

# Docker

Monday, February 23, 2026 1:53 PM

CKA: 90% of certified kubernetes administrator

444\$ usd. 50% of the cost.

Hand on exercise 65% up.

Open book exam kubernetes.io documentation.

You can buy the course you have 1 year to appear for the same. You got two attempts.

You also got two simi

#####

What do you know by containers?

Walmart: online presence

People will prefer to buy online.

The reason why I am talking about a retail chain is that the changes happen frequently in retail sector.

They lets move to the cloud they prefer azure. After few days azure goes down for almost more than 6 hours.

2x2x2

Every app need to deployed in two cloud service provider

Azure

Gcp

Two region in the same cloud

Inside the region two data center.

8 times deployment for single app.

They need a solution.

We need to build an app where you build it in your laptop it should work as it is anywhere

Container technology

Build it ship it and run anywhere

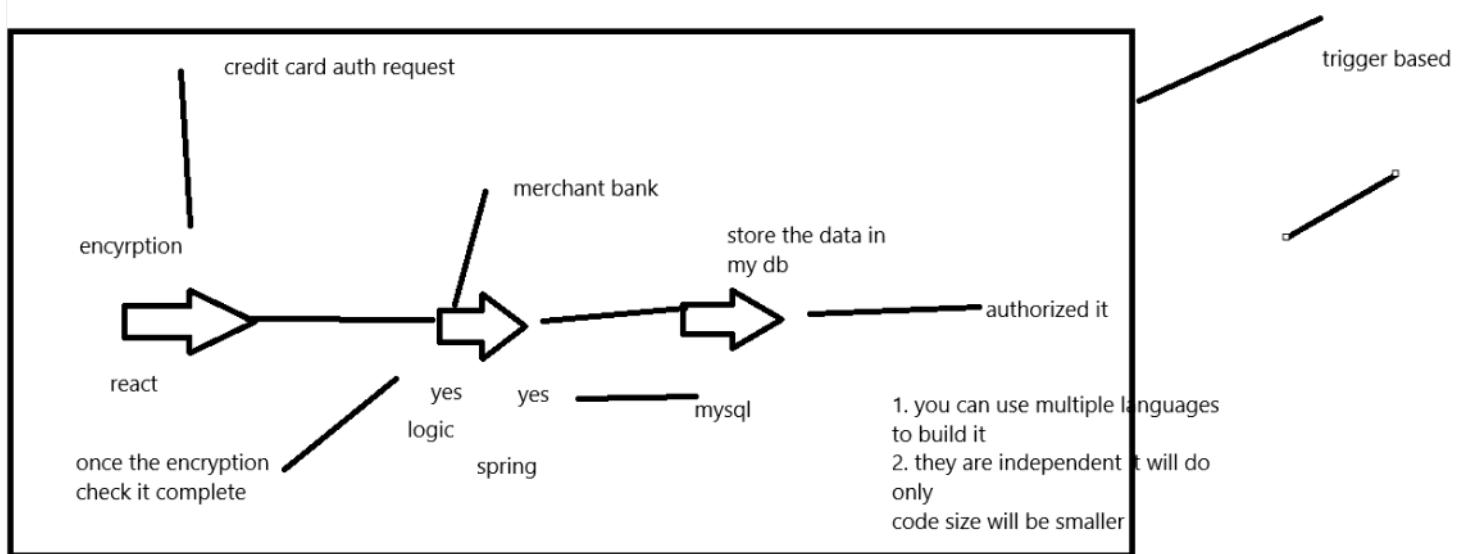
Monolithic : where every single module is tightly integrated together landing

page+cart+dispatch+logistics+paymengw

If your application required any upgrade. You need to shutdown the whole app upgrade it then redeploy there is always downtime.

Customer facing app

Microservice:



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# Cicd

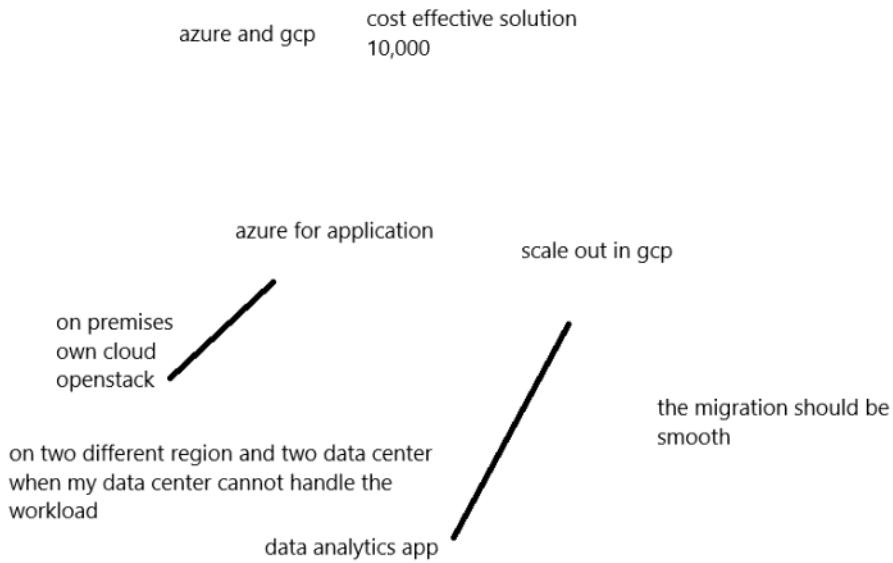
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Continues integration and continues deployment.  
We work on sprint. We have limited time to do a deployment.  
Coding we created it-automation-push my code- to a repo-building testing deployment happens  
Devops: using automation we are faster deployment.

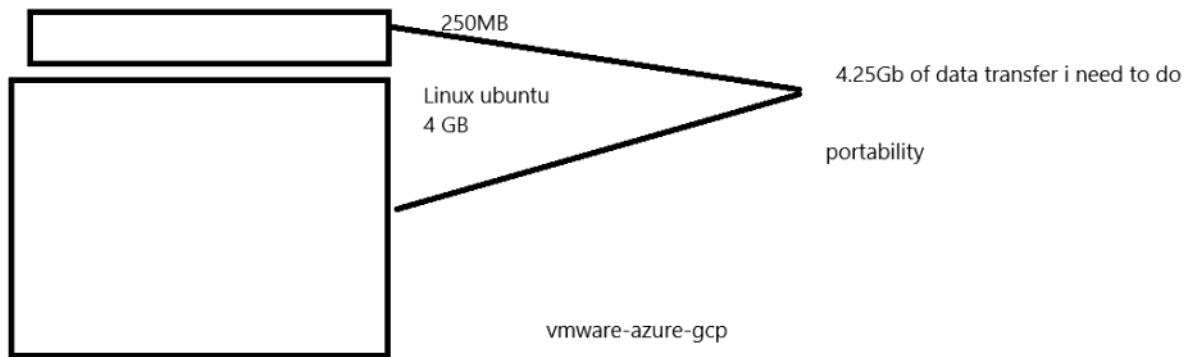
What is the main purpose of automation.  
Not to do the same work over and over.

You need a platform where I can deploy my workload easily.  
Can we achieve faster deployment with virtual machine.  
Spin a server take time 2 min  
I always need a fresh environment.

2x2x2



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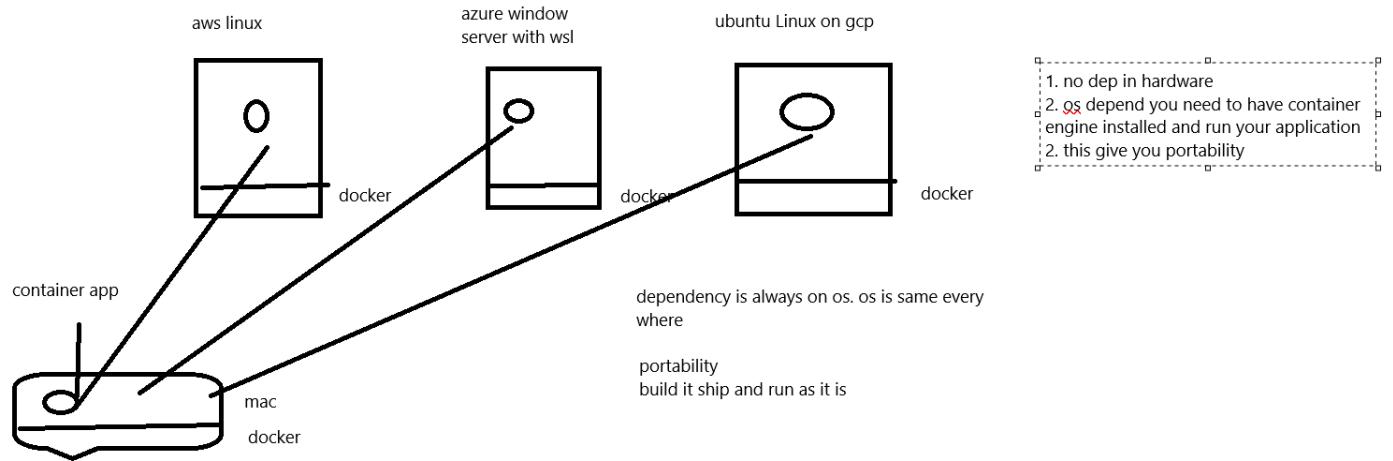
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## Virtualization

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Vm run on top of HyperV: which is attached with your specific hardware it is also called as hardware based virtualization  
Container run on top of OS.



