

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

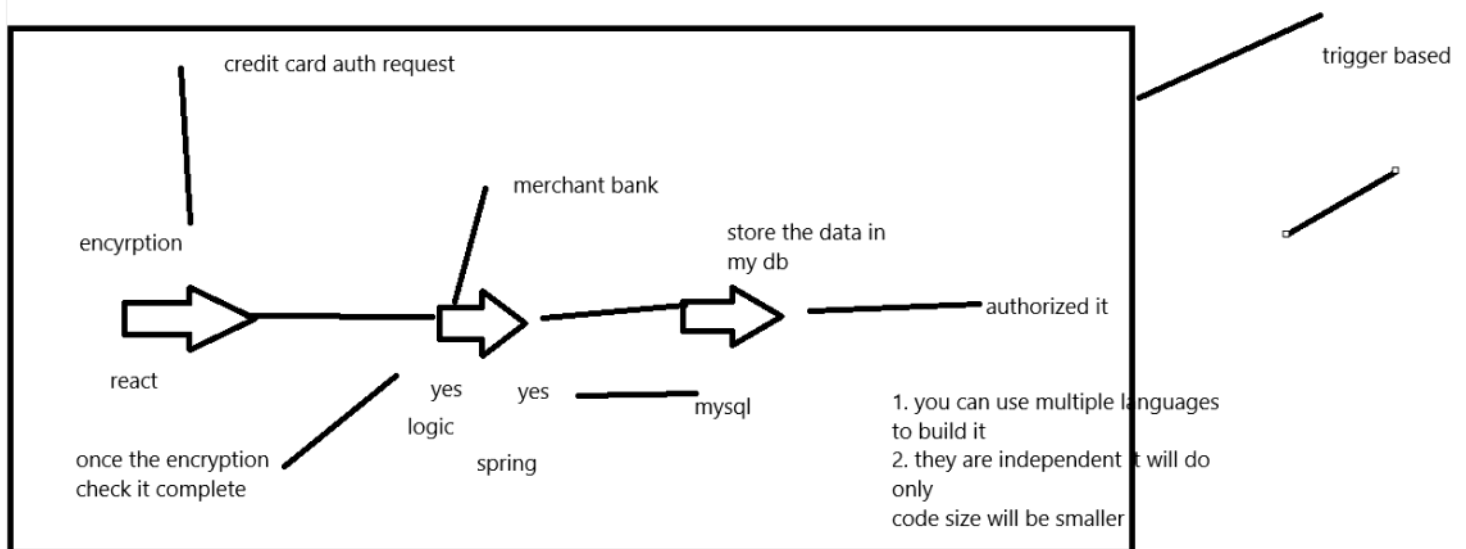
Monolithic : where every single module is tightly integrated together landing

page+cart+dispatch+logistics+paymengw

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

Customer facing app

Microservice:



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Cicd

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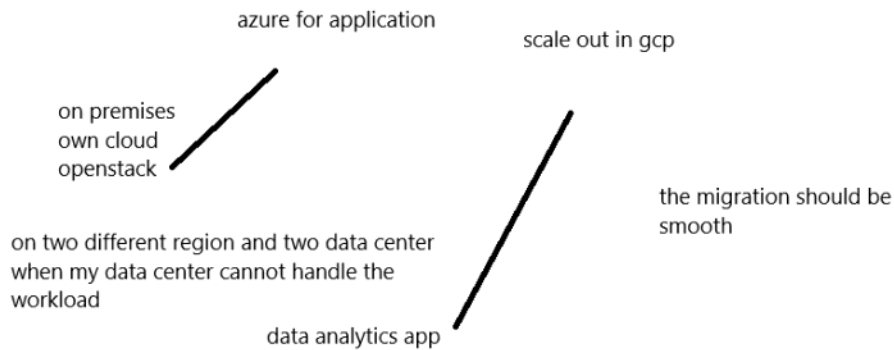
Continues integration and continues deployment.
We work on sprint. We have limited time to do a deployment.
Coding we created it-autmation-push my code- to a repo-building testing deployment happens
Devops: using automation we are faster deployment.

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

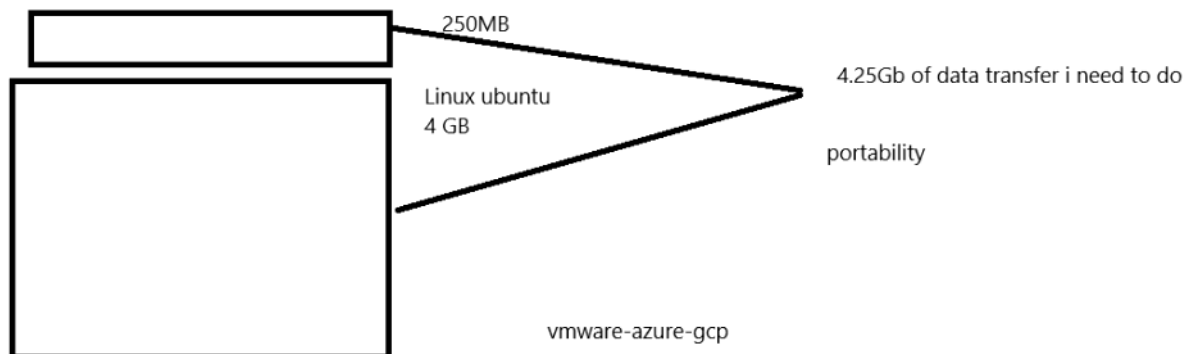
You need a platform where I can deploy my workload easily.
Can we achieve faster deployment with virtual machine.
Spin a server take time 2 min
I always need a fresh environment.

2x2x2

azure and gcp cost effective solution
10,000



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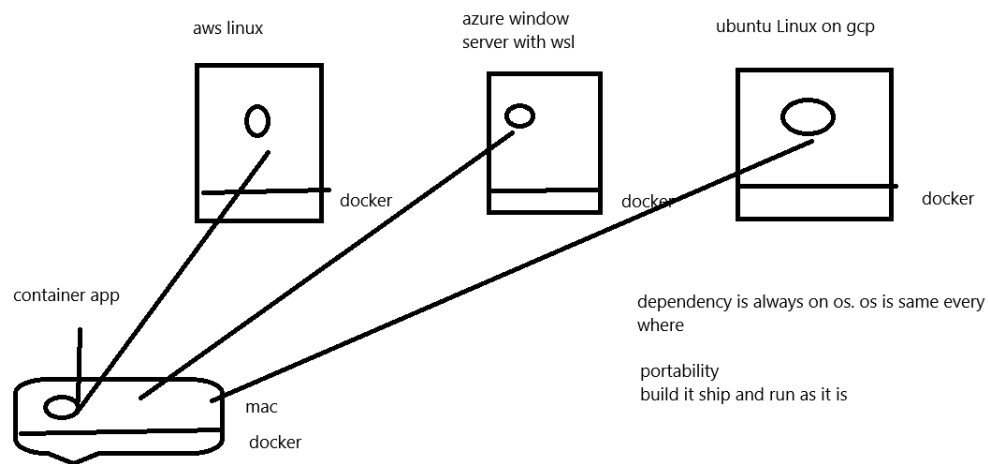


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Virtualization

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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.



