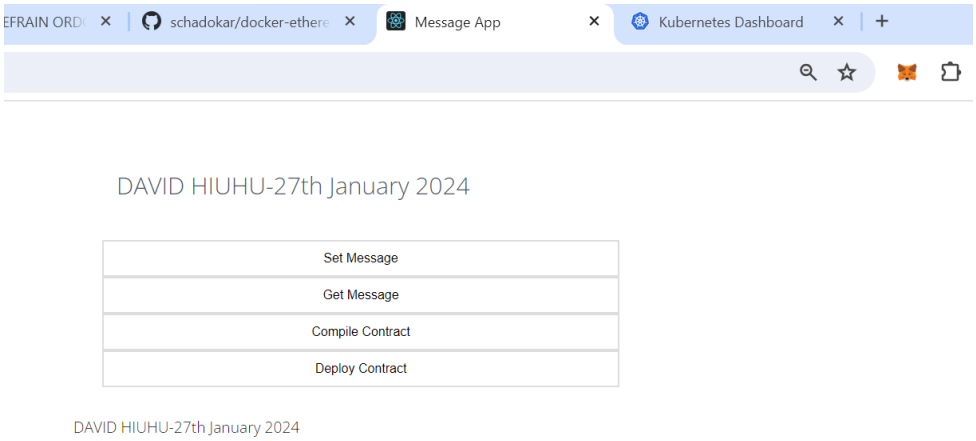
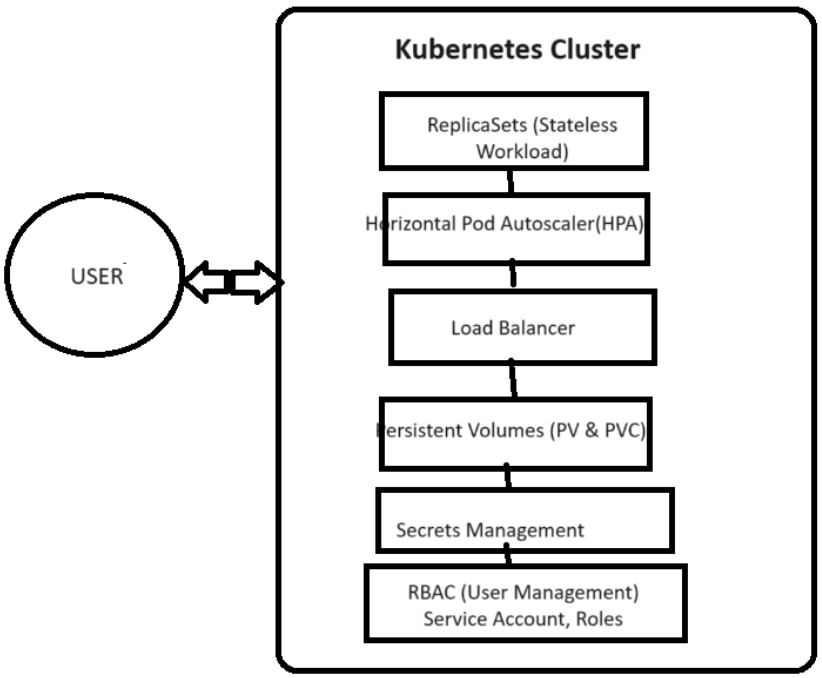




A high-level overview of the Kubernetes architecture for deploying a stateless Docker-ethereum application with considerations for scalability, data persistence, load balancing, secrets management, and user access control.

- Deployment: StatefulSets versus ReplicaSets

ReplicaSets because Docker-ethereum is a stateless application, and using ReplicaSets is more suitable for stateless workloads. Allows scaling by adding or removing replicas easily.

- Storage

Both Persistent Volumes (PV) and Persistent Volume Claims (PVC) because Ethereum nodes generate and store data that should persist even if the pod restarts. Using PVCs ensures data persistence across pod restarts or rescheduling.

- Scaling

Horizontal Pod Autoscaler because HPA ensures that the number of replicas scales based on resource utilization. This helps in optimizing resource allocation and handling varying workloads.

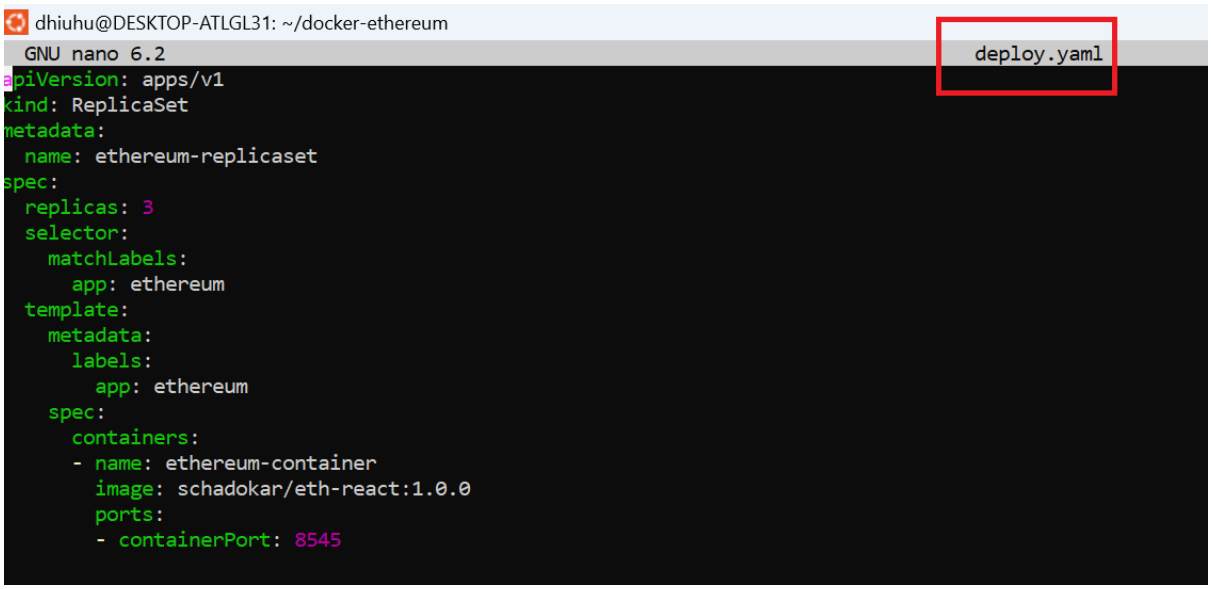
- Load Balancing

Kubernetes Service with ClusterIP (or NodePort for external service) – because A Service with ClusterIP provides internal load balancing within the cluster. NodePort can be used if external purpose.