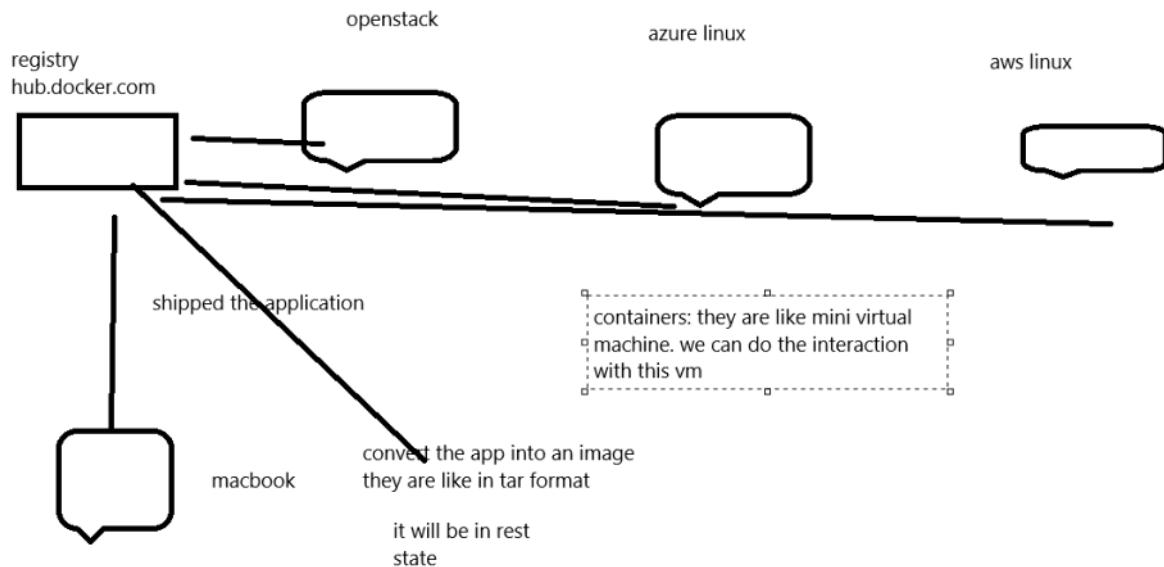
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Banking sector. They never want to migrate their core banking application in container?  
SocGen  
France labour union  
Analytics ai machine learning market research they are developing using container.  
Rearcheting

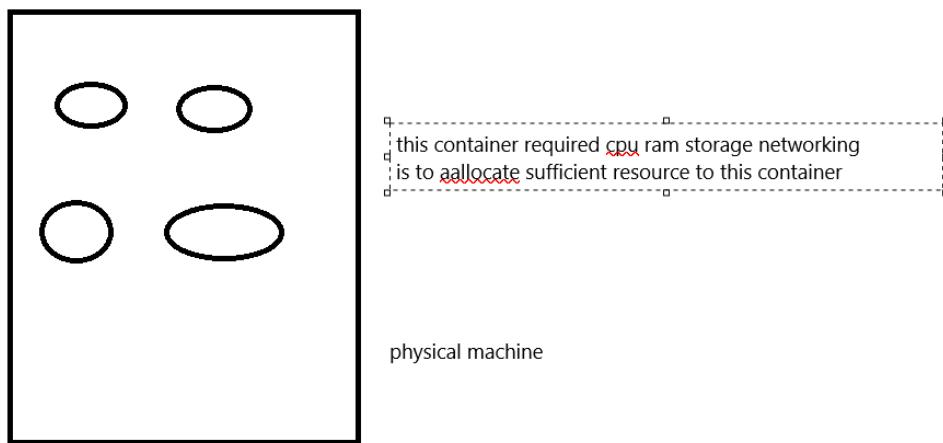
## Image and container

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Image always in rest state



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When we build an application where we store those application

Version control system in github

But version control system can store only files and folder we cannot store images and video in version control system

We required special kind of repo to store the images.

We use object storage

Whatever we store

1. Archival format
2. Read only

Nexus jfrog to store container image

Aws ecr acr gcr

Hub.docker.com

# Demo

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We will see docker

Lets check our lab ho to access this lab

According to the operating system installation of docker is different in different os.

Command related to docker will be always same

# Docker command

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Docker build using go lang  
Kubernetes go lang  
They have created a wrapper language. Simple english  
Start stop rm

```
[root@docker-engine ~]$ docker container run --publish 80:80 --detach nginx
#docker container run will always create a new container for you
#it required an image with which it will create a container for you
Unable to find image 'nginx:latest' locally #image is not avaialbe locally
latest: Pulling from library/nginx #it will go to hub.docker.com and download the image
4f4efe02d542: Pull complete
47cd406a84ef: Pull complete
0c8d55a45c0d: Pull complete
7b6cb8ccac7b: Pull complete
46bf3a120c8e: Pull complete
bae5a1799a80: Pull complete
f73400a233fd: Pull complete
2e02dba24409: Download complete
a5d78d617315: Download complete
Digest: sha256:341bf0f3ce6c5277d6002cf6e1fb0319fa4252add24ab6a0e262e0056d313208
Status: Downloaded newer image for nginx:latest
af8c141f040060a77fdcaa4d2bf29ad8ec9a55c5459ad4da5ad4d85558adb5a0
[root@docker-engine ~]$ docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS
NAMES
af8c141f0400 nginx "/docker-entrypoint...." 6 seconds ago Up 5 seconds 0.0.0.0:80->80/tcp,
[::]:80->80/tcp pedantic_rhodes
[root@docker-engine ~]$ docker container run --publish 81:80 --detach nginx
d829f102ee7600e5394f5449942ac6ba6e5655b19988c0e00876ef406a7ca2de
[root@docker-engine ~]$ docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS
NAMES
d829f102ee76 nginx "/docker-entrypoint...." 10 seconds ago Up 10 seconds 0.0.0.0:81->80/tcp,
[::]:81->80/tcp interesting_borg
af8c141f0400 nginx "/docker-entrypoint...." 43 seconds ago Up 42 seconds 0.0.0.0:80->80/tcp,
[::]:80->80/tcp pedantic_rhodes
[root@docker-engine ~]$ docker images
          i Info → U In Use
IMAGE      ID      DISK USAGE CONTENT SIZE EXTRA
nginx:latest 341bf0f3ce6c    240MB    65.8MB U
[root@docker-engine ~]$ docker container run --publish 82:80 --detach nginx
85e7c2660d41a53bb215881605cf496d35c02f61c0ab429ce91f9bd594585629
[root@docker-engine ~]$ docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS
NAMES
85e7c2660d41 nginx "/docker-entrypoint...." 14 seconds ago Up 13 seconds
0.0.0.0:82->80/tcp,[::]:82->80/tcp pedantic_black
d829f102ee76 nginx "/docker-entrypoint...." 53 seconds ago Up 53 seconds
```

0.0.0.0:81->80/tcp, [::]:81->80/tcp interesting\_borg  
af8c141f0400 nginx "/docker-entrypoint...." About a minute

# Image

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Hub.docker.com contains all the base images  
I am working on an spring boot application. Java family.

If I want to deploy any java application on a server.  
Openjdk jvm

Springboot tomcat  
If I tell the developer that we will provision a server install tomcat on top of it then only you can run your application.  
Deployment will be slow.

## --detach

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Ctrl c: existi the stuck process

--detach : this will make your container run as an deamon process  
The container will run as foreground process

Ctr c has killed the process

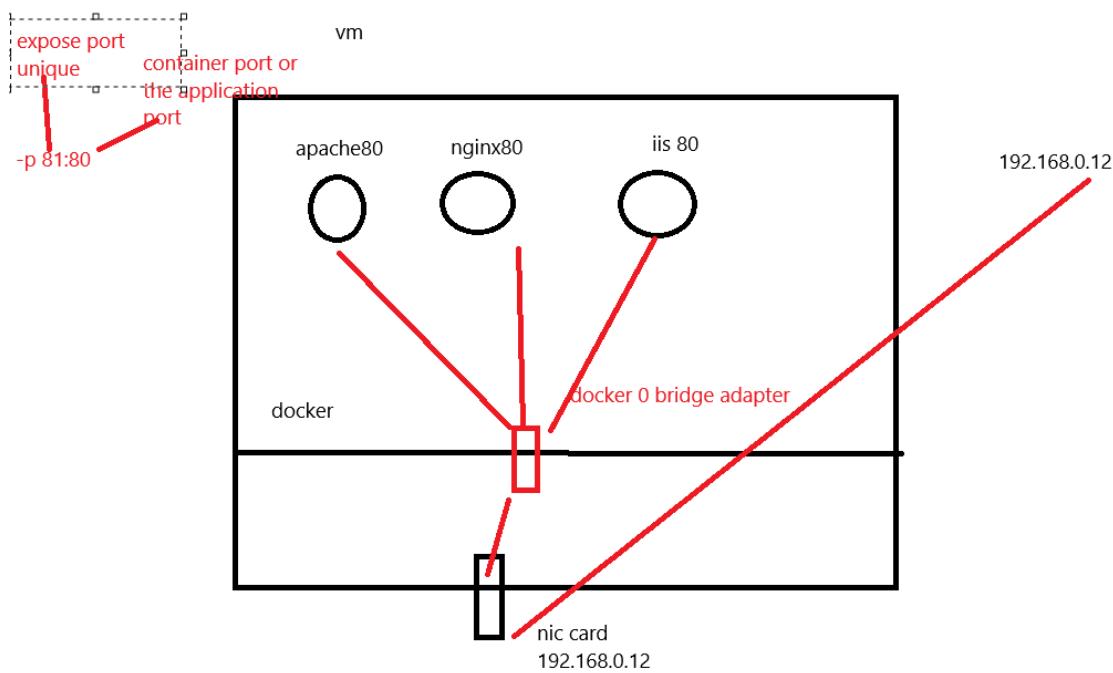
This will also give you isolation.