- 1. no dep in hardware
- 2. ~~os~~ depend you need to have container engine installed and run your application
- 2. this give you portability

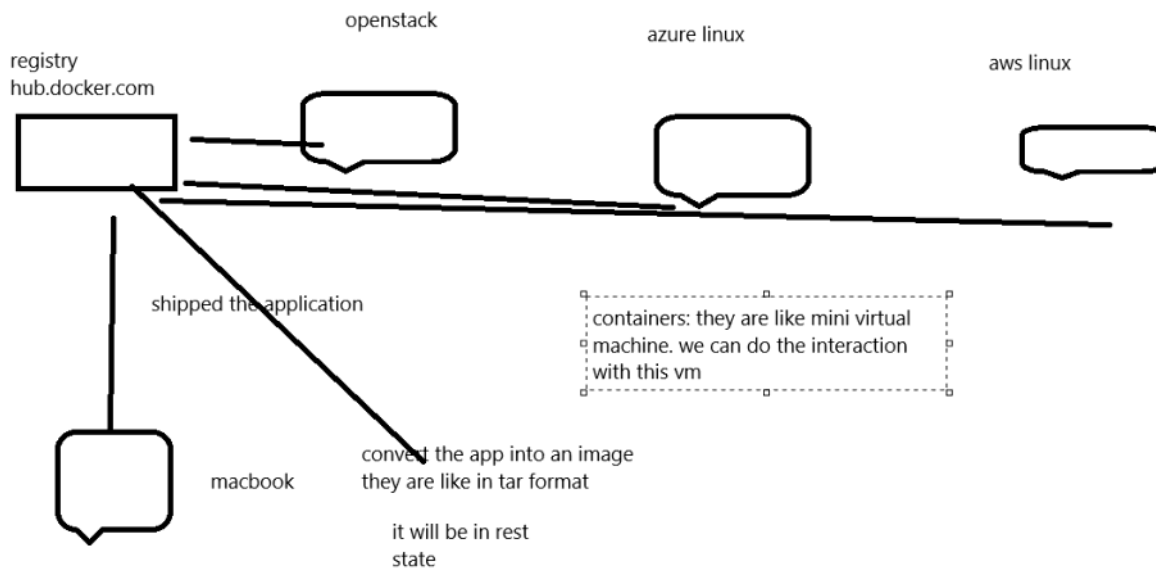
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Banking sector. They never want to migrate there core banking application in container?
SocGenerale
France labour union
Anlytics ai machine leanding market reasearch they are developing using container.
Rearchetating

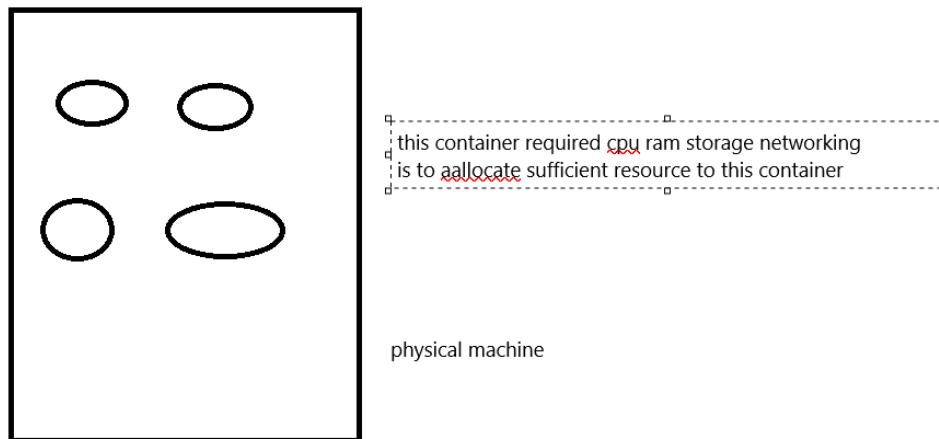
Image and container

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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 available 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
af8c141f0400	nginx	"/docker-entrypoint...."	6 seconds ago	Up 5 seconds	0.0.0.0:80->80/tcp, [::]:80->80/tcp

```
[root@docker-engine ~]$ docker container run --publish 81:80 --detach nginx
d829f102ee7600e5394f5449942ac6ba6e5655b19988c0e00876ef406a7ca2de
```

```
[root@docker-engine ~]$ docker ps
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS
d829f102ee76	nginx	"/docker-entrypoint...."	10 seconds ago	Up 10 seconds	0.0.0.0:81->80/tcp, [::]:81->80/tcp
af8c141f0400	nginx	"/docker-entrypoint...."	43 seconds ago	Up 42 seconds	0.0.0.0:80->80/tcp, [::]:80->80/tcp

```
[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
85e7c2660d41	nginx	"/docker-entrypoint...."	14 seconds ago	Up 13 seconds	0.0.0.0:82->80/tcp, [::]:82->80/tcp
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: exist the stuck process

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

Ctrl c has killed the process

This will also give you isolation.

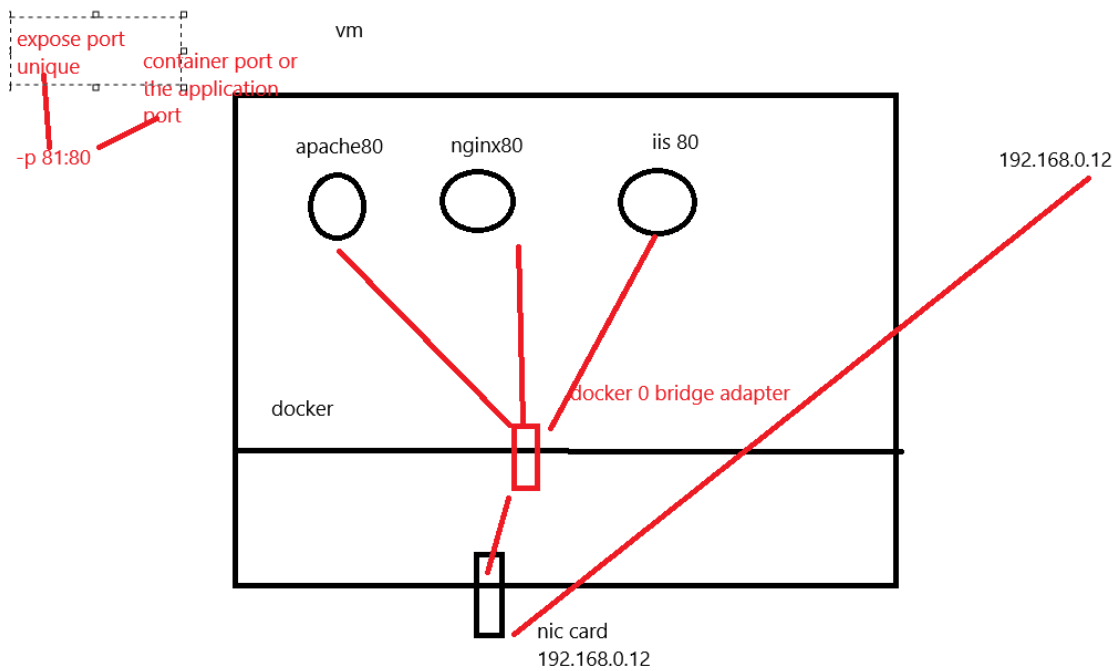
##process id

#container are running as process id

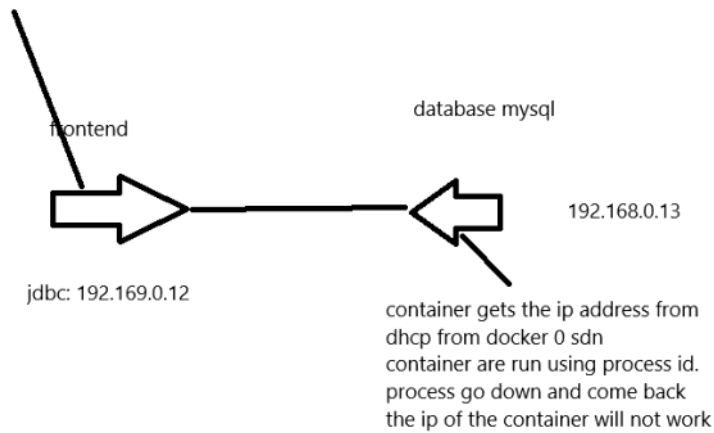
Docker networking

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Software defined network



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In container world you want establish connection between two container always use there 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