- Secrets

Kubernetes Secrets – to store sensitive information like wallet passwords, API keys and more. Sensitive data is not exposed in the deployment configuration.

Create User and Assign Roles – RBAC (Role-Based Access Control). Create a service account for the application and assign roles based on the principle of least privilege. Enhanced security by restricting access to resources.



dhiuhu@DESKTOP-ATLGL31: ~/docker-ethereum

GNU nano 6.2 storage.yaml

```yaml
apiVersion: v1
kind: PersistentVolume
metadata:
  name: ethereum-pv
spec:
  capacity:
    storage: 5Gi
  accessModes:
    - ReadWriteOnce
  hostPath:
    path: "/path/to/host/directory"

---

apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: ethereum-pvc
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 5Gi
```

dhiuhu@DESKTOP-ATLGL31: ~/docker-ethereum

GNU nano 6.2 autoscaler.yaml

```yaml
apiVersion: autoscaling/v1
kind: HorizontalPodAutoscaler
metadata:
  name: ethereum-autoscaler
spec:
  scaleTargetRef:
    apiVersion: apps/v1
    kind: ReplicaSet
    name: ethereum-replicaset
  minReplicas: 2
  maxReplicas: 5
  targetCPUUtilizationPercentage: 80
```

dhiuhu@DESKTOP-ATLGL31: ~/docker-ethereum

GNU nano 6.2 service.yaml

```yaml
apiVersion: v1
kind: Service
metadata:
  name: ethereum-service
spec:
  selector:
    app: ethereum
  ports:
    - protocol: TCP
      port: 8545
      targetPort: 8545
  type: ClusterIP
```

