

Thursday, January 2, 2025 10:27 AM

Half day on docker
Rest of three and half days on k8s
helm

Containers

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Why we are moving to the cloud..

I migrate my all application to an cloud service provider aws

Next day they will increase the cost

We need to move to another cloud service provider

I want my same app should work as it in different cloud.

Portability

You want a solution where I build my app I run it in my laptop the same should be run as it is in the cloud or in anywhere.

Containers only

Now a days most of the business are depends on technology.

Blinkit

Zepto

Zerodha

Netflix

Uber

Resilient architecture zero down time high availability

They also required new features to be added

Rolling update fashion.

Micro services

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Platform independent

Light weight

SDLC: Software development life cycle

Waterfall Model

1. Requirement gathering
2. Design
3. Development
4. Testing
5. Deployment
6. Maintenance

#####we will always have an finished product in our hand. Everything is tightly integrated together

Agile Methodology: Where are per customer requirement we are developing application

So everything need to be modifiable.

Break down your application into smaller pices

Ecommerce application

1. Landing page is an module
2. Cart will be a module
3. Payment gw
4. Inventory
5. Logistics
6. Dispatch
7. Tracking

Let your application run as it is . Core banking they are running as it is

Analytics platform

AI feature in the transaction.

You transfer some money. They will keep a track of that money 50 thousand

Till this 50 k is utilized

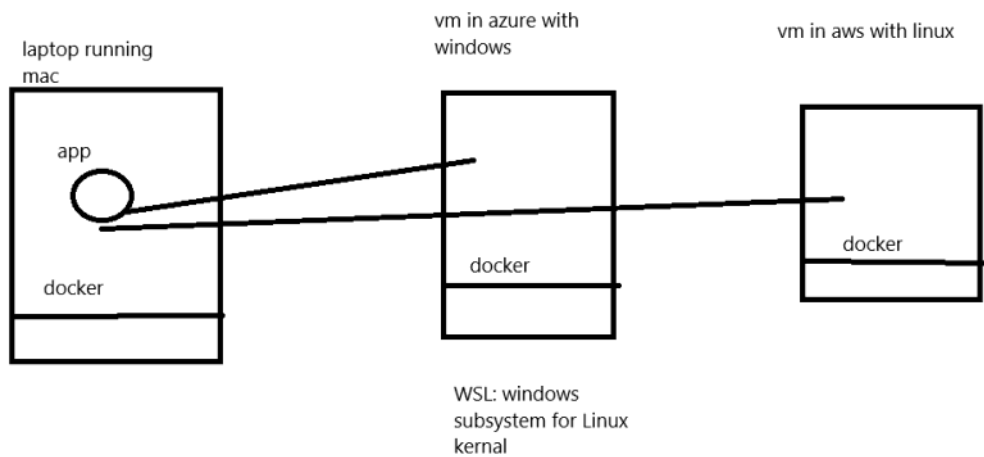
Icici bank to hdfc on someone else account

How the person in hdfc bank

We are doing a transaction once the transaction complete

Ott platform. Once you start stream keep the resource running. Once I pause it or stop it the resource

Trigger based



if your dependency is os level easily you can migrate

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Every application cannot be containerized.

Process id

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It required isolation

1. Inside a single virtual machine all the application isolated from each other
2. Whenever you spin up a container it will always run as process id--unique against that process id
we will allocate cpu ram networking storage

Cgroup and namespace

I build an container application. For portability.

The application need to be converted into an image.

Images are always in rest state the are not running.

Container will be always in running state mini vm

Resource sharing: from where the resource are shared from the os. Some container required more resource then available

2 core process

1.5 core processor

Dockerengine

It will never deploy that container and keep in pause state

There are some container already running a NEW CONTAINER IS COMING

Quota allocation

Cpu

Ram

Networking

Storage

Registry used to store your container images.

In version control system you cannot upload images or videos.

