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DOE300 - Course Presentation

Content

Prerequisites

Hardware

- One computer (MacOS, Linux, Windows™ or Solaris™),
- AZERTY FR or QWERTY US keyboard,
- 4 GB RAM minimum,
- 2-core processor minimum,
- Headphones or earphones,
- A microphone (optional).

Software

- Web Chrome version 72+ or
- Microsoft Edge version 79+ or
- Firefox version 65+.

Internet

- **Fast** Internet access (4G minimum) **WITHOUT** using a proxy,
- **Unblocked** access to ports 80 and 443 at: https://www.ittraining.team **and its sub-domains**.

Using the Infrastructure

VM	FQDN	IP	OS	Version	vCPUs	RAM (MB)	HDD (GB)	User	PW	root PW
Gateway_10.0.2.40	gateway.ittraining.loc	10.0.2.40	Debian	11.8	4	4096	32 / 4 / 64	trainee	trainee	fenestros
CentOS_10.0.2.45	centos8.ittraining.loc	10.0.2.45	CentOS	8.5.2111	4	4096	500 / 4 / 64 / 32	trainee	trainee	fenestros
Kubemaster_10.0.2.65	kubemaster.ittraining.loc	192.168.56.2	Debian	9.13	4	4096	20	trainee	trainee	fenestros
Kubenode01_10.0.2.66	kubenode01.ittraining.loc	192.168.56.3	Debian	9.13	4	4096	20	trainee	trainee	fenestros
Kubenode02_10.0.2.67	kubenode02.ittraining.loc	192.168.56.4	Debian	9.13	4	4096	20	trainee	trainee	fenestros

In your VirtualBox you **must** create a **private host network** called **vboxnet0** with address **192.168.56.1/24**.

Pre-configured **VirtualBox** VMs can be downloaded free of charge here:

- **Gateway_10.0.2.40**,
- **CentOS_10.0.2.45**,
- **Kubemaster_10.0.2.65**,
- **Kubenode01_10.0.2.66**,
- **Kubenode02_10.0.2.67**.

Curriculum

- **DOE301 - Creating Kubernetes clusters**
  - Container Orchestration
  - Introduction to Kubernetes (k8s)
    - Control Plane
    - Controller
    - Nodes (Minions)
  - LAB #1 - Creating a Kubernetes cluster with Virtual Machines
    - 1.1 - Overview
    - 1.2 - Connecting to the kubemaster
    - 1.3 - Testing the network
    - 1.4 - Initializing the Cluster Controller
    - 1.5 - Installing a Network Extension for communication between PODs
    - 1.6 - Connecting workers to the Controller
    - 1.7 - K8s and High Availability
  - LAB #2 - Creating a Kubernetes cluster with Minikube
    - 2.1 - Introducing Minikube
    - 2.2 - Installing Minikube
    - 2.3 - Configuring Minikube
    - 2.4 - Installing Docker
    - 2.5 - Installing kubectl
    - 2.6 - The minikube addons command
    - 2.7 - The minikube dashboard addon
- **DOE302 - Managing Pods, Replication Controllers, ReplicaSets, Deployments, Maintenance and Cluster Updates**
  - LAB #1 - Creating a pod
    - 1.1 - Introducing a pod
    - 1.2 - Manual pod creation
    - 1.3 - Creating a pod using a YAML file
      - apiVersion
      - kind
      - metadata

        - spec
        - Using the YAML file
    - LAB #2 - Using Replication Controllers and ReplicaSets
        - 2.1 - Replication Controllers
            - Overview
            - Implementation
        - 2.2 - ReplicaSets
            - Overview
            - Implementation
    - LAB #3 - Deployment management
        - 3.1 - Overview
        - 3.2 - Implementation
            - Rollouts
            - Rolling Updates
            - Rollbacks
    - LAB #4 - Maintenance
        - 4.1 - The drain command
        - 4.2 - The uncordon command
    - LAB #5 - Managing Cluster Updates
        - 5.1 - Updating kubeadm
        - 5.2 - Updating Workers

- **DOE303 - The kubectl, krew and kustomize commands**
    - LAB #1 - Using the kubectl command
        - 1.1 - Getting help with kubectl commands
        - 1.2 - Obtaining information about the Cluster
            - The version command
            - The cluster-info command
            - The api-versions command
            - The api-resources command
        - 1.3 - Obtaining information about nodes
            - The describe node command
            - The top command
        - 1.4 - Obtaining information about Pods

            - The describe pod command
            - The top command
        - 1.5 - Working with the kubectl command
            - The apply command
            - The create command
            - The get command
            - Using Options
            - The exec command
            - Imperative commands
    - LAB #2 - Managing kubectl plugins with the krew command
        - 2.1 - Installing krew
        - 2.2 - Viewing the list of plugins
        - 2.3 - Installing and using plugins
        - 2.4 - Updating and deleting plugins
    - LAB #3 - Managing patches with the kustomize command

- **DOE304 - Working with Pods and Containers**
    - LAB #1 - Application Configuration
        - 1.1 - Overview
        - 1.2 - Creating a ConfigMap
        - 1.3 - Creating a Secret
        - 1.4 - Using ConfigMaps and Secrets
            - Using Environment variables
            - Using Configuration Volumes
    - LAB #2 - Container Resource Management
        - 2.1 - Overview
        - 2.2 - Resource Requests
        - 2.3 - Resource Limits
    - LAB #3 - Container supervision
        - 3.1 - Overview
        - 3.2 - Liveness Probes
            - The exec Probe
            - The httpGet Probe
        - 3.3 - Startup Probes

