

Containers

Monday, February 2, 2026 9:52 AM

Learn. How update they are. Obsolete.
K8s container is an platform.
Cost a concern.
Snapchat due to the aws down time for 8 hours
A ha in the cloud
Deploy your application in two different cloud.

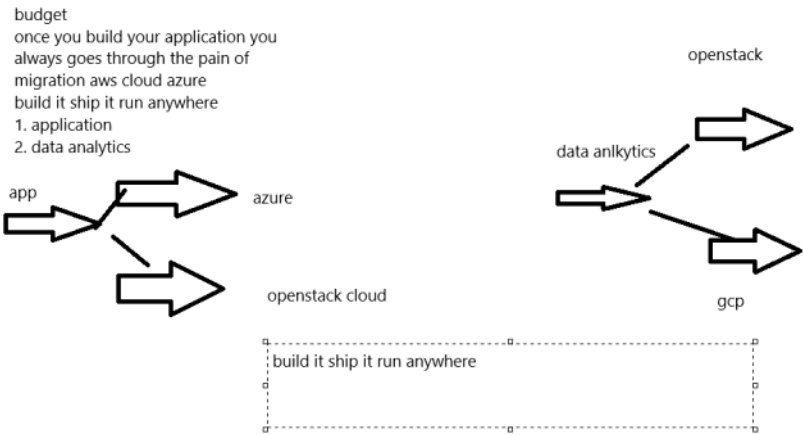
wgt: Walmart global tech

10,000 app they are running.

they also need ha

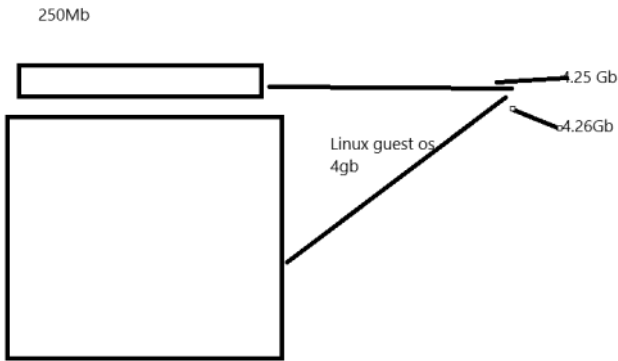
all there application will be deployed in
2x2x2

two different cloud
two different region in the cloud
two different data center inside a region in the cloud



2/2/2026 10:10 AM - Screen Clipping

10 min app
Modify
How containers resolved the issue.
Virtualization due to guest os migration become complex



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Application 250MB of APP 80 MB
Most of the smart app run on top of small hardware with limited ram and processing power.

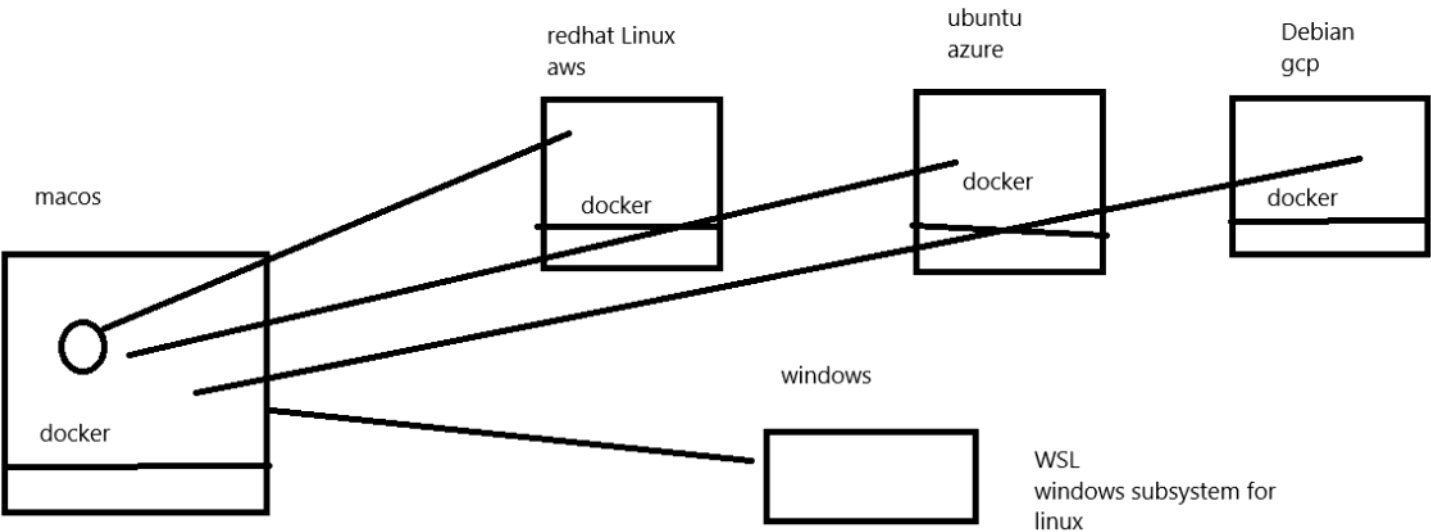
Storage

Monday, February 2, 2026 10:21 AM

Google storage
15 Gb
Start paying
They will delete all your data.
Sometime data get leak from this drive
Selfhost hardware

Container you will always have full fledged running application.
20,000

portability in container



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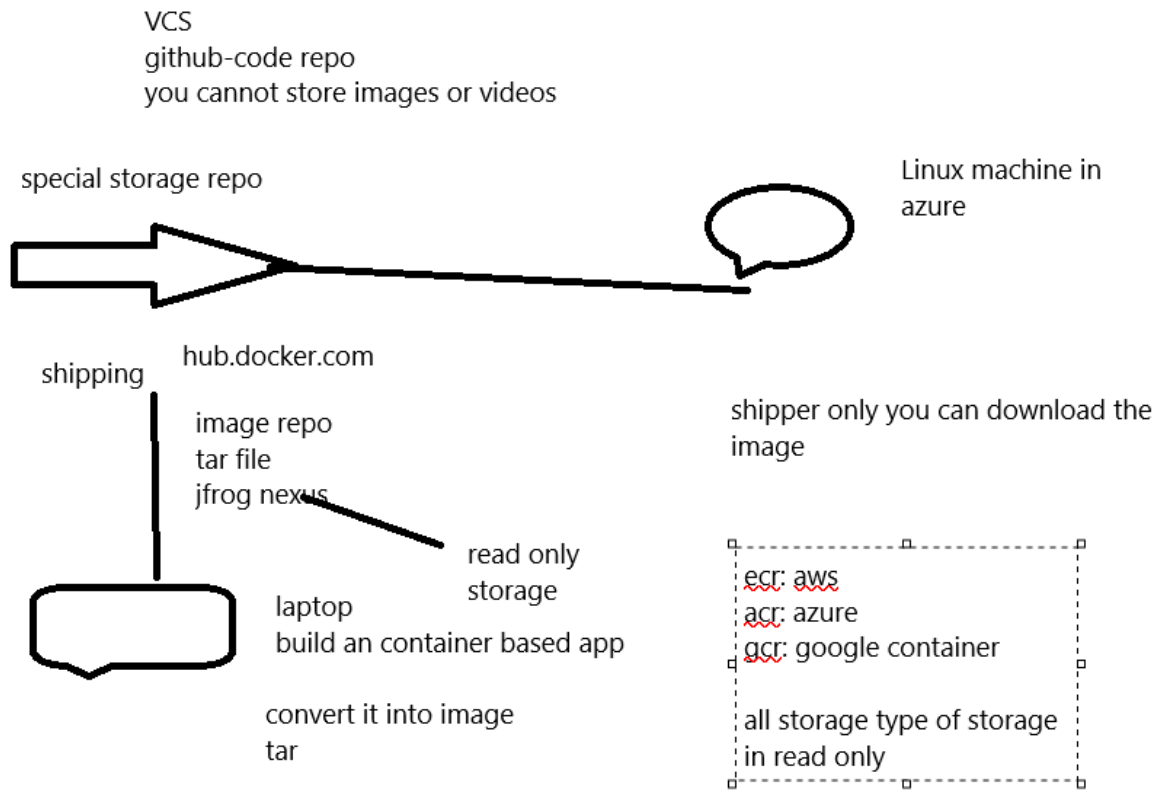
How to get portability in container?

