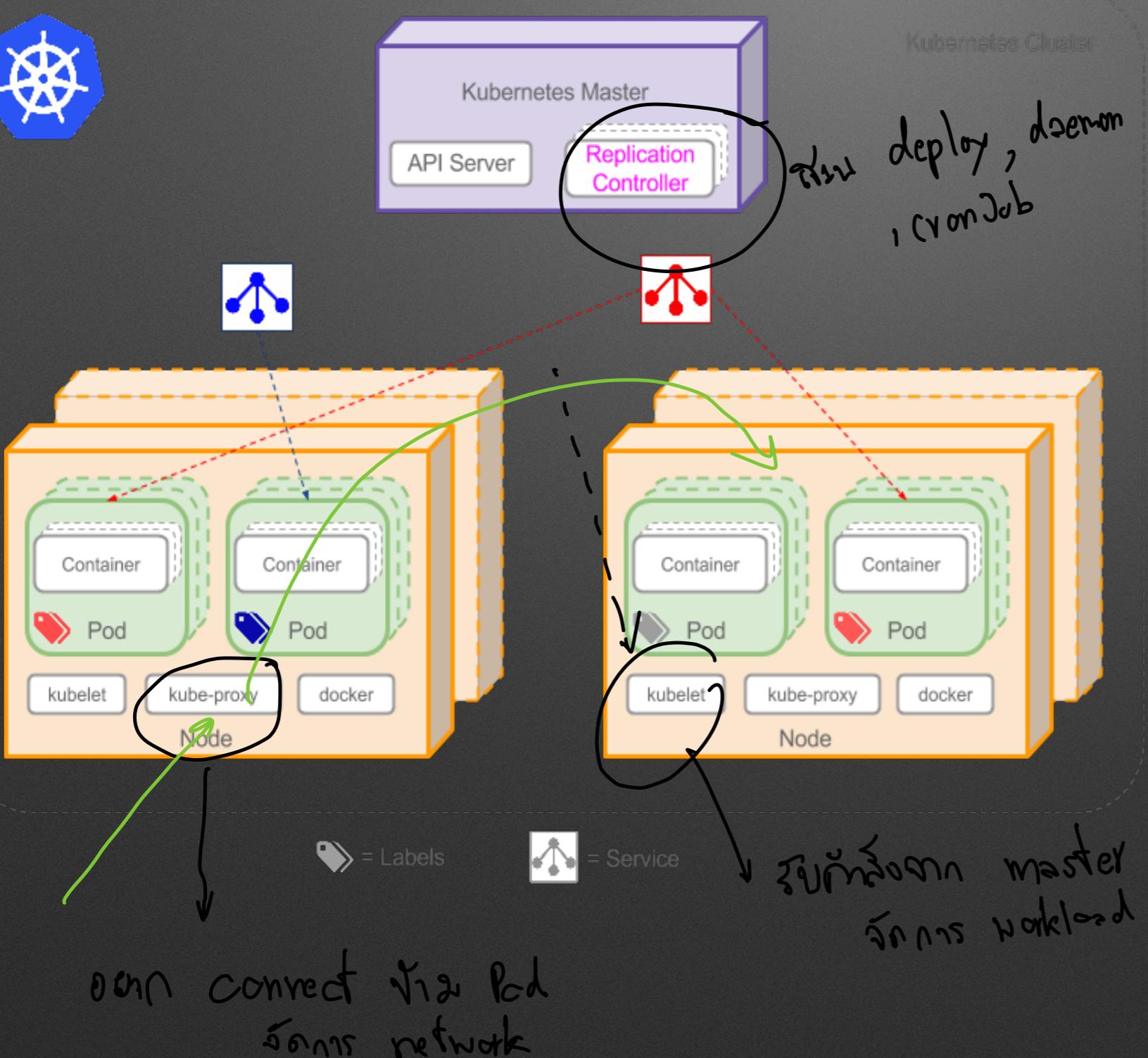
• Ingress (Reverse Proxy) virtual name server

