CCT College Dublin Continuous Assessment

Programme Title:	BSc in Computing and Information Technology
Cohort:	Full Time
Module Title(s):	**Cloud Services (CA2)**
Assignment Type:	Research Report (Individual assignment)	**Weighting(s)** (40%)	
Assignment Title:	**Implementing a proof-of-concept cloud architecture**
Lecturer(s):	Michael Weiss
Issue Date:	Thursday 31ˢᵗ October
Submission Deadline Date:	Sunday 17ᵗʰ November – 23:59
Late Submission Penalty:	Late submissions will be accepted up to **5** calendar days after the deadline. All late submissions are subject to a penalty of **10%** <u>of the mark awarded</u>. Submissions received more than 5 calendar days after the deadline above **will not** be accepted and a mark of 0% will be awarded.
Method of Submission:	**Moodle**
Instructions for Submission:	Report (Word count: 1500 words +/- 10%)
Feedback Method:	**Results posted in Moodle gradebook**
Feedback Date:	Within two weeks of submitting assignment to Moodle

<u>**A note about the use of Artificial Intelligence and this assignment:**</u>

You are <u>not</u> allowed the use of Artificial Intelligence to complete this assignment.

Each student is expected to do their own research and efforts.

Also, all research writing and examples MUST be in your own words!

Learning Outcomes:

Please note this is not the assessment task. The task to be completed is detailed on the next page. This CA will assess student attainment of the following minimum intended learning outcomes:

MLO 2 - Apply architectural design principals while planning a cloud architecture to achieve system requirements (Linked to PLO 2 (Stage 4 SLO 2))

MLO 3 - Apply best practices for reliability, and performance efficiency when utilizing cloud services

Attainment of the learning outcomes is the minimum requirement to achieve a Pass mark (40%). Higher marks are awarded where there is evidence of achievement beyond this, in accordance with QQI *Assessment and Standards, Revised 2013*, and summarised in the following table:

Percentage Range	CCT Performance Description	QQI Description of Attainment	
		Level 6, 7 & 8 awards	**Level 9 awards**
90% +	Exceptional	Achievement includes that required for a Pass and in **most** respects is significantly and consistently beyond this	Achievement includes that required for a Pass and in **most** respects is significantly and consistently beyond this
80 – 89%	Outstanding		
70 – 79%	Excellent		
60 – 69%	Very Good	Achievement includes that required for a Pass and in **many** respects is significantly beyond this	Achievement includes that required for a Pass and in **many** respects is significantly beyond this
50 – 59%	Good	Achievement includes that required for a Pass and in **some** respects is significantly beyond this	Attains all the minimum intended programme learning outcomes
40 – 49%	Acceptable	Attains all the minimum intended programme learning outcomes	
35 – 39%	Fail	Nearly (but not quite) attains the relevant minimum intended learning outcomes	Nearly (but not quite) attains the relevant minimum intended learning outcomes
0 – 34%	Fail	Does not attain some or all of the minimum intended learning outcomes	Does not attain some or all of the minimum intended learning outcomes

Please review the CCT Grade Descriptor available on the module Moodle page for a detailed description of the standard of work required for each grade band.

The grading system in CCT is the QQI percentage grading system and is in common use in higher education institutions in Ireland. The pass mark and thresholds for different grade bands may be different from what you have experience of in the higher education system in other countries. CCT grades must be considered in the context of the grading system in Irish higher education and not assumed to represent the same standard the percentage grade reflects when awarded in an international context.

Assignment Introduction

You have been hired as a cloud engineer for a new cloud computing start-up company called Clouds-Are-Us. Clouds-Are-Us has hired you to assist with setting up some of the networking infrastructure. You will report into the Clouds-Are-Us cloud engineering manager. The Clouds-Are-Us company has just launched some new products, and they are ready to share some information with prospective customers.

They have 3 requirements that they wish you to complete.

"Clouds-Are-Us will be launching a suite of services, in a couple of months. The company will specialise in the development of digital technology solutions, software design and agile software development and cloud computing consulting services." <- Ensure to advertise this on their marketing page below in task 1.

1. Clouds-Are-Us would like to setup a static website where customers can learn about their services. To host a static website, they have requested you to configure an Amazon S3 bucket and utilize simple static website hosting. They then wish you to upload some sample content to let customers know that their many services will be available soon (see information in introduction above). All of the website content should be uploaded to one bucket. They require secure, durable, highly scalable object storage. They need a simple web services interface to allow them to store and retrieve any amount of data from anywhere on the web.

1a. Provide a screenshot of your final static website (including short description of the Clouds-Are-Us services).

1b. Research Task: The company would like you to explain to them the key differences between storing data on S3 compared to storing data on EC2 with EBS. They wish to know use cases for each, find out what's similar, what's different and to provide a detailed analysis of each.

