

Deploy private docker registry in kubernetes

Step 1: Creating files for authentication

Make a folder and open terminal within a folder created

```
mkdir registry  
cd registry
```

Create tls certificate and a key

```
openssl req -x509 -newkey rsa:4096 -days 3650 -nodes -sha256 -keyout certs/tls.key -out  
certs/tls.crt -subj "/CN=<docker-registry.mydomain.com>"
```

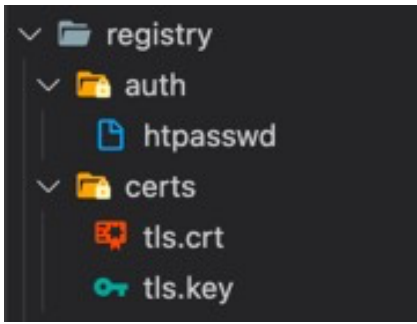
Use htpasswd to add user authentication for registry access. If htpasswd is not installed then install using below command.

```
sudo apt-get install apache2-utils
```

Create authentication file using htpasswd

```
htpasswd -Bbn <your_username> <your_password> > auth/htpasswd
```

At the end of this you will have folders as follows



Step 2: Create kubernetes secrets

Kubernetes secrets is a way of storing secrets / keys in kubernetes master storage.

Create a secret to store tls certificates

The below command creates a **Secret of type** `tls` named **certs-secret** in the **default namespace** from the pair of public/private keys we just created.

```
kubectl create secret tls registry-certs-secret --cert=<path-to-registry-  
folder>/certs/tls.crt --key=<path-to-registry- folder>/certs/tls.key
```

The Secret **auth-secret** that we create from the **htpasswd** file is of type `generic` which means the Secret was created from a local file.

```
kubectl create secret generic registry-auth-secret --from-file=<path-to-registry-  
folder>/auth/htpasswd
```

Step 3: Create storage class and persistent volume claim for repository storage

We are using OpenEBS to configure and manage persistent volumes

Create storage class

```
docker-registry-sc.yaml
```

```
apiVersion: storage.k8s.io/v1
kind: StorageClass
metadata:
  name: docker-registry-sc
  annotations:
    openebs.io/cas-type: local
    cas.openebs.io/config: |
      - name: StorageType
        value: hostpath
      - name: BasePath
        value: <path-where-registry-should-be-stored>
    # eg value: /home/techiterian/Documents/volumes/docker_registry
provisioner: openebs.io/local
reclaimPolicy: Retain
volumeBindingMode: WaitForFirstConsumer
```

Create persistent volume claim

docker-registry-pvc.yaml

```
kind: PersistentVolumeClaim
apiVersion: v1
metadata:
  name: docker-registry-pvc # Specify name for pvc
spec:
  storageClassName: docker-registry-sc # Make sure storage class name is correctly spelled
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 2G # Specify appropriate storage
```

Execute below commands to create StorageClass and Persistent Volume Claim

```
kubectl apply -f <path-to-docker-registry-sc.yaml>
kubectl apply -f <path-to-docker-registry-pvc.yaml>
```

Step 4: Create a deployment for

docker registry

docker-registry-deployment.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: docker-registry-deployment
spec:
  selector:
    matchLabels:
      app: docker-registry-deployment
  template:
    metadata:
      labels:
        app: docker-registry-deployment
    spec:
      nodeSelector: # Specify node selector to specify on which node docker registry should
be running. Persistent volumes will be created on same node
        kubernetes.io/hostname: prd-master1.rapidoreach.com
      containers:
      - name: docker-registry-deployment
        image: registry:2.7.1
        resources:
          limits:
            memory: "256Mi"
            cpu: "500m"
        ports:
        - containerPort: 5000
        volumeMounts:
          - mountPath: "/var/lib/registry" # /var/lib/registry is a common location within a
pod where all registries will be stored
            name: registry-database-volume
          - mountPath: "/certs"
            name: certs-volume
          - mountPath: "/auth"
            name: auth-volume
        env: # Environment variables being set which will be used by registry pod
          - name: REGISTRY_AUTH
```

```

    value: "htpasswd"
  - name: REGISTRY_AUTH_HTPASSWD_REALM
    value: "Registry Realm"
  - name: REGISTRY_AUTH_HTPASSWD_PATH
    value: "/auth/htpasswd"
  - name: REGISTRY_HTTP_TLS_CERTIFICATE
    value: "/certs/tls.crt"
  - name: REGISTRY_HTTP_TLS_KEY
    value: "/certs/tls.key"
volumes:
  - name: registry-database-volume # Persistent volume claim is used here
    persistentVolumeClaim:
      claimName: docker-registry-pvc
  - name: certs-volume # Secret used here to make certificates available within created
pod
    secret:
      secretName: registry-certs-secret
  - name: auth-volume # Secret used here to make htpasswd auth available within created
pod
    secret:
      secretName: registry-auth-secret

```

Use below command to create a deployment