Core bank app run on vms
Data analytics or new development containers
Oracle finacle

Trigger based app

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Book a ride that time only we need cpu ram storage networking.
Ride complete
Netflix that time only
On a virtual machine it is wastage of resource.
Uber
20 container
Finding the ride price location
Slow
Container run as process id
Starting a process and stoping process id



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Docker installation

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1. Docker installation as per the os is different
2. All the command we will use for docker will be same

Best way to learn technology devops

1. Docker k8s
 2. Terraform
 3. Ansible
 4. Chef
 5. Puppet
 6. Gitlab
 7. Github
 8. Azure devops
- Complexity
Simple english

Demo

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1. Install docker on the dokcer machine
2. Check all the command related to containers you will find they are simple english

Docker k8s terraform

Go lang 99%

Always we are learning an wrapper langauge which is build using simple english

Even mapping on the resources are done using labels

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

Docker container run: this will always create a new container for you

When you want to create a container nginx is the image

Unable to find image 'nginx:latest' locally #

latest: Pulling from library/nginx #then it start downloading

d989100b8a84: Pull complete

10b68cfefee1: Pull complete

119d43eec815: Pull complete

57f0dd1befe2: Pull complete

700146c8ad64: Pull complete

eaf8753feae0: Pull complete

500799c30424: Pull complete

e2dd2dbe6277: Download complete

785250c9bf9e: Download complete

Digest: sha256:c881927c4077710ac4b1da63b83aa163937fb47457950c267d92f7e4dedf4aec

Status: Downloaded newer image for nginx:latest

673fbb8a8a2e0e59c921d605a9be8a217e2585ceb7fa68ada4b10e63fa1ac1e1

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

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
--------------	-------	---------	---------	--------	-------	-------

673fbb8a8a2e	nginx	"/docker-entrypoint...."	4 seconds ago	Up 3 seconds	0.0.0.0:80->80/tcp, [::]:80->80/tcp	hardcore_borg
--------------	-------	--------------------------	---------------	--------------	-------------------------------------	---------------

I am building an python based application.

Or a java based application

#####

Java run or python runtime

Google drive

Nexuscloud

But I need it as a container image

You have devices which is connected to alexa

Tv: samsung

Switch: alexa

Wipro:

Tp camera

Tp link door bell

Multiple apps

Docker image

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I create a a container with nginx image

Now I can spin up another container using the same nginx image

I am running an payment gw

For every single customer they do the payment transcation. To make the transaction one time I ll download

Container vs vm

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If you run an application in a vm.

1. If your app in which the vm is running hangs restart takes time
2. If you want to update or redeploy your application on a vm again it will take time vm provisioning application deployment takes time

The benefit with the container technology is that it is running as a process id.

Creating a new process and killing the process

This process needs to allocate cpu ram storage networking

In linux system whenever we create a process using cgroup and namespace we allocate process resources

1. Containers are running as process id
2. Process id is always unique this gives me the container isolation

--detach

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As we know that container are running as process id.

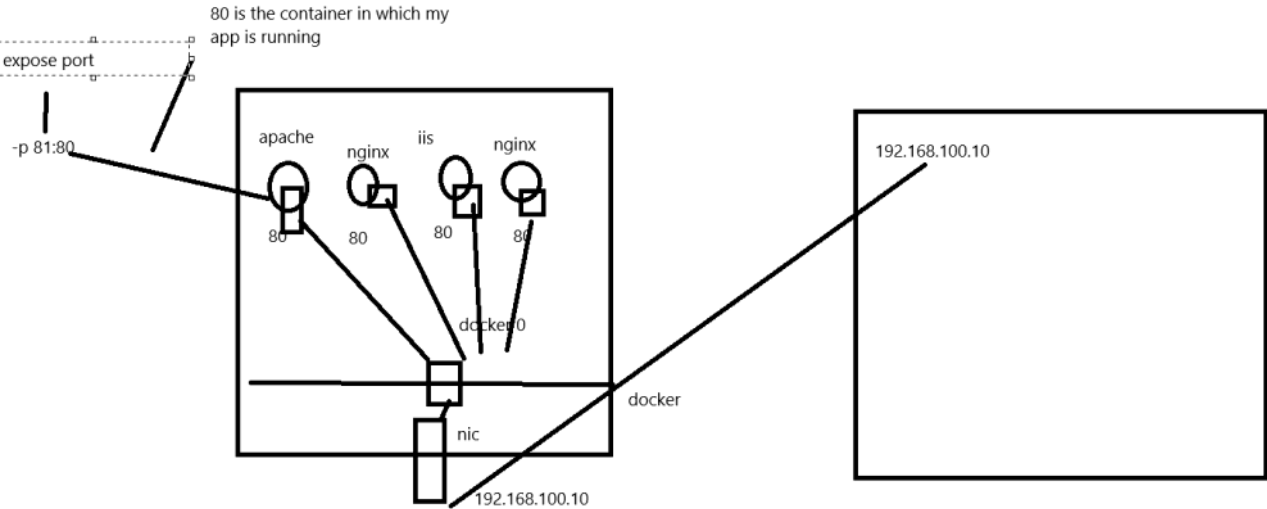
--detach will make your container run as background process

--publish

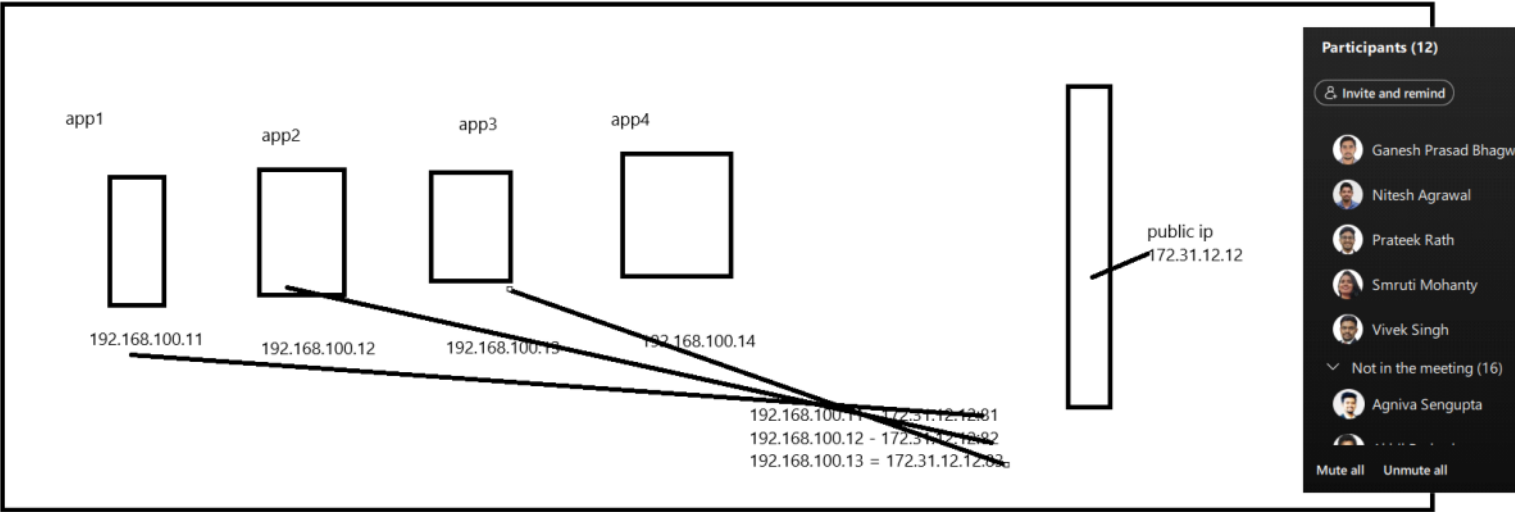
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-p 81:80
In container world everything is running as an web based application.
Always it will run using a port number

Port forwarding



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Participants (12)

Invite and remind

- Ganesh Prasad Bhagw
- Nitesh Agrawal
- Prateek Rath
- Smruti Mohanty
- Vivek Singh
- Not in the meeting (16)
- Agniva Sengupta

Mute all Unmute all

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Container to container communication

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1. We will create an custom networking
2. Create two container and attach the same with custom network
3. And we will see container to container communication

In the container world or k8s never map anything using ip they are short leave

Always map it using the name or the service of the container. Internal dns resultion is always there
coredns

Volumes

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By default all the container are ephemeral in nature.
If you start a container or stop and container no
If you delete your container the storage will be deleted.

