National College of Ireland

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MSc in Cloud Computing, Year 1, MSCCLOUD1_A
MSc in Cloud Computing, Year 1, MSCCLOUD1_B

Autumn/August Repeat Examinations Session

Repeat Assessment
Release Date on Moodle: 23rd of June 2025 at 10:00am
Online Moodle Submission Deadline: 31st of July 2025 at 16:00

Cloud Platform Programming

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Weight: The assignment will be marked out of 100. The Repeat Assessment represents 100% of the repeat module assessment.

Instructions: This is an individual assessment. You are required to submit all the repeat assessment deliverables through Moodle via the dedicated submission pages.

SUBMISSION DETAILS: All the repeat assessment deliverables must be submitted via Moodle before the deadline using the dedicated submission pages. **As this is a repeat assessment, late submissions are NOT accepted.** The report deliverable should be formed from paragraphs and should NOT contain ordered and/or unordered (e.g., bullet points) lists.

IMPORTANT: It is your responsibility to avoid plagiarism. Please read the comprehensive guidelines on academic honesty and academic integrity, and how to avoid plagiarism made available by the NCI Library (https://libguides.ncirl.ie/referencingandavoidingplagiarism).
It is expected that the Submitted Assignment is FULLY THE WORK OF THE STUDENT except where quoted material is clearly indicated. The use of Artificial Intelligence (AI) text generators (e.g., ChatGPT, Quillbot, GitHub Copilot, etc.) to rewrite/paraphrase text and/or to generate code could be considered a breach of academic integrity as you are not doing the work yourself and are using AI to carry out the work YOU should be doing. Paraphrasing is a very important part of an assignment as it proves a person understood the information enough to put it into their own words.
NOTE: YOU ARE NOT ALLOWED TO PUBLISH THIS ASSIGNMENT BRIEF OR A PART THEREOF ON ANY WEBSITES. YOU ARE NOT ALLOWED TO PUBLISH/SHARE YOUR SOLUTION WITH OTHERS. All work submitted **should be YOUR own.** Conferring with others **is NOT permitted. This is NOT a collaborative assessment.**

TURNITIN: All submissions will be electronically screened for evidence of academic misconduct (e.g., plagiarism, collusion, AI generated text and/or code, misrepresentation, etc.). Any submission showing evidence of academic misconduct will be investigated in accordance with the provisions of the Academic Integrity Policy.

The examiners reserve the right to conduct live mini presentations with a sample of the students, where students will provide answers to questions related to their project. Also, students may be required to undergo a viva (oral examination) if there is suspicion about the validity of their submitted work.

Introduction

The repeat assessment of the Cloud Platform Programming (H9CPP) module consists of a Project which represents 100% of the repeat module assessment.

The learning outcomes of the Cloud Platform Programming module are as follows:

LO1. Demonstrate in-depth knowledge of core cloud-based services.

LO2. Critically analyse advantages and disadvantages of different cloud-based technologies/services.

LO3. Formulate and produce new code libraries that implement advanced programming constructs in order to create secure, dynamic, configurable, robust, scalable cloud-based applications.

LO4. Construct and present a complex dynamic cloud-based application through selecting relevant cloud related architectural patterns and services taking into account the evaluation and assessment of application design, development, and testing methodologies.

LO5. Identify and ethically apply best practices for continuous integration, delivery and deployment of cloud-based applications.

This document presents the details of the repeat assessment of the Cloud Platform Programming module. The repeat assessment assesses all the module's learning outcomes, namely LO1, LO2, LO3, LO4, and LO5.

Note that as this is a repeat assessment, according to the NCI repeat assessment policy, you are required to complete a **NEW** project. Also, note that some of the repeat project requirements are different as compared with the project set during the semester as that project had a different weight in the overall assessment for the module.

Project Description

For this assignment, assume that a company has commissioned you to develop a complex dynamic cloud-based application in a given domain/industry sector through selecting relevant cloud related architectural patterns and cloud-based services. Your application must be deployed and hosted on a public Cloud. The given domain/industry sector is assigned to you based on the penultimate i.e., second to last digit of your Student ID as described in the *Table 1 Industry sectors.* This is an **individual** project.