ត្រូវបានដំឡើង នៅ 5 pod

- Storage

- Volumes/Claims

Cluster Architecture

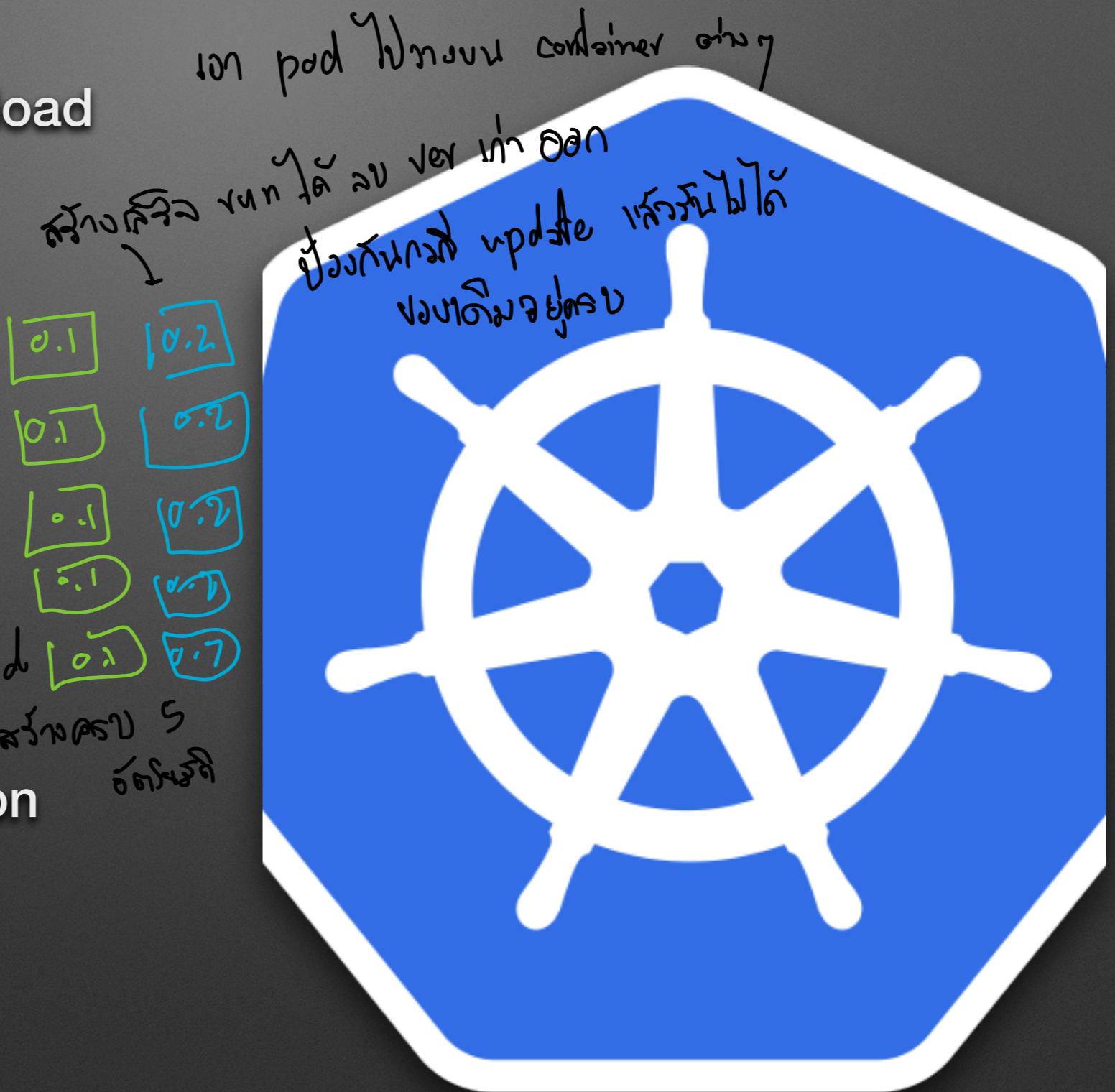


- **Master** ດຽວເປີມລະດີ
ໜັກເລື່ອກຮາມ **vote**
- **Node/Workers**
- **Kubelet**
- **Kube-proxy**
- **docker**

ຮູບແບບ yaml file
ເລື່ອງຈັກ pool, workload

Kubernetes provides:

- Service Discovery and load balancing
 - Storage Orchestration
 - DevOps Operation
 - Rolling update
 - Self Healing *ಒಮ್ಮೆಗೆ ಇರುವ 5 pod
ಅದ್ದಲ್ಲಿ 2 ಕಾರ್ಯಗಳನ್ನು*
 - Secret and Configuration Management
 - scheduling
(container placement)



Pods

- A pod is a single set of containers.
- A container is an instance of image from registry.

ນີ້ແມ່ນເຄື່ອງໃຈ ໂດຍບໍ່ໄດ້ຮັບເຫັນ

- One IP per pod (think of it as a machine)