But we need persistent volume
If you delete your container storage will not be deleted
Or database

1. We will create a mysql database with an persistent volume .
 2. Then inside the db we will create an custom db employee
 3. Then delete the mysql container create a new mysql container and attach the same with your volume
 4. If I login show databases it should show me the employee database;
- Container are running as process id can process id store your data

Recap

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What is need of container technology?

1. Speed: it will make your deployment faster

Container and vm. Abstract level for container how it gives portability?

--detach

Container and image?

Image is always in rest state

Container is runnable state we can interact

Docker Engine

Docker networking

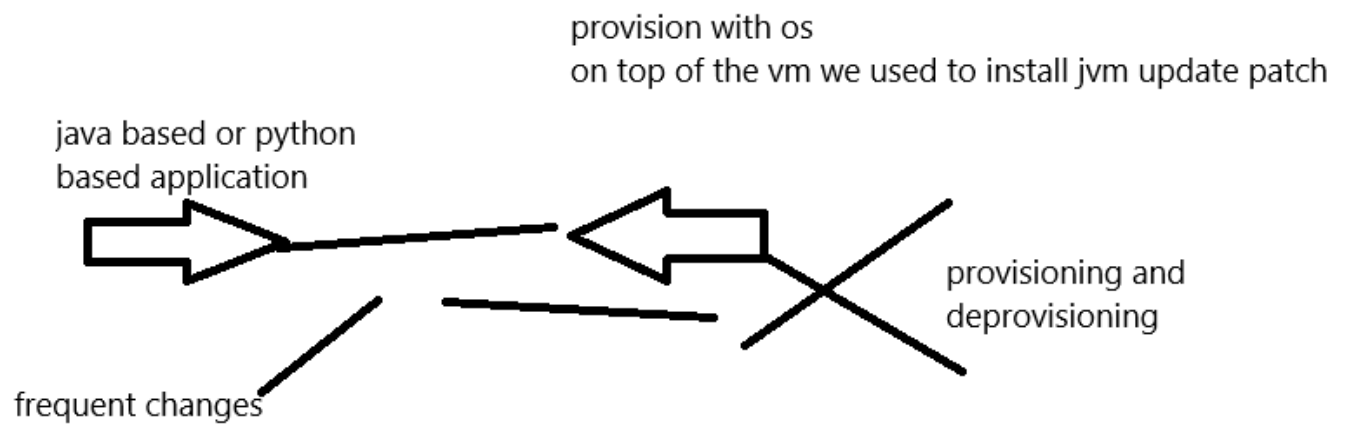
-p 81:80-container port application port

Expose or published port

image

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Previously



in a day we are deploying our app 8 times changes

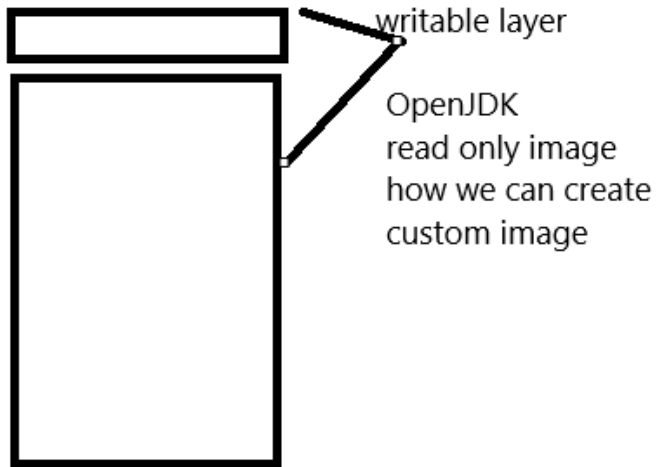
we want to deploy the app as faster as possible,,
bundle the application-deploy it as container it will be
always faster

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But to make this application deployment faster I need an readily Available environment we need to just focus only on building application too much worried about deployment . To make the deployment faster Container is the only solution

All the base image is read only

custom defination



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Demo

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1. Inside the vm we will download openjdk
2. Download maven
3. Clone an spring boot application
4. We will compile it and get a jar file
5. We will run this jar and access the application from the browser

Inside the application folder we will create a docker file

Containerized

And finally run it using docker container

And access the app from the browser but it is server from the container

dockerfile

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ecoomerce



paymentgw



logitics



we always create a folder and store all our files
related to the project inside the folder
to convert this application into an container based image
in the root folder only we need to create a simple file
the name of the file will be dockerfile

dockerfile

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Inside the docker file we will provide instruction

All the docker instruction are in capital letter

1. Before I convert my application into an container
2. I have an java based app into an container image
3. What will be my base image I need to choose openjdk
4. Python: I need to choose python
5. Nodejs

Hub.docker.com

The difference between copy and add

COPY: source will be your local machine

ADD: source can be local machine or it can be an ftp or http location

1. We install java
2. Install maven
3. Compile the application mvn clean package which created the jar file in the target directort jar is like executable file like msi or exe
4. Java -jar nameofthejarfile

Inside ENTRYPOINT you need to give the executable pathj

Once I build my image there is no way I can modify the image

Whenever there is an change in your application you need to rebuild your image once more time

Hub.docker.com

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Whatever image we have build we need to upload the same in a repo .

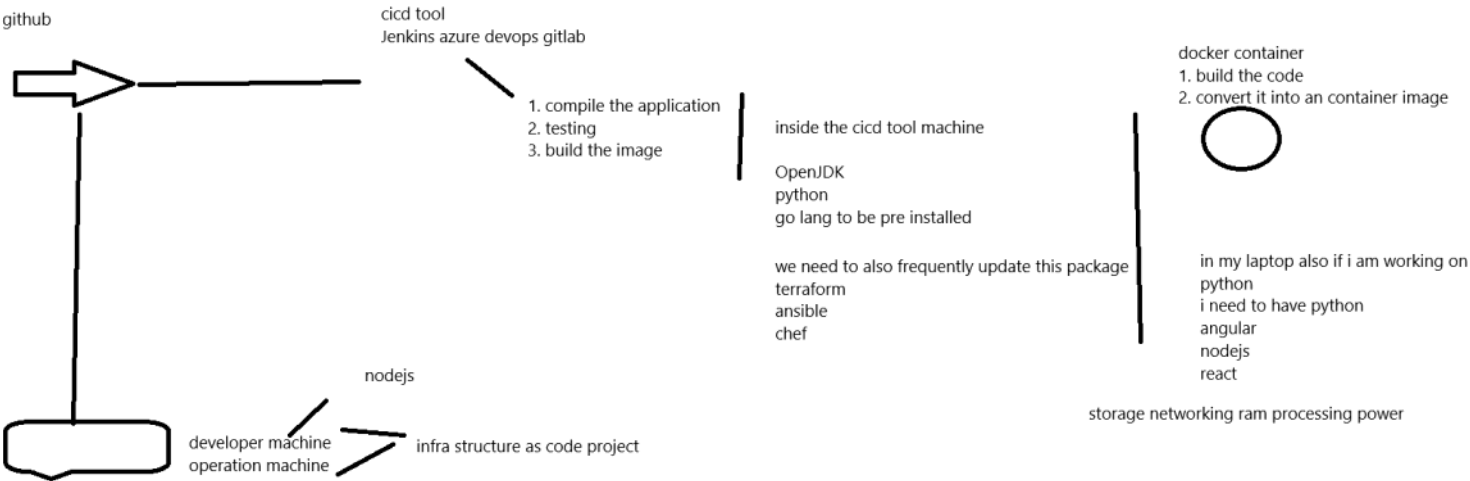
Multi-build image

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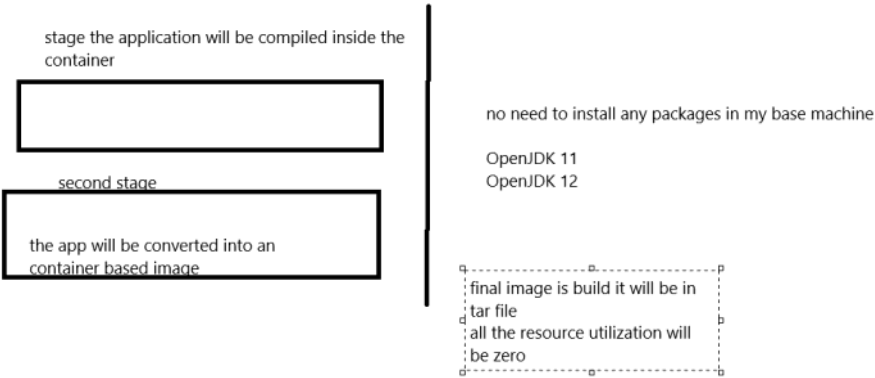
What do you know by multi-build

