Module Checklist

Container Orchestration with Kubernetes

By Techworld with Nana

Video Overview

★ Introduction to Kubernetes

★ Basic Concepts and Main K8s Components

★ Kubernetes Architecture

★ Minikube and kubectl - Local Setup

★ Kubernetes CLI - Main kubectl commands

★ Introduction to YAML Configuration File

★ Demo project: Deploying MongoDB and Mongo Express

★ Organizing components with Namespaces

★ Kubernetes Services

★ Kubernetes Ingress

★ Persisting Data with Volumes

★ ConfigMap & Secret Volume Types

★ Deploying stateful Apps with StatefulSet

★ Introduction to Managed Kubernetes Services

★ Helm - Package Manager of Kubernetes

★ Helm Demo: Install a Stateful Application on Kubernetes using Helm

★ Demo: Deploy App from Private Docker Registry

★ Extending the K8s API with Operators

★ Prometheus Operator Demo with Helm: Setup Prometheus Monitoring in K8s

Demo Projects	
K8s Demo Repo	https://gitlab.com/nanuchi/bootcamp-kubernetes
Demo Project for Private Repo	https://gitlab.com/nanuchi/developing-with-docker

Introduction to Kubernetes

❏ Watched video

Basic Concepts and Main K8s Components

❏ Watched videos

Useful Links:

● Managing K8s Secrets: https://blog.aquasec.com/managing-kubernetes-secrets

Kubernetes Architecture

❏ Watched videos

Minikube and Kubectl - Local Setup

❏ Watched videos
❏ **Demo executed:**
    ❏ Installed and setup Minikube
    ❏ Installed Kubectl

Useful Links:

● Installation guide for Minikube (Mac, Linux and Windows):
https://minikube.sigs.k8s.io/docs/start/
● Installation guide for Kubectl:
https://kubernetes.io/docs/tasks/tools/install-kubectl/

Kubernetes CLI - Main kubectl commands

- ❏ Watched video
- ❏ **Demo executed:**
    - ❏ Created nginx Deployment
    - ❏ Edited Deployment
    - ❏ Created mongodb Deployment
    - ❏ Inspected logs of a Pod
    - ❏ Got shell of a running container - kubectl exec
    - ❏ Deleted deployment
    - ❏ Applied configuration file

Useful Links:

- ● Example commands repo:
  https://gitlab.com/nanuchi/bootcamp-kubernetes/-/tree/master/basic-kubectl-commands

YAML Configuration File

- ❏ Watched videos

Useful Links:

- ● Configuration File:
  https://kubernetes.io/docs/tasks/manage-kubernetes-objects/declarative-config/
- ● Example files repo:
  https://gitlab.com/nanuchi/bootcamp-kubernetes/-/tree/master/kubernetes-configuration-file-explained

Best practices:

- ● Store Configuration Files with your application code or own Git Repository just for the configuration files

Demo project: Deploying MongoDB and Mongo Express

- ❏ Watched videos
- ❏ **Prerequisite:**
  - ❏ Minikube cluster running
- ❏ **Demo executed - Deploying MongoDB and MongoExpress:**
  - ❏ Created MongoDB Deployment
  - ❏ Created Secret for Mongo Credentials
  - ❏ Created MongoDB Internal Service
  - ❏ Created MongoExpress Deployment
  - ❏ Created ConfigMap for DB Server URL
  - ❏ Created Mongo Express External Service

Useful Links:

- MongoDB Docker Image: https://hub.docker.com/_/mongo
- Mongo Express Docker Image: https://hub.docker.com/_/mongo-express
- Project Repo:
  https://gitlab.com/nanuchi/bootcamp-kubernetes/-/tree/master/demo-kubernetes-components

Organizing components with Namespaces

- ❏ Watched videos

Useful Links:

- Kubectx: https://github.com/ahmetb/kubectx#installation

Kubernetes Services

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Useful Links:

- Service: https://kubernetes.io/docs/concepts/services-networking/service/

Best Practice:

- Do NOT use NodePort Service Type for external connections. Use Ingress or Load Balancer instead.

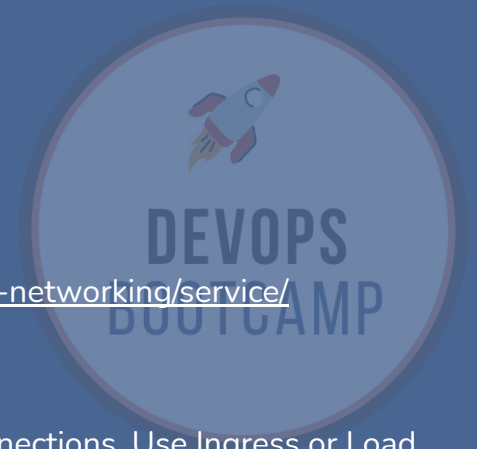## Ingress

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Useful Links:

- Project repo:
  https://gitlab.com/nanuchi/bootcamp-kubernetes/-/tree/master/kubernetes-ingress
- List of Ingress Controllers you can choose from:
  https://kubernetes.io/docs/concepts/services-networking/ingress-controllers/
- Ingress Controller Bare Metal:
  https://kubernetes.github.io/ingress-nginx/deploy/baremetal/

Persisting Data with Volumes

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Useful Links:

- Volume Types:
  https://kubernetes.io/docs/concepts/storage/volumes/#volume-types
- Project demo:
  https://gitlab.com/nanuchi/bootcamp-kubernetes/-/tree/master/kubernetes-volumes

ConfigMap & Secret Volume Types

- ❏ Watched video
- ❏ **Demo executed:**
    - ❏ Created Mosquitto Deployment without any volumes
    - ❏ Created ConfigMap component to overwrite mosquitto.conf file
    - ❏ Created Secret component to add passwords file
    - ❏ Adjusted Mosquitto Deployment to include volumes

Useful Links:

- ● Project demo:
  https://gitlab.com/nanuchi/bootcamp-kubernetes/-/tree/master/configmap-and-secret-volumes
- ● ConfigMap Volume Type:
  https://kubernetes.io/docs/concepts/storage/volumes/#configmap
- ● Secret Volume Type: https://kubernetes.io/docs/concepts/storage/volumes/#secret
- ● Mosquitto Public Docker Image: https://hub.docker.com/_/eclipse-mosquitto

Deploying Stateful Apps with StatefulSet

- ❏ Watched videos

Introduction to Managed Kubernetes Services

- ❏ Watched videos

Helm - Package Manager of Kubernetes
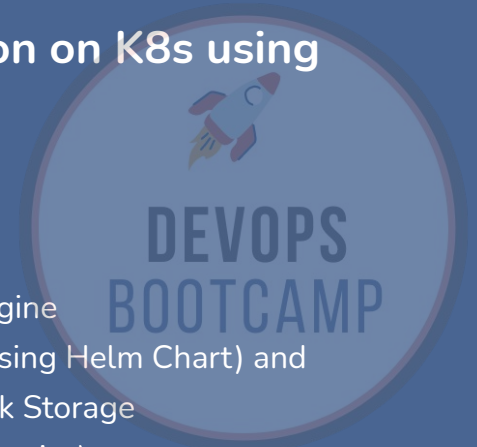
- ❏ Watched videos

Useful Links:

- - Install Helm: https://helm.sh/docs/intro/install/
- - Helm Hub: https://artifacthub.io/

Helm Demo: Install a Stateful Application on K8s using Helm

- ❏ Watched video
- ❏ **Demo executed:**
    - ❏ Created K8s cluster on Linode Kubernetes Engine
    - ❏ Deployed replicated MongoDB (StatefulSet using Helm Chart) and configured Data Persistence with Linode Block Storage
    - ❏ Deployed MongoExpress (Deployment and Service)
    - ❏ Deployed NGINX Ingress Controller as Loadbalancer (using Helm Chart)
    - ❏ Configured Ingress rule

Useful Links:

- Project Repo: https://gitlab.com/nanuchi/bootcamp-kubernetes/-/tree/master/linode-kubernetes-engine-demo
- Create a Linode account ($100 - 60day credit with this link: https://bit.ly/31p4GW2)
- Mongo Express Docker Image: https://hub.docker.com/_/mongo-express

Demo: Deploy App from Private Docker Registry

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❏ **Demo executed:**
  ❏ Logged in to AWS Container Repository | docker login and create docker config.json file
  ❏ Created Secret component
  ❏ Configured Deployment for demo app
❏ **Pre-Requisites:**
  ❏ Setup a Private Docker Repository (e.g. AWS Elastic Container Registry)
  ❏ Have a demo application (see provided one)

Useful Links:

● K8s Project Repo:
https://gitlab.com/nanuchi/bootcamp-kubernetes/-/tree/master/pull-images-from-private-reporsitory-in-k8s
● Sample NodeJs application Repo:
https://gitlab.com/nanuchi/developing-with-docker

Extending the K8s API with Operators

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Useful Links:

● Find Operators: https://operatorhub.io/

Prometheus Operator Demo with Helm: Setup Prometheus Monitoring on Kubernetes

- ❏ Watched videos
- ❏ **Demo executed:**
    - ❏ Installed Prometheus Operator Helm Chart
    - ❏ Accessed Grafana UI (configured port-forward)
    - ❏ Accessed Prometheus UI (configured port-forward)

Useful Links:

- Prometheus Monitoring - What it is and how it works:
  https://youtu.be/h4Sl21AKiDg
- Project Repo:
  https://gitlab.com/nanuchi/bootcamp-kubernetes/-/tree/master/setup-prometheus-operator

More Resources...

Best practices

- Configuration Best Practices:
  https://kubernetes.io/docs/concepts/configuration/overview/
- 9 Security Best Practices:
  https://www.cncf.io/blog/2019/01/14/9-kubernetes-security-best-practices-everyone-must-follow/

Cheatsheet

- K8s CLI Cheat Sheet: https://kubernetes.io/docs/reference/kubectl/cheatsheet/