CMM707

Academic Year	**2023 / 24**
Semester	**1**
Module Number	**CMM707**
Module Title	**Cloud Computing**
Assessment Method	**Coursework**
Deadline (time and date)	**11/12/2023 , 11:00PM - For the report** **12/12/2023, 8:30 AM onwards Viva would commence**
Submission	**Assessment Dropbox in the Module Study Area in CampusMoodle**
Word Limit **(see Assessment Word Limit Statement)**	**Not more than 2000 words (Including images, references)**
Module Co-ordinator	**Lasitha Petthawadu**

What knowledge and/or skills will I develop by undertaking the assessment?

Fundamental theoretical and practical knowledge on Cloud computing starting from the foundational aspects of the subject area.

- You would be able to differentiate different approaches to migrating and deploying applications on the cloud.
- Understand compute related services both server based and serverless such as AWS EC2, AWS Lambda.
- Understand data related services ranging from Object storage to block storage services such as AWS S3, AWS EBS.
- Understanding of databases and DBMS solutions available on the cloud such as relational, Non relational.
- Understanding of Cloud Design Patterns and Principles.
- Practically understand the implementation of non functional aspects such as scalability, availability on cloud environments using load balancers, auto scaling groups.
- Introduction to cloud containerization and working with Docker.
- Detailed introduction to container orchestration on Kubernetes.
- Introduction to Microservices & the difference between monolithic architectures vs microservices.
- Understanding and implementation of containerization in microservices architecture

What knowledge and/or skills will I develop by undertaking the assessment?

On successful completion of the assessment students will be able to achieve the following Learning Outcomes:

1. Compare the operational concepts, implementation and performance issues of cloud computing systems, and the relative merits and suitability of each for complex data-intensive applications..

2. Critically appraise different cloud computing models, namely, infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS)

3. Evaluate design choices when solving real-world cloud computing problems by analysing and contrasting different cloud computing solutions.

4. Integrate software components in novel ways to architect and develop cloud-based applications solutions for an enterprise

5. Security and ethics of cloud computing with public cloud solutions, Legal implications of off-premise hosted data, impact on society implications and benefits

Please also refer to the Module Descriptor, available from the module Moodle study area.

What is expected of me in this assessment?

Task(s) - content

This coursework aims to validate the theoretical and the practical aspects discussed during the labs and the lectures of this module.

Case Study

The IT department of AcmeCorp has contacted you to develop a solution known as DeveloperIQ.

DeveloperIQ is a developer productivity tracker. Its main purpose is to track how productive a developer is. You are required to design a microservice architecture which would run on a Kubernetes cluster. Your solution needs to consider the following attributes;

- Scalable
- Secure
- Fault tolerant
- Affordable.

You need to identify **at least three metrics** that can be extracted by integrating with the Github REST API (https://docs.github.com/en/rest/reference) (eg:- Commits of searched user, Issues for user could be example metrics, students are allowed to come up with relevant metrics)

What is expected of me in this assessment?

Store your metrics in either an RDS or AWS DynamoDB database outside of the Kubernetes cluster.

Observability infrastructure is deployed on the same Kubernetes cluster and all the solutions deployed into the Kubernetes cluster are observed using this solution.

Also the IT department wants to automate the service build and deployment of this solution using a CI/CD pipeline. They want to maintain the 100% uptime of all the services by using the rolling out deployment strategy. They want to test their solution automatically after every deployment using an integration test suite. Also they want to test the solution periodically with the same test suite.

Task(s) - format

Students are tasked to write a report to describe the designed solution.

1. The report needs to be in the format of a PDF file.
2. Students should include the solution architecture diagram and the deployment architecture diagram into the report. In the solution diagram the student has to highlight the request flows and the data flows. **[LO1]**
3. Include a highlight on security and ethics challenges that might arise during the implementation of the DeveloperIQ platform. **[LO1]**
4. Include the CI/CD pipeline designs diagrams and CI/CD process descriptions into the same report under CI/CD process section. Highlight security and ethics challenges of this cloud solution. **[LO1][LO2][LO3][LSEPI]**
5. Implement the services and create Kubernetes artefacts required to deploy the designed solution into a Kubernetes cluster. **[LO4]**
6. Implement a CI/CD pipeline to deploy the created solution. This pipeline should be able deploy the artefacts to the production environment following the Blue-Green model. **[LO4]**
7. The report should consist of scripts used to deploy the CI/CD pipeline.**[LO4]**
8. Create a simple test suite to automatically test the solution. Implement the test automation. **[LO4]**
9. Create a simple runbook with the steps to deploy the designed solution and test it. Students have to include this runbook in the final report. **[LO4]**

What is expected of me in this assessment?

Remark: If you have any difficulties using a locally deployed Kubernetes cluster to complete the coursework, you have the freedom to use other Kubernetes providers such as AWS, GCloud, Azure with matching technologies.

Failing to attend the viva session would result in the coursework being graded as zero.

How will I be graded?

A grade will be provided for each criterion on the feedback grid which is specific to the assessment.

The overall grade for the assessment will be calculated using the algorithm below.