Convert an java based app into an container based image
We download java
We download maven
Then only I can compile the application got the jar file

#####stage 2 we created docker file and convert the application into an image



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Multi-build image

Tuesday, February 3, 2026 2:25 PM

1. I have an spring boot application
 - a. First stage will be to build it inside the container : maven
 - b. Convert the application into an final image
 - c. RUN once you download your base image
 - d. RUN apt-get update yum
 - e. RUN wget https

kubernetes

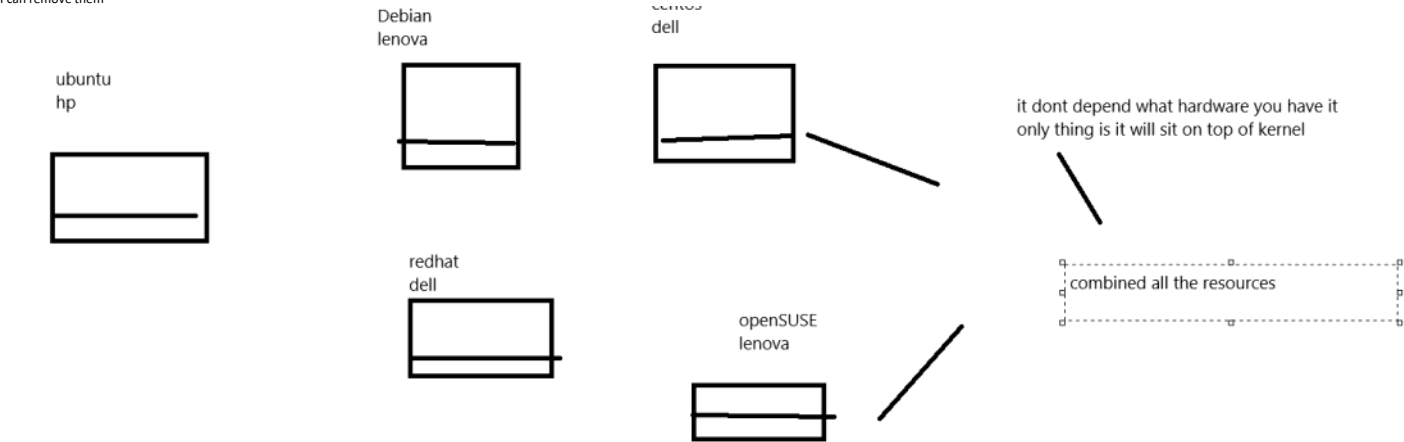
Tuesday, February 3, 2026 3:50 PM

It is an clustering or data center solution for your container workload

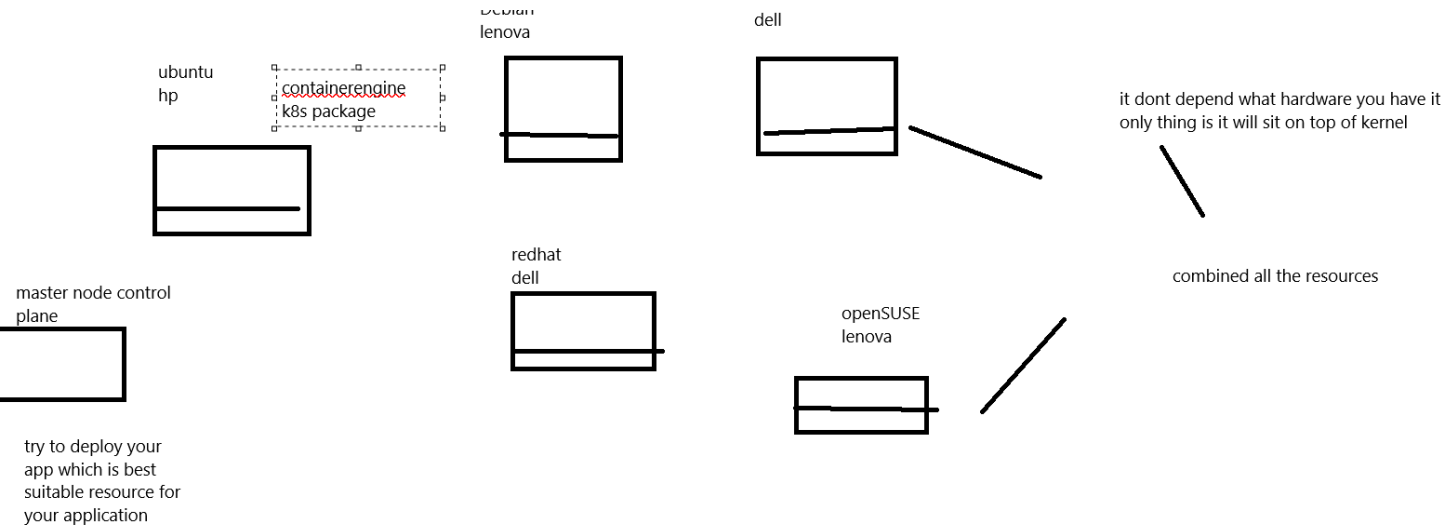
It is an micro service
Payment gw
Encryption decrption
Talking to marchant bank tightly integrated together
Due to some reason if update an patch is required I have to shutdown the application.
But now a days down time is not acceptable

We break down the application into smaller code
The benefit I can easily make changes

K8s is an micro service. When I need any feature I can easily add it
I want an monitoring tool need to added promothus grafan
I can remove them



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Container runtime

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Docker engine

2017 docker stop supporting k8s it get sold to miranthis.

K8s open source

Containerd

Virtlet

Podman

Crio.