dhiuhu@DESKTOP-ATLGL31: ~/docker-ethereum

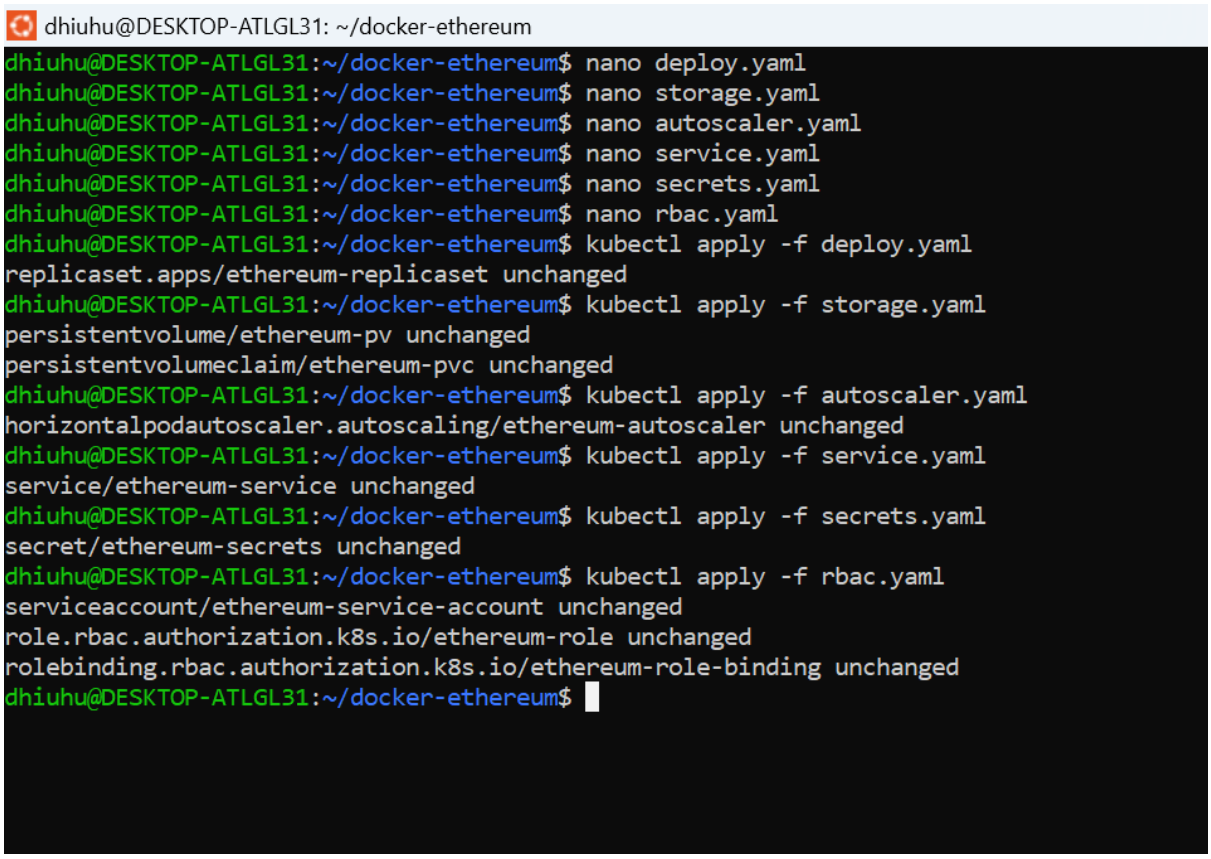
GNU nano 6.2 secrets.yaml

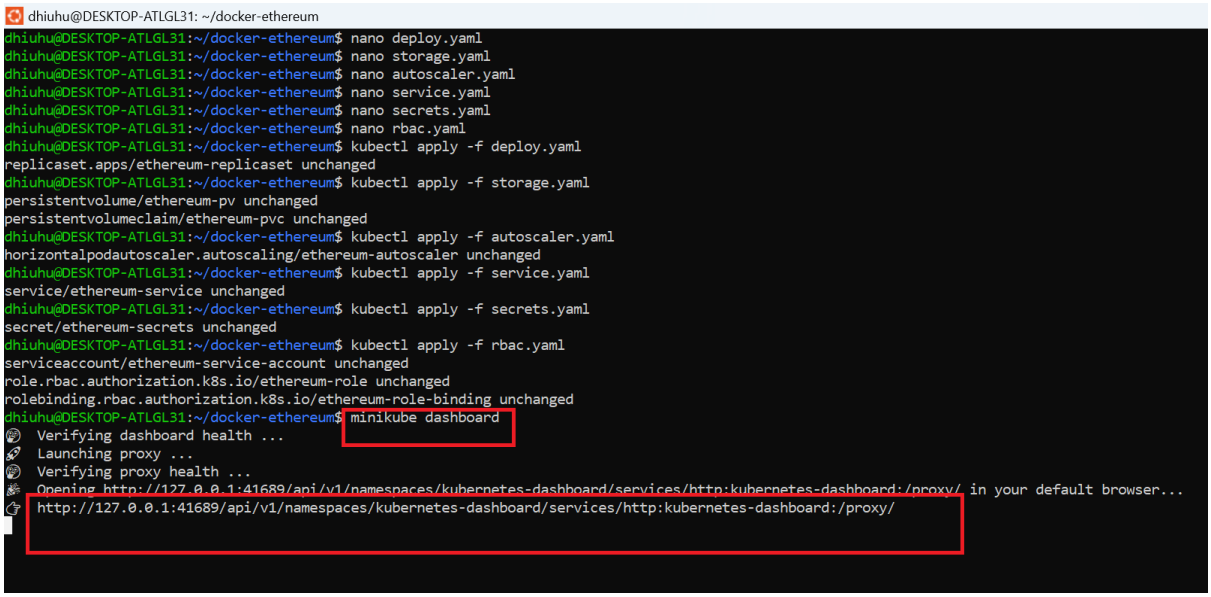
```yaml
apiVersion: v1
kind: Secret
metadata:
  name: ethereum-secrets
type: Opaque
data:
  wallet-password: ZGhpdWh1
  api-key: ZGhpdWh1
```

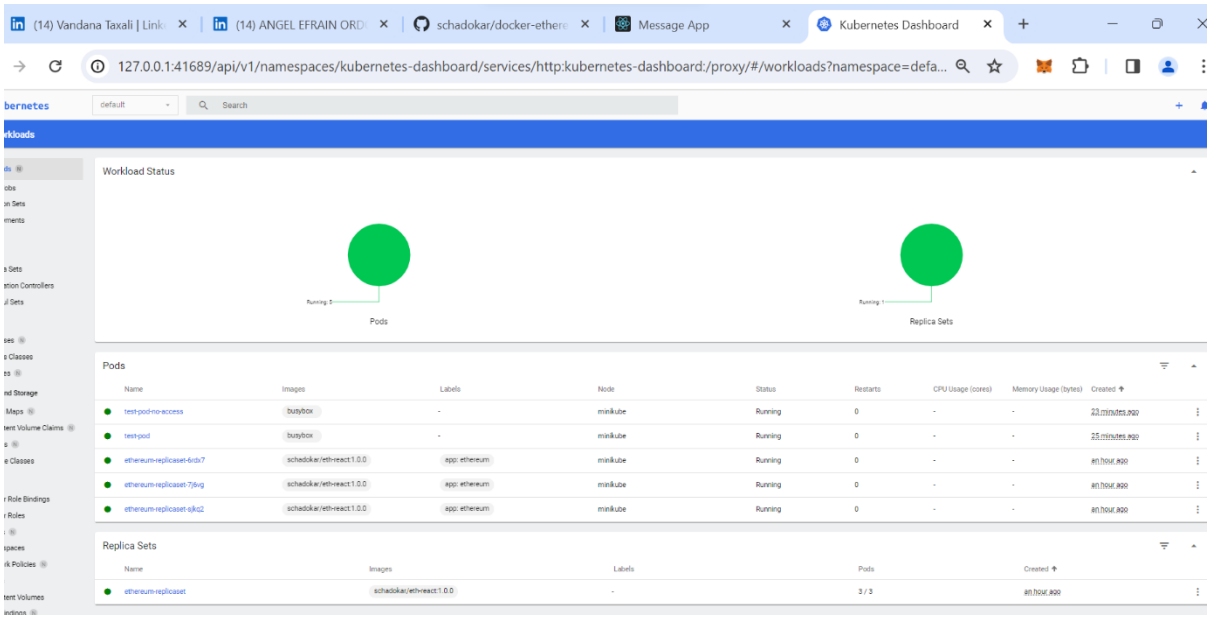
dhiuhu@DESKTOP-ATLGL31: ~/docker-ethereum