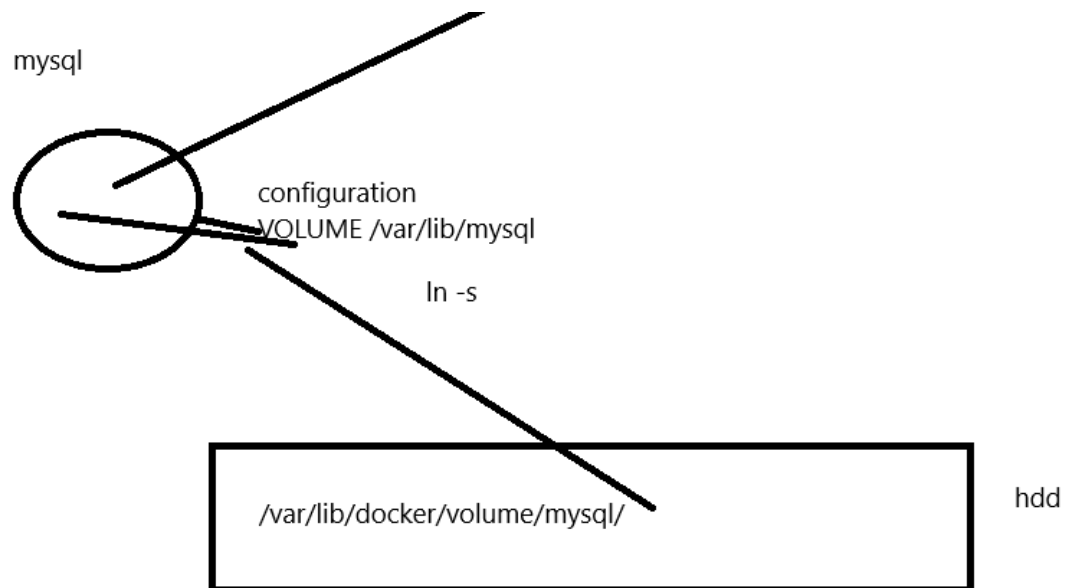
Volumes

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By default in container world storage are ephermal 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 scenario 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 delete 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 a 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 create folder in your local hdd and store your data inside it.

Docker images

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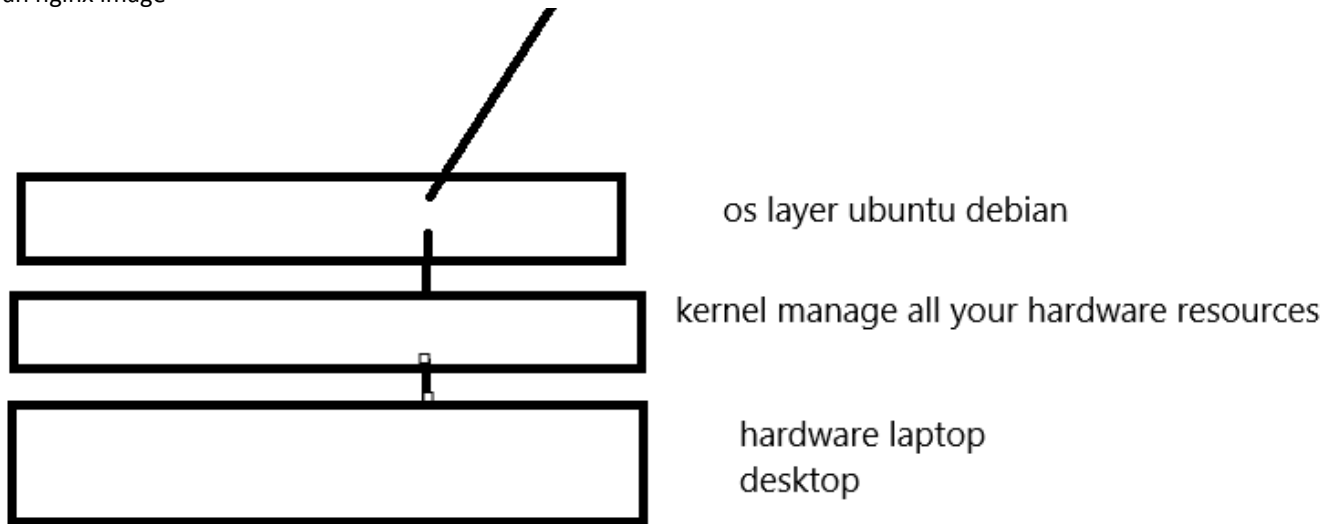
As of now whatever images we have used they are like base images

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.

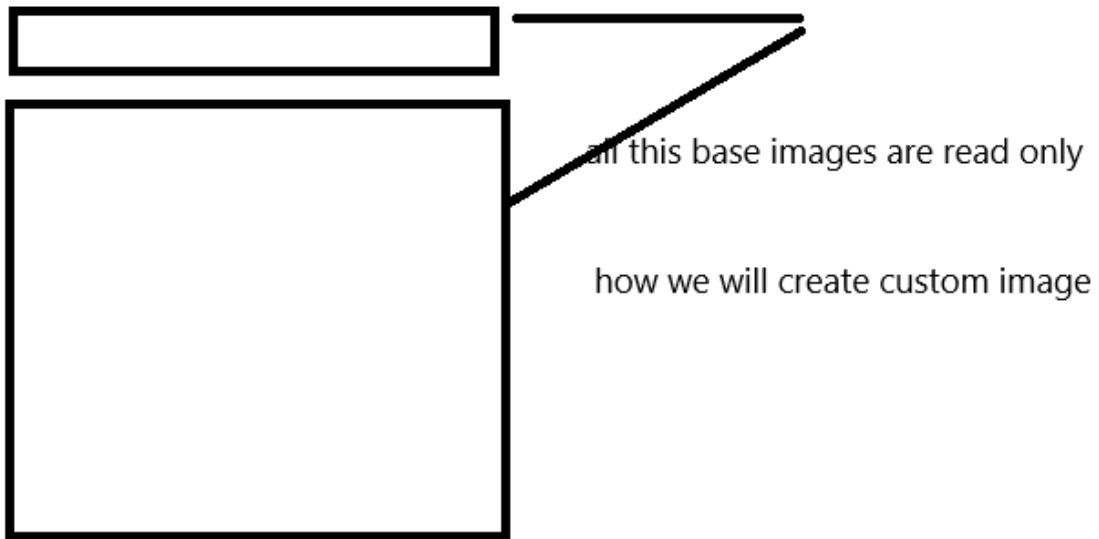
Fridge: temprature increase or decrease the tempratur camera attach email alert

300 lines they require a system with low ram proccessiong 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

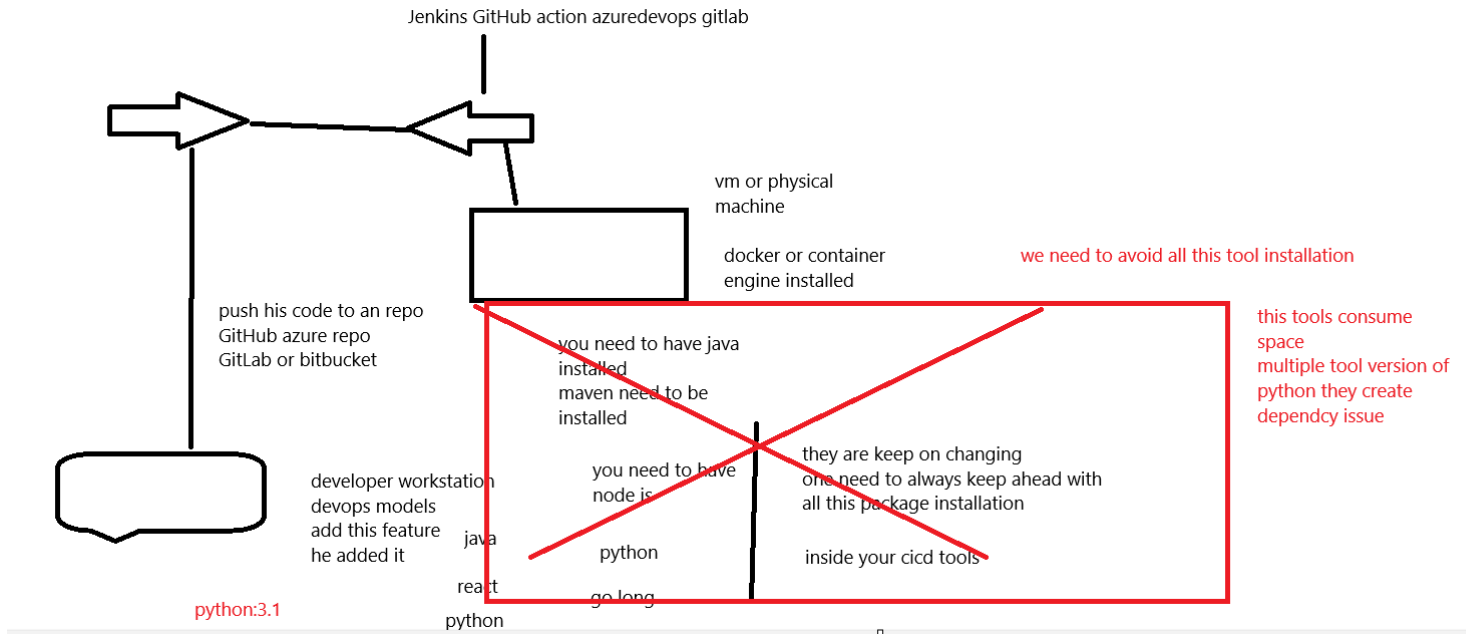
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To ship image the process is same. For acr ecr gcr
Hub.docker.com