##the command will be similar like docker only

Docker ps

Crictl ps

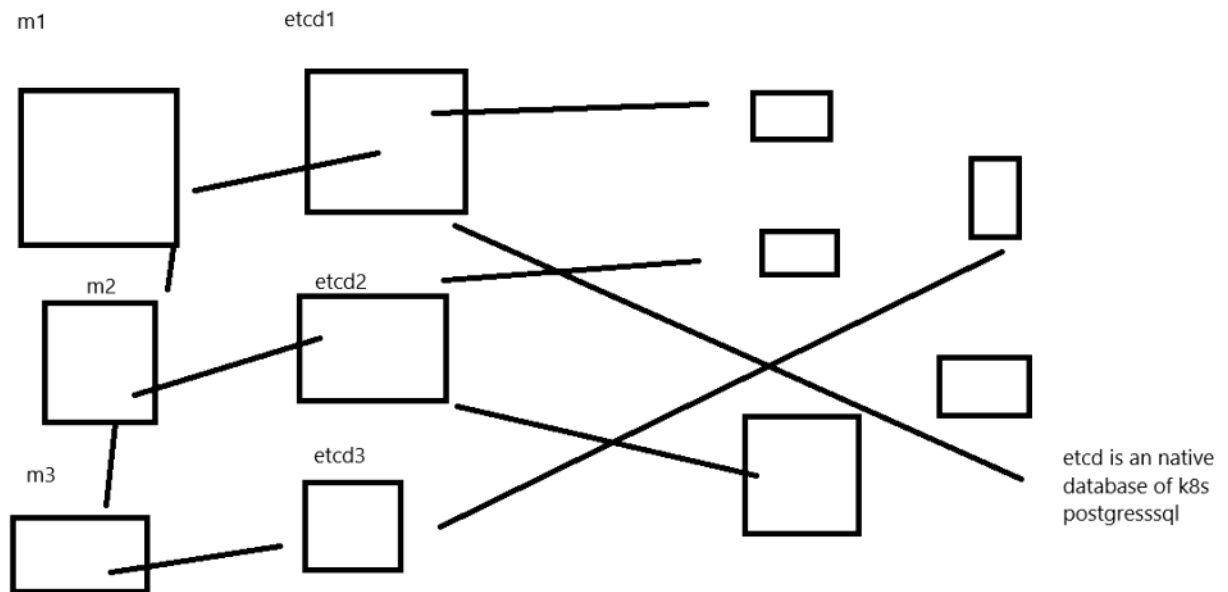
Ctr ps

Api

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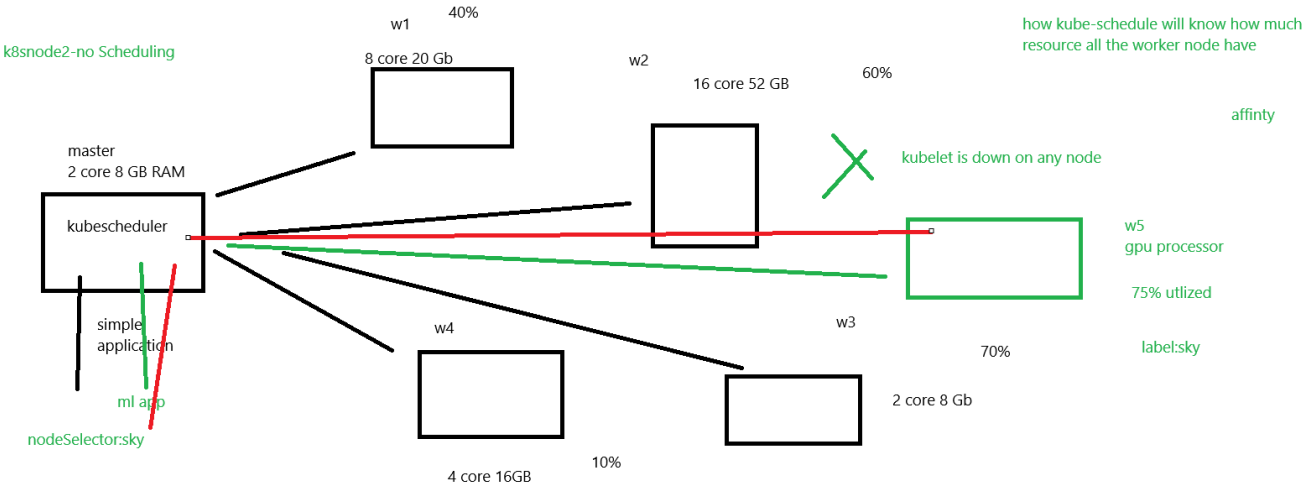
My organization want to promote in social networking
Once the promotion has been done
I need to download reports
Likes click or location
Facebook
They have open this feature using api
But we are geeting benefit only the required functionality will be avaiable to me using http get put delete request
Rdp or ssh

EtcD : is like an database which store your k8s cluster wide information.
As k8s is an open source and we keep on geeting updated patches
We need to take backup of the etcd first. Then we update our k8s cluster. Restore the backup k8s cluster will be as it is
Due to some reason while upgrading u r k8s cluster the server mis function. Chances of currepted server will be and you will loose all the information



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You created 80 container. Deleted it
Ssl certificate
Tls
Garbage collection
Storage
network



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Affinity: run your app in workers if worker5 is not available it will pause your application
Anti-affinity: preference will be given to worker5 if it is not available it will start on other node

kubernetes

Wednesday, February 4, 2026 9:53 AM

What is the need of k8s?

1. Remove hardware dependency..as it is running on top of kernal
2. One of the node will have a windows. WSL
3. It an coe container orchestrator engine.
4. Data center solution for containers
5. Resilient architecture

When I need to add a new feature I can add it I can remove it.

All the component of k8s are running as an container

Kubelet is running as a service in k8s cluster

Apt install apache2

Apt install nginx

Yum install nginx

Systemctl status nginx

Container they are running as an process id

Kube-proxy

Wednesday, February 4, 2026 10:12 AM

1. Frontend - backend: clusterIP that will do only internal communication in your k8s cluster
2. When you want to expose your application outside k8s cluster
 - a. nodePort
 - b. Loadbalancer: aks eks gke
 - c. Gateway load balancer

Docker'

containerd

Podman

Crio

Virtlet: paid product

Docker ps

Crictl ps

Pod

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Called as Pod?

Wrapper

Shipping: images-images are in tar format

All the communication to your k8s is happening using api get put request

Pod is to convert those images into an runnable object inside your k8s cluster

Api which is used to download the image from a repo make it runnable in a container

Api access

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Kubectl get pod deployment node

Kubectl describe

Kubectl delete

Kubectl apply -f nameofthefile

Full managed

Wednesday, February 4, 2026 11:12 AM

Aks: azure k8s service

Eks: elastics k8s service amazon

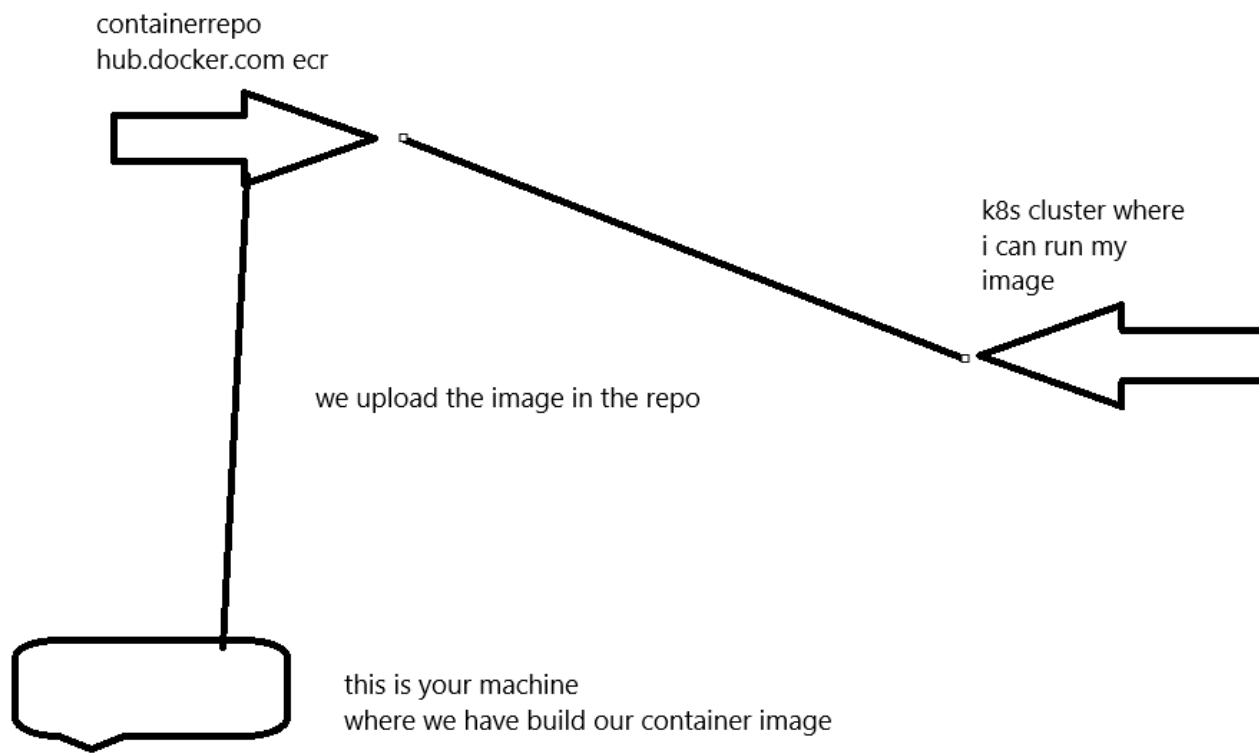
Gke: google k8s service

Vmware platform there is an fully managed k8s cluster you will find tanzu

Container

Wednesday, February 4, 2026 11:14 AM

How to verify that all the master componet are running as container



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Pod

Wednesday, February 4, 2026 11:29 AM

We need to create a pod definition pod manifest using the same I can deploy my container image inside my k8s cluster

1. You need to write down this manifest in yaml or json
2. Mostly written in yaml
3. Indentation in yaml happen using two spaces
4. In json you define a function start with curl brace and end with curly brace