Pod

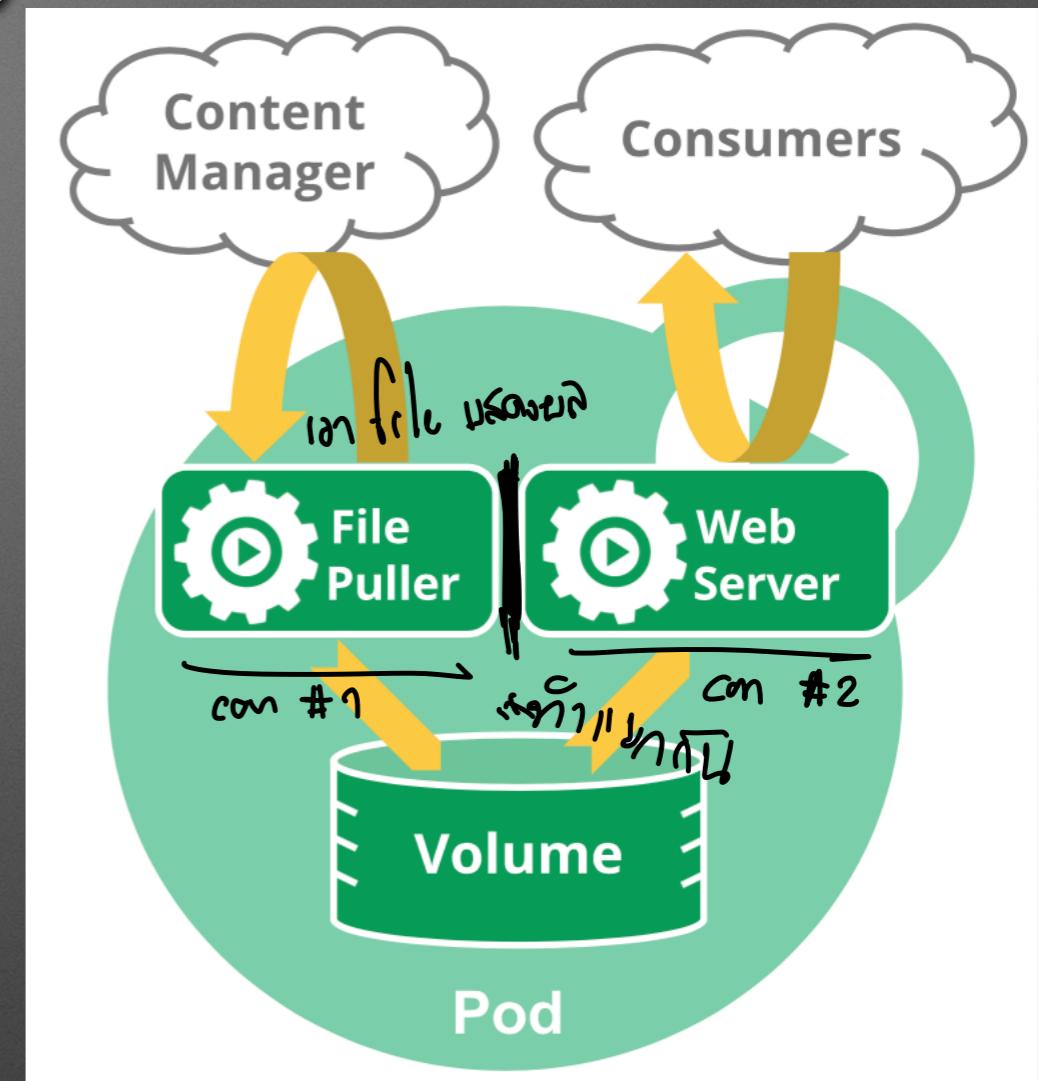
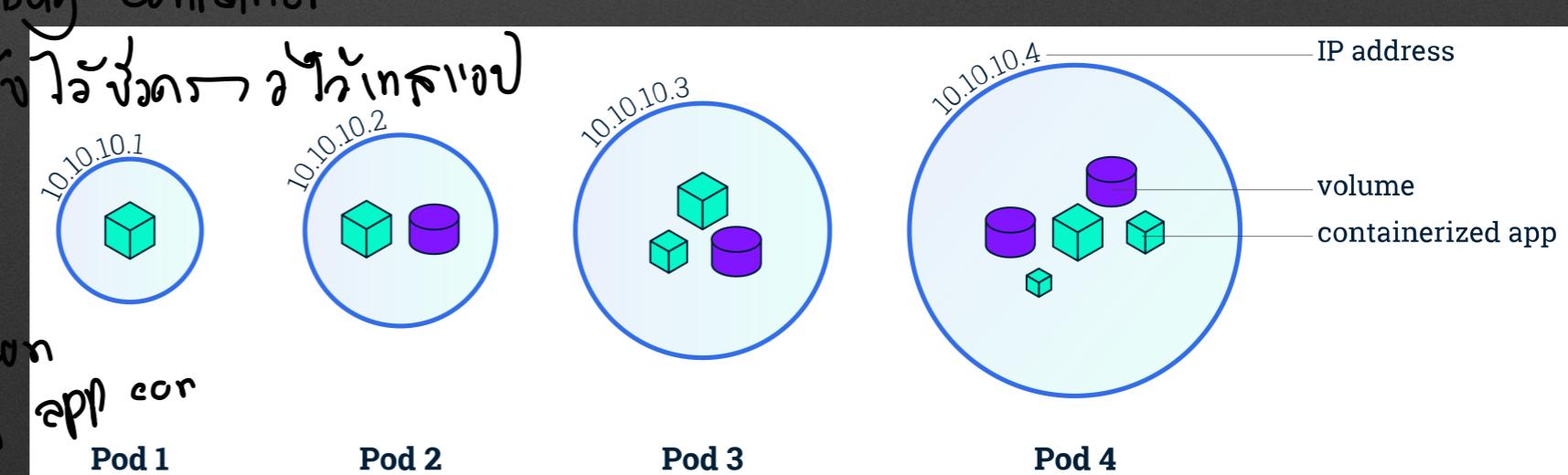
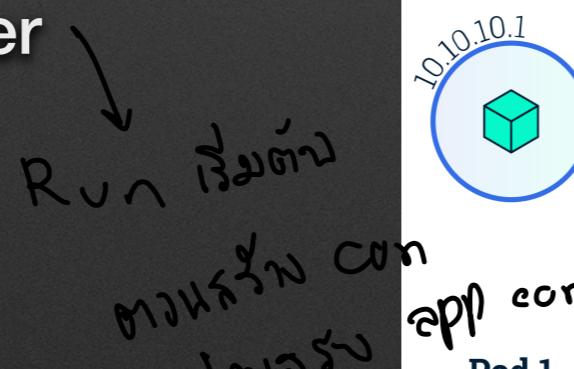
- App Container(s)