You need a different kind of storage to share container images

On prem you can use jfrog or nexus for storing artifact

Ecr acr gcr hub.docker.com

Demo

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1. We will create an ubuntu
2. Install docker on top of it
3. Create some container
4. And access the same

```
root@ip-172-31-26-3:~# docker container run --publish 81:80 --detach nginx
```

##whenever we run docker container run command it will always create a new container for you the last one nginx is the name of the container images

Unable to find image 'nginx:latest' locally --first it will show me it cannot find the image locally

latest: Pulling from library/nginx#so it goes to hub.docker.com and download the image

fd674058ff8f: Pull complete

566e42bcee1c: Pull complete

2b99b9c5d9e5: Pull complete

bd98674871f5: Pull complete

1e109dd2a0d7: Pull complete

da8cc133ff82: Pull complete

c44f27309ea1: Pull complete

Digest: sha256:42e917aaa1b5bb40dd0f6f7f4f857490ac7747d7ef73b391c774a41a8b994f15

Status: Downloaded newer image for nginx:latest

B9975716eb505687eb5faf82d0462be49457ce948b8afca6709a26ecb95d59a2 #create a container out of it

```
root@ip-172-31-26-3:~#
```

#if I talk about image

There are already predefined images create

Suppose I need to run an python based or a java based app

Python:

We will install an os

On top of that we will deploy the python run time

#####i have an java based application

We will install an os

On top of that we will install openjdk

###they have already build this images

You need to just focus on your application base image is already ready., you bind your base image with your application

--detach

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Lets try undestand the --detach mode

Container run as a process id.

This will run as forground process

--detach will make the process ad background or I can say deamon

Acs

Ecs

##we launch an vm install docker on top of it

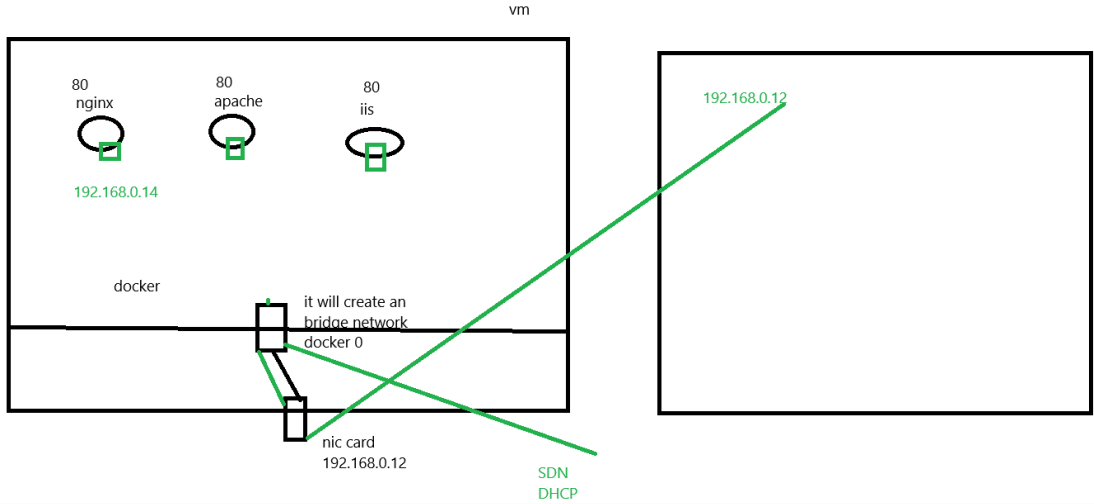
Just give an container image to the cloud service

They will launch an vm install docker on top of it install and container image create load balancer

