COMSATS UNIVERSITY, ISLAMABAD
Department of Computer Science
Assignment - 2, Fall 2025

[CLO2]: Enumerate virtualization and containerization techniques used in cloud computing

Course: CSC483 – Topics in Computer Science II (DevOps)　　　　　　**Class: BCS-7 / BDS-7**
Instructor: Qasim Malik　　　　　　　　　　　　　　　　　　　　　　　**Total Marks: 10**

Part-I: Containerized deployment of a web application [4+1]

Docker is a software framework for building, running, and managing containers. In this part of the assignment, you are required to build or reuse any previously built web application and deploy it over the Public Cloud AWS in a *containerized* way using Docker. Since building a web application is out of the scope of this course, it can be any simple web application with the only requirement being that it uses some Database Server for storing application's data. You are required to deploy the containerized web application using IaaS based service, Amazon Elastic Compute Cloud (Amazon EC2), offered by AWS. Specifically, you are required to write a *Dockerfile* to build a docker image containing the image of your web server and the code and push it to Docker Hub. Afterwards, you are required to write a *docker-compose* file running of which will launch the containerized web application. In your *docker-compose* file, you must attach a volume to the database container for data to remain persistent.

Upon completion of this part, you will be able to:
- Write *Dockerfile* and *docker-compose* file
- Configure and deploy containerized applications over the cloud

Part-II: Creation of a containerized automation pipeline [4+1]

Jenkins is an open-source automation server which helps automate the parts of software development related to building, testing, and deploying, thus facilitating continuous integration and continuous delivery (CI/CD). In this assignment, you are going to use Jenkins, running over AWS EC2 instance, to automate build phase of the software development. You are required to put the code, of the same web application you used in Part-I, in a GitHub repository. Afterwards, you are required to write a Jenkin pipeline script using *Git*, *Pipeline*, and *Docker Pipeline* plugins that will fetch code from GitHub and build your web application in a containerized environment using Docker. You can re-use the docker-compose file from Part-I after making the following changes:
- Attach a volume for the code instead of writing *Dockerfile*
- Use different port numbers and container names

Upon completion of this part, you will be able to:
- Configure and install Jenkins over the cloud
- Integrate Git and Docker with Jenkins
- Create a containerized automation pipeline in Jenkins for build phase

What to submit

This is an individual assignment. Please fill out the following Google form to provide URLs for both the Parts:

https://forms.gle/ubA9DRzQSudr2qhY6

Here's the link of the response sheet for the above google form to view your responses:

https://docs.google.com/spreadsheets/d/1TkLJfPSVe1xWh3RjrCKl0Kfzc_VAugOWXoUxbGoBej0

You are also required to submit a well-formatted report describing your application and documenting all the micro steps you followed for both parts, along with relevant screenshots.

- For Part I, include your *Dockerfile*, *docker-compose.yml*

- For Part II, provide the *docker-compose.yml* and the Jenkins pipeline script.

The Part II containerized environment must be down initially. Please add me (qasimalik@gmail.com) as a collaborator to your GitHub repository so I can trigger your Jenkins pipeline to bring the environment up.

Evaluation Criteria

Criteria	Marks
Containerized application is up and running	4
Pipeline is triggered by the GitHub push	4
Report with screenshots and steps	2