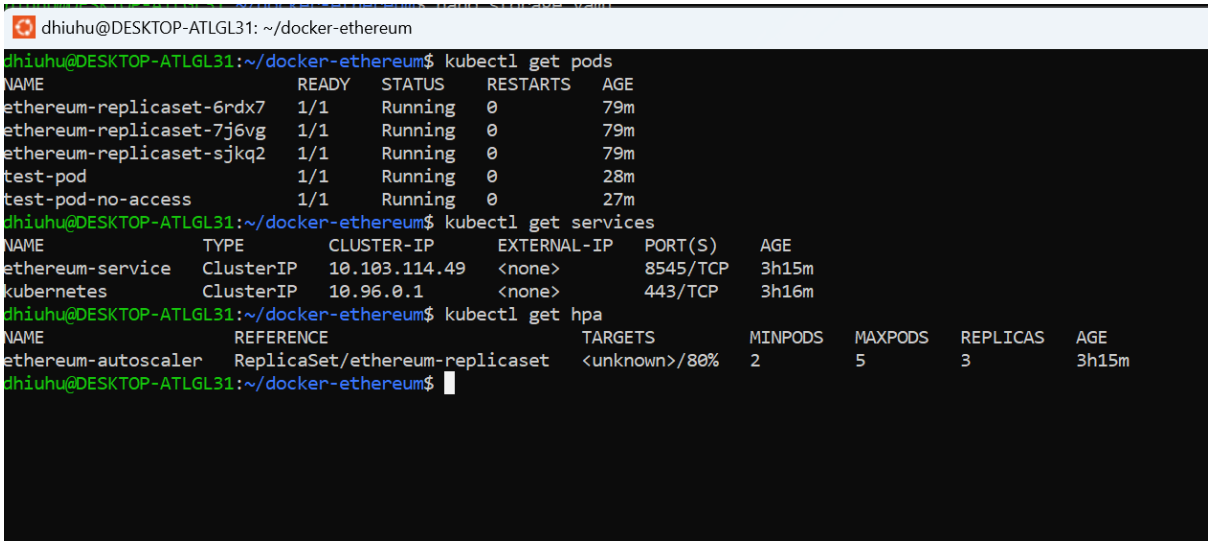
GNU nano 6.2 rbac.yaml

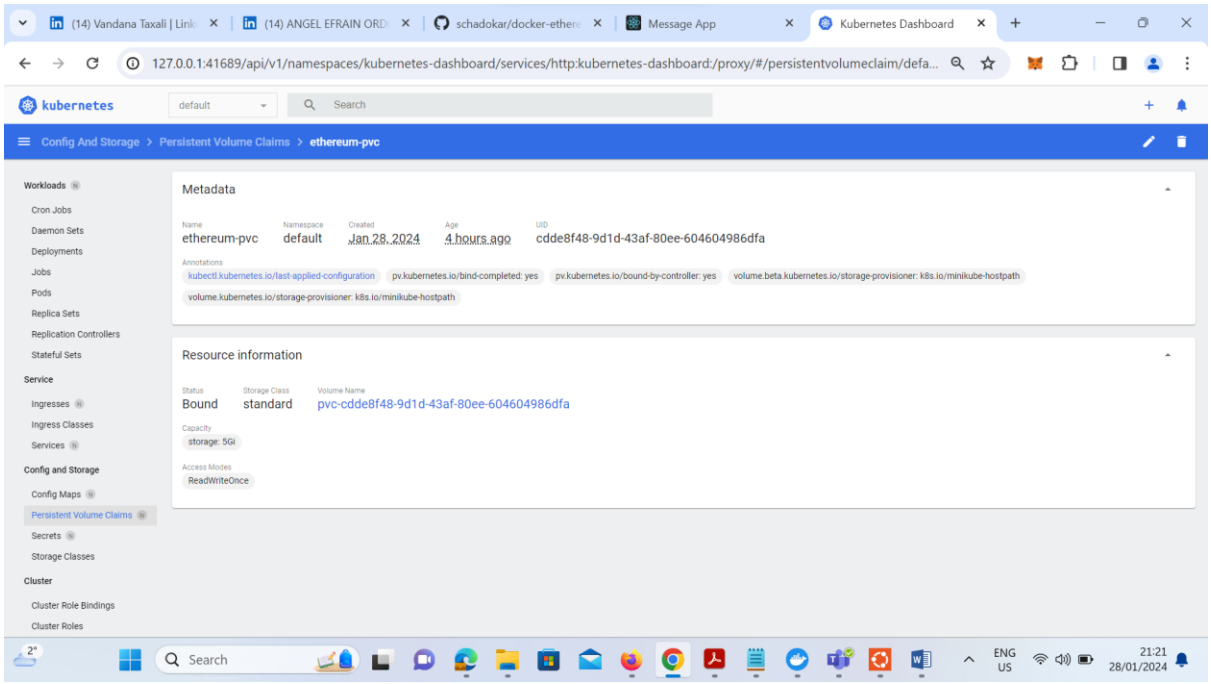
```yaml
apiVersion: v1
kind: ServiceAccount
metadata:
  name: ethereum-service-account

---

apiVersion: rbac.authorization.k8s.io/v1
kind: Role
metadata:
  name: ethereum-role
rules:
- apiGroups: [""]
  resources: ["pods"]
  verbs: ["get", "list", "watch"]

---

apiVersion: rbac.authorization.k8s.io/v1
kind: RoleBinding
metadata:
  name: ethereum-role-binding
subjects:
- kind: ServiceAccount
  name: ethereum-service-account
roleRef:
  kind: Role
  name: ethereum-role
  apiGroup: rbac.authorization.k8s.io
```