Table 1 Industry sectors

Penultimate (i.e., second to last) digit of Student ID	Industry Sector
0 OR **1**	Construction
2 OR **3**	Clothing Manufacturing
4 OR **5**	Food and Beverage Manufacturing
6 OR **7**	Agriculture and Forestry
8 OR **9**	Electricity, Gas, Steam and Air Conditioning

IMPORTANT: Each student must develop a complex dynamic cloud-based application in the correct industry sector based on the guidelines from *Table 1 Industry sectors.* **IMPORTANT: This is a submission requirement.** If the incorrect industry sector is chosen, the project will not be valid, and **NO marks** will be provided.

Example: According to *Table 1*, a student with the student ID = 249876**5**4 would be assigned the industry sector *Food and Beverage Manufacturing* (because the penultimate i.e., second to last digit of that student ID is **5**).

Once you have decided what your application will do, you should go through the following process:

- Define requirements: describe the functional and non-functional requirements of your application.
- Critically analyse and document the architecture of your cloud-based application.
- Implement a complex, dynamic cloud-based application that addresses the requirements defined above. This application must employ programmatically **at least five** different cloud services including cloud services for object storage, database, and serverless computing. In addition, the application must use, at least, one new library that

you develop in an object-oriented programming language. The new library should provide meaningful functionality to your application.

- Ensure that you implement/code your application to take advantage of suitable cloud architectural patterns.
- Deploy your application to a suitable public cloud platform. The deployed application must not be modified after the submission deadline. The examiner should be able to view your deployed application without having to register for any account with the public cloud provider where you deployed your application (i.e., the application (**not its source code!**) should be publicly accessible via an URL). This publicly accessible URL should not be shared with anyone else but the examiners of this instance of the Cloud Platform Programming module at NCI.
- You must conduct some independent research and include any relevant bibliography in the accompanying report.

Project Deliverables

You are required to submit all the deliverables through Moodle via the dedicated submission pages.
You are required to document the process of developing the cloud-based application and reflect on it through the following deliverables:

1. A **project report** in **pdf** (8-9 pages formatted using the IEEE Conference double-column template[1]) which should include:
   - NCI Project Submission Sheet/ Project Cover Sheet
   - Headline: title of the report, your name, student number, module, programme, and date
   - Abstract – a 150-300-word executive summary of the project and the main results
   - Section 1: Introduction – motivation for your project and its main objectives
   - Section 2: Project requirements: describe the functional and non-functional requirements of your application
   - Section 3: Architectural design aspects of your application – critically analyse and document the architecture of your cloud-based application including the architecture diagram of the application; the architecture diagram should indicate where the different cloud-based services fit into your system/application. Note that the diagram should be created by you based on your own application and cloud services used.
   - Section 4: For each of the cloud-based services used in the application, critically analyse advantages and disadvantages of those cloud-based services and justify the choice of cloud services used (i.e., motivate your selection/choice of a particular cloud-based service as compared to other options available).
   - Section 5: Library description – first, present the main purpose of the library you developed. Next, describe the functionalities the library supports in your application. You should include relevant code snippets of where the library is used in your application.
   - Section 6: Implementation – document the implementation of the requirements of your application. For each cloud service used programmatically in your application, explain the requirement(s)/functionality/functionalities that particular cloud service supports, and include code snippets to show how you integrated that cloud service in your application.
   - Section 7: Continuous integration, delivery, and deployment of your application
     1) Include in the report the URL to your deployed application
     2) Note that at all times you **must use a private repository** for versioning control (e.g., GitHub)
   - Section 8: Conclusions including findings/interpretations – what did you learn and find out? Include a short reflection on developing this project. If you were to implement this project again, what would you do differently?
   - Section 9: References – a complete list of academic works and/or online materials used in the project. References should be included as in-text citations using the IEEE referencing style. Note that a good starting point to find academic works is the NCI Library Guide on Cloud Computing at https://libguides.ncirl.ie/cloudcomputing

IMPORTANT: Any content after the Page 9 will not be considered i.e., it WILL NOT BE MARKED! (Note that the NCI Project Submission Sheet/ Project Cover Sheet is not considered as part of the page count.)

[1] https://www.ieee.org/conferences/publishing/templates.html

2. The **source code artefacts** submission (a ZIP file) should include:
   - Source code of the application (including comments)
     Note: Please include substantial meaningful comments in YOUR source code to document your ORIGINAL contributions.
   - Source code of the library (including comments)
     Note: Please include substantial meaningful comments in YOUR source code to document your ORIGINAL contributions.

