KubeOps

Cheat Sheet: Time Synchronization in Kubernetes

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Introduction

Numerous containers and services run in parallel in Kubernetes clusters. Precise time synchronisation is crucial to avoid unexpected behaviour, performance issues and errors. This guide explains the importance of time synchronisation and provides instructions for implementation in Kubernetes environments.

Why is time so important in Kubernetes?

Many containers and services run simultaneously in a Kubernetes cluster. Precise time synchronisation is crucial to avoid errors, unexpected behaviour and performance problems. For example, incorrectly synchronised times can lead to problems with distributed systems, incorrect logs or certificate problems. In this white paper, we show you how to ensure time synchronisation in Kubernetes.

Importance of time synchronisation

The following key messages provide a compact overview of central security measures for Kubernetes environments in critical infrastructures:

Asynchronous timestamps can lead to various problems:

- Unexpected behaviour: Inconsistent times can lead to malfunctions.
- Performance issues: Inaccurate timestamps make troubleshooting and performance analysis more difficult.
- Certificate errors: Problems with certificates can occur during system or Kubernetes updates.
- Log confusion: Different time zones in log files make it difficult to analyse.
- CronJob problems: Time deviations can affect the execution of CronJobs.

Installation and configuration of NTP

Why is NTP important?
The Network Time Protocol (NTP) ensures that all nodes in a Kubernetes cluster use the same, synchronised time. This is essential for the consistency of logs, transactions and processes.

Installation of NTP on CentOS/RHEL

1. Install NTP and ntpdate:

```
sudo yum install ntp ntpdate
```

2. Start NTP service:

```
sudo systemctl start ntpd
```

3. Activate NTP service at system startup:

```
sudo systemctl enable ntpd
```

4. Check the status of the NTP service

```
sudo systemctl status ntpd
```

5. One-time synchronisation of the time with an NTP server:

```
sudo ntpdate -u -s 0.centos.pool.ntp.org
```

6. Restart the NTP service to apply changes:

```
sudo systemctl restart ntpd
```

Then check the synchronisation status with :

```
timedatectl status
```

Adjustment of the time zone in Kubernetes

By default, containers in Kubernetes run in the UTC time zone. For some applications, it may be necessary to set a different time zone.

Checking the time zone of a pod

To check the time zone of a running pod, use the following command:

```
kubectl exec -it <POD_NAME> -- date
```

Changing the time zone for a pod

One way to change the time zone within a pod is to mount the corresponding time zone file:

```
apiVersion: v1
kind: Pod
metadata:
  name: timezone-pod
spec:
  containers:
  - name: app
    image: busybox
    volumeMounts:
    - name: tz-config
      mountPath: /etc/localtime
  volumes:
  - name: tz-config
    hostPath:
      path: /usr/share/zoneinfo/Europe/Berlin
```

Save the file under the name ‘timecheck-new.yaml’ and activate it with

```
kubectl apply -f timecheck-new.yaml
```

Check the pod's time zone again:

```
kubectl exec busybox-sleep --date
```

Automatic time zone setting with k8tz

The open source tool k8tz significantly simplifies time zone management in Kubernetes clusters. It is an admission controller that automatically sets the correct time zone for pods and CronJobs.

Advantages of k8tz

Automatic time zone adjustment: Automatically sets the correct time zone for each pod.
Increased consistency: Prevents time deviations within the cluster.
Easy integration: Works with existing Kubernetes clusters without much configuration effort.
Further information and installation instructions can be found in the official repository: GitHub: k8tz

Conclusion

Precise time and time zone synchronisation is essential for the smooth operation of Kubernetes clusters. With the correct configuration of NTP and the use of tools such as k8tz, time deviations can be avoided and logs kept consistent. Companies that use Kubernetes productively should regularly check and optimise the time synchronisation of their clusters.

Über KubeOps

KubeOps GmbH was founded in 2019 as a subsidiary of ARWINET GmbH.

Our mission is to enable KRITIS organisations to build a robust container infrastructure quickly and efficiently. We understand the specific requirements of our customers, support them in setting up secure, resilient Kubernetes clusters and ensure their stable operation.

By using open source Kubernetes and carefully integrated components, we create automated, highly available and hardened clusters that are independent of vendor lock-ins to maximise our customers' flexibility and security.

We also offer training and certification to enhance your Kubernetes expertise.