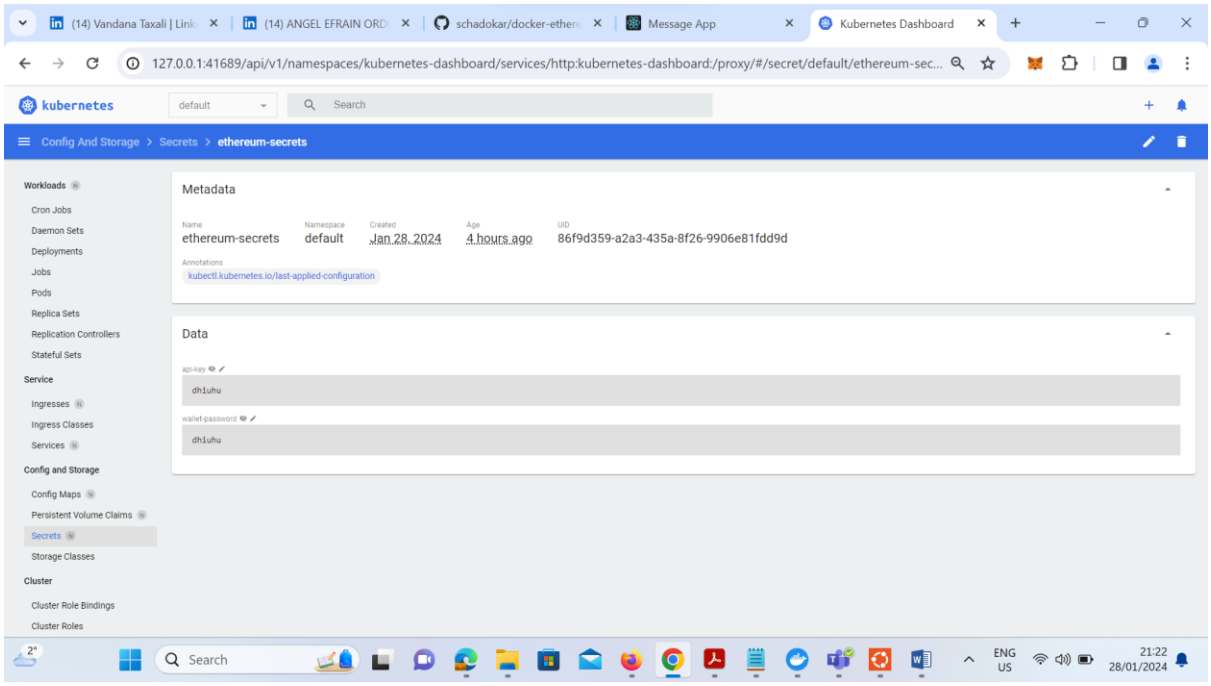

dhiuhu@DESKTOP-ATLGL31: ~/docker-ethereum
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ nano deploy.yaml
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ nano storage.yaml
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ nano autoscaler.yaml
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ nano service.yaml
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ nano secrets.yaml
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ nano rbac.yaml
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl apply -f deploy.yaml
replicaset.apps/ethereum-replicaset unchanged
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl apply -f storage.yaml
persistentvolume/ethereum-pv unchanged
persistentvolumeclaim/ethereum-pvc unchanged
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl apply -f autoscaler.yaml
horizontalpodautoscaler.autoscaling/ethereum-autoscaler unchanged
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl apply -f service.yaml
service/ethereum-service unchanged
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl apply -f secrets.yaml
secret/ethereum-secrets unchanged
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl apply -f rbac.yaml
serviceaccount/ethereum-service-account unchanged
role.rbac.authorization.k8s.io/ethereum-role unchanged
rolebinding.rbac.authorization.k8s.io/ethereum-role-binding unchanged
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$

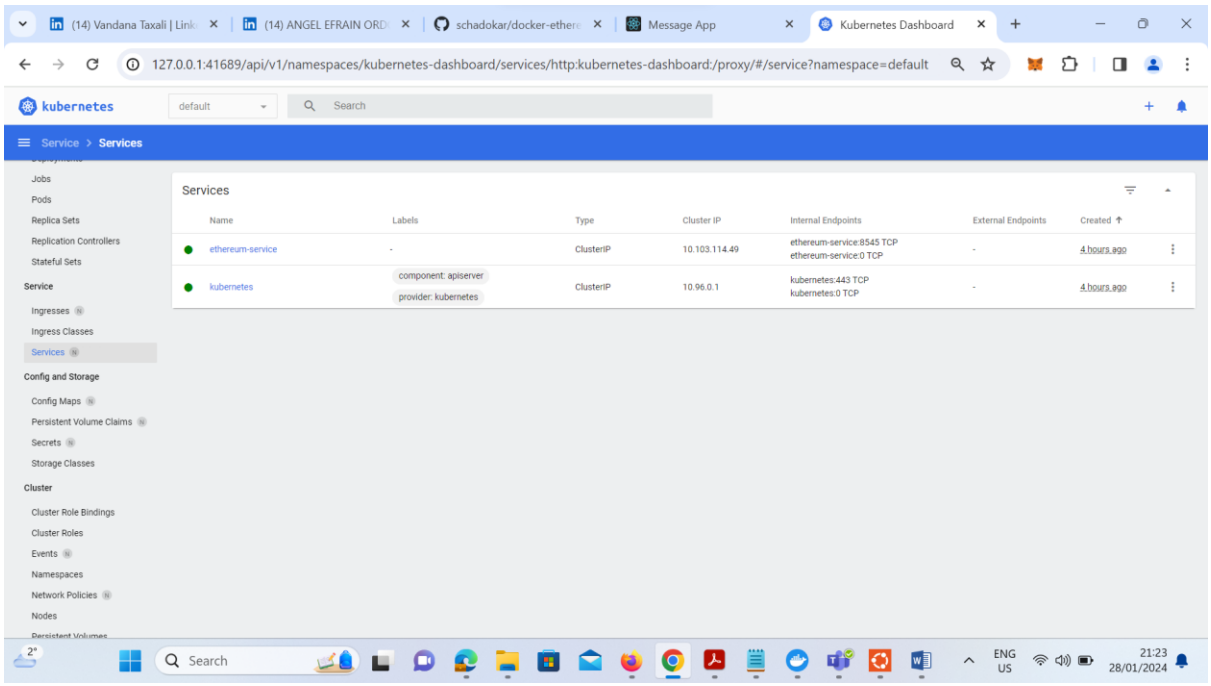

dhiuhu@DESKTOP-ATLGL31: ~/docker-ethereum
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ nano deploy.yaml
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ nano storage.yaml
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ nano autoscaler.yaml
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ nano service.yaml
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ nano secrets.yaml
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ nano rbac.yaml
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl apply -f deploy.yaml
replicaset.apps/ethereum-replicaset unchanged
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl apply -f storage.yaml
persistentvolume/ethereum-pv unchanged
persistentvolumeclaim/ethereum-pvc unchanged
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl apply -f autoscaler.yaml
horizontalpodautoscaler.autoscaling/ethereum-autoscaler unchanged
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl apply -f service.yaml
service/ethereum-service unchanged
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl apply -f secrets.yaml
secret/ethereum-secrets unchanged
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl apply -f rbac.yaml
serviceaccount/ethereum-service-account unchanged
role.rbac.authorization.k8s.io/ethereum-role unchanged
rolebinding.rbac.authorization.k8s.io/ethereum-role-binding unchanged
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ minikube dashboard
Verifying dashboard health ...
Launching proxy ...
Verifying proxy health ...
Opening http://127.0.0.1:41689/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/ in your default browser...
http://127.0.0.1:41689/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/