Writing yaml file is always an complex task

We need to deploy an application image inside my k8s cluster

I need to create a pod definition

deployment

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Deployment=pod+replicaset

Replica:1

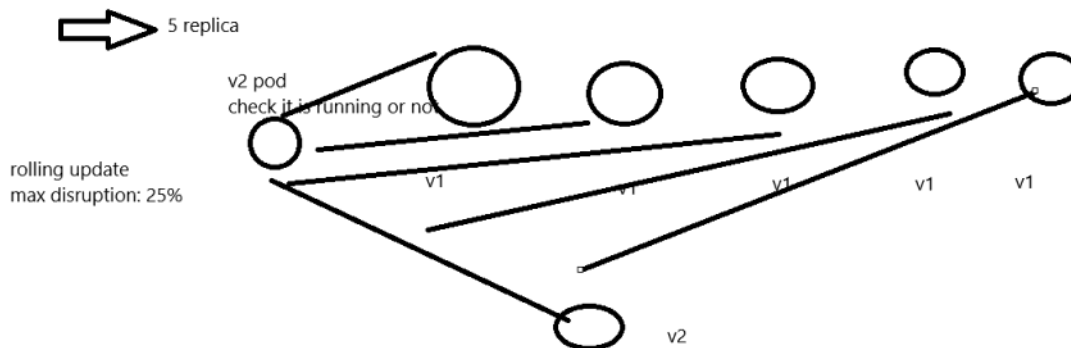
We have a frontend application: single pod cannot handle the workload

Replica: 5

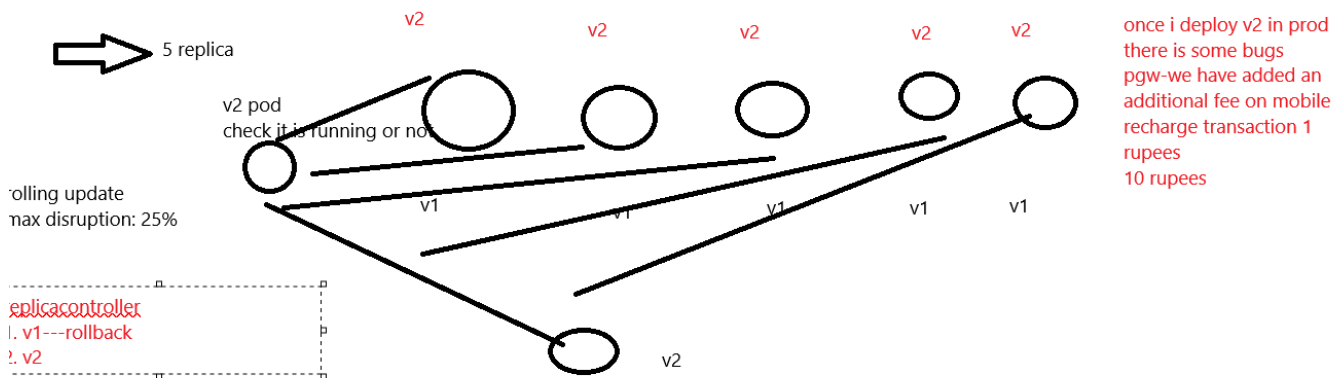
Create a deployment to rollout replicas

1. I need 5 pod to support my application
2. 2 pod scale down
3. Autoscaling
4. I can update the deployment also

Rolling update fashion



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Replicaccontroller can also be used for rollback to previous release

1. Scale out
2. Autoscaling
3. Upgrading
4. Rolling back
5. Rolling update strategy

Max disruption

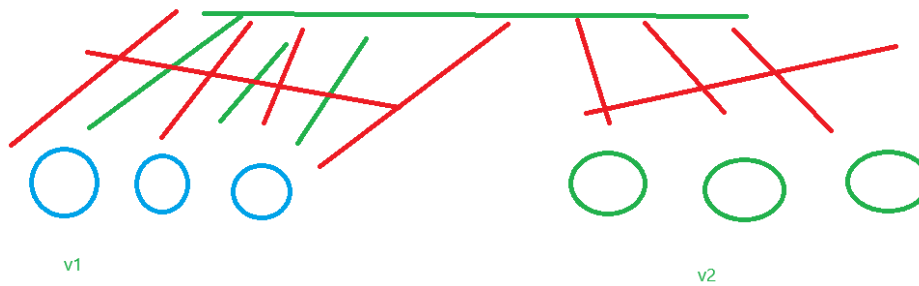
1. Blue green
2. Canary deployment

Rolling strategy

Wednesday, February 4, 2026 2:14 PM

Deployment=pod+replicaset

1. Rolling update strategy: min disruption 25% so that the update will happen
2. Roll back
3. Blue green deployment: it is costly; but it will eliminate or reduce downtime and risk during application update by using two identical independent environment



currently the traffic is in blue environment
it is the current running environment

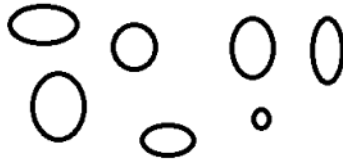
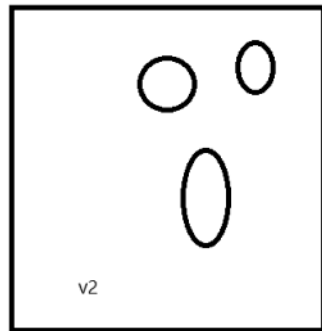
green is the new environment

we need to create two identical environment
switch the traffic with the lb
but when there is two identical environment
we need to consume more resources

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Canary deployment

Wednesday, February 4, 2026 2:20 PM



v1

uber they have online and cash payment

v1 and v2 of the application are running simultaneously

testing will be done live
again it is an complex architecture
service mesh

uae or us
there is no cash
only online
transaction

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Huge resource

Dry-run

Wednesday, February 4, 2026 2:32 PM

--dry-run=client: there will be no connection will be made to the cluster

--dry-run=server connection is made to the server

1. Perform basic client side validation it will check that your yaml file is properly indented
Perform full validation on the cluster

Selector match label is also called as match expression

Pod is like an virtual machine which is created

I want to access this vm outside or internal to our k8s cluster.

Service.

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POD AND Deployment : they always create a container but container are like virtual machine

Now this pod need to be exposed or we need to create networking so that I can access the pod internally or externally.,

1. For internal communication frontend want to send traffic to backend: we will use ClusterIp
2. For external communication I want to expose my application outside k8s cluster. To do the same we can use
 - a. NodePort: using a node machine ip address and port number: 30000 till 32700
 - b. LoadBalancer: but this will work with fully managed k8s cluster from the cloud service provider like aws azure gcp

Proportionate scaling

Recap

Thursday, February 5, 2026 9:54 AM

We learn about pod in k8s?

Pod is an api which help you to run container image inside your k8s cluster.

Deployment

Which is an combination of two api

Pod+replicaset using that we can make your application ha roll back rolling update scaling

Service

1. clusterIp: internal
2. NodePort: using a nodemachine 30000 till 32767
3. Loadbalancer

1. We will start with namespace and quota management in namespace
 2. Kubernetes dashboard
 3. Pv pvc configmap secret-mysql container-frontendapplication-whatever data we insert will be applied to frontend app.
 4. RBAC
 5. Network policy
 6. Etcd backup
 7. Upgrading k8s cluster
- 90% for cka exam

Namespace

Thursday, February 5, 2026 10:01 AM

If a courier guy or delivery boy want to find your address they can find it easily using your nameplate.

You stay in a society where 100 of bungalows are there

Inside that specific block you have everything.