- Sidecar Container *as debug container*

- Init Container

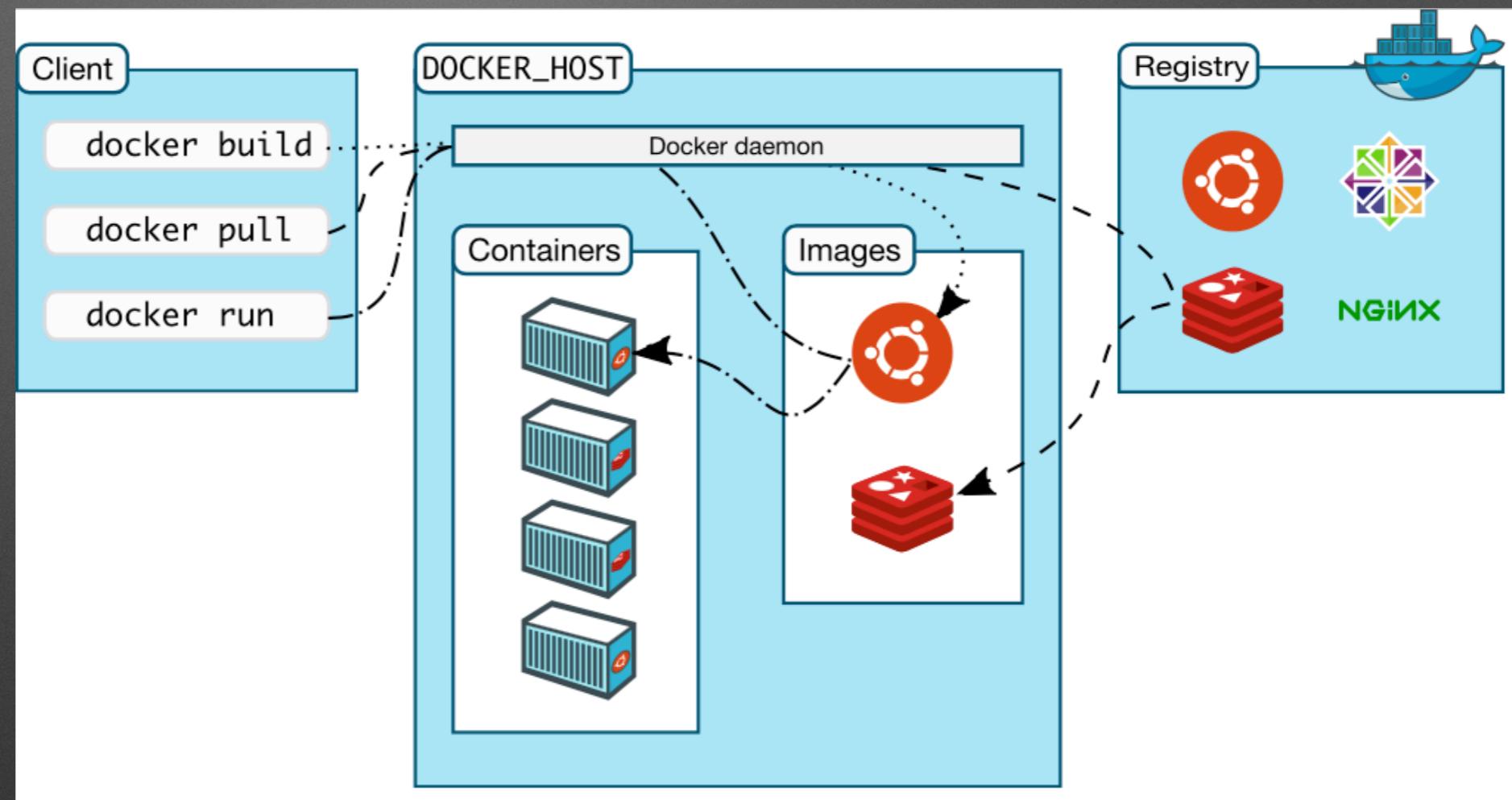
- Adapter

(Service Mesh)
Container
Cloud



Containers

- Same as docker containers.
- An instance of predefined image pulling from registry.



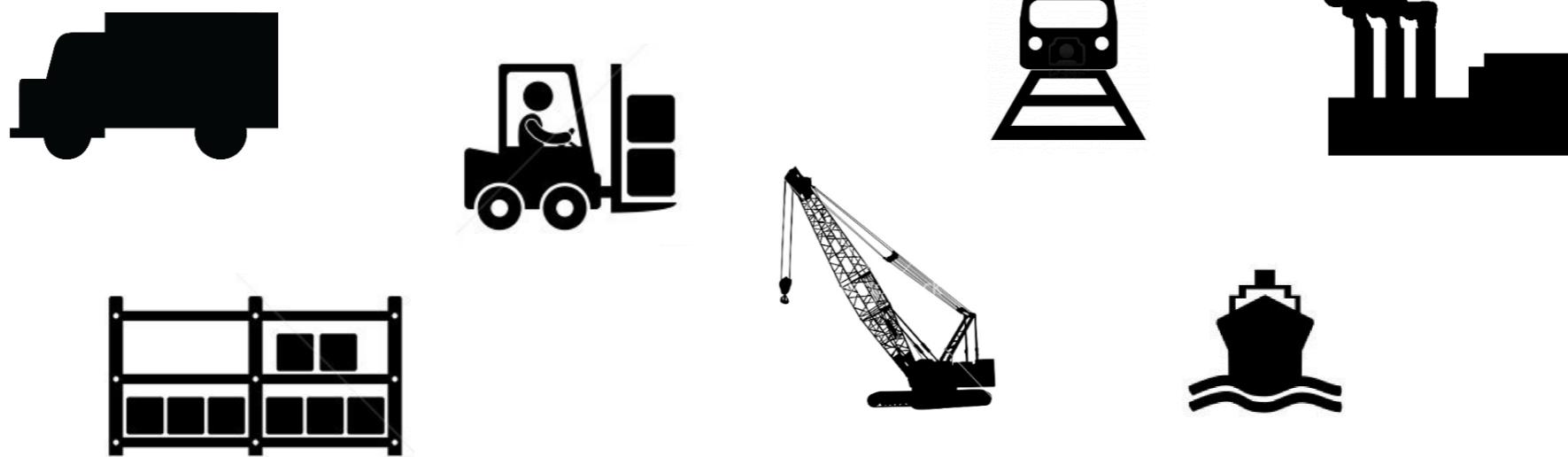
Cargo Transport Pre-1960

Multiplicity of Goods



Do I worry about how goods interact (e.g. coffee beans next to spices)

Multiplicity of methods for transporting/storing

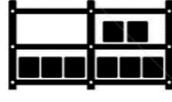


Can I transport quickly and smoothly (e.g. from boat to train to truck)



Picture from docker public presentation

Also a matrix from hell

	?	?	?	?	?	?	?
	?	?	?	?	?	?	?
	?	?	?	?	?	?	?
	?	?	?	?	?	?	?
	?	?	?	?	?	?	?
	?	?	?	?	?	?	?
							