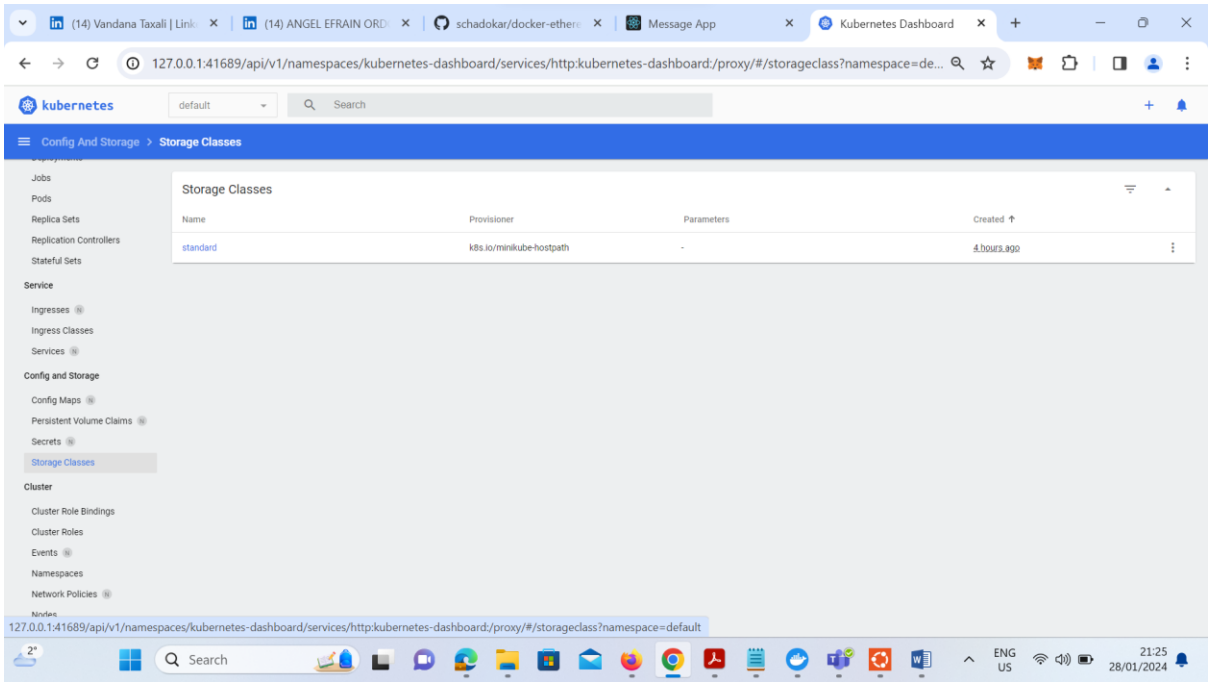

Kubernetes Dashboard
127.0.0.1:41689/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/#/workloads?namespace=defa...
Workload Status
Pods
Replica Sets
Pods
Replica Sets

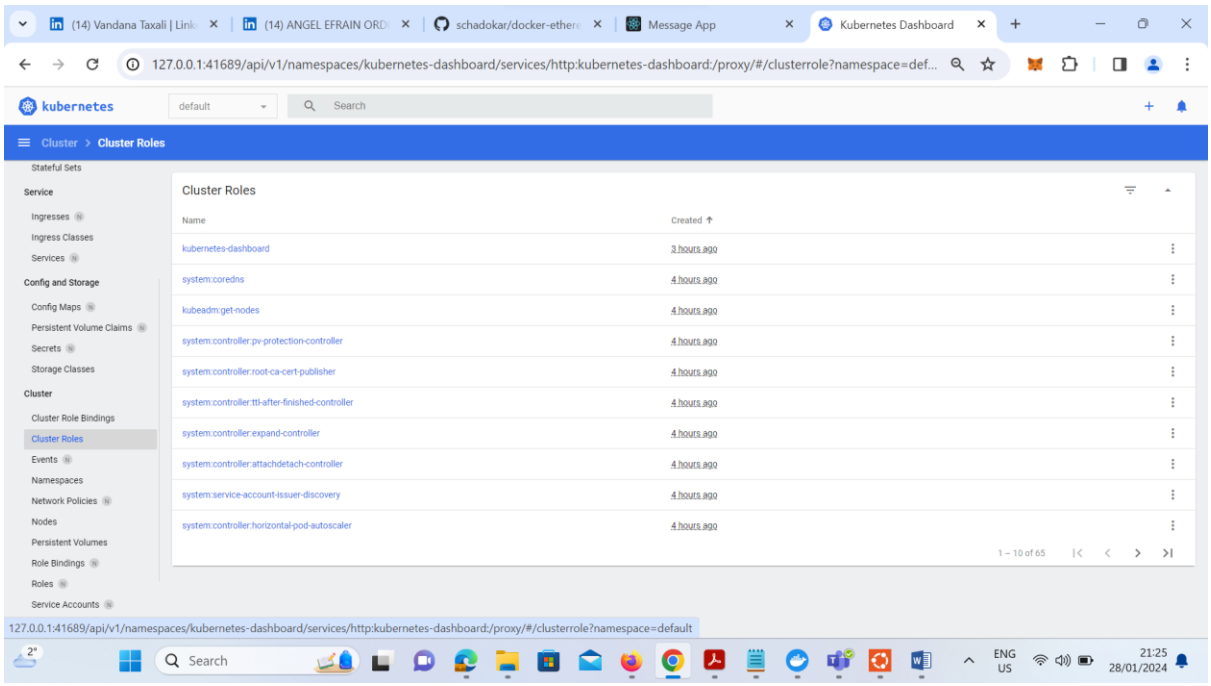

dhiuhu@DESKTOP-ATLGL31: ~/docker-ethereum
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl get pods
NAME READY STATUS RESTARTS AGE
ethereum-replicaset-6rdx7 1/1 Running 0 79m
ethereum-replicaset-7j6vg 1/1 Running 0 79m
ethereum-replicaset-sjkq2 1/1 Running 0 79m
test-pod 1/1 Running 0 28m
test-pod-no-access 1/1 Running 0 27m
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl get services
NAME TYPE CLUSTER-IP EXTERNAL-IP PORT(S) AGE
ethereum-service ClusterIP 10.103.114.49 <none> 8545/TCP 3h15m
kubernetes ClusterIP 10.96.0.1 <none> 443/TCP 3h16m
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$ kubectl get hpa
NAME REFERENCE TARGETS MINPODS MAXPODS REPLICAS AGE
ethereum-autoscaler ReplicaSet/ethereum-replicaset <unknown>/80% 2 5 3 3h15m
dhiuhu@DESKTOP-ATLGL31:~/docker-ethereum$