##process id  
#container are running as process id

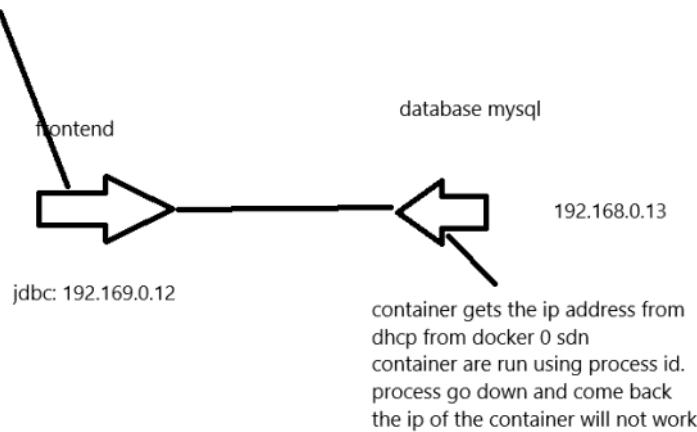
## Docker networking

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### Software defined network



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In container world you want establish connection between two container always use their naming convention. By default has dns capability

We will create a custom network  
Attach two container with the custom network  
Run an curl request from one container to another but using naming convention

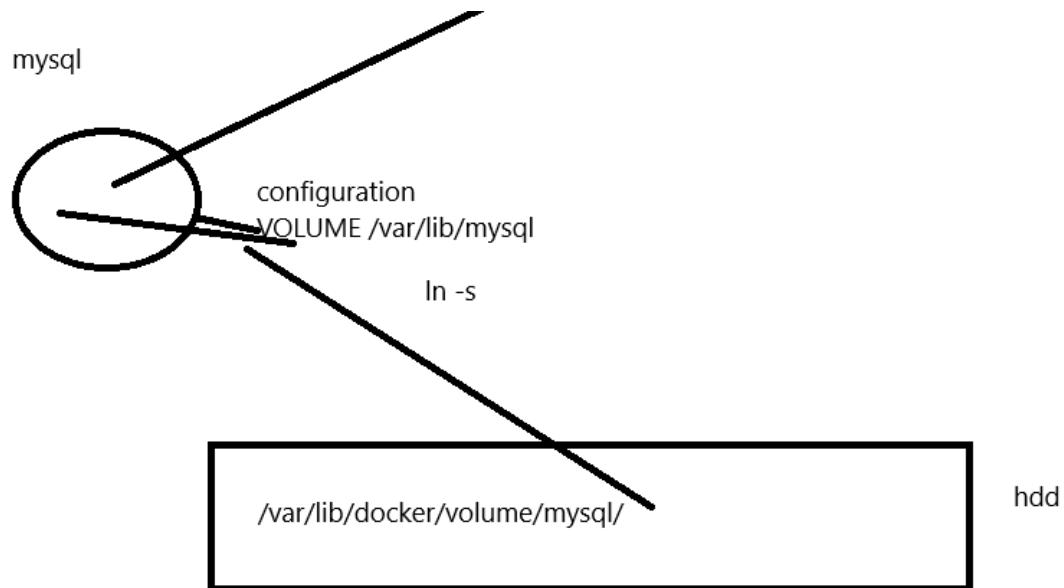
# Volumes

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By default in container world storage are ephemeral in nature

If you stop or start the container the storage will not be deleted  
But if you delete your container storage will be deleted

There are scenarios where you need persistent volume.  
Container cannot store data. It is running as process id



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# Volume demo

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1. We will create an mysql container with persistent volume and a label.
2. Login inside the mysql container
3. Create a new database called as employee
4. Once I create the db in your storage it will create a folder called as employee
5. I will stop the mysql container
6. And delete the mysql container.
7. The container will be deleted but the storage will not go away
8. Create a new container of mysql with same path
9. I login inside the container show database should show me the employee db

Environment variable use case:

Uber:

Src airport to home

There will be an container created which will look for your ride

How many people 6 env uber will look for a car which support 6 person

Gaming app 2 people

Mobile you are using apple card amount 5000

Startup variables

Netflix

Adult childrean account

# Docker images

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# Recap

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We learn about container  
How to manage your container.

What difference did you people find it between container and vm

Cgroup and namespace linux kernel capability which allow you to share resource for the process id.

Docker networking

SDN: software defined network

Create an bridge connection between your nic card and virtual nic adapter

-publish 81:80

81: expose port publish port of the container outside the vm it should be always unique

80 : container port or the application port

Docker volumes

When you need persistent volume

It creates a folder in your local hdd and store your data inside it.

# Docker images

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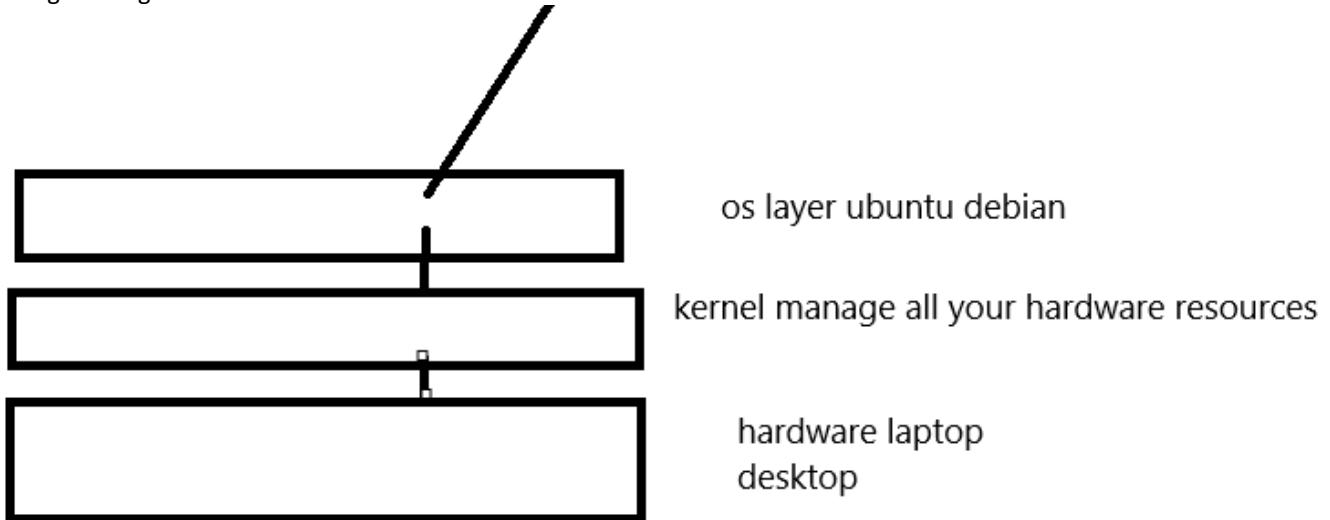
As of now whatever images we have used they are like base images

Nginx

Apache

Mysql

I deploy an nginx image



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So every container will have an base os available

How to reduce the size of an image

Why we need an light weight os

Now days we have so many IOT devices.

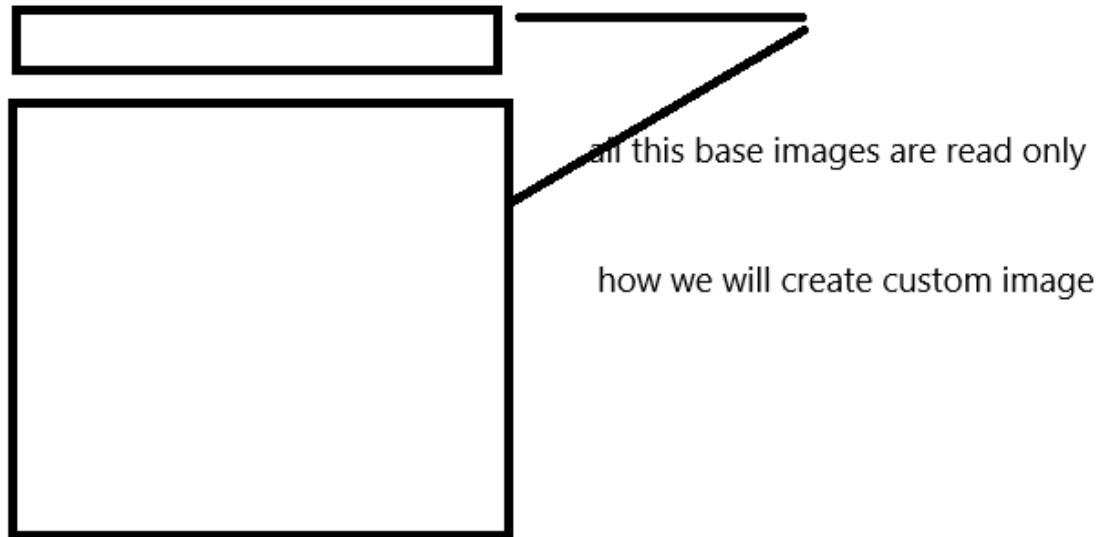
Fridge: temprature increase or decrease the tempratur camera attach email alert

300 lines they require a system with low ram processiong storage networking

Os layer is always there light weight

writable layer

custom images



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# Demo

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1. We will clone an spring boot maven application.
2. Install java
3. Install maven
4. Compile the app
5. You will get an executable file in jar format
6. We will run the application using jar format
7. Using a browser we will test the application.