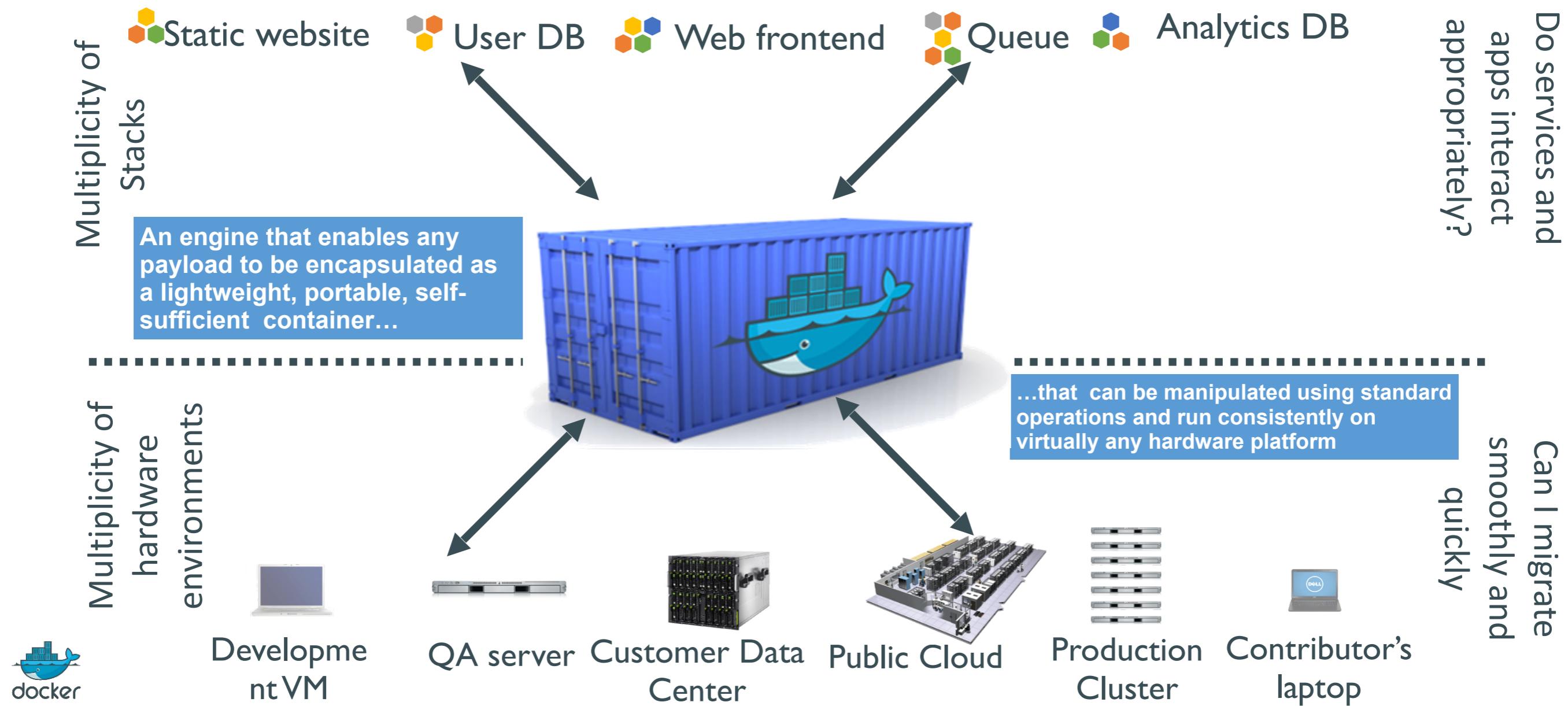


Picture from docker public presentation

Solution: Intermodal Shipping Container



Docker is a shipping container system for code



Picture from docker public presentation

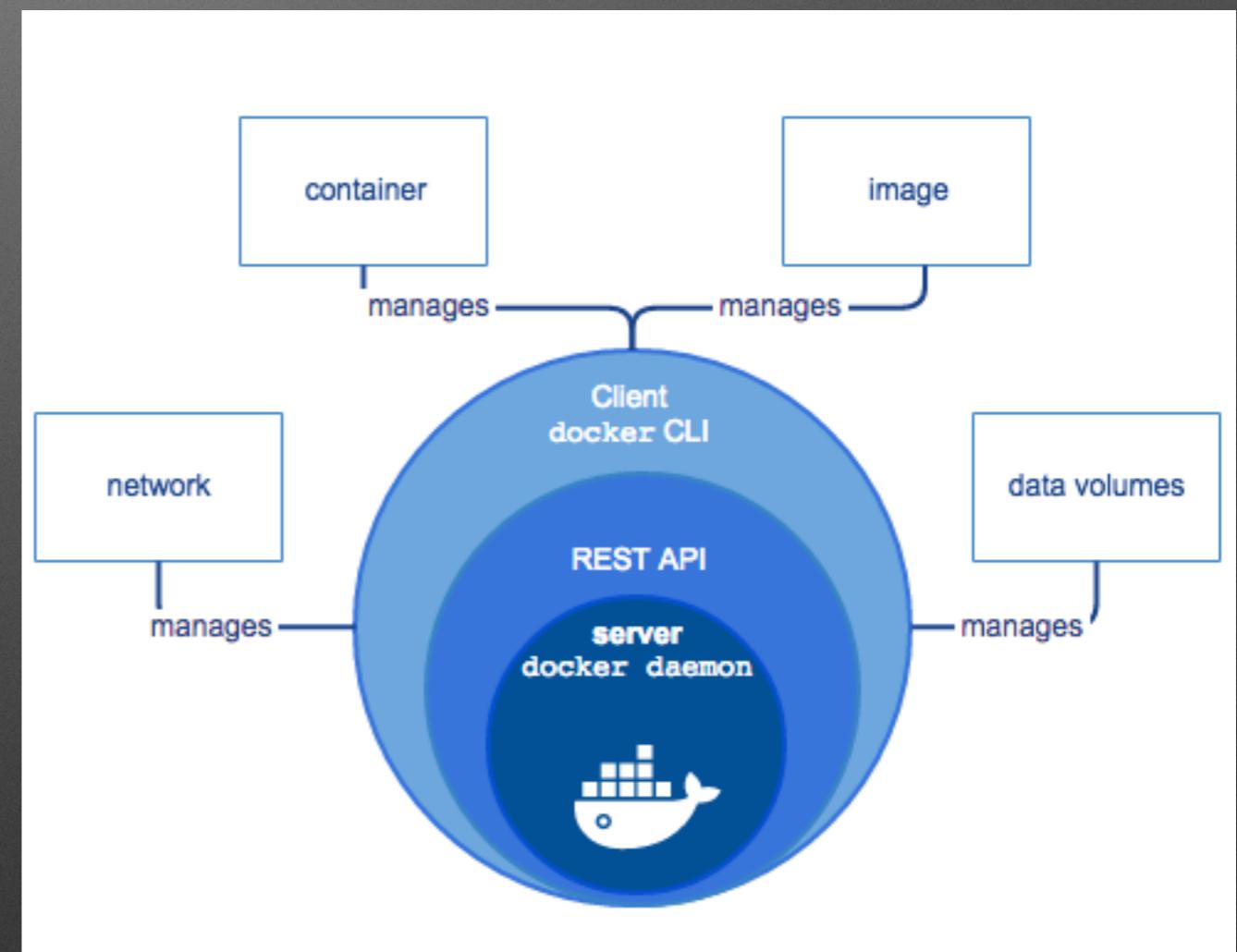
Docker eliminates the matrix from Hell

	Static website							
	Web frontend							
	Background workers							
	User DB							
	Analytics DB							
	Queue							
	Development VM	QA Server	Single Prod Server	Onsite Cluster	Public Cloud	Contributor's laptop	Customer Servers	
								