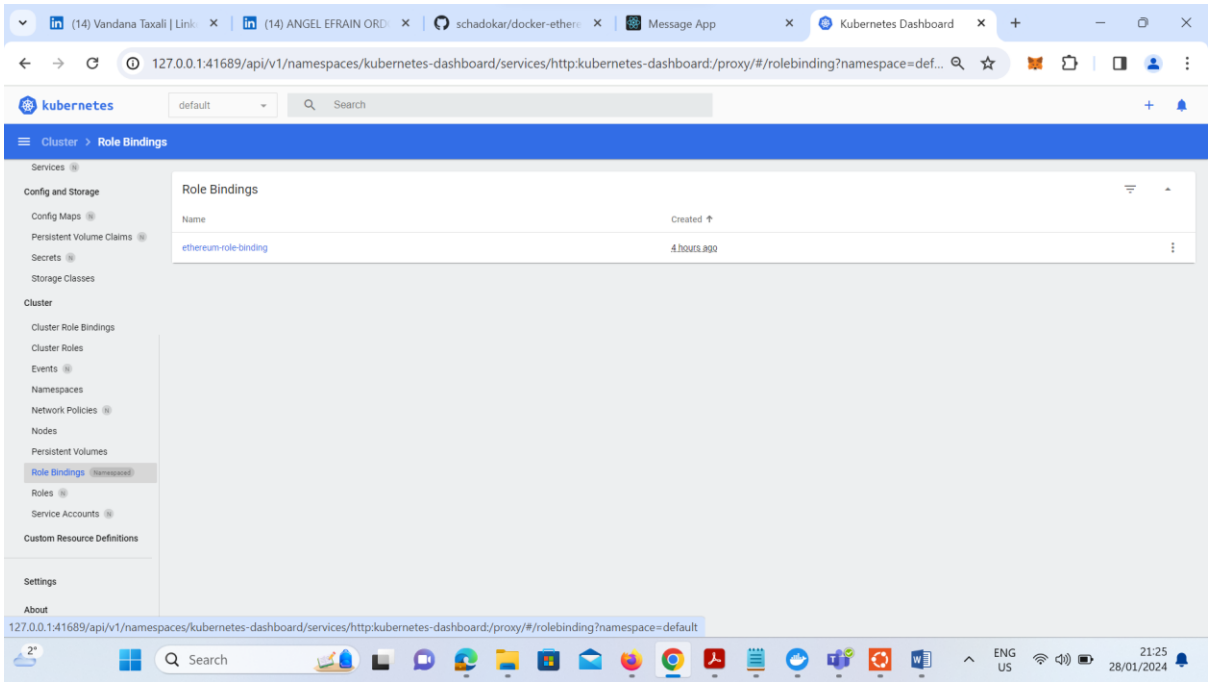

Kubernetes Dashboard
127.0.0.1:41689/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/#/persistentvolumeclaim/defa...
Config And Storage > Persistent Volume Claims > ethereum-pvc
Metadata
ethereum-pvc
default
Jan 28, 2024
4 hours ago
cdde8f48-9d1d-43af-80ee-604604986dfa
Resource information
Bound
standard
pvc-cdde8f48-9d1d-43af-80ee-604604986dfa
storage: 5Gi
ReadWriteOnce