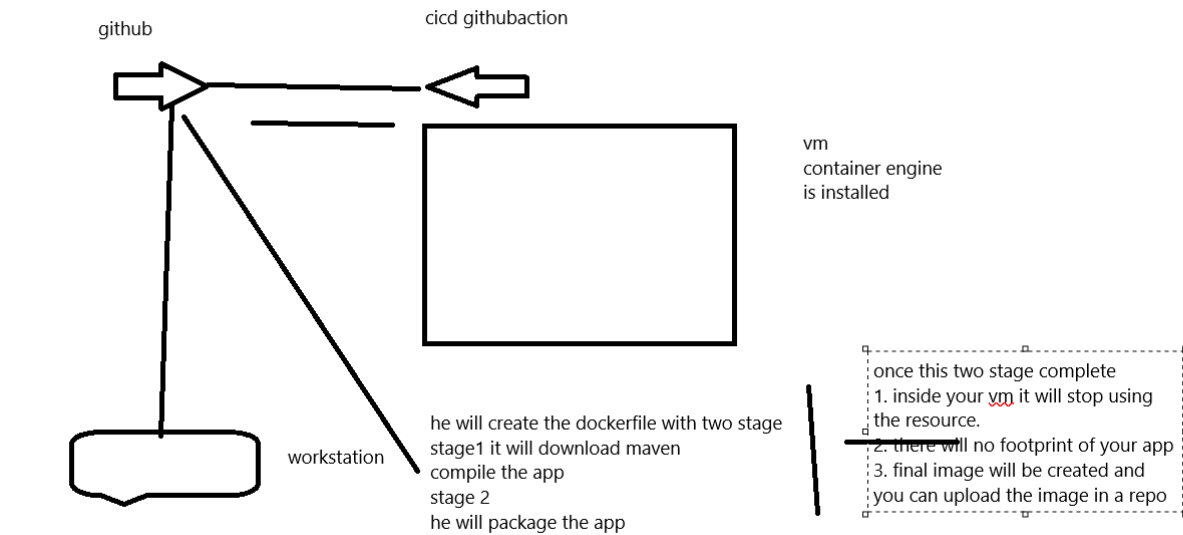
Docker multibuild image

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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 add in google

I need reports

How many people has access my ad

From which location

Time duration.

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

Bearer token decode

Get renewed

Etcd

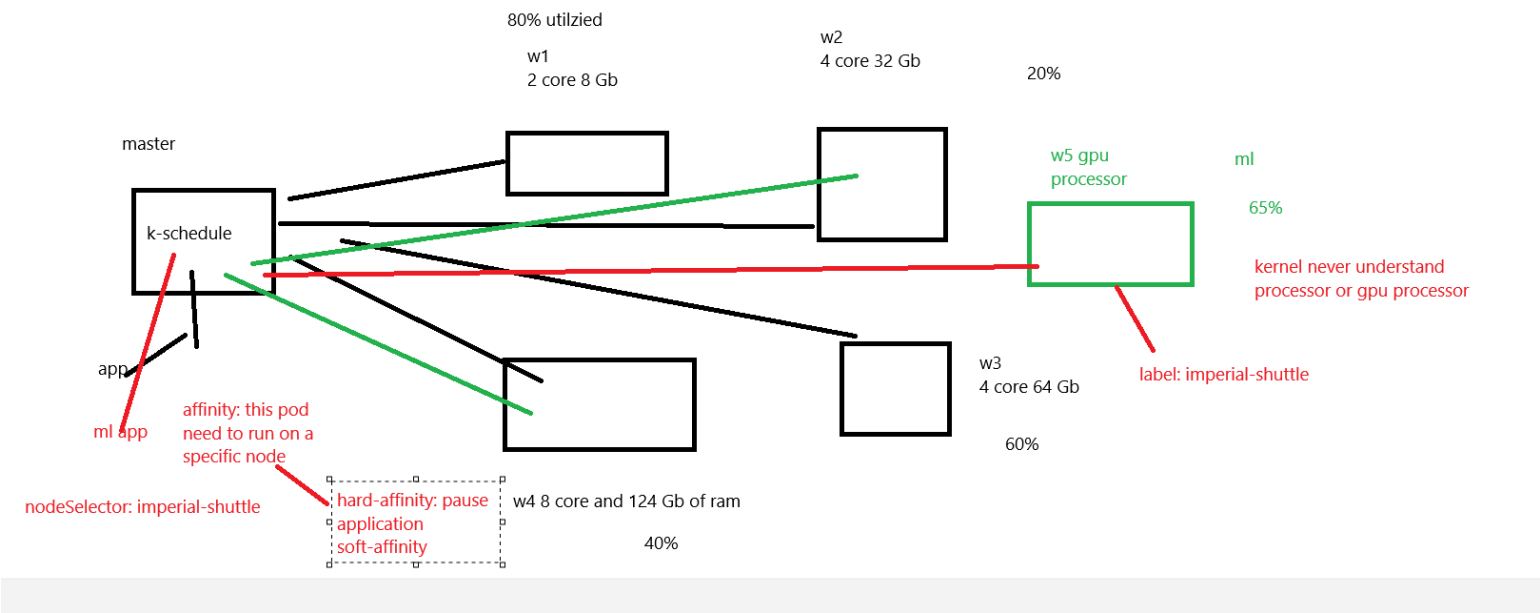
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1 we are getting frequent updates new new version of k8s are geeting release
If you want to update your cluster
Always take the backup of etcd
Then only upgrade the k8s cluster
Bcz while upgrading if anything happen cluster factory setting you will 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 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	Kubelete down

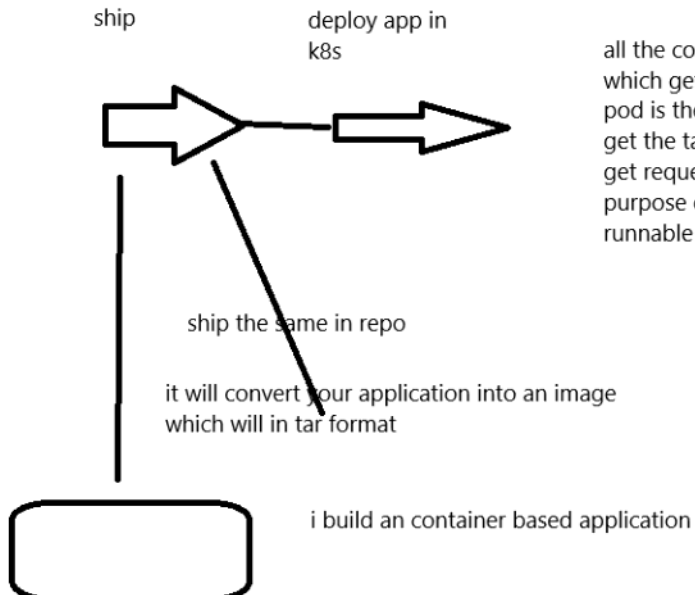
Kubelet is down in node3 the node will not be part of your k8s cluster all the resource which is running in node3 will be evicted and going to reschedule in other node
Shutdown the kubelete service
Evict all the workload in the node
Then shutdown the kubelet service

