Assignments for Distributed Computing CS G557: KUBERNETES ADMINISTRATION IMPLEMENTATION

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Instructions

A lab environment will be provided to you at the following URL: `https://naulabportal.netapp.com`. You will be given a username and password to login to your account. The labs will be available from **February 19 through March 1, 2024**.

Your exercise environment contains the following virtual machines:

- One Windows Server system
- A three-node Kubernetes cluster
- An ONTAP 9.9 single-node cluster (Cluster1). The ONTAP cluster can be ignored for this exercise.

When you use the connection information that your instructor assigns to you, you first connect through Remote Desktop Connection to a Windows Server. From this Windows desktop, you connect to the other servers in your exercise environment.

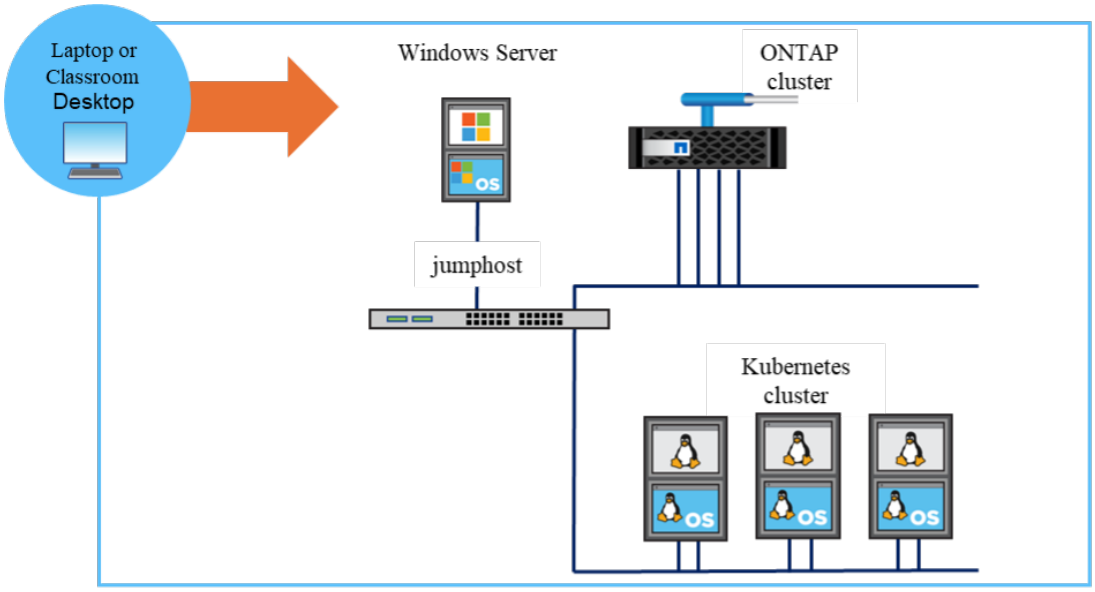


Figure 1: Solution Architecture

Go through the following additional materials for deeper understanding.

- Overview: `https://kubernetes.io/docs/concepts/overview/`
- Kubernetes basics: `https://kubernetes.io/docs/tutorials/kubernetes-basics/`