Second stage

We will convert this app into an container based image

We will also create a container from this custom image

We will try to access the same from the browser

Same output you will get like in first stage but this time your application is being served using container

Next stage we will convert this application into an container based image

To do the same we need to create a file called as dockerfile in the root directory of the application

All the instruction need to be provided in capital letter.

Before you write your instruction we need to check what type of application you are creating

According to that you need to choose your base image.

This is an spring boot java application

Openjdk

React nodejs

Python

Go lang

In place of copy you can use ADD instruction

COPY src will be always your local machine

ADD src can be local or it can be an http or ftp location

# Hub.docker.com

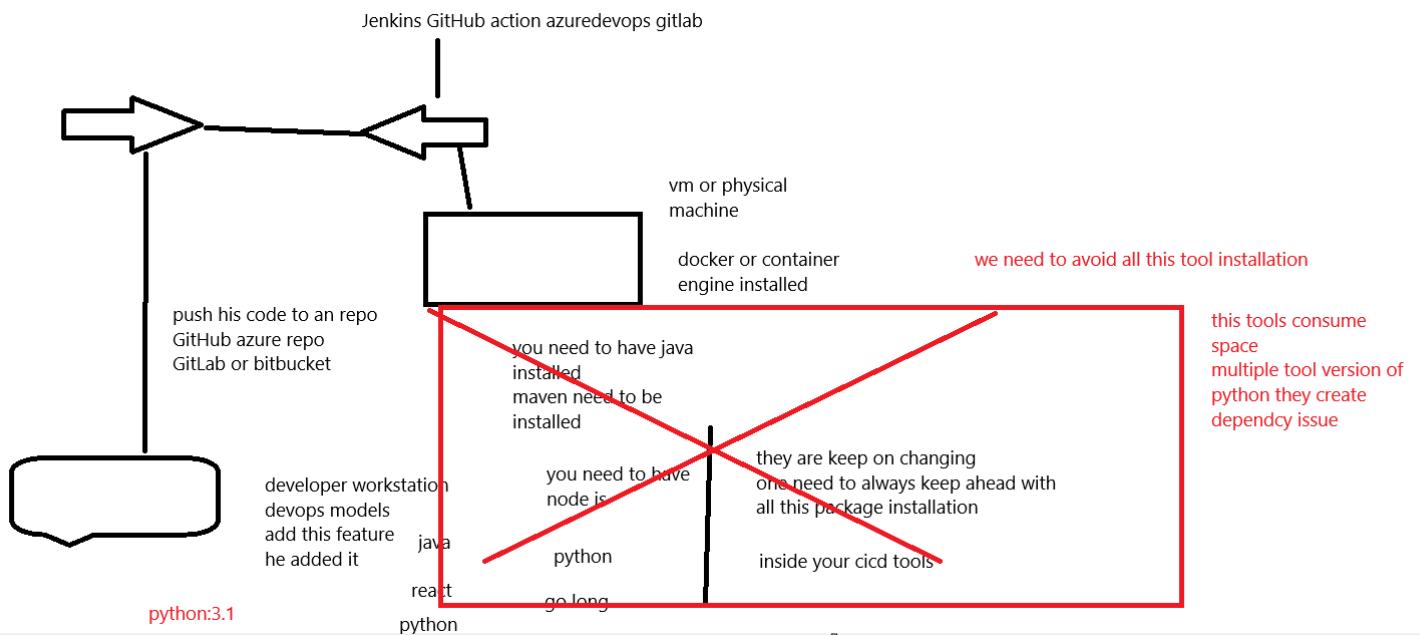
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To ship image the process is same. For acr ecr gcr  
Hub.docker.com

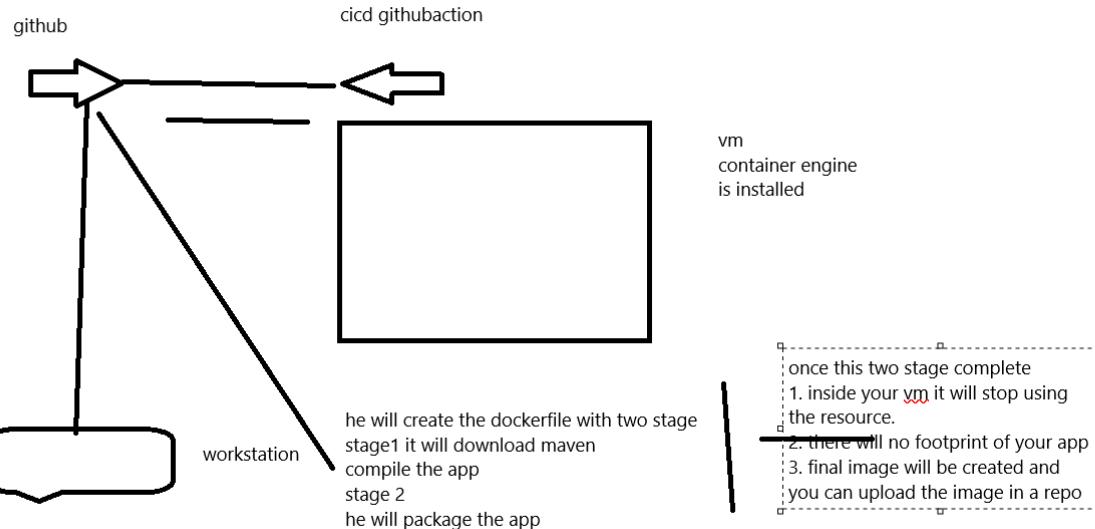
## Docker multibuild image

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Multi build  
Several image dependency  
Multi stage



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# COE

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Container Orchestrator Engine

1. Kubernetes
2. Openshift but it run on top of k8s
3. Apache mesos

What do you know about k8s

Micro service

When you want to add a feature you can add it when you don't need just delete it. It will not effect the whole environment

You deploy a dashboard in k8s

Delete that dashboard

Can we run android app in iphone

What happen on march 2020

Covid

Drain out the money

Docker sold it to miranthis

Docker become business licence

K8s cannot use docker for commerical purpose

1. Containerd
2. Crio
3. Podman

Docker ps

Crictl ps

Podman ps

Building images using docker is simplified

Ctr it is in development stage

How we access a windows machine RDP

Linux SSH

Once login we will have full access

Api based communication.

We publish an ad in google

I need reports

How many people has access my ad

From which location

Time duration.

Only the required function will be available using http get put delete update request

Bearer token decode

Get renewed

# Etcd

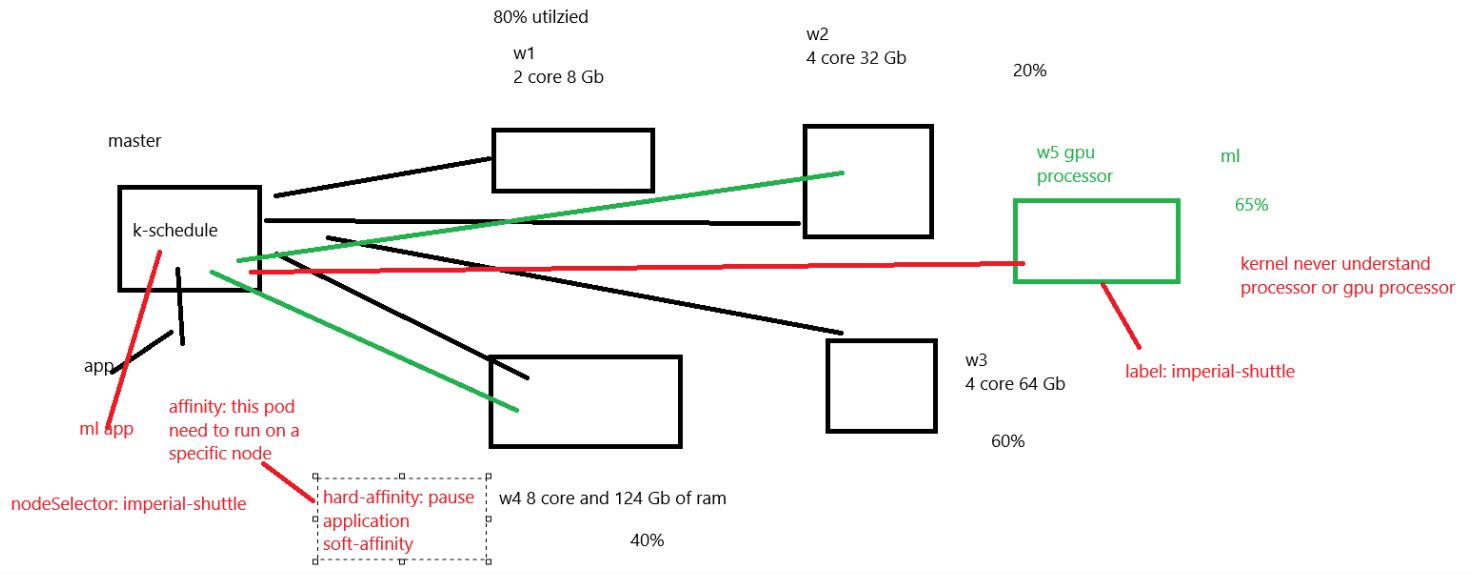
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1 we are getting frequent updates new new version of k8s are geeting release  
If you want to update your cluster  
Always take the backup of etcd  
Then only upgrade the k8s cluster  
Bcz while upgrading if anything happen cluster factory setting you will losse all the information.  
You take backup of etcd  
Restore it  
###we will take a backup of etcd at 11:30  
After that 11:31 I will create a container  
11:32 I will restore the back of 11:30  
CKA 8 % markx  
8% upgrading  
Load balancer  
100 container which is not in running state garbage collection  
Replicase  
Autoscaling  
Storage  
networking