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 lb but it is avaiable in aks eks gke cloud based k8s cluster

Pod

Tuesday, February 24, 2026 8:12 PM

What is pod in k8s?



all the communication to your k8s cluster happen using api request
which get put request
pod is the minimal api
get the tar file untar it create a container and start the container
get request modify update update
purpose of the pod: convert your container based image into an
runnable container inside your k8s cluster

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Recap

Wednesday, February 25, 2026 1:56 PM

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

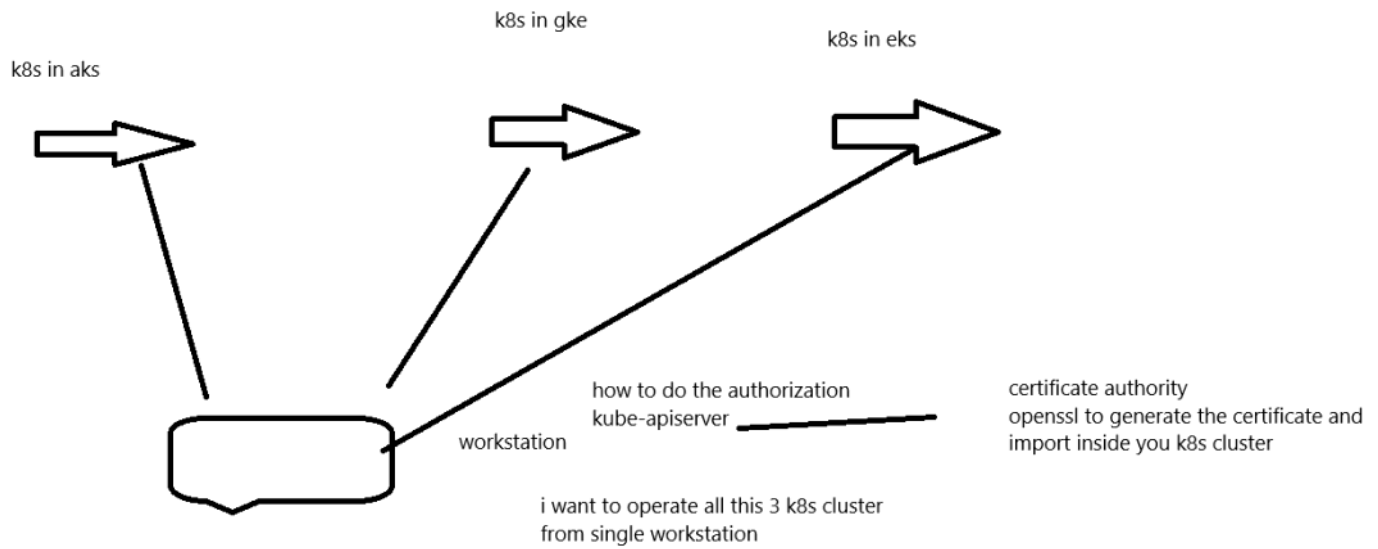
As I know they are running as container

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

Wednesday, February 25, 2026 2:15 PM

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 staging prod

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

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

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

default	Active	209d
---------	--------	------

 #there is an 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 pod are stored in this namespace

Have you ever met with an insurance sales person

How they do there sales pitch

You invest this much money you will get guaranteed income

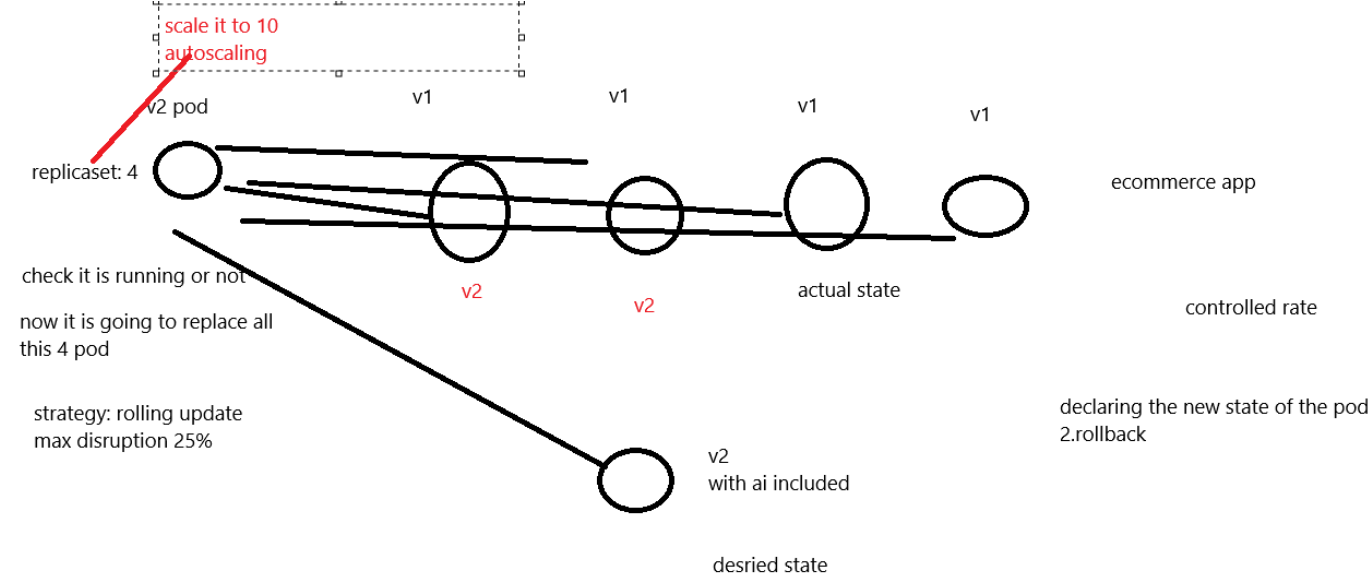
Who is going to use the memory or cpu

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
Replicaset 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



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 in avaialbe on in aks eks gke fully managed k8s cluster running on top of cloud