Picture from docker public presentation

Containers

- Docker/Container Abstraction
 - Storage
 - Network
 - Management (start/stop)



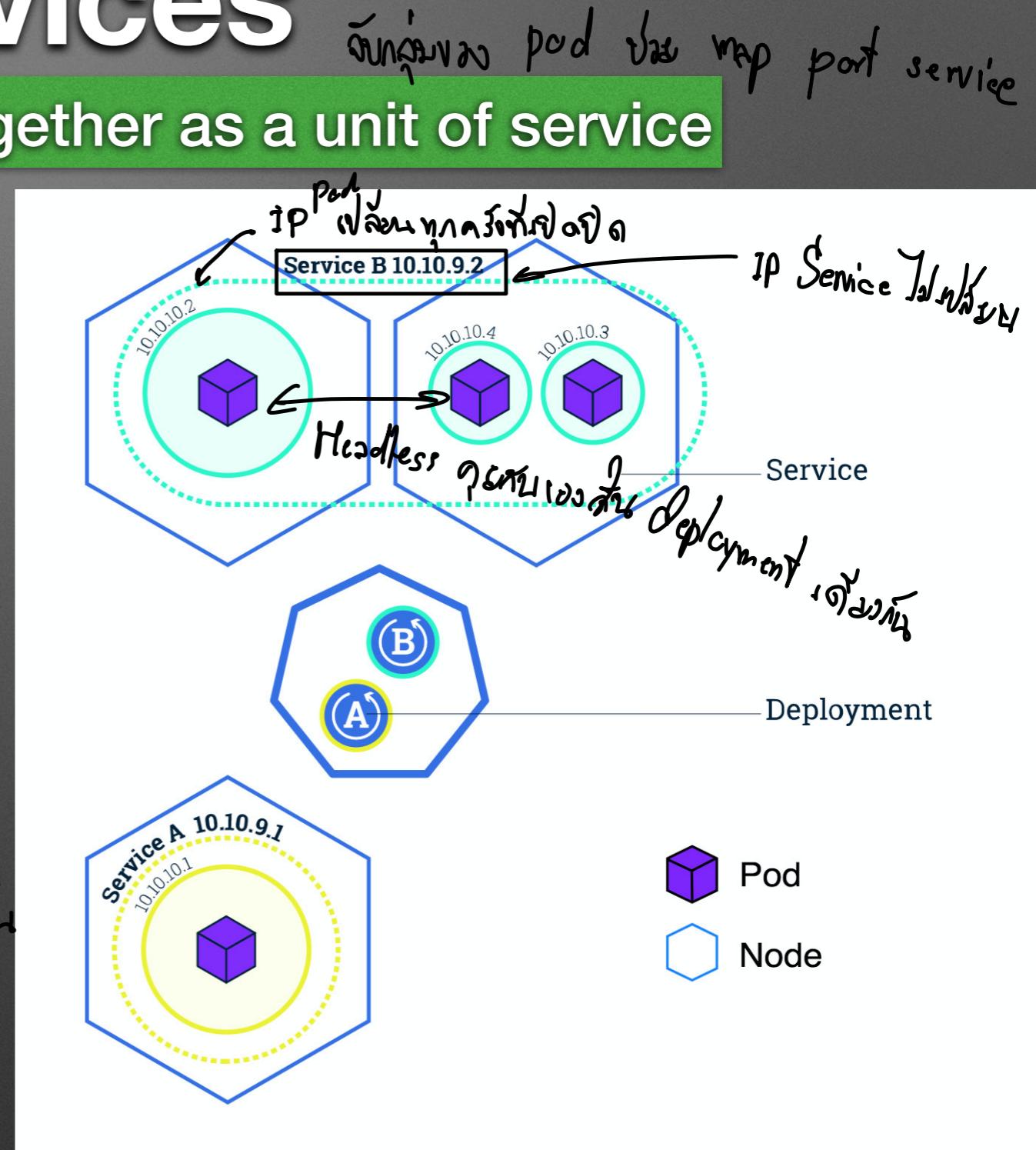
Controllers

- Deployments
 - ReplicaSet + Pod
- StatefulSet
 - Deployments with naming scheme (e.g. pod-0, pod-1,)
- DaemonSet
 - One pod per node
- Job - run until complete รัน batch จนเสร็จ
- CronJob - Scheduled Job ตั้ง Job เลื่อนเวลา นิยม (similar to cron on Linux/Unix)