Namespace in k8s is like isolation

We have an huge k8s cluster with more than 200 nodes. We have too much resources

We want to control the resource utilization

1. Dev test staging prod environment we can allocate resources we can create networking policy RBAC
You build an CRM application.
Travel industry
.agoda so I will create a namespace agoda
Makemytrip join I will create a namespace makemytrip
RBAC: when a user from agoda login they will see their data

Namespace with quota

Thursday, February 5, 2026 10:09 AM

We will do an exercise on namespace with quota management
By default there are some namespace which is system generated

default Active 188d : when you create a pod and do not provide any namespace will go to default
kube-node-lease Active 188d : related to node machine
kube-public Active 188d : if you create a pod in this namespace it will be available
kube-system Active 188d: all the system related are stored in this namespace

Request: guaranteed plan in insurance
Limit : mutual which is subject to market risk

Dashboard in k8s

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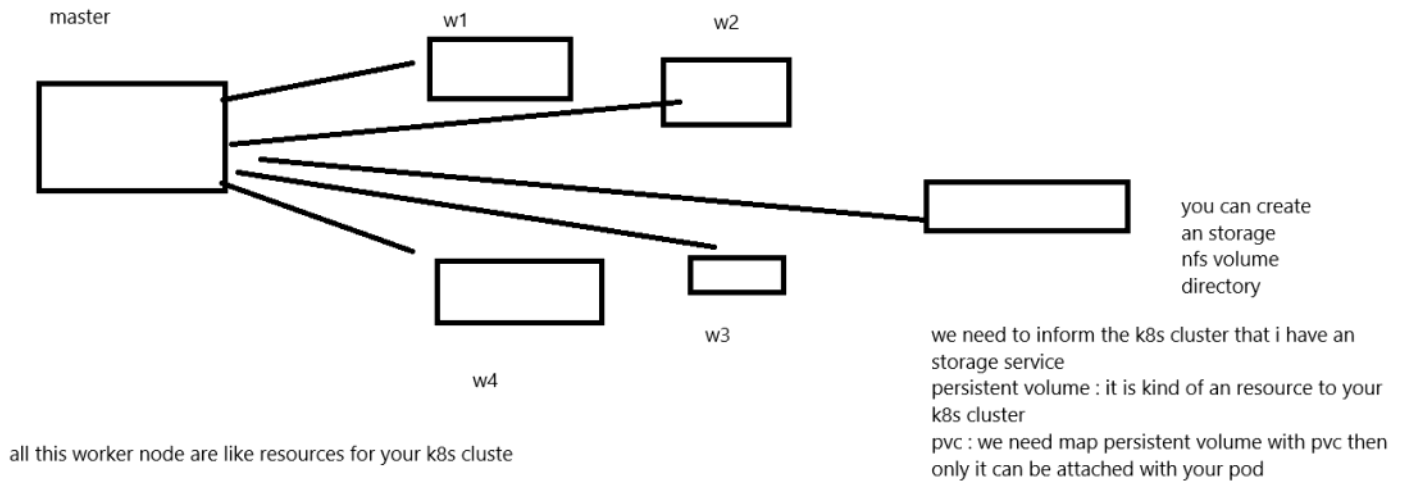
Persistent volume

Thursday, February 5, 2026 12:14 PM

I want to deploy an db we need an persistent volume in k8s

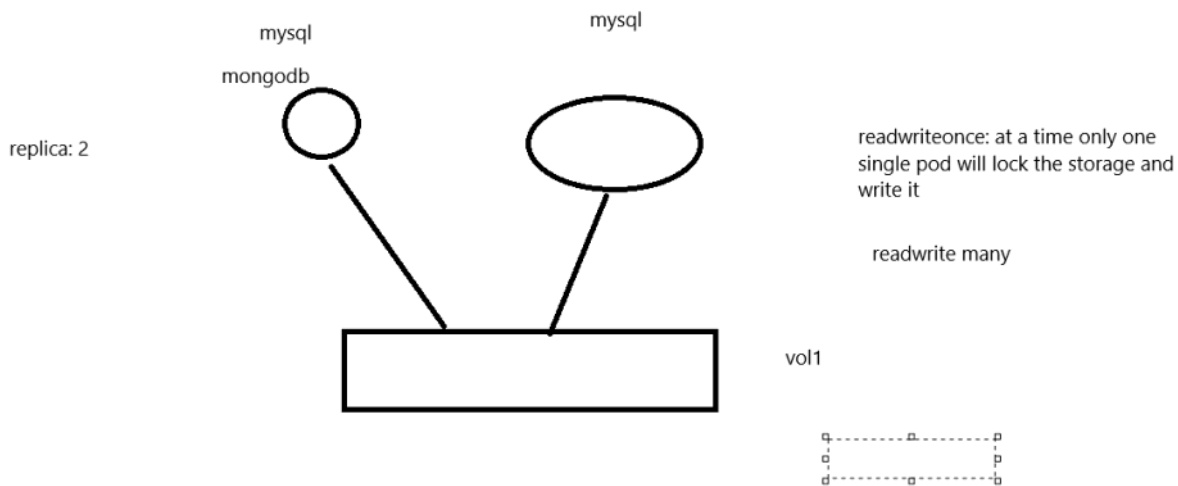
There are two api to create persistent volume in k8s

- 1. Persistent volume: this will create the volume
- 2. Persistent volume claim: we will attach the volume with u r pod



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Pv is like an administyrave provisioing of storage
Pvc is claiming the storage to an pod



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Delete: once the pod got deleted the volume will also be deleted

Retain: pod deleted but the volume will not be deleted this is the default behaviour

Recycle: pod deleted volume will not be deleted but data in the volume will be deleted `rm -rf /vol1`

When we will create the pod we will see affinity nodeSelector

Secret manager

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We have secret manager where you can store your secrets and call those secret inside your pod

By default the secret manager store the secret in base64encoded format

Configmap

Thursday, February 5, 2026 2:20 PM

1. Configmap has a capacity 1MB of data.
2. It is like an startup script bootstrap
3. It will apply only while launching your pod
4. Nothing in configmap will be stored in encrypted format so never store your api key or secret inside the configmap

Any application before it get started you want to pass some value

RBAC

Thursday, February 5, 2026 4:09 PM

A clusterrole | role where define set of permission where it is available in the whole cluster or just a single namespace

A clusterrolebinding | rolebinding connect a set of permission with an account and define where it is applied, either in whole cluster or just a single namespace

There will be 4 combination but only three are valid

1. Role+RoleBinding: available in single namespace, applied in single namespace: a dev called as jane join the organization they will have access to only dev namespace
2. Clusterrole+clusterrolebinding available cluster wide, applied clusterwide: a new admin join the organization his job is to upgrade take backup so in that type of situation
3. Clusterrole+rolebinding available cluster wide, applied in single namespace. Admin access to whole cluster they can deploy a new feature in your cluster. But on a particular namespace
4. Role+clusterrolebinding not possible

I will create a service account called as jane

Role

Bind the role with jane

Learning

Friday, February 6, 2026 9:47 AM

1. We will start network policy
2. Helm chart
3. Backing up the etcd
4. Upgrading the k8s cluster

This way we will complete CKA certification question

How to create your own cluster for practice

Network policy

Friday, February 6, 2026 9:49 AM

By default inside your k8s cluster your workload is running on pod

All the communication is open inside your cluster

Which is kind of security risk

In your cluster there are multiple app running some of them are frontend application access by customer they logged in using a front pod and they can destroy all the resources

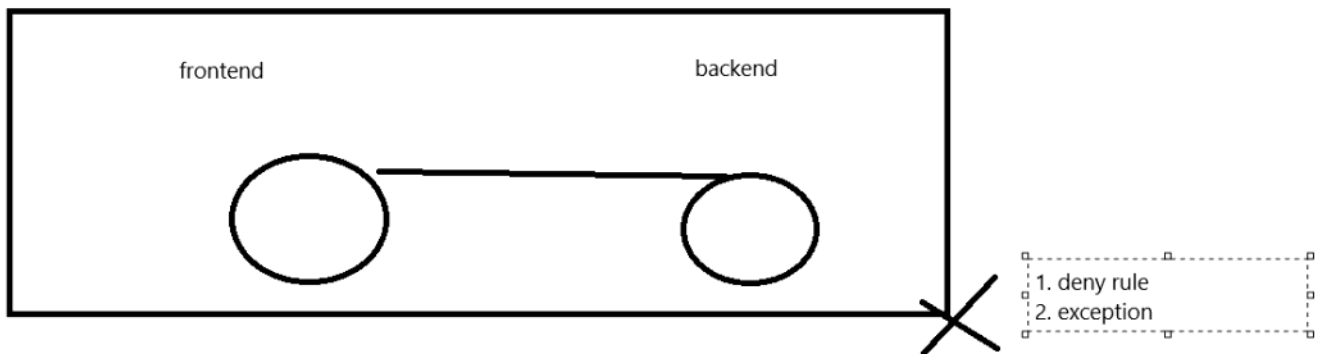
Without network policy

1. By default every pod can access every pod

2. Pods are not isolated

So we need to create

1. Ingress and egress routing



1. frontend want to initiate connection to backend: which policy i need to add : egress

2. backend need to accept the connection from frontend : ingress

3. network policy will be always applied inside a namespace

4. to create a network policy

in the particular namespace we need to first create a deny rule

Demo network policy

Friday, February 6, 2026 9:59 AM

1. I will create a namespace
2. Inside the namespace we will create two pod and see they can communicate with each other or not
3. Then we will create a deny rule
4. Check that the pod stop communicating
5. Then we will create exception

This network policy is supported by two driver in k8s calico/weavenet container network interface cni plugin

Exception will be created on the basis of

1. Ip address
2. Portnumber
3. labels

Etcd backup

Friday, February 6, 2026 11:57 AM

It contains the cluster wide information.