Scaling a deployment

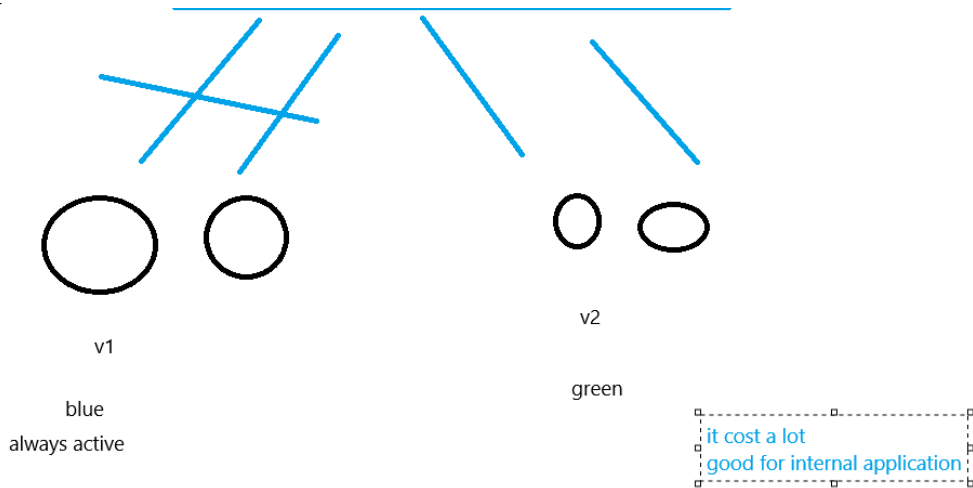
Autoscaling

Recap

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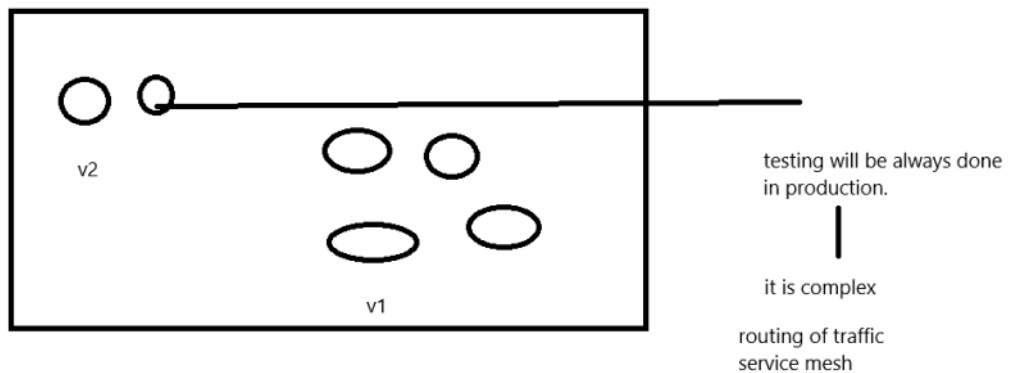
We learn about deployment in k8s
Combination of two api
Deployment=pod+replicaset
Because of the replicaset we can control the pod environemnt we can make it ha
Deployment will always update in a controlled rate

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



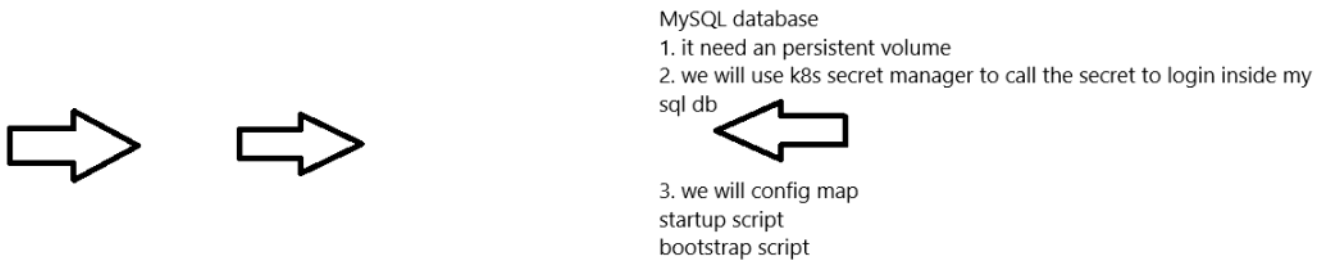
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Next we learn about services in k8s
Pod is kind of virtual machine
When you want to access the pod internally or external to your k8s cluster
networking

Storage

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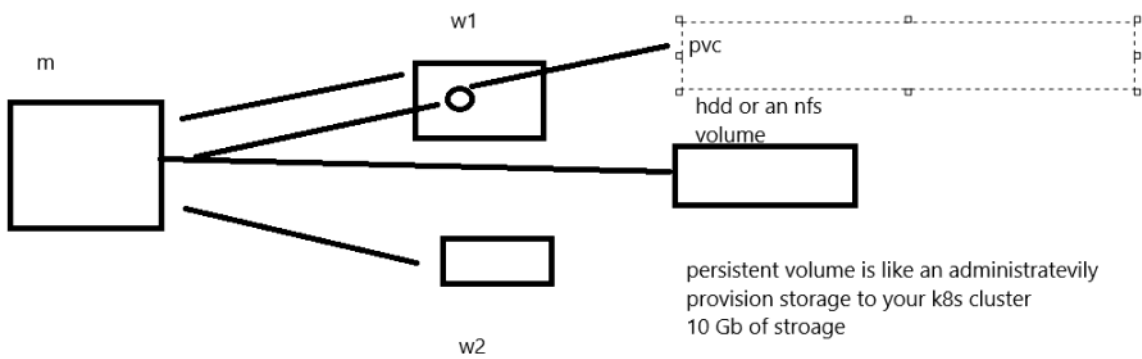
By default inside your k8s cluster storage is ephemeral in nature.
Till the pod is there the storage will be there if you delete the pod the storage will be deleted
Persistent volume in k8s



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storage in k8s

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



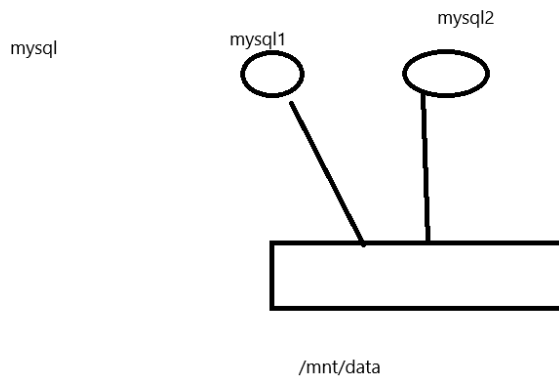
all there worker node are like resources to your k8s cluster

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Pv and pvc demo

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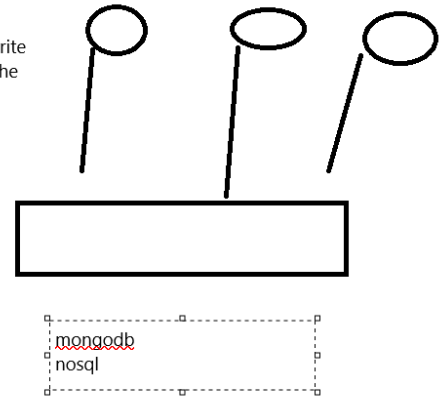
1. Pod will always run where in worker node
 2. We don't have an nfs volume
 3. I will use one of the worker node eoc-node2 and create a folder where I can store my data
 4. Then I'll spin up a mysql pod. If the mysql pod gets started in eoc-node1
 5. Affinity where we will use nodeselector when I deploy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



we don't 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 an big security risk

Secret manager store your secret but it support 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