3. **Video of project presentation, project demonstration and answers to questions**. A **maximum 10-minutes video submission** that should include the followings:
   - A concise (approximate 1-2 minutes) presentation of the motivation and high-level description of the idea of the project
   - Demonstration – give a demonstration of your application highlighting the main features of your application, focussing on those features that are supported by cloud services that you used programmatically in implementing your application. You should use the **deployed** version of your application (do show evidence that you demonstrate the deployed application, i.e., the URL of the application should be visible in the browser throughout the demo).
   - Answers to questions/items which are included in this document under the section named *Video Presentation and Demonstration – Questions and Guidelines* (see page 4)

   IMPORTANT: Every second after the 10 minutes video will not be considered i.e., it WILL NOT BE MARKED!

   Please record your project video and upload it to YouTube as an **UNLISTED** video (for instructions please consult https://support.google.com/youtube/answer/157177).

   The YouTube URL of your project presentation, project demonstration and answers to questions video **must be included in your report (e.g., https://youtu.be/mxT233EdY5c) AND must be publicly accessible. Please test it well before your submission using a private window of your browser.**

Video Presentation and Demonstration – Questions and Guidelines

You are required to submit a maximum 10-minutes video presentation and demonstration of your project for the repeat assessment of the Cloud Platform Programming module which also addresses the questions/items provided below.
IMPORTANT: Every second after the 10 minutes video will not be considered i.e., it WILL NOT BE MARKED!
The URL to your recorded video **must be publicly accessible** AND **must be included in the project report**.

Your video submission should include the followings:

- **Presentation**: Start the video with a concise presentation of the motivation and high-level description of the idea of the project. Provide a brief outline of the followings:
  1. The main objectives of your application
  2. The cloud services you have used programmatically in your application
  3. All the other cloud services you have used in your application
  4. The functionalities provided by the library/libraries you have implemented
  5. Note that all the above items should be addressed in no more than 2 minutes

- **Demonstration**: Give a demonstration of your application's high-level functionality highlighting the main features of your application, focussing on those features that are supported by cloud services that you used programmatically in implementing your application. You should use the **deployed** version of your application (do show evidence that you demonstrate the deployed application, i.e., the URL of the application should be visible in the browser throughout the demo). If you did not manage to deploy your application or if there are issues with the deployed version, you should

highlight/mention this and show the deployment attempt of your application, and then demonstrate the local/Cloud9 version of your application.

- **Questions/Items**: Identify in your application (i.e., in the source code of your application) examples of the following project requirements. You should explain how your implementation meets each item by **explaining your coded solution**. If you have not addressed a particular item please just say *"I did not implement/address that item"* (please do specify the name of the item), if you have a solution start by saying *"This is how I achieved item … etc."*:
    1. Specify all the cloud services that you are using in your application and for the cloud services that you are using programmatically identify in your application source code where do you use those cloud services, and concisely explain the functionalities they support/provide in your application
        - Also, show in the Cloud Provider's (e.g., AWS) Management Console the cloud services you are using in your project
    2. Identify in your application source code where do you use the library/libraries you have implemented and concisely explain the functionalities they support in your application
    3. What is the most interesting/challenging/complex functionality that you implemented?

Assessment Criteria

The Repeat Assessment will be assessed based on the assessment criteria shown in shown in *Table 2* and the marking rubric shown in *Table 3.*

Notes:

- **The examiners reserve the right to conduct live mini presentations with a sample of the students, where students will provide answers to questions related to their project.**
- **Students may be required to undergo a viva (oral examination) if there is suspicion about the validity of their submitted work.**

Table 2 Assessment Criteria

Architectural Design	10%	Critique possible architectures for the cloud application and discuss the chosen architecture.
Cloud Services & Critical Analysis	15%	Evaluate, select, and use in your project multiple cloud services.
Library Creation	15%	Design and implement at least one new library documenting the usefulness of the library in the context of your application.
Implementation	20%	Develop a complex dynamic cloud-based application in which at least five cloud services are integrated programmatically to support the features of the application.
Deployment	10%	Deploy your application to a suitable public cloud platform.
Conclusions and Findings	5%	The report should incorporate conclusions including findings/interpretations.
Video Project Presentation & Project Demonstration & Answers to Questions	25%	Present the cloud-based application. Demonstrate the cloud-based application you developed, presenting the dynamic characteristics of it and highlighting the cloud-based services used to support the functionalities of your application. Answer the questions/items which are included in this document under the section *named Video Presentation and Demonstration – Questions and Guidelines*

