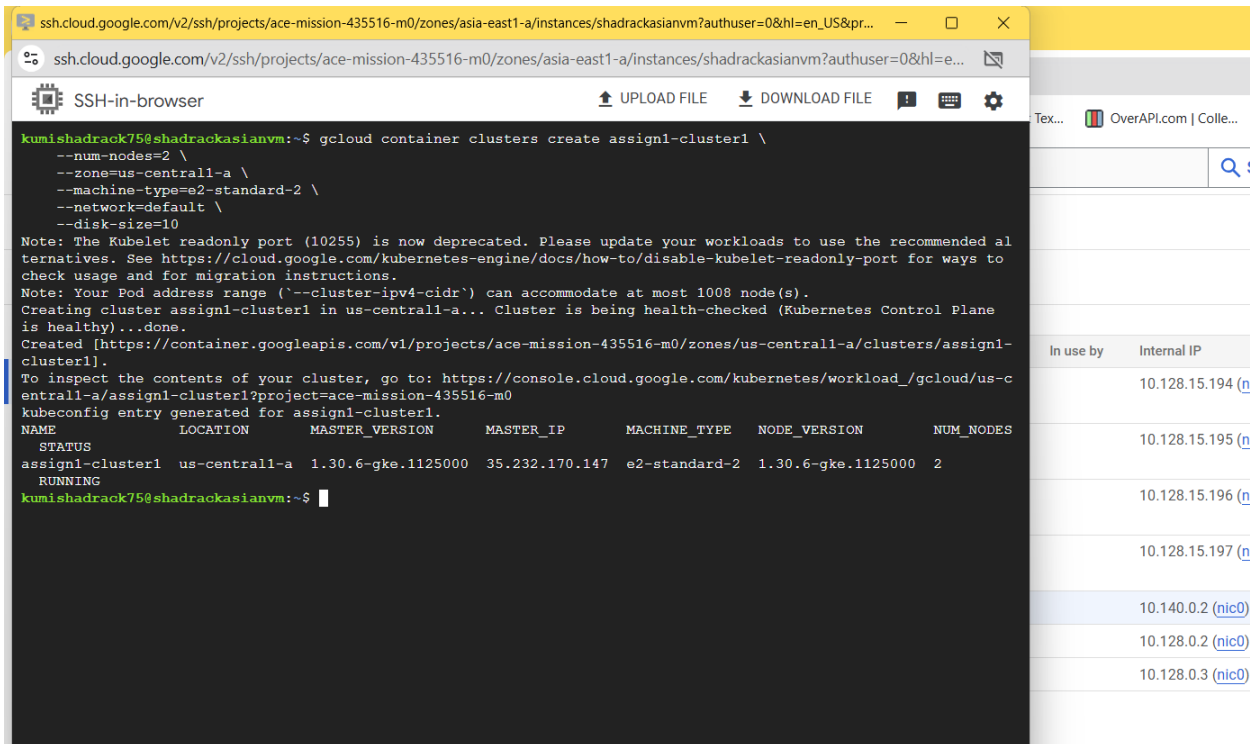


## 1. Create a GKE Cluster

- **Create a New GCP Project:**

Use the Google Cloud Console to create a new project and enable the Kubernetes Engine API.

- **Create the Cluster:** Use either the Console or the gcloud CLI. For example:



```
kumishadrack75@shadrackasianvm:~$ gcloud container clusters create assign1-cluster1 \
--num-nodes=2 \
--zone=us-central1-a \
--machine-type=e2-standard-2 \
--network=default \
--disk-size=10
Note: The Kubelet readonly port (10255) is now deprecated. Please update your workloads to use the recommended al
ternatives. See https://cloud.google.com/kubernetes-engine/docs/how-to/disable-kubelet-readonly-port for ways to
check usage and for migration instructions.
Note: Your Pod address range ('--cluster-ipv4-cidr') can accommodate at most 1008 node(s).
Creating cluster assign1-cluster1 in us-central1-a... Cluster is being health-checked (Kubernetes Control Plane
is healthy)...done.
Created [https://container.googleapis.com/v1/projects/ace-mission-435516-m0/zones/us-central1-a/clusters/assign1-
cluster1].
To inspect the contents of your cluster, go to: https://console.cloud.google.com/kubernetes/workload/_gcloud/us-c
entral1-a/assign1-cluster1?project=ace-mission-435516-m0
kubeconfig entry generated for assign1-cluster1.
NAME          LOCATION    MASTER_VERSION  MASTER_IP      MACHINE_TYPE   NODE_VERSION     NUM_NODES
STATUS
assign1-cluster1  us-central1-a  1.30.6-gke.1125000  35.232.170.147  e2-standard-2  1.30.6-gke.1125000  2
RUNNING
kumishadrack75@shadrackasianvm:~$
```

