Assignment 2

CSCI 5410 (Serverless Data Processing)
Date Given: Jun 19, 2023
Due Date: Jul 3, 2023 at 11:59 pm
Late Submissions are not accepted.
A deduction of 10% per day will be applied for late submission.

To avoid any additional charges for resource consumption - Delete the GCP resources, and AWS services after fulfilling the assignment submission requirements.

Objective:
This assignment covers concepts of containerization and Serverless components of cloud computing. The primary objective of this assignment is to introduce you to the cloud computing containerization application using Docker and creation of a chatbot using Lex.

Plagiarism Policy:

- This assignment is an individual task. Collaboration of any type amounts to a violation of the academic integrity policy and will be reported to the AIO.
- Content cannot be copied verbatim from any source(s). Please understand the concept and write in your own words. In addition, cite the actual source. Failing to do so will be considered as plagiarism and/or cheating.
- The Dalhousie Academic Integrity policy applies to all material submitted as part of this course. Please understand the policy, which is available at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Assignment Rubric - based on the discussion board rubric (McKinney, 2018)

	Excellent (25%)	Proficient (15%)	Marginal (5%)	Unacceptable (0%)	Problem # where applied
Completeness including Citation	All required tasks are completed	Submission highlights tasks completion. However, missed some tasks in between, which created a disconnection	Some tasks are completed, which are disjoint in nature.	Incorrect and irrelevant	**Part A** **Part B**
Correctness	All parts of the given tasks are correct	Most of the given tasks are correct However, some portions need minor modifications.	Most of the given tasks are incorrect. The submission requires major modifications.	Incorrect and unacceptable	**Part A** **Part B**
Novelty	The submission contains novel contribution in key segments, which is a clear indication of application knowledge.	The submission lacks novel contributions. There are some evidence of novelty, however, it is not significant	The submission does not contain novel contributions. However, there is an evidence of some effort.	There is no novelty	**Part A** **Part B** **Part C (if done – will receive Excellent)**

Clarity	The written or graphical materials, and developed applications provide a clear picture of the concept and highlights the clarity.	The written or graphical materials, and developed applications do not show clear picture of the concept. There is room for improvement	The written or graphical materials, and developed applications fail to prove the clarity. Background knowledge is needed.	Failed to prove the clarity. Need proper background knowledge to perform the tasks.	**Part A** **Part B**

Citation:
McKinney, B. (2018). The impact of program-wide discussion board grading rubrics on students' and faculty satisfaction. Online Learning, 22(2), 289-299.

Tasks:
This assignment has 3 parts. Part A is related to research and Part B is related to coding and exploring cloud services. However, Part C is an additional task - if performed in addition to Part A and Part B, you will receive an "excellent" in Novelty

Part A. Read the following paper and write a summary (visit IEEE from libraries.dal.ca)

N. Naik, "Performance Evaluation of Distributed Systems in Multiple Clouds using Docker Swarm," *2021 IEEE International Systems Conference (SysCon)*, Vancouver, BC, Canada, 2021, pp. 1-6, doi: 10.1109/SysCon48628.2021.9447123.

URL: https://ieeexplore-ieee-org.ezproxy.library.dal.ca/document/9447123
It can be approximately 1 page summary and must be written in your own words. **Your in-depth review of the paper is expected**.

- There should be inline citations in an acceptable format.
- The summary should include - (a) what the authors have presented in the paper, (b) if any specific issue is addressed, (c) if any experiments or studies performed, (d) analysis or findings made by the authors.

Part A - Submission requirement: A pdf file with the summary is needed.
Please write in the form of summary only (i.e., interconnected sentences with continuous flow forming meaningful paragraph). Do not write it in question-answer format.

Part B. Build, deploy, and run a Containerized Application using GCP.

Using GCP create and validate an online meeting account.

take screenshots at every step and submit as part of the PDF:

a. Create three containerized microservices, which will be responsible for the backend logic in this application. The database you will be using here is, **Firestore**

b. Your database should contain only 2 collections. One collection is "***Reg***" to contain **registration data** (Name, Password, Email, Location), another collection is "***state***" to contain user **state** (online, offline, timestamp etc.) information.

c. Code and the required dependencies of **Container #1** are responsible for accepting registration details from frontend and store it in backend database. (**image 1**)

d. Code and the required dependencies of **Container #2** are responsible for validating) the Login information (checking with the database values) (**image 2**)

Once a user is logged in – the state of a user changes to online in the FireStore database, and it appears on the front page (image 3)

e. Code and the required dependencies of **Container #3** are responsible for extracting state information from database. E.g. who is online. You need to maintain the session from login to logout. The session must expire after clicking the logout, which should update the **state** item in the Firestore database.