Table 3 Marking Rubric

Grade Criterion	H1 (> 70%)	60-69%	50-59%	40-49%	Fail (< 40%)
Architectural Design: 10%	Architectural considerations have been well prepared, explored and critically analysed.	Architectural considerations have been prepared, explored and analysed.	Architectural considerations have been prepared and mostly explored, but not analysed.	Architectural considerations have been prepared but somewhat trivial.	Architectural considerations are not evident.
Cloud Services & Critical Analysis: 15%	Excellent/very good critical analysis of relevant cloud services. Evidence of breadth and depth in the reviewed cloud services. Excellent justification/discussion for/on the choice of cloud services used.	Good critical analysis of relevant cloud services. Evidence of breadth in the reviewed cloud services. Good justification/discussion for/on the choice of cloud services used.	Adequate critical analysis of relevant cloud services. Reasonable use of concepts, but there is a lack of breadth in the reviewed cloud services. Adequate justification/discussion for/on the choice of cloud services used.	Limited critical analysis of cloud services. Limited use of concepts. Limited justification/discussion for/on the choice of cloud services used.	Very limited and poor or inexistent critical analysis of cloud services. Very limited use of concepts. Very limited/ poor or inexistent justification/discussion for/on the choice of cloud services used.
Library Creation: 15%	Excellent/very good identification and development of a library in terms of providing suitable/meaningful functionalities to the application. Excellent/very good documentation/description of the library.	Good identification and development of a library in terms of providing suitable/meaningful functionalities to the application. Good documentation/description of the library.	Adequate identification and development of a library in terms of providing suitable/meaningful functionalities to the application. Adequate documentation/description of the library.	Weak identification and development of a library in terms of providing suitable/meaningful functionalities to the application. Weak documentation/description of the library.	Poor identification and development of a library in terms of providing suitable/meaningful functionalities to the application. Poor documentation/description of the library.
Implementation: 20%	Excellent/very good implementation of a complex cloud-based dynamic application in terms of appropriate methodology and cloud-based services used programmatically to support the features of the application. Excellent/very good discussion and documentation of the implementation of the application.	Good implementation of a complex cloud-based dynamic application in terms of appropriate methodology and cloud-based services used programmatically to support the features of the application. Good discussion and documentation of the implementation of the application.	Adequate implementation of a complex cloud-based dynamic application in terms of appropriate methodology and cloud-based services used programmatically to support the features of the application. Adequate discussion and documentation of the implementation of the application.	Weak implementation of a complex cloud-based dynamic application in terms of appropriate methodology and cloud-based services used programmatically to support the features of the application. Weak discussion and documentation of the implementation of the application.	Poor implementation of a cloud-based dynamic application in terms of appropriate methodology and cloud-based services used programmatically to support the features of the application. Poor discussion and documentation of the implementation of the application.
Deployment: 10%	The application is deployed on a suitable public cloud platform. All the functionalities of the application are working properly on the deployed application and are available via the deployed URL.	The application is deployed on a suitable public cloud platform. Some of the functionalities of the application are working on the deployed URL.	Efforts have been made to deploy the application on a suitable cloud platform, but it is not working properly as required.	Efforts have been made to deploy the application on a suitable cloud platform, but this may be unsuccessful.	No efforts have been made to deploy the application on a cloud platform.
Conclusions and Findings: 5%	Excellent/very good conclusions, insightful findings and reflection.	Good conclusions and good discussion of findings and reflection.	Adequate conclusions and adequate discussion of findings and reflection.	Limited/weak conclusions and limited/weak discussion of findings and reflection.	Very limited and poor/inexistent conclusions. Very limited and poor/inexistent discussion of findings and reflection.
Video Project Presentation & Project Demonstration & Answers to Questions: 25%	Excellent well directed presentation and demonstration with impeccable handling of questions.	Clear presentation and demonstration with good handling of questions.	Neat oral presentation and demonstration and acceptable handling of questions.	Poor oral presentation and demonstration and weak handling of questions.	Unacceptable oral presentation and demonstration and poor handling of questions.