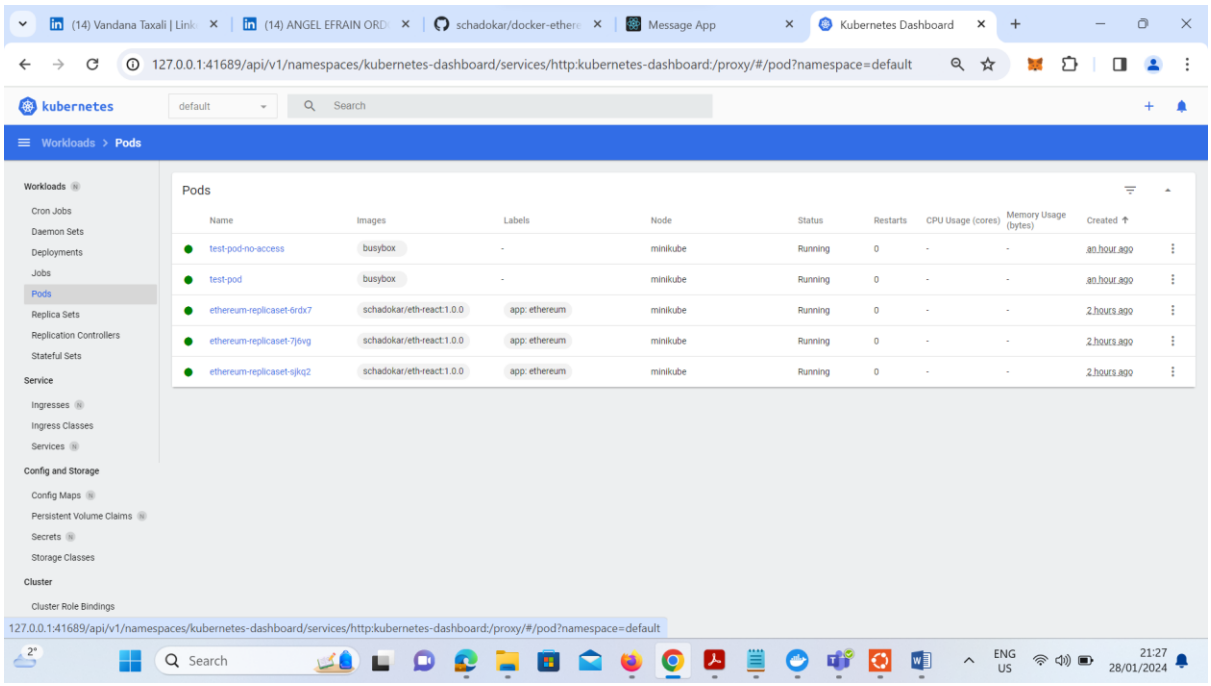

Kubernetes Dashboard
127.0.0.1:41689/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/#/secret/default/ethereum-sec...
kubernetes
default
Search
Config And Storage > Secrets > ethereum-secrets
Workloads
Cron Jobs
Daemon Sets
Deployments
Jobs
Pods
Replica Sets
Replication Controllers
Stateful Sets
Service
Ingresses
Ingress Classes
Services
Config and Storage
Config Maps
Persistent Volume Claims
Secrets
Storage Classes
Cluster
Cluster Role Bindings
Cluster Roles
Metadata
Name
ethereum-secrets
Namespace
default
Created
Jan 28, 2024
Age
4 hours ago
UID
86f9d359-a2a3-435a-8f26-9906e81fdd9d
Annotations
kubectl.kubernetes.io/last-applied-configuration
Data
api-key
dh1uhu
wallet-password
dh1uhu
ENG
US
21:22
28/01/2024


Kubernetes Dashboard
127.0.0.1:41689/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/#/service?namespace=default
kubernetes
default
Search
Service > Services
Jobs
Pods
Replica Sets
Replication Controllers
Stateful Sets
Service
Ingresses
Ingress Classes
Services
Config and Storage
Config Maps
Persistent Volume Claims
Secrets
Storage Classes
Cluster
Cluster Role Bindings
Cluster Roles
Events
Namespaces
Network Policies
Nodes
Services
Name
Labels
Type
Cluster IP
Internal Endpoints
External Endpoints
Created
ethereum-service
ClusterIP
10.103.114.49
ethereum-service:8545 TCP
ethereum-service:0 TCP
4 hours ago
kubernetes
component: apiserver
provider: kubernetes
ClusterIP
10.96.0.1
kubernetes:443 TCP
kubernetes:0 TCP
4 hours ago
ENG
US
21:23
28/01/2024


Kubernetes Dashboard
127.0.0.1:41689/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/#/storageclass?namespace=de...
kubernetes
default
Search
Config And Storage > Storage Classes
Storage Classes
Name
Provisioner
Parameters
Created
standard
k8s.io/minikube-hostpath
-
4 hours ago
Jobs
Pods
Replica Sets
Replication Controllers
Stateful Sets
Service
Ingresses
Ingress Classes
Services
Config and Storage
Config Maps
Persistent Volume Claims
Secrets
Storage Classes
Cluster
Cluster Role Bindings
Cluster Roles
Events
Namespaces
Network Policies
Nodes
127.0.0.1:41689/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/#/storageclass?namespace=default
Search
ENG
US
21:25
28/01/2024


Kubernetes Dashboard
127.0.0.1:41689/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/#/clusterrole?namespace=def...
kubernetes
default
Search
Cluster > Cluster Roles
Cluster Roles
Name
Created
kubernetes-dashboard
3 hours ago
system:coredns
4 hours ago
kubeadm:get-nodes
4 hours ago
system:controller:pv-protection-controller
4 hours ago
system:controller:root-ca-cert-publisher
4 hours ago
system:controller:ttl-after-finished-controller
4 hours ago
system:controller:expand-controller
4 hours ago
system:controller:attachdetach-controller
4 hours ago
system:service-account-issuer-discovery
4 hours ago
system:controller:horizontal-pod-autoscaler
4 hours ago
1 – 10 of 65
Stateful Sets
Service
Ingresses
Ingress Classes
Services
Config and Storage
Config Maps
Persistent Volume Claims
Secrets
Storage Classes
Cluster
Cluster Role Bindings
Cluster Roles
Events
Namespaces
Network Policies
Nodes
Persistent Volumes
Role Bindings
Roles
Service Accounts
127.0.0.1:41689/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/#/clusterrole?namespace=default
Search
ENG
US
21:25
28/01/2024


Kubernetes Dashboard
127.0.0.1:41689/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/#/rolebinding?namespace=def...
kubernetes
default
Search
Cluster > Role Bindings
Role Bindings
Name
Created
ethereum-role-binding
4 hours ago
Services
Config and Storage
Config Maps
Persistent Volume Claims
Secrets
Storage Classes
Cluster
Cluster Role Bindings
Cluster Roles
Events
Namespaces
Network Policies
Nodes
Persistent Volumes
Role Bindings
Roles
Service Accounts
Custom Resource Definitions
Settings
About
127.0.0.1:41689/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/#/rolebinding?namespace=default
Search
ENG
US
21:25
28/01/2024


Kubernetes Dashboard
127.0.0.1:41689/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/#/pod?namespace=default
kubernetes
default
Search
Workloads > Pods
Pods
Name
Images
Labels
Node
Status
Restarts
CPU Usage (cores)
Memory Usage (bytes)
Created
test-pod-no-access
busybox
minikube
Running
0
an hour ago
test-pod
busybox
minikube
Running
0
an hour ago
ethereum-replicaset-6rdx7
schadokar/eth-react:1.0.0
app: ethereum
minikube
Running
0
2 hours ago
ethereum-replicaset-7j6vg
schadokar/eth-react:1.0.0
app: ethereum
minikube
Running
0
2 hours ago
ethereum-replicaset-sjkq2
schadokar/eth-react:1.0.0
app: ethereum
minikube
Running
0
2 hours ago
Workloads
Cron Jobs
Daemon Sets
Deployments
Jobs
Pods
Replica Sets
Replication Controllers
Stateful Sets
Service
Ingresses
Ingress Classes
Services
Config and Storage
Config Maps
Persistent Volume Claims
Secrets
Storage Classes
Cluster
Cluster Role Bindings
127.0.0.1:41689/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/#/pod?namespace=default
Search
ENG
US
21:27
28/01/2024