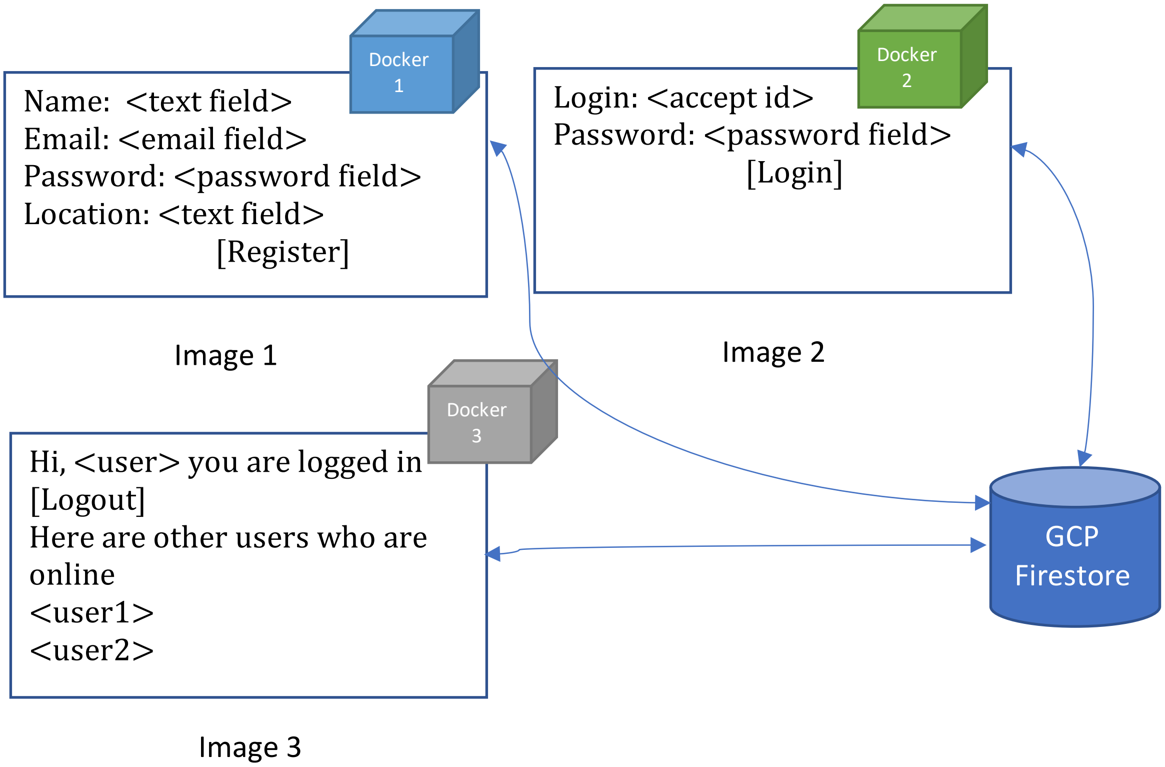
f. Once the docker images are built, you need to push those container images to artifact registry repository (GCR is deprecated now). Once it is done, you need to deploy those in **Cloud Run**.

g. In order complete the tasks, and perform interaction, you need build 3 simple web pages (or 1), using any technology of your choice.

h. Write test case to test your application and perform testing. Provide screenshots as evidence for all steps.

i. You need to study Google Cloud Run, GCR/ Artifact registry, Docker Container documentations, and write a summary within 1 page explaining how you have used these technologies in your application.

Note: You can use any front-end and backend language/technologies (E.g. Angular/React,... etc)



Name: <text field>
Email: <email field>
Password: <password field>
Location: <text field>
[Register]

Login: <accept id>
Password: <password field>
[Login]

Hi, <user> you are logged in
[Logout]
Here are other users who are online
<user1>
<user2>

Fig 1: General architecture/control flow of Part B. Shows inter container interactions are allowed only through database.

Part B - Submission requirement:

- For (a to h), submit screenshots of every steps. Please do not exclude any steps.
- Submit screenshots of empty and populated Firestore database
- For (a to h), submit your program files (Source code on Gitlab) as well.
- However, from the source code - add the important methods (pseudocode), or program instructions as part of the pdf. E.g. Login Validation method etc.
- For (i), add the summary as part of the pdf file

Part C. Building a Chatbot: (This Part is for **Novelty** only)

Using AWS academy account or AWS account perform the following:

take screenshots at every step

a. Using AWS Lex - Create a chatbot on **RideRequest**
b. Consider it as a “Taxi and Car rental service”. (Assumptions: they have 3 types of vehicles –SUV, Sedan, Minivan.
c. The chatbot can accept information on car, such as **self-drive** or **Taxi**
d. If it is Taxi, then customer address, pickup date, and time are accepted
e. If it is self-drive, then assuming same day, it should ask arrival time of customer.

E.g.

Utterances – “I want to request a self-drive ride”
Prompts - “When are you coming to get your vehicle?”
Slots – “I will come around noon”
Prompts – “What do you want today (SUV, Sedan, Minivan)?”
Slots – “SUV”
Prompts – “How many?”
Slots – “1”
Fulfillment –
“You have requested for 1 SUV, and you will be arriving at 12:00 pm”
“Yes”
“Your request has been placed successfully”

Part C - Submission requirement:

A pdf file with the screenshots of AWS Lex chatbot creation, customization, test etc. Paragraph explaining how the operation is performed.