## Kubescheduler

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### Affinity



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### Anti-affinity

1. Repels a container from specific node according to matching label
2. Spread your container by preventing them from running on the same node

Dev test prod

The do the deployment they never delete it

Control them deployment but on specific node

My prod environment will not be affected

### Law of jungle

All the VM or physical should be in local area network

Between nodes we cannot have latency

Master	Node1	Service
	Node2	Service
	Node3	Kubelite down

Kubelite is down in node3 the node will not be part of your k8s cluster all the resource which is running

in node3 will be evicted and going to reschedule in other node

Shutdown the kubelite service

Evict all the workload in the node

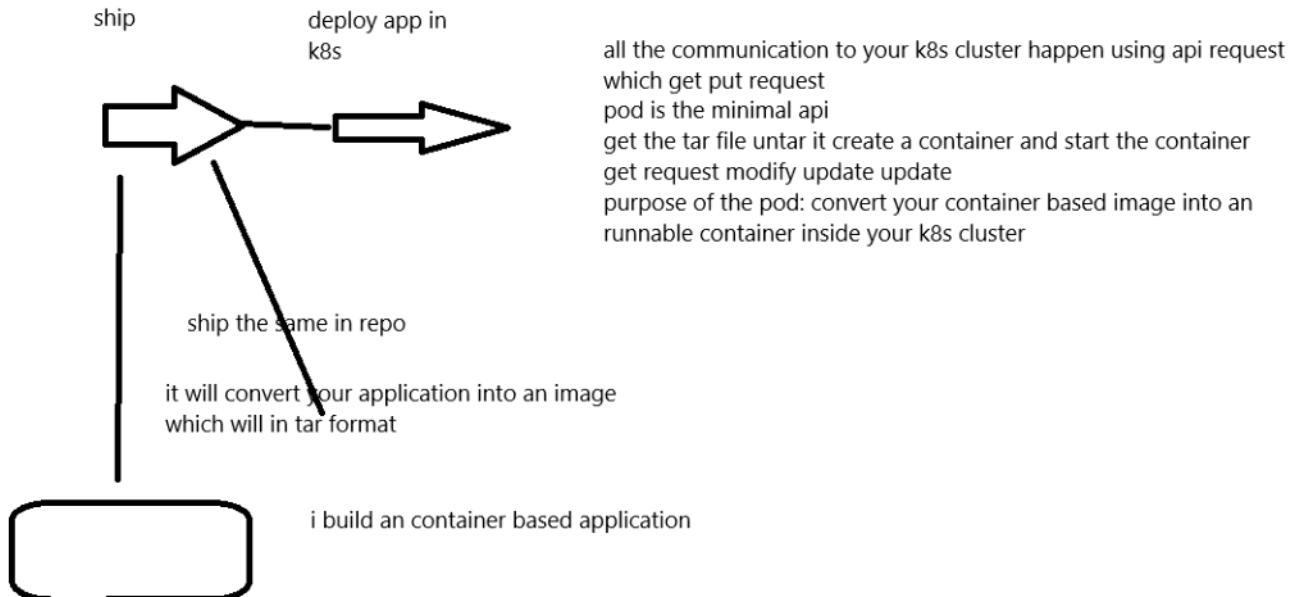
Then shutdown the kubelite service

1. Proxy can do multiple type of networking
- a. clusterIP: using clusterIP one container can talk to another container inside the cluster
- b. nodePort: using a node machine and port number I can access my app
- c. Load balancer: you can create an external IP but it is available in AKS EKS GKE cloud based k8s cluster

# Pod

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What is pod in k8s?



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# Recap

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We learn about k8s.

How k8s works

All the component or k8s is running as containers?

Like kube-apiserver is not running what may be the reason

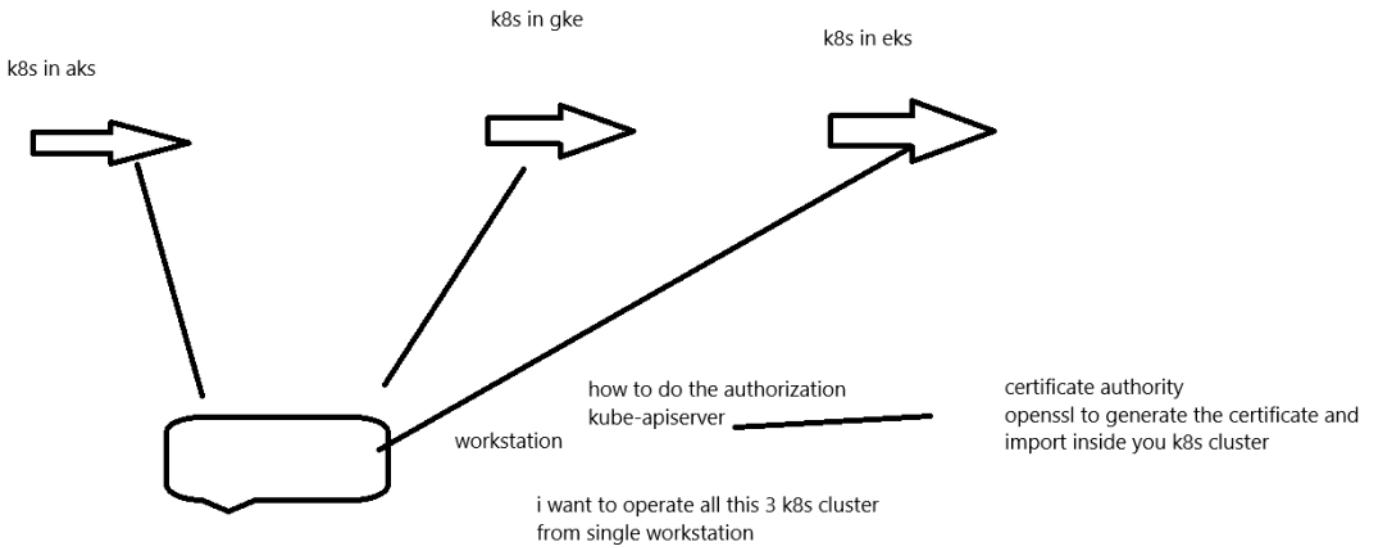
As I know they are running as container

Crictl logs kube-apiserver

# Kubectl

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This is the command line you are going to use to interact with k8s



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# Nodes information

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How to get the node information

# Pods

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What is pod in k8s.

It allow you to run your container based image inside your k8s cluster.

In our hand we have an image and I want to run that image inside the k8s cluster

So we need to create pod.

A manifest file which will help me to deploy my workload in k8s

Go lang

Kubernetes all the manifest will be created using yaml or json

Yaml: xml version

Like in json which comes from java family indentation {} starting curl and end curly

Where as in yaml the indentation will happen using two spaces

I need a way so that the manifest defination can be created easily

# Namespaces

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Namespaces in k8s

Netflix full fledged container app

Gopal-india

Ahmed-poland

#the content I see in india is different than poland

# I need to control the user behaviour once they login

We create namespace in k8s

Virtual cluster in k8s dev test stagin prod

1. Quota management
2. Role based access control dev test staging
3. Network policy using namespace
4. #by default there are some namespaces which are already created in k8s

[root@eoc-controller ~]\$ kubectl get ns

NAME	STATUS	AGE
------	--------	-----

default Active 209d #there is a default namespace if you do not define a namespace

kube-node-lease Active 209d : this is the namespace where your node information or node containers are stored

kube-public Active 209d : accessible to entire cluster namespace

kube-system Active 209d: all the system related pods are stored in this namespace

Have you ever met with an insurance sales person

How they do their sales pitch

You invest this much money you will get guaranteed income

Who is going to use the memory or CPU

## Deployment in k8s

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Why you need deployment api?

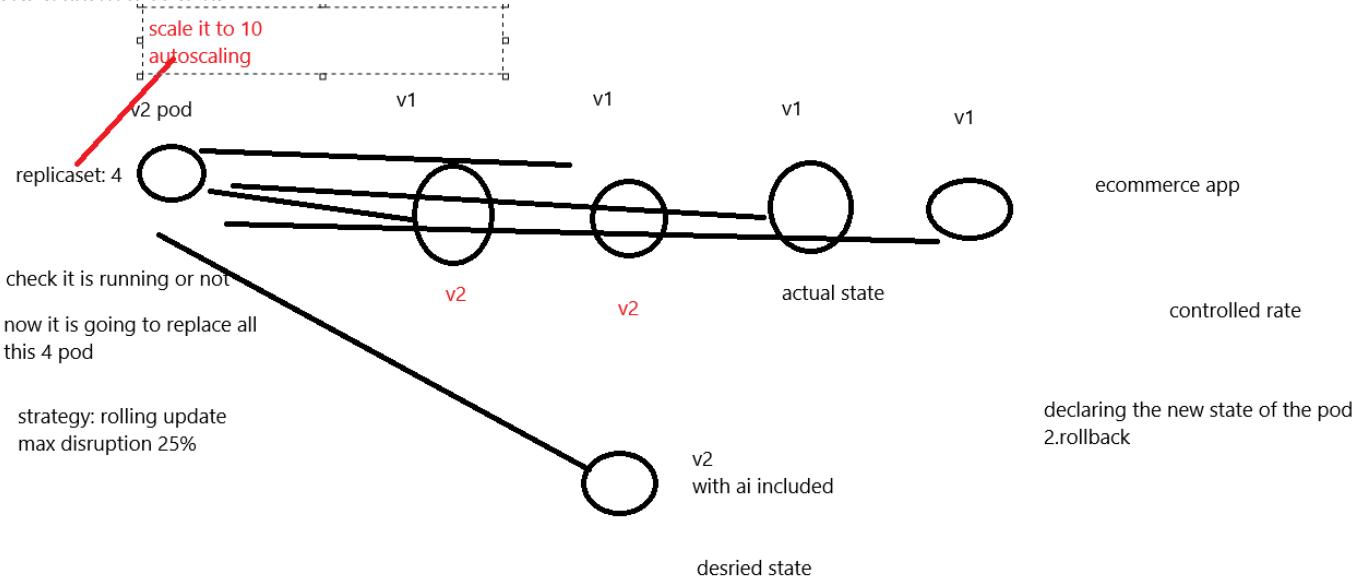
Pod api only has capability of deploying a container