2. In the medium term, the management at Clouds-Are-Us wishes to setup infrastructure utilizing high availability using the following illustration as a guide (as shown in Figure 1 below):
    Figure 1
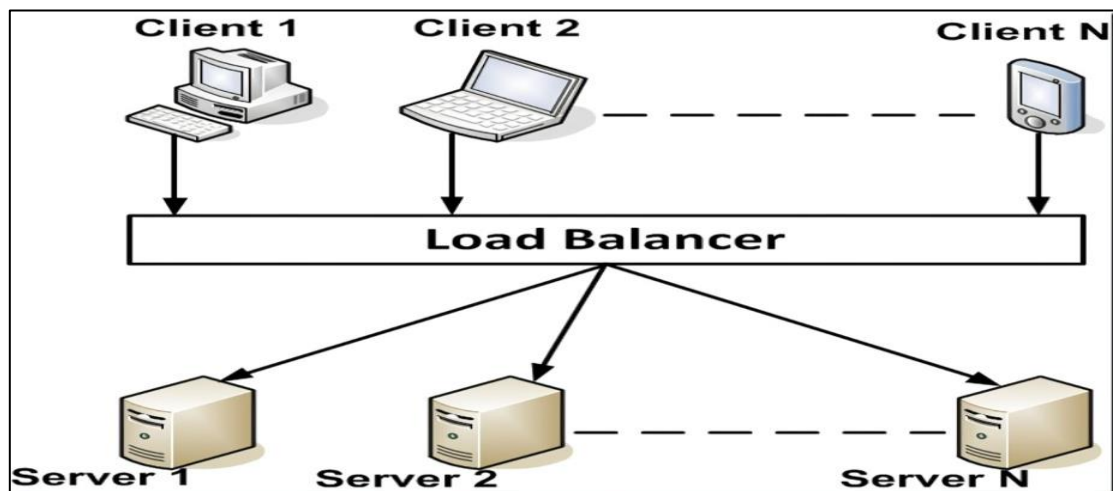
Web site on group of load balanced web servers

2a. Create five Linux servers that use the start-up script provided (see below). The start-up script will install Linux updates, install the HTTP web service, and load a test that shows the name of the Web Server. Using these 5 Linux instances, set up an Application Load Balancer (ALB) that includes these web servers that need to add to a target group.

Note: You can create this create this ALB in the default AWS VPC, but you will gain additional marks if you create your own VPC and then launch the ALB into your custom VPC.

Demonstrate that the ALB function is working correctly.

2b. Challenge: Incorporate the DigiTech Website (available on Moodle) into the ASG/ALB configuration described above. When testing the ALB, the DigiTech Web page should be displayed along with your name, your student number, and the server's name.

3. Task 3a and 3b: Auto-scaler and load-balancer confirmation and research.

3a. Challenge Task: Clouds-Are-Us has contracted with the DigiTech corporation to host their website. The management at DigiTech wishes to automate the infrastructure deployment of their website and they would like to see a proof of concept. Your manager at Clouds-Are-Us would like you to set up an Auto-Scaling Group (ASG) integrated with an Application Load Balancer (ALB) on one of the subnets in a VPC that you will create (or a VPC that you will soon create). In addition to demonstrating this configuration, explain, using a real-world example, the benefits integrating the ASG combined with the ALB.

Present the proposed proof of concepts to the cloud engineering manager in the form of a professional report.

3b. Research Task: In your own words, explain how the proposed DigiTech ALB works and what benefits it provides to DigiTech. Amazon Web Services (AWS) has a 'Well Architecture Framework' that includes several 'Pillars of Architectural Excellence' that provide a framework of cloud computing best practices. In your explanation, discuss two of the architectural design principals that would be utilized while planning the cloud architecture that would be provided by combining the ASG with the ALB.

Bootstrap Script to add to the User Data area inside your Linux Web Servers:

#!/bin/bash

yum update -y

yum install httpd -y

service httpd start

chkconfig httpd on

cd /var/www/html

echo "<html><h1> DigiTech! This is Server $(hostname -f) </h1></html>" > index.html

IMPORTANT NOTES:

Use references (both text and images) to help backup the points you make. Note the Harvard referencing system should be used.

WORD COUNT: Approx. 1000-1500 words. This is a guide only. You will not be penalized for being over or under this suggestion, however if your report is very short then you have probably not dealt with the requirements. Equally, if it is very long then you have probably included unnecessary information.

In configuration tasks above, your AWS account using AWS Academy should be used. **You are NOT required to use an AWS account that requires you to spend any money on implementing these proof-of-concept solution.**

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Marking Scheme Summary

Weighting	Description	Marking
[0 to 10]	TASK 1a: S3 website hosting	
[0 to 10]	TASK 1b: Research Task	
[0 to 30]	TASK 2a: Application Load Balancer Configuration and discussion	
[0 to 10]	TASK 2b Challenge	
[0 to 20] [0 to 10]	TASK 3: Challenge Task 3a Challenge Task 3b	
[0 to 10]	Present the proposed solution to the cloud engineering manager in the form of a professional report. Use of referencing (for both text and images) to help back-up the points you make. Note the Harvard referencing system should be used.	
[0 to 100]	**TOTAL**	

Your submission must be your own work and once completed, must be uploaded to Moodle within the time frame above. Any student found breaking College regulations will receive zero marks.

Copying and pasting large sections of text directly from web sites / resources is NOT permitted and will result in zero marks awarded. **Read the assignment carefully and answer the questions that have been asked.**