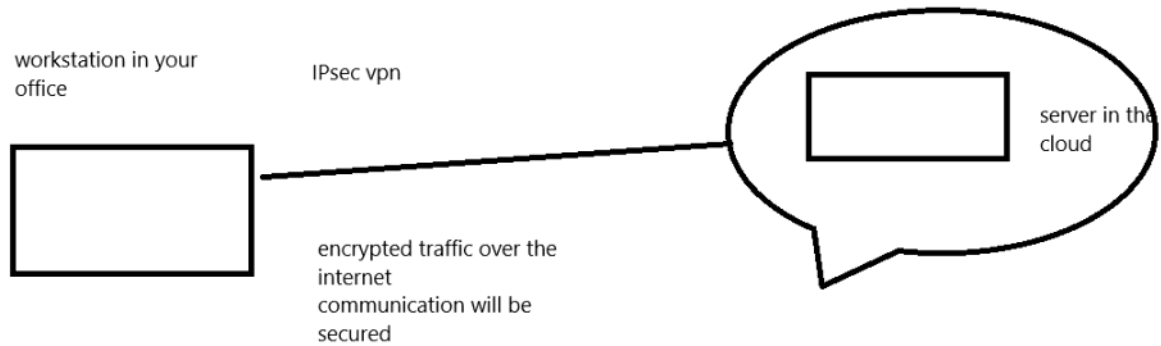
Upgrading the cluster

Taking backup of etcd

Network policy in k8s

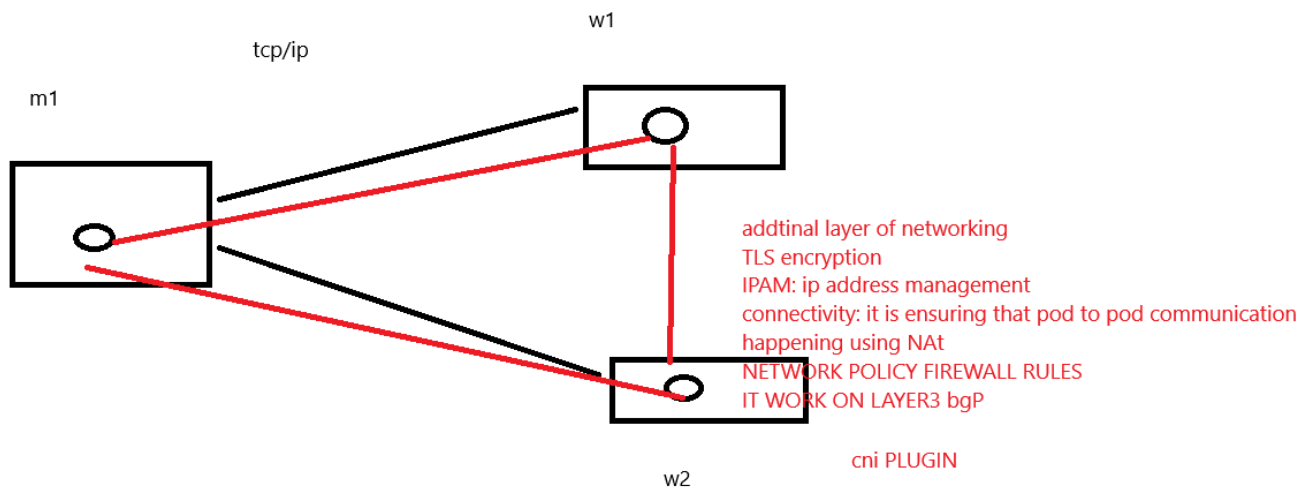
Friday, February 27, 2026 1:54 PM

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

Friday, February 27, 2026 2:15 PM

Firewall rules we will implement in the namespace level

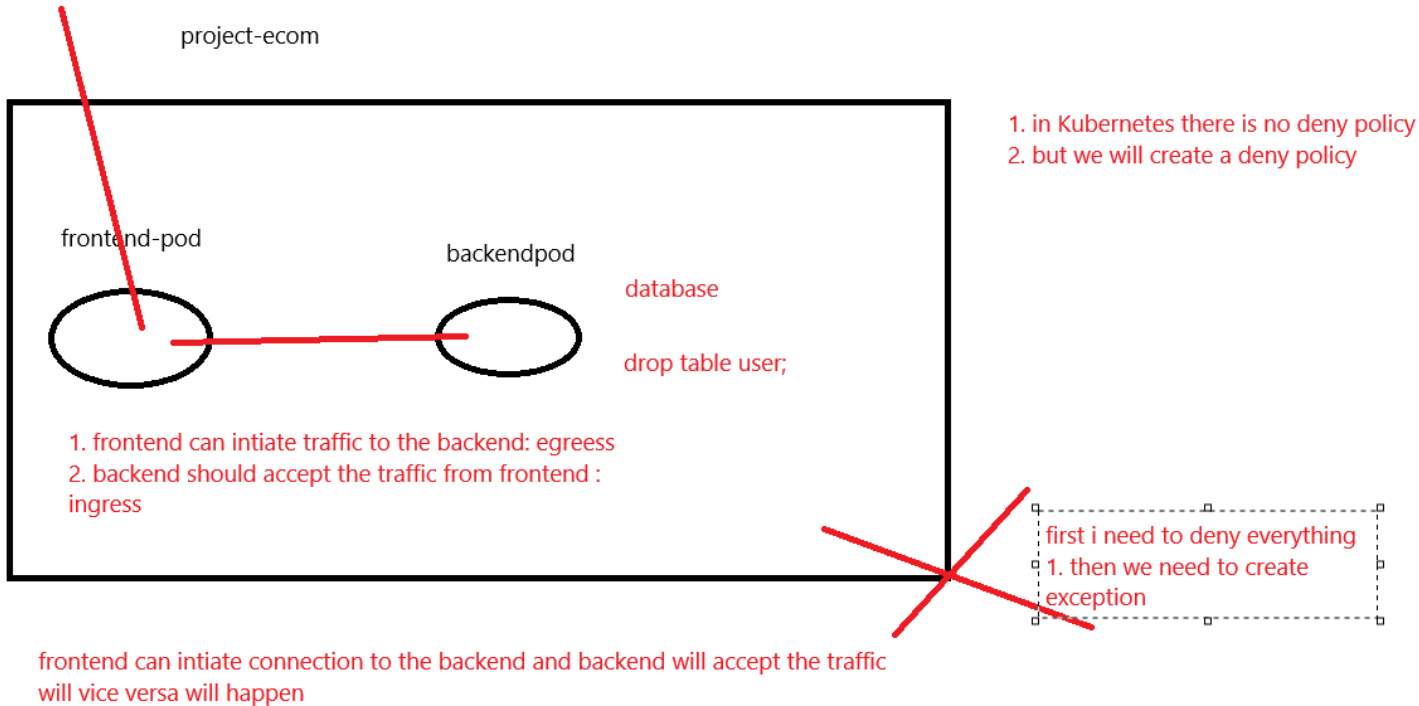
Dev test staging prod environment RBAC

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



2/27/2026 2:26 PM - Screen Clipping

Exception in network policy you can create on the basis of

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

Upgrade our k8s cluster

Friday, February 27, 2026 4:31 PM

New feature
Security patch
ai

Etcd

Friday, February 27, 2026 7:06 PM

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

Friday, February 27, 2026 7:50 PM

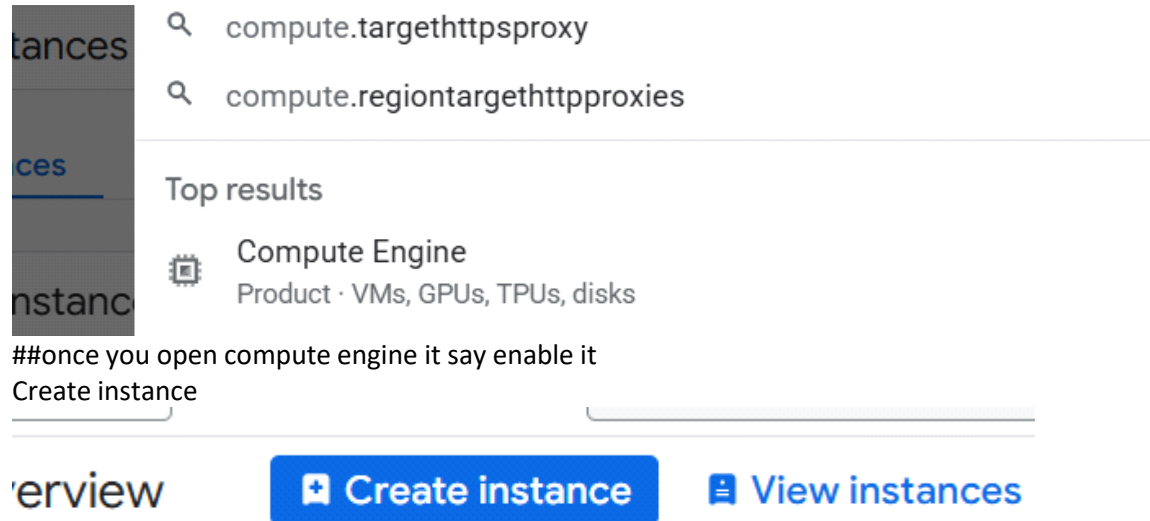
Create a free tier account in azure or gcp

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 months.