Replicaset there is another api which will help you to make your container ha

Deployment=pod+replicaset

Replicontroller will ensure that the number of pod you have define that many number of pod will always in running state

You describe an desired state in a deployment and the deployment controller changes the actual state to the desired state at a controlled rate



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# Deployment demo

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We will create our first deployment with 2 replicas  
Then we will delete one of the pod a new pod should be created

# Service

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Pod it is like we are creating a vm inside your k8s cluster

To do networking in k8s we have service

There are three type of common service

1. clusterIP: when you want to connect your frontend with backend internal to your k8s cluster
2. NodePort: using a nodemachine Ip address and port number we can access the application outside k8s cluster  
30000-32767
3. LoadBalancer: this service is available on in aks eks gke fully managed k8s cluster running on top of cloud

Scaling a deployment

Autoscaling

## Recap

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We learn about deployment in k8s

Combination of two api

Deployment=pod+replicaset

Because of the replicaset we can control the pod environment we can make it ha

Deployment will always update in a controlled rate

I have 4 pod running with v1 of the application

We are upgrading the 4 pod with v2

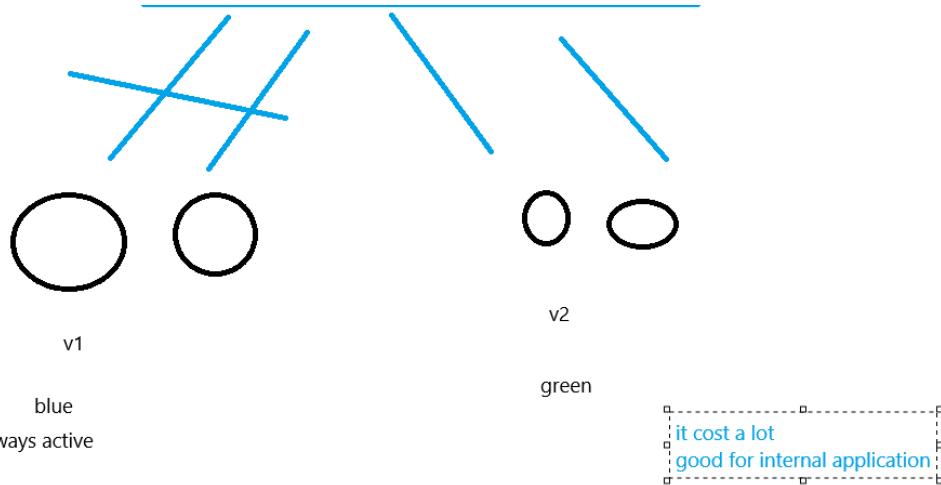
5 pod

25% max unavailable 25% max surge

Rolling update is good for internal application.

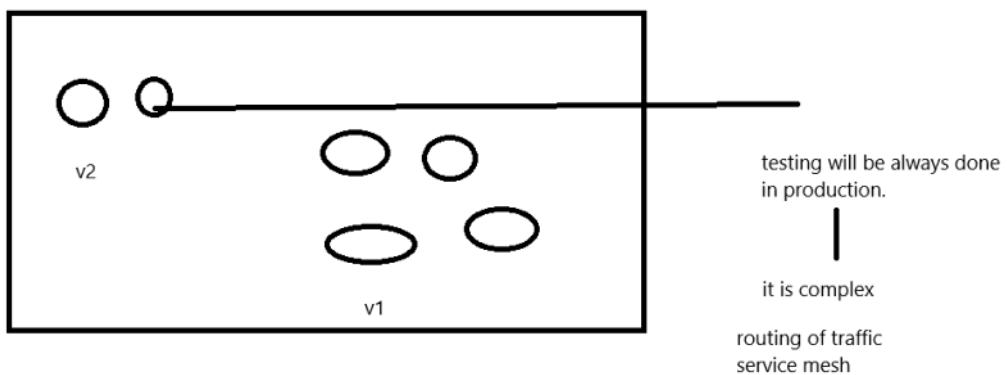
Testing will not be completed till all the pod are replaced

Blue green deployment



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canary deployment



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Next we learn about services in k8s

Pod is kind of virtual machine

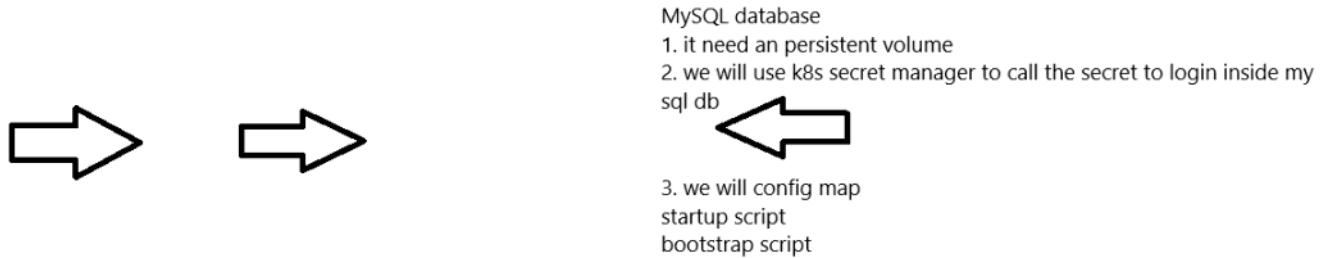
When you want to access the pod internally or externally to your k8s cluster

networking

## Storage

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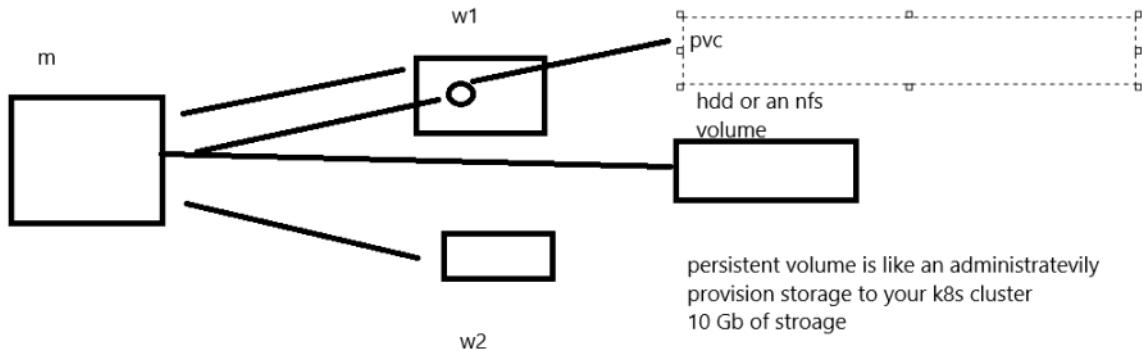
By default inside your k8s cluster storage is ephemeral in nature.  
Till the pod is there the storage will be there if you delete the pod the storage will be deleted  
Persistent volume in k8s



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### storage in k8s

1. persistent volume - it is like administratively provisioning an storage
2. persistent volume claim - it is the claim which will be used by the pod



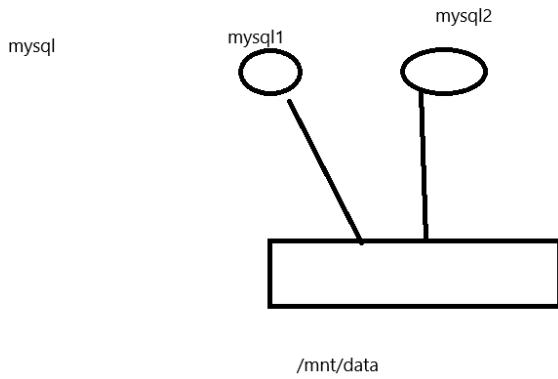
all these worker node are like resources to your k8s cluster

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## Pv and pvc demo

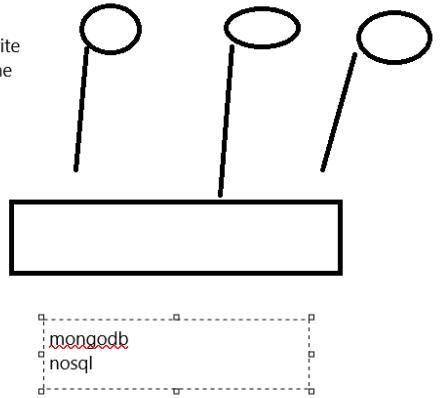
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1. Pod will always run where in worker node
  2. We don't have an nfs volume
  3. I will use one of the worker node eoc-node2 and create a folder where I can store my data
  4. Then I'll spin up a mysql pod. If the mysql pod gets started in eoc-node1
  5. Affinity where we will use nodeselector when I deploy my mysql pod
- Nodeselector will ensure my pod will be always spin in eoc-node2



we dont want both the pod should write simultaneously to avoid duplicity of the data

readwriteonce  
readwritemany



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To login to the database we need password  
In our manifest of mysql database if I put password it will be a big security risk  
Secret manager store your secret but it supports only base64 encoded format

# Configmap

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Inside configmap you should never store any secret or api key . In configmap nothing is encrypted  
Configmap has a capacity of 1MB  
It will execute when you start your container.