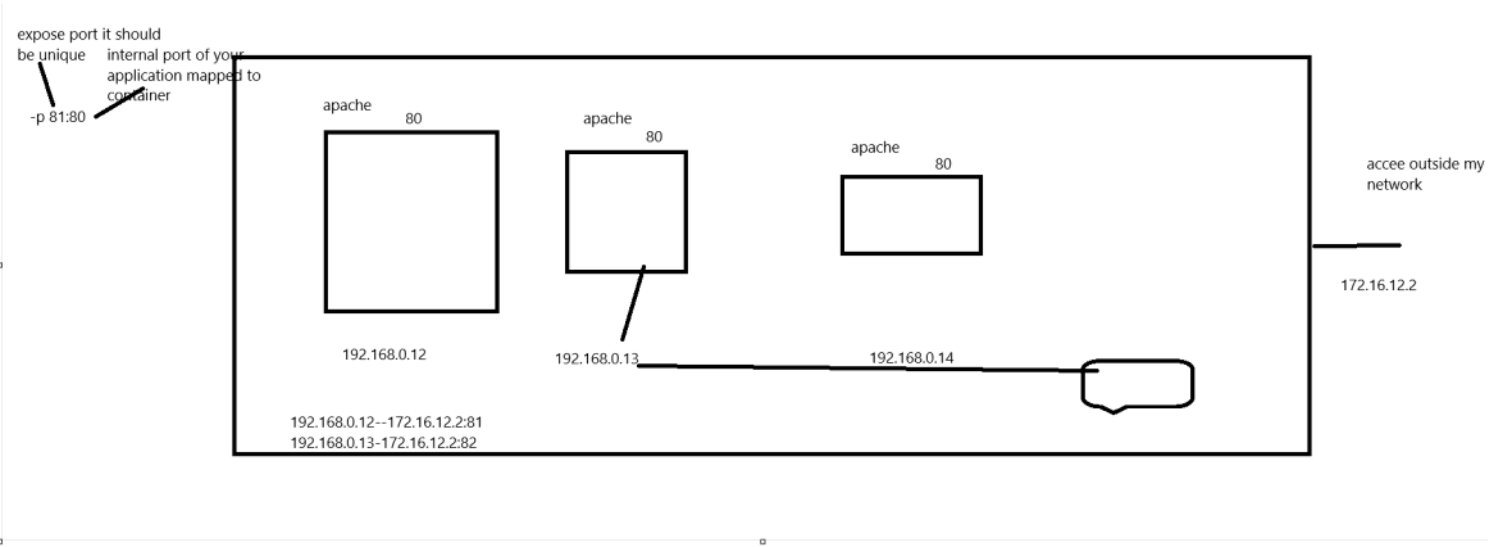
Docker networking

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When we run an application as a container based app. It will be run as an web based application.
To run an web based application.
It should run on some port number.
So when you create an web based application it is always running using a port number



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Kubernetes

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What is k8s

COE: container orchestrator engine

Docker

Containerd: comes docker family used by aks eks gke

Podman: redhat openshift redhat

Crio: redhat

Without the container engine we cannot run k8s

]

What is service in linux

Apt install httpd

Systemctl

Service

Communication

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We do communication with windows machine using RDP

Linux shell

When we do RDP or Shell we have full access.

Kubernetes strictly do the communication using API.

I want to create an channel in youtube. I want to collect the reports how many hits

To do the same we cannot do ssh rdp connection to the you tube server

We want to publish some add in facebook instagram.

They expose only the required functionality

To communicate with rdp and ssh: we use password or keypair based authentication

How about api based communication. We authenticate.,
Openssl we generate CSR certificate. Certificate authentication.

Machine to machine communication

Jane

Jane an service or account machine

You send your token csr certificate aes 256 bit encrypted

Recap

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Kube-api server

All the communication to your k8s cluster will happen using an kube-api server
Linux and windows
Ssh or RDP: I have access to full system

API server: only give access to limited resource

Etcid is the database of k8s: all the resources information updating

Data store of your k8s cluster

The whole cluster wide information is stored inside etcd.