A	At least 75% of the feedback grid to be at Grade A, at least 100% of the feedback grid to be at Grade B or better
B	At least 75% of the feedback grid to be at Grade B or better, at least 100% of the feedback grid to be at Grade C or better
C	At least 75% of the feedback grid to be at Grade C or better, and at least 100% of the feedback grid to be at Grade D or better.
D	At least 75% of the feedback grid to be at Grade D or better, and at least 100% of the feedback grid to be at Grade E or better.
E	At least 100% of the feedback grid to be at Grade E or better.
F	Failing to achieve at least 100% of the feedback grid to be at Grade E or better, nor not attending the scheduled viva session.
NS	Non-submission.

Feedback grid

GRADE	A	B	C	D	E	F
DEFINITION / CRITERIA (WEIGHTING)	**EXCELLENT** Outstanding Performance	**COMMENDABLE/VERY GOOD** Meritorious Performance	**GOOD** Highly Competent Performance	**SATISFACTORY** Competent Performance	**BORDERLINE FAIL**	**UNSATISFACTORY** Fail
Participation for the viva **Weight 1**	Student has participated on time, is ready with the demonstration.	Student participated for the viva on time but took time to start his demonstration due to hardware/software, online screen sharing issues.	Student has participated for the viva late and was ready with the demonstration.	Student was late for the viva and was not ready to demonstrate and took time after being late as well.	Student rescheduled the viva at the last moment without prior notice. and joined late on the rescheduled date or had trouble starting the demonstration on time	Student did not participate to the viva on the scheduled date
Identifying Metrics **Weight 1**	The Student has managed to identify more than 3 metrics that are relevant to the coursework expectation.	Student has managed to identify more than 3 metrics but fails to justify the relevance of them to the coursework expectation.	The student has identified 3 metrics which are relevant to the coursework expectations	The student has identified 3 metrics out of which at least one metric is not relevant to the coursework expectations	The Student has identified less than 3 metrics.	Student has failed to identify any metrics.
Report Outline **Weight 2**	The student has clearly organised and outlined the report, meeting all the delivery criteria outlined in the assessment content. Adhering to the word count	The overall report outline is archived but the student has made minor errors in the main sections of the report. Not adhering to the word count	The Student has missed 25% of the main outcomes outlined as expectations of the report.	The Student has missed 50% of the main outcomes outlined as expectations of the report.	The Student has missed 75% of the main outcomes outlined as expectations of the report.	The Student has missed 90% of the required content assessed in the report.

GRADE	A	B	C	D	E	F
DEFINITION / CRITERIA (WEIGHTING)	**EXCELLENT** Outstanding Performance	**COMMENDABLE/VERY GOOD** Meritorious Performance	**GOOD** Highly Competent Performance	**SATISFACTORY** Competent Performance	**BORDERLINE FAIL**	**UNSATISFACTORY** Fail
Solution Implementation **Weight 3**	The solution is detailed and the student has covered a broader depth including functional as well as non-functional aspects	The solution implemented covers what is expected as well as tried to cover a broader depth with minimum errors that have been highlighted during the viva	The solution implemented covers what is expected but the student has made errors in one area of the assignment due to lack of understanding or misinterpretation	The solution implemented covers the bare minimum that is expected by the scope of this coursework.	The solution is partially functional with a majority of the functional and non-functional requirements not been met	The solution is not functional or is not a workable solution
Demonstration **Weight 1**	The student is able to demonstrate in a clear, understandable manner following an organised logical presentation sequence. The student was able to intuitively answer all the questions raised during the viva	The student is able to demonstrate clearly and was able to completely demonstrate all the requirements. But the student made minor errors during the viva demonstration.	The student was able to demonstrate clearly and was able to completely demonstrate all the requirements but had major	The student demonstrates more than 50% of the functionality but fails in answering questions accurately.	The student failed to demonstrate 50% of the expected functionality.	The student failed to demonstrate more than 75% of the functionality.

Coursework received late, will be regarded as a non-submission (NS) and one of your assessment opportunities will be lost.

What else is important to my assessment?

What is plagiarism?

"Plagiarism is the practice of presenting the thoughts, writings or other output of another or others as original, without acknowledgement of their source(s) at the point of their use in the student's work. All materials including text, data, diagrams or other illustrations used to support a piece of work, whether from a printed publication or from electronic media, should be appropriately identified and referenced and should not normally be copied directly unless as an acknowledged quotation. Text, opinions or ideas translated into the words of the individual student should in all cases acknowledge the original source" (RGU 2022).

What is collusion?

"Collusion is defined as two or more people working together with the intention of deceiving another. Within the academic environment this can occur when students work with others on an assignment, or part of an assignment, that is intended to be completed separately" (RGU 2022).

For further information please see Academic Integrity.

What is the Assessment Word Limit Statement?

It is important that you adhere to the Word Limit specified above. The Assessment Word Limit Statement lists what is included and excluded from the word count, along with the penalty for exceeding the upper limit.

What if I'm unable to submit?

- The University operates a Fit to Sit Policy which means that if you undertake an assessment then you are declaring yourself well enough to do so.
- If you require an extension, you should complete and submit a Coursework Extension Form. This form is available on the RGU Student and Applicant Forms page.
- Further support is available from your Course Leader.

What else is important to my assessment?

What additional support is available?

- RGU Study Skills provide advice and guidance on academic writing, study skills, maths and statistics and basic IT.
- RGU Library guidance on referencing and citing.
- The Inclusion Centre: Disability & Dyslexia.
- Your Module Coordinator, Course Leader and designated Personal Tutor can also provide support.

What are the University rules on assessment?

The University Regulation 'A4: Assessment and Recommendations of Assessment Boards' sets out important information about assessment and how it is conducted across the University.