In use by	Internal IP
	10.128.15.194 (n)
	10.128.15.195 (n)
	10.128.15.196 (n)
	10.128.15.197 (n)
	10.140.0.2 (nic0)
	10.128.0.2 (nic0)
	10.128.0.3 (nic0)

**Cluster Name:** assign1-cluster1

**Region/Zone:** us-central1-a

**Node Configuration:** e2-standard-2, 2 nodes.

**Network Configuration:** Default VPC with necessary firewall rules

## 2. Deploy the NTP Server Container

- **Choose a Container Image:** Use a pre-built image from Docker Hub like cturra/ntp. This image provides a simple and reliable NTP server setup.
- **Create Deployment and Service Manifests:** Example manifests:

- **Deployment Manifest (ntp-deployment.yaml)**

The screenshot shows a web browser window with an SSH-in-browser session. The nano editor is editing a file named `ntp-deployment.yaml`. The content of the file is as follows:

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: ntp-server
spec:
  replicas: 2
  selector:
    matchLabels:
      app: ntp-server
  template:
    metadata:
      labels:
        app: ntp-server
    spec:
      containers:
        - name: ntp-server
          image: cturra/ntp
          ports:
            - containerPort: 123
              protocol: UDP
```

To the right of the editor, a table of VM instances is visible. The table has columns for 'In use by', 'Internal IP', and 'External IP'. The data rows are as follows:

In use by	Internal IP	External IP
	10.128.15.194 (nic0)	34.56.21...
	10.128.15.195 (nic0)	35.239.2...
	10.128.15.196 (nic0)	34.58.28...
	10.128.15.197 (nic0)	34.59.93...
	10.140.0.2 (nic0)	34.81.11...
	10.128.0.2 (nic0)	
	10.128.0.3 (nic0)	

**Service Manifest (ntp-service.yaml):**

```
ssh.cloud.google.com/v2/ssh/projects/ace-mission-435516-m0/zones/asia-east1-a/instances/shadrackasianvm?authuser=0&hl=en_US&pr...
SSH-in-browser
GNU nano 7.2 ntp-service.yaml *
apiVersion: v1
kind: Service
metadata:
  name: ntp-service
spec:
  selector:
    app: ntp-server
  ports:
    - protocol: UDP
      port: 123
      targetPort: 123
  type: LoadBalancer
```

Deploy the manifests:

```
kumishadrack75@shadrackasianvm:~$ gcloud container clusters create assign1-cluster1 \
  --num-nodes=2 \
  --zone=us-central1-a \
  --machine-type=e2-standard-2 \
  --network=default \
  --disk-size=10
Note: The Kubelet readonly port (10255) is now deprecated. Please update your workloads to use the recommended alternatives. See https://cloud.google.com/kubernetes-engine/docs/how-to/disable-kubelet-readonly-port for ways to check usage and for migration instructions.
Note: Your Pod address range ('--cluster-ip4-cidr') can accommodate at most 1008 node(s).
Creating cluster assign1-cluster1 in us-central1-a... Cluster is being health-checked (Kubernetes Control Plane is healthy)...done.
Created [https://container.googleapis.com/v1/projects/ace-mission-435516-m0/zones/us-central1-a/clusters/assign1-cluster1].
To inspect the contents of your cluster, go to: https://console.cloud.google.com/kubernetes/workload/_gcloud/us-central1-a/assign1-cluster1?project=ace-mission-435516-m0
kubeconfig entry generated for assign1-cluster1.
NAME          LOCATION    MASTER_VERSION  MASTER_IP      MACHINE_TYPE  NODE_VERSION    NUM_NODES
STATUS
assign1-cluster1  us-central1-a  1.30.6-gke.1125000  35.232.170.147  e2-standard-2  1.30.6-gke.1125000  2
RUNNING
kumishadrack75@shadrackasianvm:~$ nano ntp-deployment.yaml
kumishadrack75@shadrackasianvm:~$ nano ntp-service.yaml
kumishadrack75@shadrackasianvm:~$ kubectl apply -f ntp-deployment.yaml
deployment.apps/ntp-server created
service/ntp-service created
kumishadrack75@shadrackasianvm:~$
```

In use by	Internal IP	External IP
	10.128.15.194 (nic0)	34.56.211.52
	10.128.15.195 (nic0)	35.239.212.19
	10.128.15.196 (nic0)	34.58.28.187
	10.128.15.197 (nic0)	34.59.93.245
	10.140.0.2 (nic0)	34.81.113.24
	10.128.0.2 (nic0)	
	10.128.0.3 (nic0)	

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### 3. Configure the NTP Server (Optional)

- Configure the container to use specific NTP pools or restrict access via environment variables or additional commands (if supported by the image).

### 4. Test the NTP Server

- Retrieve the external IP address:

```
kumishadrack75@shadrackasianvm:~$ gcloud container clusters create assign1-cluster1 \
--num-nodes=2 \
--zone=us-central1-a \
--machine-type=e2-standard-2 \
--network=default \
--disk-size=10
Note: The Kubelet readonly port (10255) is now deprecated. Please update your workloads to use the recommended al
ternatives. See https://cloud.google.com/kubernetes-engine/docs/how-to/disable-kubelet-readonly-port for ways to
check usage and for migration instructions.
Note: Your Pod address range ('--cluster-ipv4-cidr') can accommodate at most 1008 node(s).
Creating cluster assign1-cluster1 in us-central1-a... Cluster is being health-checked (Kubernetes Control Plane
is healthy)...done.
Created [https://container.googleapis.com/v1/projects/ace-mission-435516-m0/zones/us-central1-a/clusters/assign1-
cluster1].
To inspect the contents of your cluster, go to: https://console.cloud.google.com/kubernetes/workload/_gcloud/us-c
entral1-a/assign1-cluster1?project=ace-mission-435516-m0
kubeconfig entry generated for assign1-cluster1.
NAME                LOCATION    MASTER_VERSION  MASTER_IP      MACHINE_TYPE  NODE_VERSION    NUM_NODES
STATUS
assign1-cluster1    us-central1-a  1.30.6-gke.1125000  35.232.170.147  e2-standard-2  1.30.6-gke.1125000  2
RUNNING
kumishadrack75@shadrackasianvm:~$ nano ntp-deployment.yaml
kumishadrack75@shadrackasianvm:~$ nano ntp-service.yaml
kumishadrack75@shadrackasianvm:~$ kubectl apply -f ntp-deployment.yaml
kubectl apply -f ntp-service.yaml
deployment.apps/ntp-server created
service/ntp-service created
kumishadrack75@shadrackasianvm:~$ kubectl get svc ntp-service
NAME                TYPE          CLUSTER-IP      EXTERNAL-IP      PORT(S)          AGE
ntp-service         LoadBalancer  34.118.226.222   34.29.223.163    123:30829/UDP    100s
kumishadrack75@shadrackasianvm:~$ -
```

Use a client machine to query the NTP server. Example using ntpdate

```
Setting up python3-ntp (1.2.2+dfsg1-1+deb12u1) ...
Setting up ntpsec-ntpdig (1.2.2+dfsg1-1+deb12u1) ...
Setting up ntpsec-ntpdate (1.2.2+dfsg1-1+deb12u1) ...
Setting up ntpdate (1:4.2.8p15+dfsg-2~1.2.2+dfsg1-1+deb12u1) ...
Processing triggers for man-db (2.11.2-2) ...
kumishadrack75@shadrackasianvm:~$ sudo ntpdate -q 34.29.223.163
2024-12-18 15:50:56.608280 (+0000) +0.004951 +/- 0.088304 34.29.223.163 s4 no-leap
kumishadrack75@shadrackasianvm:~$
```

Release Notes

recovery

billing

VM instance started

GET NODES:

```
kumishadrack75@shadrackasianvm:~$ ntpdate -q 34.29.223.163
-bash: ntpdate: command not found
kumishadrack75@shadrackasianvm:~$ kubectl get nodes
NAME                                STATUS    ROLES    AGE   VERSION
gke-assign1-cluster1-default-pool-4f09259b-1z9p   Ready    <none>   10m   v1.30.6-gke.1125000
gke-assign1-cluster1-default-pool-4f09259b-pk2w   Ready    <none>   10m   v1.30.6-gke.1125000
kumishadrack75@shadrackasianvm:~$
```

Release Notes

recovery

billing

VM instances - Compute Engine

Kubernetes clusters - Kubernetes

console.cloud.google.com/kubernetes/list/overview?project=ace-mission-435516-m0&inv=Abkelw

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Status	Name	Location	Tier	Fleet	Number of nodes	Total vCPUs	Total m
<input checked="" type="checkbox"/>	assign1-cluster1	us-central1-a	Standard	REGISTER	2	4	
<input checked="" type="checkbox"/>	assign2-cluster	asia-east1-a	Standard	REGISTER	3	6	
<input checked="" type="checkbox"/>	assign3-cluster3	asia-east1-a	Standard	REGISTER	3	6	
<input checked="" type="checkbox"/>	assign4-cluster4	us-central1-f	Standard	REGISTER	2	4	
<input checked="" type="checkbox"/>	final-web-cluster	us-central1-a	Standard	REGISTER	2	4	
<input checked="" type="checkbox"/>	testcluster1	us-central1-a	Standard	REGISTER	2	4	

Create and explore a cluster

Create a cluster and deploy a workload

Tutorial 15 min

Create a Kubernetes cluster, deploy a sample web app (workload), and view the running web app in your browser.

Explore the cluster and workload

Tutorial 5 min

Take a tour through notable components and configurations of the resources you created.

Example workflows

Configure a cluster and workload for staging

Tutorial 20 min

Learn the basics of configuring a cluster for staging and testing your web app.

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## Summary: Deploying an NTP Server on GKE

### 1. Set Up My GCP Environment

First, I logged into my Google Cloud Platform (GCP) account and created a new project specifically for this assignment. I made sure to enable the Kubernetes Engine API so I could create and manage a GKE cluster.

### 2. Created the GKE Cluster

Using the gcloud CLI, I created a Kubernetes cluster named assign1-cluster1 in the us-central1-a zone. I configured it with two nodes using the e2-standard-2 machine type. The cluster was connected to the default VPC network, and I ensured the necessary firewall rules were in place to allow UDP traffic on port 123, which is required for NTP servers.

### Selected an NTP Server Container Image

After setting up the cluster, I decided to use the pre-built cturra/ntp container image from Docker Hub. This image is a lightweight, reliable implementation of an NTP server.

### Created Kubernetes Manifests

Next, I wrote two Kubernetes manifest files: one for the Deployment and one for the Service.

- The **Deployment Manifest** defined the number of replicas (2), the container image, and the UDP port (123) for the NTP server.
- The **Service Manifest** exposed the NTP server externally using a LoadBalancer Service and also ensured the NTP service was accessible on port 123.

I saved these files as ntp-deployment.yaml and ntp-service.yaml respectively.

### Deployed the NTP Server

Using kubectl, I deployed the manifests to my GKE cluster:

```
kubectl apply -f ntp-deployment.yaml
```

```
kubectl apply -f ntp-service.yaml
```

I confirmed the deployment and verified the external IP address of the Service by running:

```
kubectl get svc ntp-service
```

### **Installed ntpdate on My Client Machine**

When it was time to test the NTP server, I tried using the ntpdate command to query the server. However, I encountered an error stating that ntpdate was not found on my machine.

To fix this, I installed ntpdate as follows:

- On my Ubuntu machine, I updated the package list and installed ntpdate:

```
sudo apt update
```

```
sudo apt install ntpdate
```

### **Tested the NTP Server**

With ntpdate installed, I queried the NTP server using its external IP address. Here's the command I ran:

```
sudo ntpdate -q <external-ip>
```

This command successfully returned the time data from the NTP server, proving that the server was functioning as expected and synchronizing time correctly.