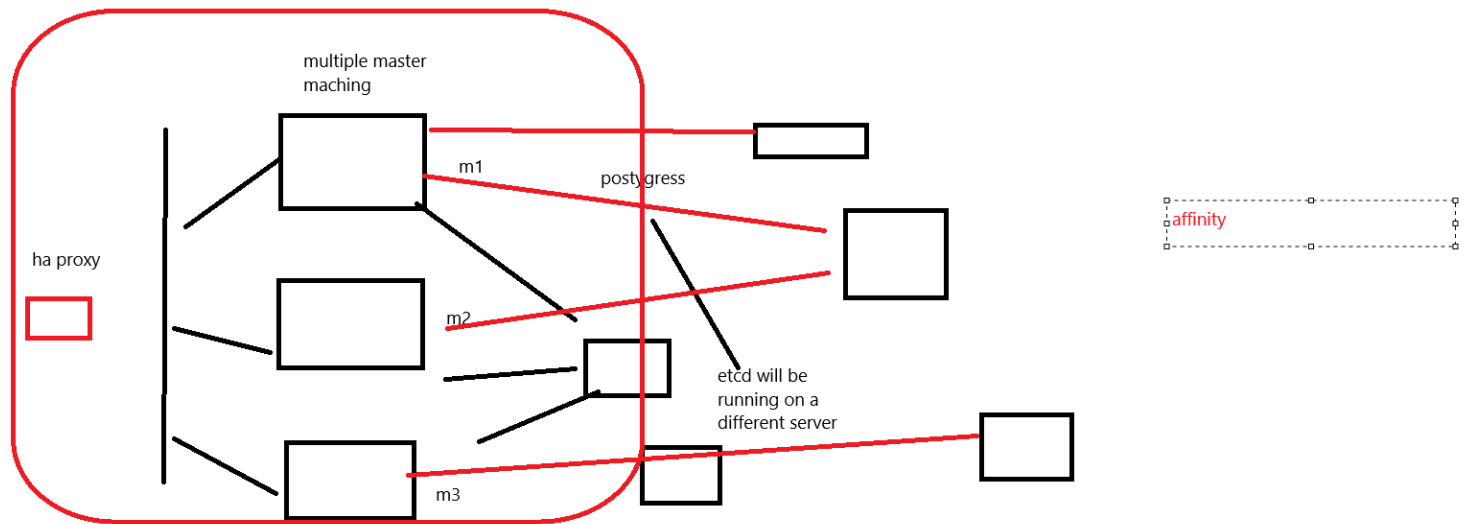
We got updates in k8s

1.31 tommrow a new relase comes 1.32

Before your upgrade you need to take the backup of etcd then only do the upgradation.

While upgrading if anything happen

You can create a new cluster restore etcd



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Cloud native foundation.

You want to integrate an EBS : elatic block storage

You can integrate with your cloud provider load balancer . Fully managed k8s

Kube-proxy

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Internal communication inside your k8s happen using kube-proxy

1. Clusterip: it will allow internal communication in your k8s cluster
 2. nodePort: using a node machine ip and port number I can access my application outside k8s cluster
 3. Loadbalancer: to access your application outside k8s cluster: but it is available with AKS eks gke
- Kube-proxy

CNI plugin: container network interface

Pod

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What is pod ?

We are going to deploy container image inside your k8s cluster.

Images are in gz or tar format

K8s understands only api call.

Pod will convert your container image into runnable state using

Yaml which will be used in k8s to convert your container image into runnable state

Demo

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We will create two virtual machine

1. In both the vm we will install container engine and k8s
2. One of the vm we will promote it as master
3. Then we will connect the second vm as worker node
4. Finally we will deploy the CNI plugin so that master and worker will be in ready state.

Master installation

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We want to install master machine in k8s

1. 2 core processor and 4 GB of RAM
2. Ubuntu debian redhat
3. In the master machine you need to enable some ports

Once I login to this machine I need to install

1. Containerd the container engine and the kubernetes package

Swap memory need to be disabled in all the linux system

Enable br_netfilter in the kernel

Enable ipv4 and ipv6 forwarding

#####

To manage kubernetes administratively

Kubeadm

#kubeadm init : will make that vm as master node

Kubeadm reset: you want to factory reset your k8s node or master machine

Kubeadm upgrade

Kubeadm config

Kubeadm token

###to deploy your workload in kubernetes

Kubectl

#####

command

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To administratively manage k8s we use
Kubeadm