99% workload will be available

CKA : 440\$ USD 50%

Buy it and appear in one year two attempts

Everything is hand on

Kubernetes.io

operator

# Mysql deployment

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1. Before I deploy the mysql deployment I also need to ensure that my mysql db will run on eoc-node2

I have an container and the container has environment variable which need to be passed from kubernetes secret

# RBAC

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Role based access control in k8s. This is the primary security mechanism in k8s for regulation . It simple operate in least privilege

Which ensure that user and application will have only necessary permission.

Core component of RBAC in k8s

1. Role: it will define set of permission on a specific namespace
2. Clusterrole: it is similar to role but it will define permission across the entire cluster spanning all namespace

#role and cluster role are used to define permission in a namespace.

We need to bind it with an user group or service account in a specific namespace

1. Rolebinding: binds a role to a subject user group or services
2. Clusterrolebinding: bind it across the whole cluster

Note: in k8s there is no concept called as user.

All the user in k8s are called as service: they authenticate using certificate

####permission you need to define they are simple english verbs like get list create delete watch and resource like pod service deployment

#in k8s there is no explicit deny rule

#RBAC will always apply in a namespace

#we will create a custom namespace

Inside the custom namespace we will create a service account

Create an role

Bind the role and test it

# Dashboard in k8s

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Kubernetes has a dashboard

# Topics

Friday, February 27, 2026 1:53 PM

Network policy

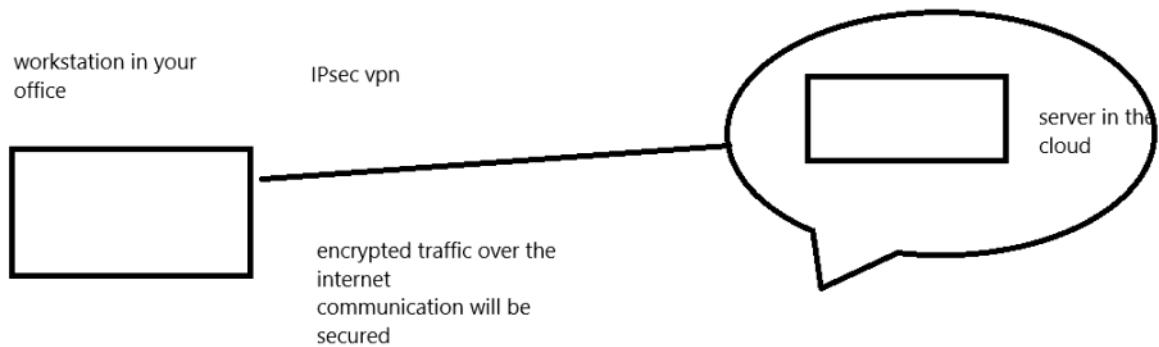
Upgrading the cluster

Taking backup of etcd

## Network policy in k8s

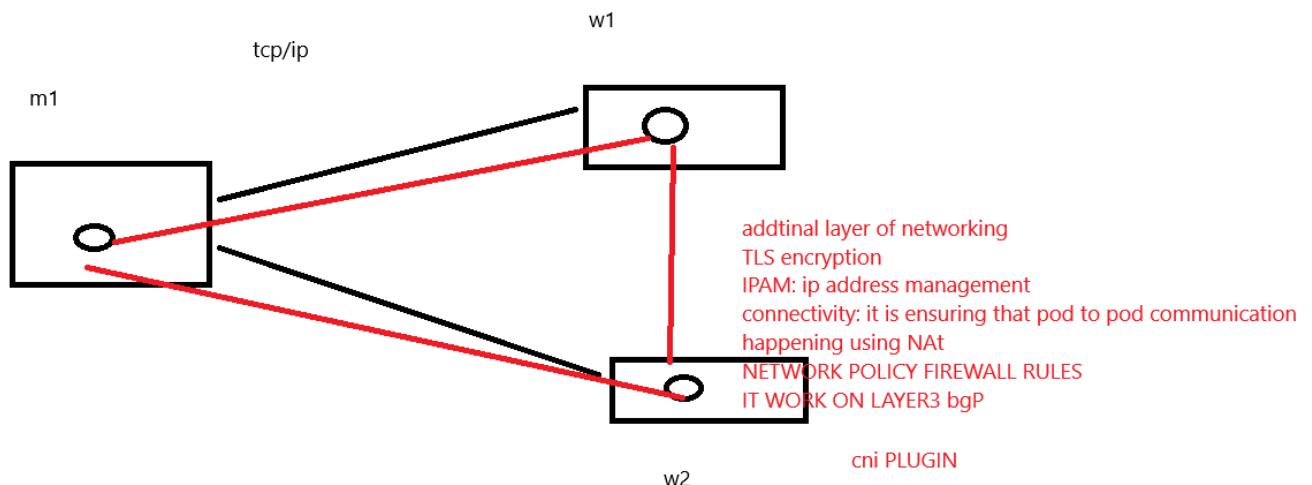
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We are looking of ingress and egress routing.  
By default where we need to put this network policy.  
Which component in k8s is always active pod  
This is kind of an firewall rules in kubernetes  
Supported by a CNI : container network interface plugin(calico/weave)



2/27/2026 2:02 PM - Screen Clipping

Kubernetes has CNI plugin



2/27/2026 2:07 PM - Screen Clipping

# Firewall

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Firewall rules we will implement in the namespace level

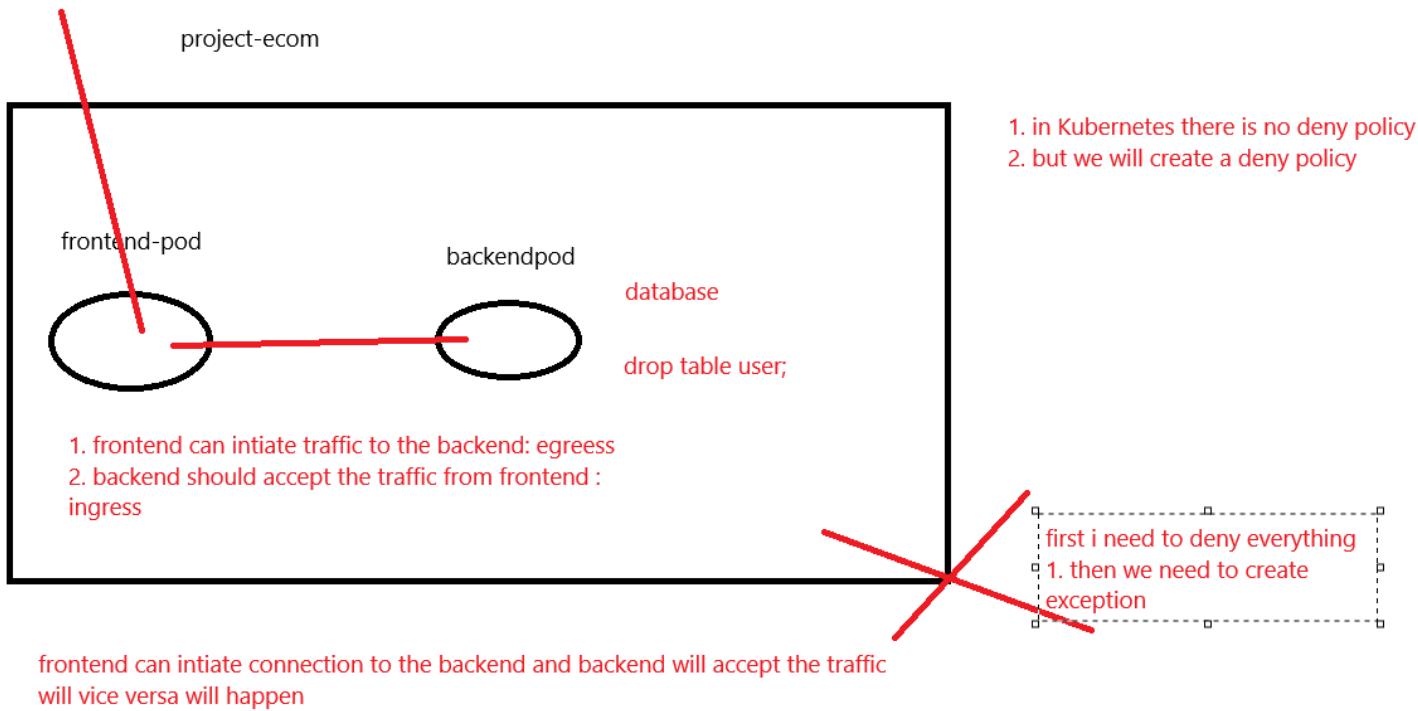
Dev test prod environment RBAC

Network policy will be applied in the namespace

When you want to apply the same inside the namespace you will do ingress and egress routing on pod level

By default every pod can access every pod

Pods are not isolated



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Exception in network policy you can create on the basis of

1. Ip address
2. Portrange
3. Namespace
4. labelok

# Upgrade our k8s cluster

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New feature

Security patch

ai

# Etcd

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What is purpose of this etcd

It is an key value data store storing your data in key value format

It is an kind of database

It store your cluster wide information

###when I upgrade my cluster I need to take the backup of etcd

While upgrading my cluster if anything happen

In that type of secnarion I can create an restore the backup of etcd my cluster will be in previous state

###demo

7 o clock we take the backup of etcd

7:10 I create a pod

7:20 I restore the 7 o clock backup

#to do the backup of etcd we required a tools etcdctl

#we also need certificate authority

Ca.certificate

Client certificate

Client key

# Gcp setup

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Create a free tier account in azure or gcp

Cloud.google.com

#create a free tier account which will give you 200\$ credit but you need to scan using google or put your debit card. Rs.1000 this account is valid for 3 month.