```
kubectl apply -f <path-to-docker-registry-deployment.yaml>
```

Step 5: Create node port service

Node port service will be used to expose created docker registry over internet

```
docker-registry-node-port.yaml
```

```

apiVersion: v1
kind: Service
metadata:
  name: docker-registry-node-port
spec:
  type: NodePort
  ports:

```

```
- port: 5000 # Port which will be used internally by all pods
  targetPort: 5000 # Target port of docker registry pod where registry is listening
  nodePort: 30001 # Public port where docker registry will be available
selector:
  app: docker-registry-deployment # Make sure selector should match with the label of
deployment
```

Use below command to create a node port service

```
kubectl apply -f <path-to-docker-registry-node-port.yaml>
```

Step 6: Configure docker to trust self signed tls certificate

We must copy the `tls.crt` that we created earlier as `"ca.crt"` into a custom `/etc/docker/certs.d/<subdomain-where-registry-is-accessible>` directory in all the nodes in our cluster to make sure that our self-signed certificate is trusted by Docker. Note that the directory that is created inside `/etc/docker/certs.d` should have the name of the format `<registry_name>:<registry_port>` for `<subdomain-where-registry-is-accessible>`

```
sudo mkdir -p /etc/docker/certs.d/<subdomain-where-registry-is-accessible>
```

Copy tls certificate

```
cp <path-to-registry-folder>/certs/tls.crt /etc/docker/certs.d/<subdomain-where-registry-is-accessible>/ca.crt
```

Step 7: Testing of private docker registry

Lets try to connect with private docker registry. Perfereably use master node

```
docker login <docker-registry-fully-qualified-domain-name>:<port> -u myuser -p mypasswd
```

It will output

```
techiterian@prd-master1:~/Documents/registry$ docker login docker-registry.kondgekar.com:30001 -u techiterian -p
WARNING! Using --password via the CLI is insecure. Use --password-stdin.
WARNING! Your password will be stored unencrypted in /home/techiterian/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
techiterian@prd-master1:~/Documents/registry$
```

“ If Login is not successful then make sure you follow step 6 and copied **tls.crt** as **ca.crt** in appropriate folder of whichever machine you are running above command.

Additionally check if username and password is correctly put same as that of Step 1

Step 8: Use secret to store image pull login details

To authorize a pod to pull image from private registry we need to provide image pull credentials to pod. Let's create a secret which will store these credentials

```
kubectl create secret docker-registry regcred --docker-server=<your-registry-server> --docker-username=<your-name> --docker-password=<your-password>
```

Step 9: Test if custom image can be pushed to our private docker registry

```
# Pull standard image available on docker hub
docker pull nginx

# Tag the image for private registry
docker tag nginx:latest <your-registry-server>/mynginx:v1

# Push docker image to private repository
```

```
docker push <your-registry-server>/mynginx: v1
```

Command output will look like

```
techiterian@prd-master1:~/Documents/registry$ docker pull nginx
Using default tag: latest
latest: Pulling from library/nginx
Digest: sha256:df13abe416e37eb3db4722840dd479b00ba193ac6606e7902331dcea50f4f1f2
Status: Image is up to date for nginx:latest
docker.io/library/nginx:latest
techiterian@prd-master1:~/Documents/registry$ docker tag nginx:latest docker-registry.kondgekar.com:30001/mynginx:v1
techiterian@prd-master1:~/Documents/registry$ docker push docker-registry.kondgekar.com:30001/mynginx:v1
The push refers to repository [docker-registry.kondgekar.com:30001/mynginx]
f0f30197ccf9: Layer already exists
eeb14ff930d4: Layer already exists
c9732df61184: Layer already exists
4b8db2d7f35a: Layer already exists
431f409d4c5a: Layer already exists
02c055ef67f5: Layer already exists
v1: digest: sha256:eba373a0620f68ffdc3f217041ad25ef084475b8feb35b992574cd83698e9e3c size: 1570
techiterian@prd-master1:~/Documents/registry$
```

Step 10: Deploy a pod and use private registry to pull image from

Refer: <https://kubernetes.io/docs/tasks/configure-pod-container/pull-image-private-registry/>

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