Services

Group deployments together as a unit of service

- Expose a deployment to the network for others to use.
- Headless Service - use internally in the cluster
- Standard Service - associated with a cluster IP or nodes port or host port. (port map)



Ingress/Load Balancing

Smart uses of resources (network)

- Manage external access to services (HTTP, HTTPS)
- 2 features
 - Share IPs with several host name (named virtual host) 1 IP មែនលាយក់
 - Map several services to different paths of a host
 - **www.example.com (10.0.0.1) - sample-service**
 - **/app1/ - to app1-service**
 - **/app2/ - to app2-service**
 - **www.test.com (10.0.0.1) - test-service**

Claim តែងតាំងក្នុង yaml

Storage

- Volume - a storage drive
 - attached to a pod, stateless ក្រោមពាណិជ្ជកម្ម Pod
(deleted when the pod is deleted)
- Persistent Volumes នូវ disk នៅក្នុង pod
 - Persist without POD រាយការណ៍ Pod ក្នុង volume ត្រូវ
 - Static - local disk, network fs
បច្ចុប្បន្ន ស្ថាប់ការប្រើប្រាស់
 - Dynamic - provisioning on demand
ឧបត្ថម្ភ ក្នុងការប្រើប្រាស់

Types of Volumes

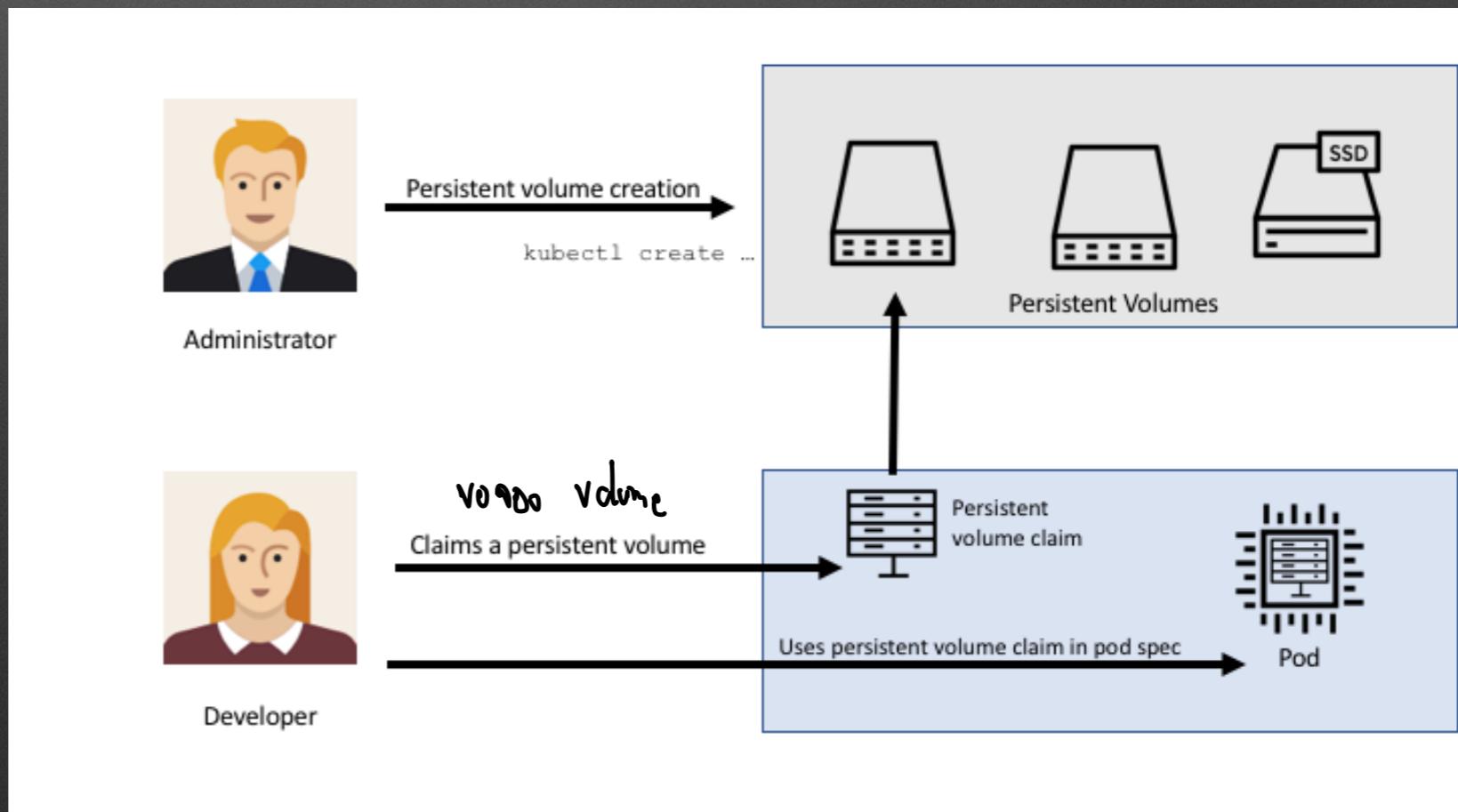
Kubernetes supports several types of Volumes:

- awsElasticBlockStore
- azureDisk
- azureFile
- cephfs
- cinder
- configMap
- csi
- downwardAPI
- emptyDir
- fc (fibre channel)
- flexVolume
- flocker
- gcePersistentDisk
- gitRepo (deprecated)
- glusterfs
- hostPath
- iscsi
- local
- nfs
- persistentVolumeClaim
- projected
- portworxVolume
- quobyte
- rbd
- scaleIO
- secret
- storageos
- vsphereVolume

Open source

Dynamic Volumes

- Dynamically claim (using Persistent Volume Claim) from storage class (a storage lot for allocation units)
- Pods view the claims as volumes.



Picture from <https://portworx.com/tutorial-kubernetes-persistent-volumes/>

Horizontal Pod Autoscaling

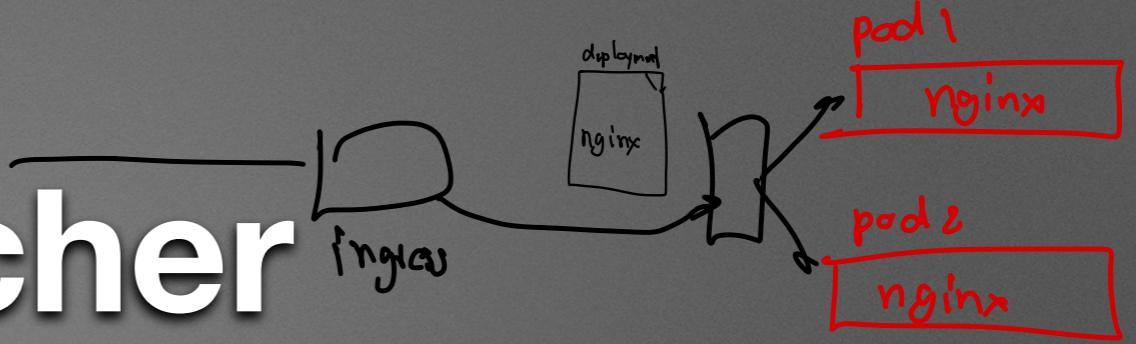
HPA

ຈະສົ່ງ Pod ເສັ້ນ 2,3,4 ກີ່ຕ່ວເຄີ້ງ ແນ CPU > 40%

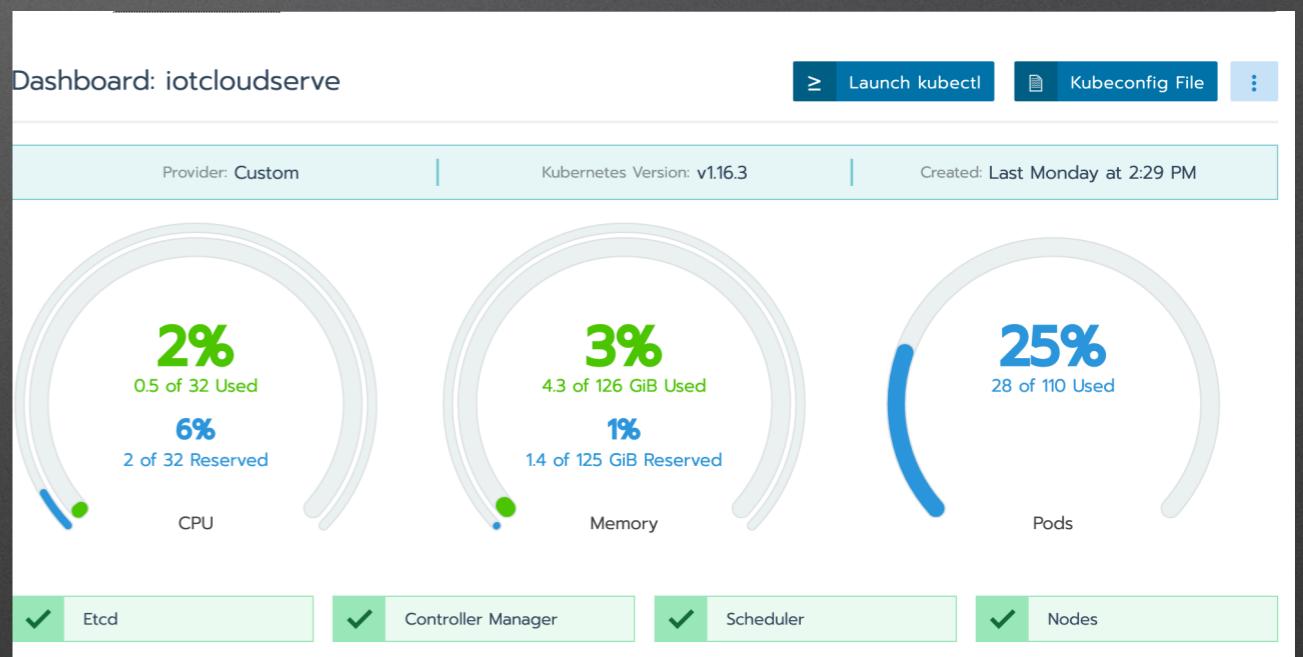
ສ່າງ Pod ໃຫ້ 95 HPA ໃນການກໍາພະນັກງານ Po

- Monitor the resources of the POD
- Scaling according to rules (CPU, Memory)

Rancher



- An open-source CNCF certified kubernetes distribution. Jointly developed by RedHat and Rancher Labs.
- Easy GUI for Kubernetes.



Let's try it.