After three month you can cancel the account they will refund 1000

#####

The screenshot shows the Google Cloud Platform search interface. A sidebar on the left lists 'Instances', 'Compute', and 'Compute Engine'. The main search bar has the query 'compute.targethttpsproxy' and below it is another search bar with 'compute.regiontargethttpproxies'. Below these, a section titled 'Top results' shows a card for 'Compute Engine' with the subtext 'Product · VMs, GPUs, TPUs, disks'. At the bottom of the search results, there is a 'Create instance' button and a 'View instances' link.

#give a name to your instance

The screenshot shows the 'Machine configuration' step of the 'Create instance' wizard. It includes fields for 'Name' (k8smaster), 'Region' (us-central1 (Iowa)), and 'Zone' (Any). There is also a note about Gemini generating machine type suggestions. Below this, the 'Machine type' section allows selecting between 'Preset' and 'Custom'. A dropdown menu shows 'e2-medium (2 vCPU, 1 core, 4 GB memory)'. Under 'Custom', it shows 'vCPU' as '1-2 vCPU (1 shared core)' and 'Memory' as '4 GB'. A link to 'Advanced configurations' is visible.

#replace the same with

From the drop down select this machine

custom machine for your workload's particular needs. [Learn more](#)

Preset Custom

Filter instance sizes

Shared-core

Standard

High memory

P Weak CPU

e2-standard-2

2 vCPU (1 core), 8 GB memory

e2-standard-4

4 vCPU (2 core), 16 GB memory

###now choose the os

central1

- OS and storage

Debian GNU/Linux

12 (bookworm)



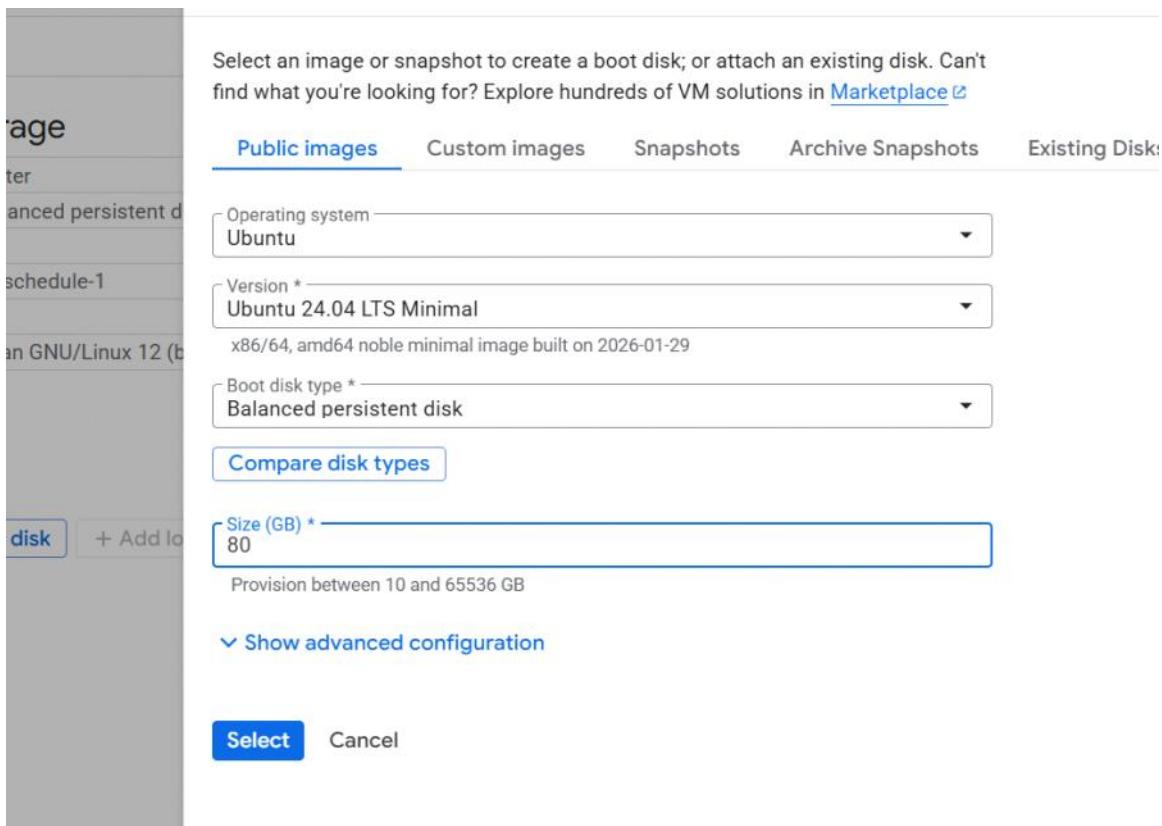
Click on change

## Operating system and storage

Name	k8smaster
Type	New balanced persistent disk
Size	10 GB
Snapshot schedule	default-schedule-1
License type	Free
Image	Debian GNU/Linux 12 (bookworm)

Change

####make it ubuntu 24



Select it and click on create

Data protection

Snapshot schedules

Networking

1 network interface

Observability

Install Ops Agent

Security

Advanced

Image: Ubuntu 24.04 LTS Minimal

Change

Additional disks

+ Add new disk   + Attach existing disk   + Add local SSD

Container Deprecated

Deploy a container image to this VM instance

Deploy container

Create   Cancel   [Equivalent code](#)

Instances deleted

```
#like this you need to create a worker node also
#before we login we need to open some port in the firewall
https://kubernetes.io/docs/reference/networking/ports-and-protocols/
##how to open the port in gcp firewall
Search for firewall
```

The screenshot shows the Cloud Armor Firewall policies interface. A sidebar on the left lists options like 'Armor', 'DDoS Dashboard', 'Cloud Armor policies', and 'Adaptive Protection'. The main area has a search bar at the top with the text 'firewall policies'. Below it, a section titled 'Top results' shows two items: 'Firewall' (Product page · VPC Network) and 'Firewall policies'. There is also a link to 'View more'.

###now open the port

#open default-allow-ssh

<input type="checkbox"/>	Name	Type	Targets	Filters	Protocols / ports	Action	Priority	Network
<input type="checkbox"/>	<a href="#">default-allow-icmp</a>	Ingress	Apply to all	IP ranges:	icmp	Allow	65534	<a href="#">default</a>
<input type="checkbox"/>	<a href="#">default-allow-internal</a>	Ingress	Apply to all	IP ranges:	tcp:0-65535 udp:0-65535 icmp	Allow	65534	<a href="#">default</a>
<input type="checkbox"/>	<a href="#">default-allow-rdp</a>	Ingress	Apply to all	IP ranges:	tcp:3389	Allow	65534	<a href="#">default</a>
<input type="checkbox"/>	<a href="#">default-allow-ssh</a>	Ingress	Apply to all	IP ranges:	tcp:22, 2379-2380, 6443, 10250, 10257, 10259, 30000-32767 udp:30000-32767	Allow	65534	<a href="#">default</a>

Click on edit

The screenshot shows the 'Firewall rule details' page for the 'default-allow-ssh' rule. At the top, there are tabs for 'My First Project' and 'firewall'. The main content area shows the rule name 'default-allow-ssh' and a 'Description' field containing 'Allow SSH from anywhere'. There are also 'Edit' and 'Delete' buttons.

...	...	◀ Firewall rule details	<a href="#">Edit</a>	<a href="#">Delete</a>
-----	-----	-------------------------	----------------------	------------------------

default-allow-ssh

Description

Allow SSH from anywhere

Logs [?](#)

Targets  
All instances in the network

Source filter  
IPv4 ranges

Source IPv4 ranges \*  
0.0.0.0/0 x for example, 0.0.0.0/0, 192.168.2.0/24

Second source filter  
None

Destination filter  
None

Protocols and ports ?

Allow all

Specified protocols and ports

TCP

Ports  
22,6443,2379-2380,10250,10259,10257,30000-32767

E.g. 20, 50-60

#add all the port and save it

##lets ssh into master and worker node

Search for computer

The screenshot shows the Google Cloud Platform search interface. The search bar at the top has the query "compute.targethttpsproxy" and "compute.regiontargethttpproxies". Below the search bar, there is a "Top results" section for "Compute Engine". It shows a card for "Product · VMs, GPUs, TPUs, disks" with a "VM instances" link. At the bottom of the search results, there is a "Security RISK OVERV..." link.

## Virtual machines

### VM instances

#select the master machine and ssh into it

1									Start / Resume	Stop	Suspend	Reset	More actions
Filter Enter property name or value													
Status	Name	Zone	Recommendations	In use by	Internal IP	External IP	Connect						
<input checked="" type="checkbox"/>	k8smaster	us-central1-c			10.128.0.9 (nic0)	34.27.97 (nic0)	SSH	<input type="button" value="..."/>					
<input type="checkbox"/>	k8snode1	us-central1-c			10.128.0.10 (nic0)	34.28.22 (nic0)	SSH	<input type="button" value="..."/>					

Fully hand on

Two attempt

Once register you have 1 year to appear

3 minutes

Kubernetes.io

There are already two simulator is there