We as an admin need to know how to take backup and restore it

1. First we will take the backup of etcd
2. Then create a pod called as test pod
3. We will restore the backup
4. The test pod will not be there

9:20 I take the backup

9:21 I create a pod called as test

If I restore the 9:20 backup

To take the backup of etcd you need to install a package in the master machine etcdutil

All the component in k8s are running as a pod . So if they are running as a pod there will be an manifest file

#from the manifest you need the controller ip address

Ca.crt

Crt

key

Upgrading k8s cluster

Friday, February 6, 2026 2:36 PM

we will see how to upgrade the k8s cluster

1. There are two thing one is node and master

When you upgrade you need to first upgrade your master node then upgrade the worker node

If you have 1.30 you cannot upgrade to 1.33

Draining is like cordoning

I am disabling the scheduling on the master node

Means no more new workload can be deployed on master node

####

Uncordong enable the scheduling

Install master and worker node

Friday, February 6, 2026 3:56 PM

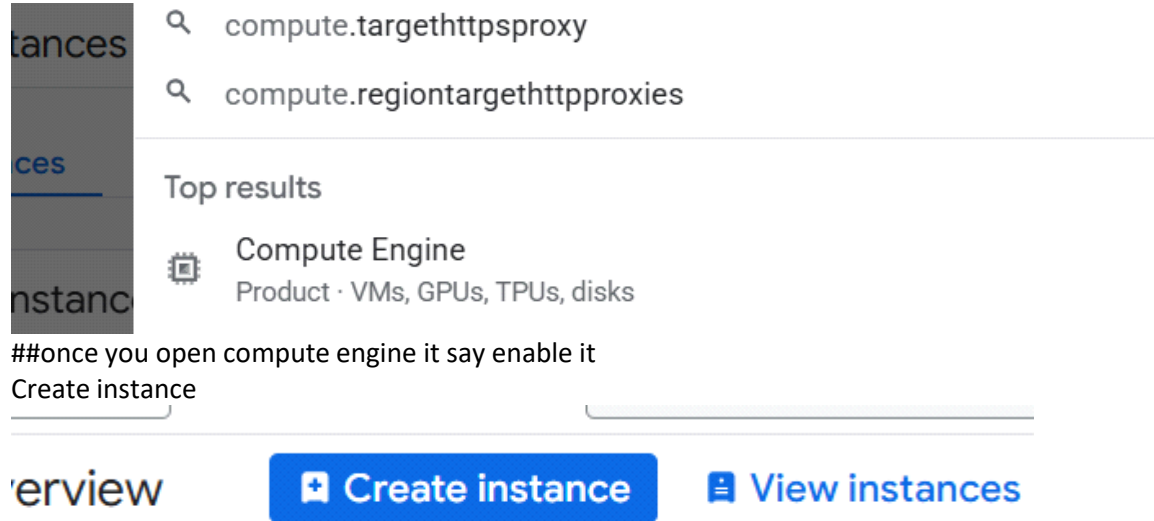
Create a free tier account in azure or gcp

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

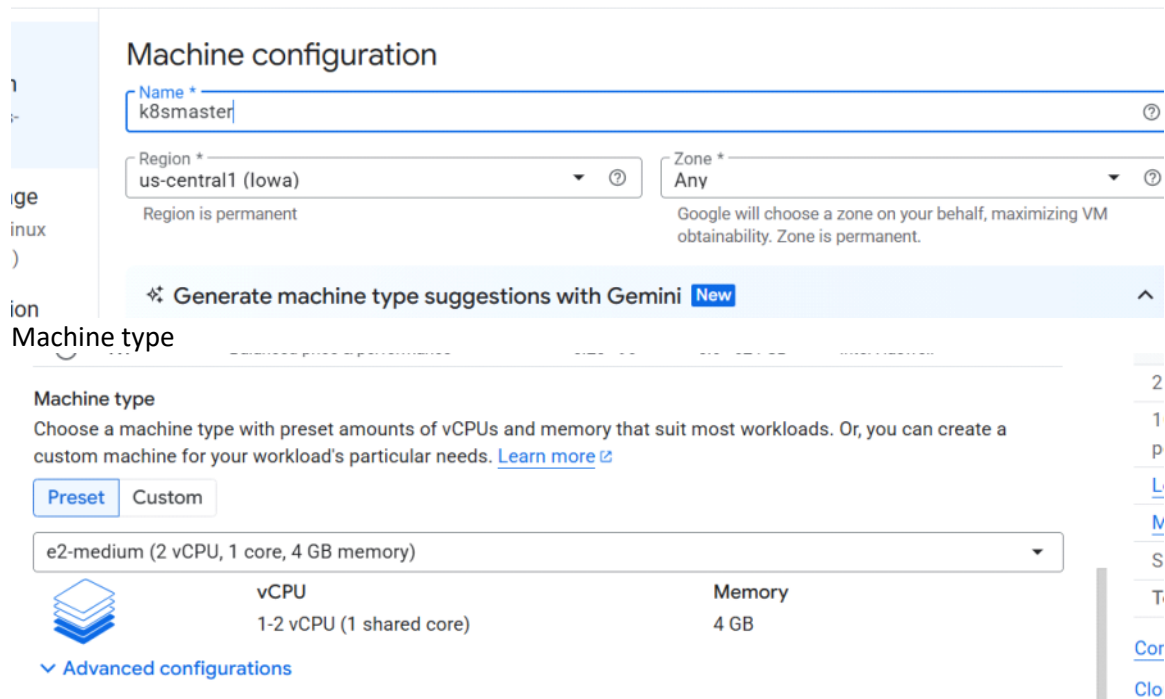
#####



The screenshot shows a search interface with the query 'compute.targethttpsproxy'. Below the search bar, there are two search suggestions: 'compute.targethttpsproxy' and 'compute.regiontargethttpsproxies'. Under the 'Top results' section, the first result is 'Compute Engine', described as 'Product · VMs, GPUs, TPUs, disks'. At the bottom of the page, there are three buttons: 'Overview', 'Create instance' (highlighted in blue), 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 set to 'k8smaster'. The 'Region' is set to 'us-central1 (Iowa)' and the 'Zone' is set to 'Any'. Below these fields, there is a section for 'Machine type' with a dropdown menu showing 'e2-medium (2 vCPU, 1 core, 4 GB memory)'. To the right of the dropdown, there is a table showing the specifications: 'vCPU' (1-2 vCPU (1 shared core)) and 'Memory' (4 GB). At the bottom, there is a link to '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 [×](#)

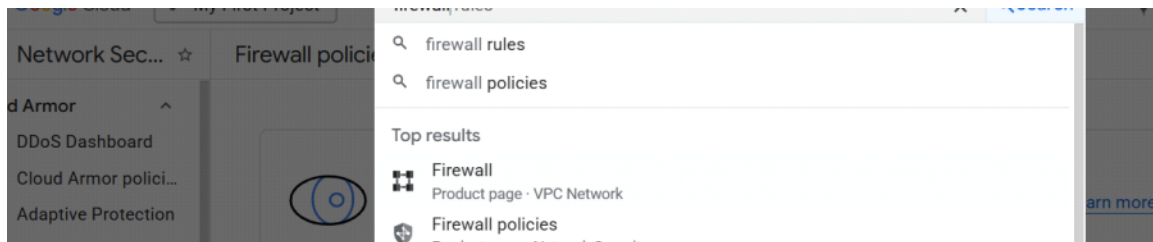
#like this you need to create a worker node also

#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

Description
Allow SSH from anywhere

Loas (?)

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

compute.targethttpsproxy

compute.regiontargethttpsproxies

Top results

Compute Engine
Product · VMs, GPUs, TPUs, disks
... VM instances

#vm instance

Security risk overv...

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