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

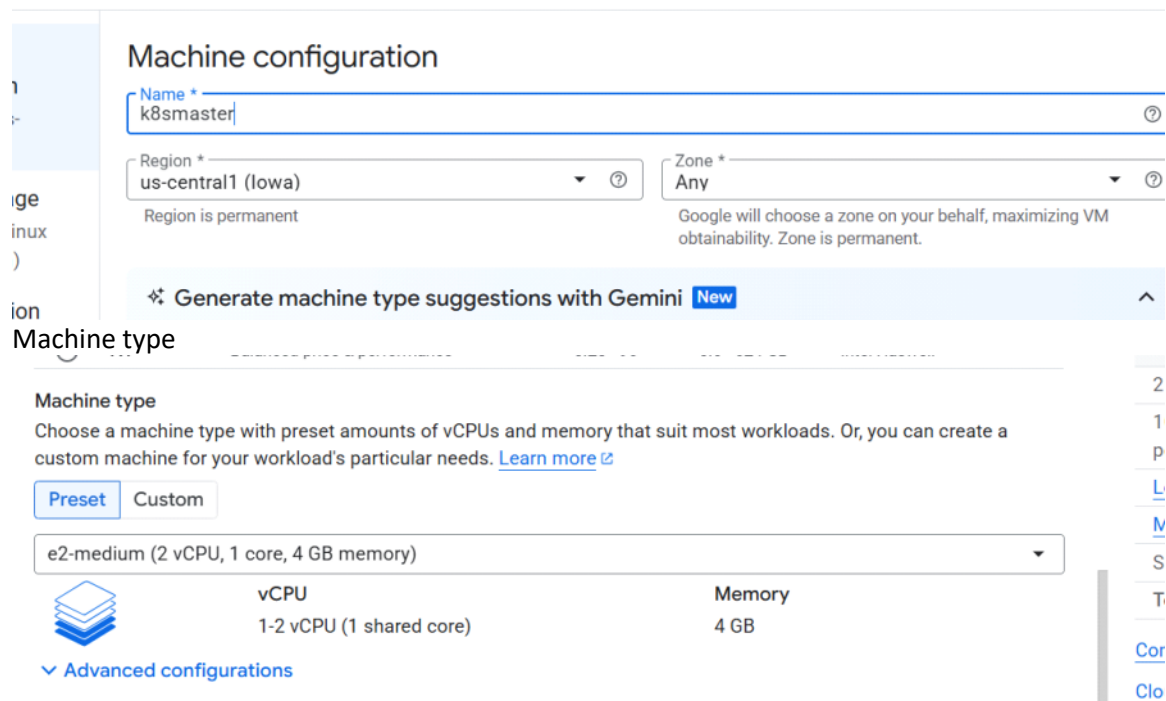
#####



The screenshot shows a search interface with a sidebar on the left containing the words 'instances', 'ces', and 'instanc'. The search bar contains the text 'compute.targethttpsproxy'. Below the search bar, there are two search suggestions: 'compute.targethttpsproxy' and 'compute.regiontargethttpsproxies'. Under the heading 'Top results', the first result is 'Compute Engine' with a subtext 'Product · VMs, GPUs, TPUs, disks'. At the bottom of the search results, there are three buttons: 'Overview', 'Create instance' (in a blue box), and 'View instances'.

##once you open compute engine it say enable it
Create instance

#give a name to your instance



The screenshot shows the 'Machine configuration' page in the Google Cloud Platform. The 'Name' field is filled with 'k8smaster'. The 'Region' is set to 'us-central1 (Iowa)' and the 'Zone' is set to 'Any'. Below these fields, there is a note: 'Google will choose a zone on your behalf, maximizing VM obtainability. Zone is permanent.' There is a button 'Generate machine type suggestions with Gemini' with a 'New' tag. Below this, the 'Machine type' section is visible, showing a dropdown menu with 'e2-medium (2 vCPU, 1 core, 4 GB memory)' selected. To the right of the dropdown, the specifications are listed: 'vCPU 1-2 vCPU (1 shared core)' and 'Memory 4 GB'. At the bottom, there is a link 'Advanced configurations'.

#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

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 an image or snapshot to create a boot disk; or attach an existing disk. Can't find what you're looking for? Explore hundreds of VM solutions in [Marketplace](#)

Public images Custom images Snapshots Archive Snapshots Existing Disk

Operating system
Ubuntu

Version *
Ubuntu 24.04 LTS Minimal
x86/64, amd64 noble minimal image built on 2026-01-29

Boot disk type *
Balanced persistent disk

[Compare disk types](#)

Size (GB) *
80
Provision between 10 and 65536 GB

[Show advanced configuration](#)

Select Cancel

Select it and click on create

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 [×](#)

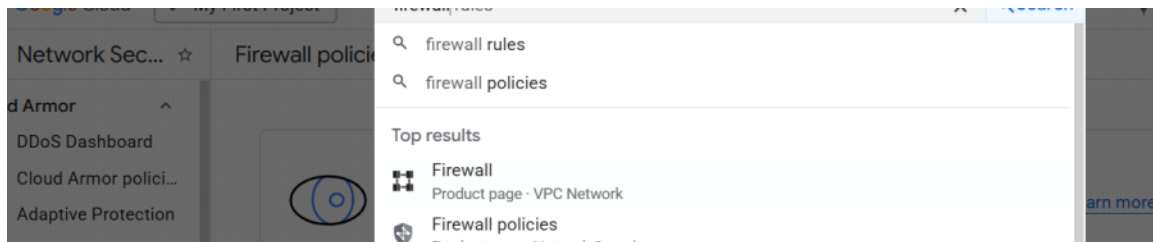
#like this you need to create a worker node also

#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



###now open the port
#open default-allow-ssh

Filter Enter property name or value

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

Click on edit

My First Project firewall

... ☆ ← Firewall rule details Edit Delete

^ default-allow-ssh

d

ici... Description

tion Allow SSH from anywhere

Loas (?)

Targets
All instances in the network

Source filter
IPv4 ranges

Source IPv4 ranges *
0.0.0.0/0 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

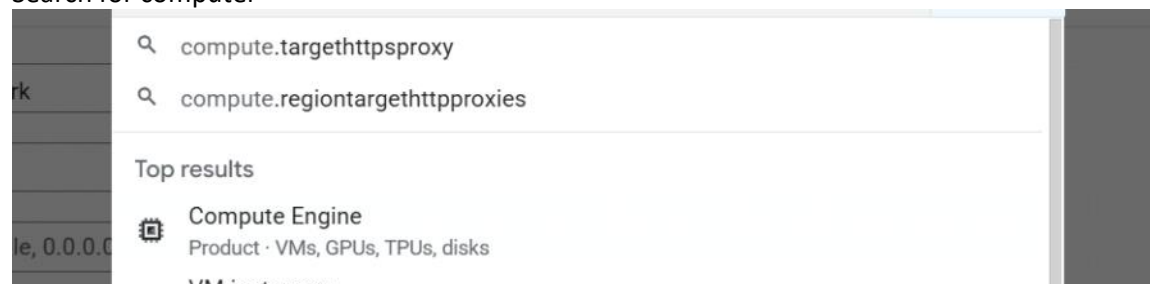
Ports
22,6443,2379-2380,10250,10259,10257,30000-32767

E.g. 20, 50-60

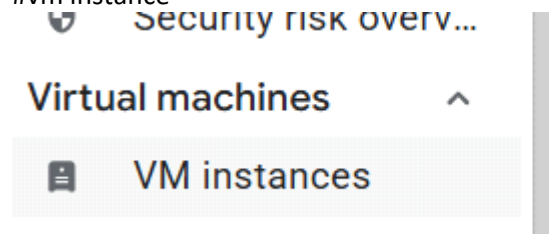
#add all the port and save it

##lets ssh into master and worker node

Search for computer



#vm instance



#select the master machine and ssh into it

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="checkbox"/>	k8snode1	us-central1-c			10.128.0.10 (nic0)	34.28.22 (nic0)	SSH

Fully hand on

Two attempt

Once register you have 1 year to appear

3 minutes

Kubernetes.io

There are already two simulator is there