Table 1: System Description

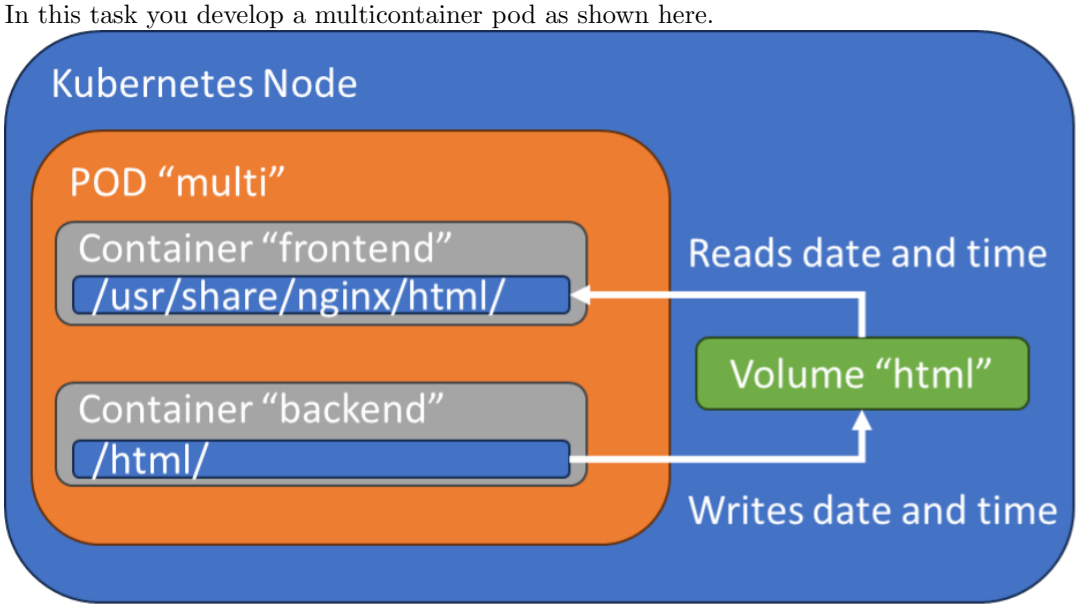
System	Host Name	IP Address	Username	Password
Windows Server	Jumphost	192.168.0.5	DEMO\Administrator	Netapp1!
Kubernetes Control Plane	kubmas	192.168.0.61	root (case sensitive)	Netapp1!
Kubernetes Worker 1	kubwor1	192.168.0.62	root (case sensitive)	Netapp1!
Kubernetes Worker 2	kubwor2	192.168.0.63	root (case sensitive)	Netapp1!
ONTAP cluster mgmt	Cluster1	192.168.0.101	admin (case sensitive)	Netapp1!
node1 (Cluster1)	Cluster1-01	192.168.0.111	admin (case sensitive)	Netapp1!

- Cluster Architecture: `https://kubernetes.io/docs/concepts/architecture/`
- Nodes: `https://kubernetes.io/docs/concepts/architecture/nodes/`
- Communication between nodes and the Control Plane: `https://kubernetes.io/docs/concepts/architecture/control-plane-node-communication/`
- Workloads: `https://kubernetes.io/docs/concepts/workloads/`
- Tools for administrating Kubernetes: `https://kubernetes.io/docs/tasks/tools/`
- API Overview: `https://kubernetes.io/docs/reference/using-api/`
- Creating a cluster with kubeadm `https://kubernetes.io/docs/setup/production-environment/tools/kubeadm/create-cluster-kubeadm/`
- Optional additional training: `https://kubernetes.io/training/`

The machines in this environment are in Table 1 .

1 Assignment: Develop a Multicontainer Pod

In this task you develop a multicontainer pod as shown here.



1.1 Tasks

Task 1 Create a declarative YAML file to create a namespace called activity2 and create the namespace.

Task 2 Create a declarative YAML file that creates the following multi-container pod running in the STEP 1 namespace that has an emptyDir volume called html. Also, within the same YAML file create a pod with 2 containers, mounting the volume to both containers. The backend container, running Debian:11.8-slim version, will have the html volume mounted at /html in the Debian image. Then the backend container will have while true loop running that will write the current date to the /html/index.html page in the backend container and sleep for 1 minute before repeating the loop. Then the frontend container, running ngix:1.24.0-alpine-slim version, will mount same html volume receiving data from the Debian container and will expose that data via Nginx's port 80. The structure should be like Figure 1.

Task 3 Using imperative commands to save a text file of the running index.html from the backend container. Add the commands used to create the text file to the top of the STEP 3 text file.

Task 4 Using imperative commands to save a text file of the running index.html page from the frontend container. Add the commands used to create the text file to the top of the STEP 4 text file.

Task 5 Create a declarative YAML file that creates a nodeport service that exposes the multi-container pod running from STEP 2 and execute this YAML file. Create the service.

1.2 Evaluation

1. Create a zip file named yourGROUPID-K8s-1.zip and include the following:
   (a) The STEP 1 YAML file
   (b) The STEP 2 YAML file
   (c) The STEP 3 YAML file
   (d) The STEP 4 YAML file
   (e) The STEP 5 YAML file
   (f) The STEP 6 screenshot file
2. Upload the zip file in Google assignment. The Google Assignment will have a due date and time. This will ensure that you finish your assignment ON time. If you can't upload within the time, I will assume that you have not been able to complete the assignment.
3. Total marks = 10.

   The STEP 1 YAML file = 2 marks

   The STEP 2 YAML file = 2 marks

   The STEP 3 text file = 1 mark

   The STEP 4 text file = 1 mark

   The STEP 5 YAML file = 1 marks

   The STEP 6 screenshot = 1 marks

   Final writeup (text document with 2/3 lines) - 2 marks
   1. Nodeport service: what does this portbinding mean?
   2. When you opened a web browser, how this any node ip address in the `cluster:<port number>` lands up to the correct pod?