        - 3.4 - Readiness Probes
    - LAB #4 - Restart Policy Management
        - 4.1 - Overview
        - 4.2 - Always
        - 4.3 - OnFailure
        - 4.4 - Never
    - LAB #5 - Creating Multi-container Pods
        - 5.1 - Overview
        - 5.2 - Implementation
    - LAB #6 - Init containers
        - 6.1 - Overview
        - 6.2 - Implementation
    - LAB #7 - Scheduling
        - 7.1 - Overview
        - 7.2 - Implementation
    - LAB #8 - DaemonSets
        - 8.1 - Overview
        - 8.2 - Implementation
    - LAB #9 - Static Pods
        - 9.1 - Overview
        - 9.2 - Implementation

- **DOE305 - Network, Service and Microservices Architecture Management**
    - LAB #1 - Network and Service Management
        - 1.1 - Overview of Network Extensions
        - 1.2 - DNS K8s
            - Overview
            - Implementation
        - 1.3 - Network Policies
            - Overview
            - Implementation
        - 1.4 - Services
            - Overview
            - Implementation

        - The NodePort service
        - The ClusterIP service
    - 1.5 - Services and the K8s DNS
        - Overview
        - Implementation
    - 1.6 - K8s Ingress management
        - Overview
        - Implementation
- LAB #2 - Microservices Architecture Management
    - 2.1 - Overview
    - 2.2 - Creating Deployments
    - 2.3 - Creating Services
    - 2.4 - Deploying the Application
    - 2.5 - Scaling Up

- **DOE306 - Managing Volumes with Kubernetes**
    - Overview
        - Volumes
        - Persistent Volumes
        - Volume Types
    - LAB #1 - Using K8s Volumes
        - 1.1 - Volumes and volumeMounts
        - 1.2 - Sharing volumes between containers
    - LAB #2 - Persistent Volumes
        - 2.1 - Storage Classes
        - 2.2 - Persistent Volumes
        - 2.3 - Persistent Volume Claims
        - 2.4 - Using a PersistentVolumeClaim in a pod
        - 2.5 - Resizing a PersistentVolumeClaim

- **DOE307 - Troubleshooting K8s**
    - LAB #1 - The API Server
        - 1.1 - Connection Refused
        - 1.2 - System Pod Logs
    - LAB #2 - The Nodes

        - 2.1 - NotReady Status
    - LAB #3 - Pods
        - 3.1 - The ImagePullBackOff Error
        - 3.2 - The CrashLoopBackOff Error
    - LAB #4 - Containers
        - 4.1 - The exec Command
    - LAB #5 - Networking
        - 5.1 - kube-proxy and DNS
        - 5.2 - The netshoot Container

- **DOE308 - Introduction to Securing K8s**
    - LAB #1 - Role Based Access Control and TLS Certificates
        - 1.1 - Overview
        - 1.2 - The /etc/kubernetes/manifests/kube-apiserver.yaml File
        - 1.3 - Creating a serviceAccount
        - 1.4 - Creating a User
        - 1.5 - TLS Certificates
    - LAB #2 - Pod Security Implementation
        - 2.1 - Overview
        - 2.2 - Kubernetes Security Context
        - 2.3 - Kubernetes Network Policies
        - 2.4 - Kubernetes Resource Allocation Management

- **DOE309 - Package Management for Kubernetes with Helm**
    - Overview
    - LAB #1 - Working with Helm
        - 1.1 - Installing Helm
        - 1.2 - The helm search hub Command
        - 1.3 - Searching the Artifact Hub
        - 1.4 - Adding and Deleting a Repository
        - 1.5 - The helm search repo Command
        - 1.6 - The helm show Command
        - 1.7 - Installing a Chart
        - 1.8 - The helm get Command
        - 1.9 - Using NOTES

        - 1.10 - The helm upgrade Command
        - 1.11 - The helm history Command
        - 1.12 - The helm rollback Command
        - 1.13 - The helm uninstall Command
    - LAB #2 - Monitoring Kubernetes with the EFK Stack
        - 2.1 - Overview
        - 2.2 - Installing the elasticsearch Chart
        - 2.3 - Installing fluentd-elasticsearch Chart
        - 2.4 - Installing the kibana Chart
        - 2.5 - Generating Logs in Kubernetes
        - 2.6 - Visualizing Data with Kibana

- **DOE310 - StatefulSets, Advanced StorageClass Usage, Creating a Helm Chart and Monitoring**
    - Contents
    - StatefulSets
        - Overview
        - LAB #1 - Setting up a simple StatefulSet
            - 1.1 - Service and StatefulSet creation
            - 1.2 - Scaling Up a StatefulSet
            - 1.3 - Scaling Down a StatefulSet
            - 1.4 - Deleting a StatefulSet
    - Advanced StorageClass Usage
        - LAB #2 - Dynamic NFS provisioning
            - 2.1 - NFS Server Configuration
            - 2.2 - NFS Client Configuration
            - 2.3 - Configuring K8s
            - 2.4 - Creating a PersistentVolumeClaim
            - 2.5 - Using the PersistentVolumeClaim with a Pod
            - 2.6 - Creating a Second PersistentVolumeClaim
            - 2.7 - Deleting the PersistentVolumeClaims
    - Creating a Helm Chart
        - Overview
        - LAB #3 - Creating a Simple Helm Package
            - 3.1 - The values.yaml File

            - 3.2 - Templates
            - 3.3 - Installation and Removal
    - Monitoring
        - Overview
        - LAB #4 - Implementing a Prometheus Solution
            - 4.1 - Stack Deployment with Helm
            - 4.2 - Viewing Data with Grafana
            - 4.3 - Viewing Alerts with the Prometheus Web UI

- **DOE311 - Exam - Acquired knowledge**
    - 60 questions from a pool of 104 questions