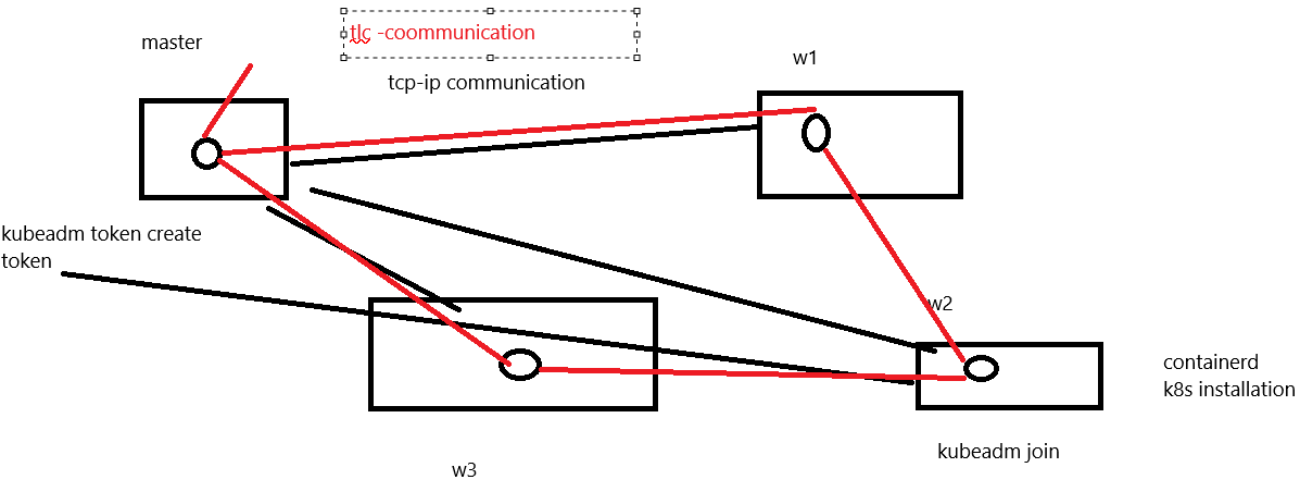
##to do the day today work we use
Kubectl

Master node upgrade we do it one by one
Worker node upgrade we can do one by one or all of them together

Docker miranthis
Crio
Podman
Rkt
Virtlet

Lxc: linux container engine sun micro system
Ctr

Eks: aws
Aks: azure
Gke:
NRSC: national remote sensing satellite



Pod in k8s

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When we talk about pod. Using the same we can deploy our workload in k8s

Pod is like an manifest file

Nginx httpd

###deploy this as an pod in your k8s cluser

Hub.docker.com

Quay.io-redhat

#on prem also you will have contianer registry

Jfrog nexus

You need an image and a manifest file

Deployment

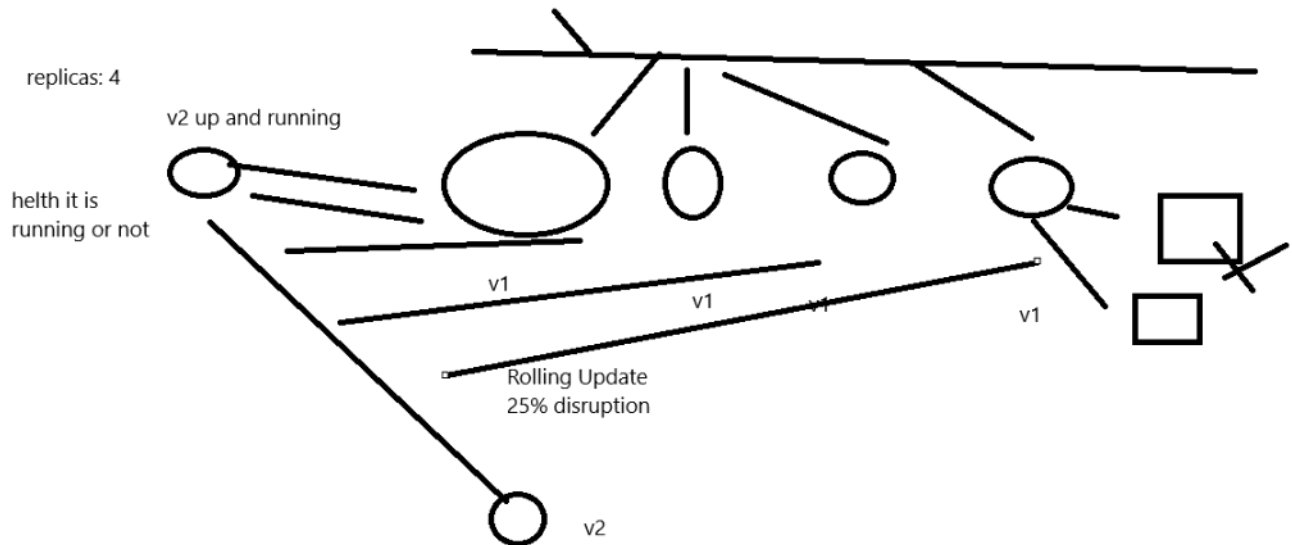
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K8s has come up with another api they called it deployment

###this is an new kind of api

Pod+replicaset=deployment

1. It will allow you to create multiple pod of the same application
2. We can declare the new state of the pod
3. Roll back: in prod I deployed a new version and it has bugs I need to roll back
4. Scaling: when there is need I can add more number of pod and when the need goes down it should reduce the number of pod. Cpu network memory utilization



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Recap

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We learn about pod.

