NAMIBIA UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF COMPUTING AND INFORMATICS
DEPARTMENT OF SOFTWARE ENGINEERING

Assignment 2

Course Title: Distributed Systems and Applications
Course Code: DSA612S
Assessment: Second Assignment

Released on: 25/09/2024.
Due date: 14/10/ 2024 at 11h59AM

Total Marks: 100

Containerized Microservices with Ballerina and Kafka

Description

In this project, we are working on part of a larger logistics system. This system handles requests for package delivery from multiple providers, offering specialized services for different types of shipments, such as standard delivery, express delivery, and international delivery. The focus is on situations where customers need to schedule a package pickup and delivery service.

Here's how it works:

1. When a customer wants to send a package, they submit a request to the central logistics service through Kafka as a middleware. This request includes details such as the type of shipment (standard, express, international), pickup location, delivery location, preferred time slots, and customer information (first name, last name, contact number).

2. The logistics service processes the request and communicates with various delivery services (standard, express, international) to find the best available time for the pickup and delivery based on the customer's preferences. These delivery services may need to coordinate to determine the optimal route and schedule, especially for international deliveries.

3. Once the pickup and delivery times are confirmed, the logistics service sends the complete details back to the customer, including tracking information and estimated delivery time.

Your job is to create and set up this logistics sub-system.

Important things to note:

a) The system should be designed using a microservices architecture with a central logistics service and three specialized services: standard delivery, express delivery, and international delivery.
b) Use a Kafka instance to support the communication between the client and the various services.
c) Use a data store such as MongoDB or SQL to store customer information, shipment details, and delivery schedules.
d) Finally, deploy each service (logistics, standard, express, and international delivery) in separate Docker containers.

Evaluation Criteria:

- Setup of the Kafka cluster, including topic management. (30 marks)

- Setup of the MongoDB/SQL database instance. (10 marks)
- Docker container configuration. (10 marks)
- Implementation of Client and Services in Ballerina (50 marks)

Submission Instructions

- This assignment is to be completed by groups of minimum 5 and maxi of 7 students each.
- For each group, a repository should be created on Github. The repository should have all group members set up as contributors.
- All assignments must be completed from GitHub repository. Students who haven't **pushed** any codes to the repository will not be given the opportunity **to present and defend the assignment.** More particularly, if a student's username does not appear in the commit log of the group repository, that student will be assumed not to have contributed to the project and thus be awarded the mark 0.
- The assignment will be group work, but individual marks will be allocated based on each student's contribution to the assignment.
- Marks for the assignment will only be allocated to students who have presented the assignment.
- It's the responsibility of all group members to make sure that they are available for the assignment presentation. An assignment cannot be presented more than once.
- The submission **date is Monday, October 14, 2024, at 11h59AM.** Please note that commits after that deadline will not be accepted. Therefore, a submission will be assessed based on the clone of the repository at the deadline.
- Any group that fails to submit on time will be awarded the mark 0. Late Submission will not be considered.
- There should be no assumption about the execution environment of your code. It could be run using a specific framework or on the command line.