What is pod? Used for deploying container images inside your k8s cluster.

We learn about deployment

Deployment: pod+replicaset

Once we created the deployment I want to expose this application internally or externally

Service

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I want to access the application outside inside my k8s cluster

To the same we will create a service

There are three different type of service

1. Clusterip: used for internal communication in the pod
 2. Nodeports: this will allow your app to communicate outside k8s cluster using node machine ip and port number
 3. Load balancer: this will create a lb but available with fully managed k8s cluster AKS EKS GKE
- Kubeadm token create --print-join-command --0

Phpsysinfo

1 to 7 : 20% discount : 1

7 to 15: 30% :2

15 to 30 : 10 % :3

Usermod -aG kubecthl hcladmin

Namespace in k8s

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When you want to create an virtual cluster where you will organize manage and secure your resources in a single cluster.

Creating virtual cluster

I have an k8s cluster

I want to allocate resource

To dev test staging prod

They will have access to only dev namespace

```
root@ip-172-31-22-191:~# kubectl get ns
```

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

default	Active	2d23h
---------	--------	-------

: when you create a resource and do not define the namespace it will always go to default namespace

kube-node-lease	Active	2d23h
-----------------	--------	-------

: it contains node system information

kube-public	Active	2d23h
-------------	--------	-------

: if you deploy your resource in this particular namespace it will be available across the whole k8s cluster. Some packages

kube-system	Active	2d23h
-------------	--------	-------

: it will contain the system related resource

```
root@ip-172-31-22-191:~#
```

Helm

You can use argocd

Harness

CRD: custom resource definition

Go lang

RBAC

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Lets try RBAC in k8s

Restriction

A clusterrole | role. Define a set of permission and 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 in the whole cluster or just a single namespace

Clusterrole: it will be available to the entire cluster. Admin account. Audit

Role: will be applied to individual in a particular namespace

#there are 4 combination

1. Role+ Rolebinding(available in single namespace and applied in single namespace)
2. Clusterrole+ clusterrolebinding(available cluster wide and applied cluster wide)
3. Clusterrole + rolebinding(available cluster wide, applied in a single namespace) admin
4. Role + clusterrolebinding: this combination do not work

In k8s we don't have an password based or keypair based authentication. It will always CSR. That is being used to do machine to machine communication.

#first we will create a service account.

Network Policy

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By default all the pod can communicate with each other inside a namespace
And namespace to namespace communication

Tommrow

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Ingress

Upgrading

Helm chart: awx,

Graffan prometheus

Kubernetes dashboard

Ingress controller

Tuesday, January 7, 2025 10:14 AM

Ingress in kubernetes

It is used for doing path based routing internally. Not only that it is also used for saving cost on the load balancer

We created a service in kubernetes and expose the service using loadbalancer of the cloud service provider.

It is too costly

LCU: load count unit

1. Hourly charges of the load balancer.
 2. How much data you have used using the lb
 3. How may rule evaluation you have done
 4. How many new connection
 5. How many running connect
- Sometimes it is 27 \$ per hour for the cloud load balancer

But most of the service are internal to your k8s cluster

YOU CAN do it every pod you can have ssl certificate

1. Certificate manager
2. Letsencrypt

#the pod will go down and come back

Ingress controller worker

Running means it will create a pod in the worker node or master

Running it will create a pod a vm in the k8s cluster. This can be done in master or worker. It will be running on worker but you can run it on master also.

To

There are two service need to point to your ingress controller

Acme.com/cart-cartservice-caRTPOD

Upgrade the k8s cluster

Tuesday, January 7, 2025 2:22 PM

Lets see how to upgrade the k8s cluster

Helm

Tuesday, January 7, 2025 3:26 PM

Helm is an package manager in k8s.
Yum install httpd