National College of Ireland

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BSC (Honours) in Computing - Year 4
BSHCSD4, BSHCSDE4

Terminal-Based Assignment Assessment (TBAA) – 2020-21

Saturday 1st May, 10:00am to 8:00pm

Distributed Systems

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Breakdown: The Terminal-Based Assignment Assessment is worth 40% of your overall mark for the module

Duration: The students will have to answer questions (1, 2, 3) and any two from question 4, within the same day from 10:00am to 8:00pm.

All submissions will be electronically screened for evidence of academic misconduct (plagiarism and collusion). The assessment should be submitted via a Turnitin link.

Attachments: None

Presentation of Code: Your code should be presented as follows. You should include screenshots of all the inputs and outputs of your services. You should also include screenshots of all your code in your IDE (whichever IDE you are using Eclipse, NetBeans IntelliJ).

Question 1. By using the MQTT protocol implement in Java the Publisher - Subscriber parts as follows:

a) **One publisher** announces news in **sports**, **sports/football**, **sports/cricket**, **sports/regional**, and **another publisher** that announces news on **politics**, **politics/elections** and **business/regional**.
Implement these 2 publishers and demonstrate the sending of messages on these topics and subtopics.

[10 marks]

You should also develop **a subscriber** that listens for news (messages) on the following topics and subtopics

b) strictly messages send to a sports/football

[5 marks]

c) any messages that are related to politics (including its subtopics)

[5 marks]

d) messages that are related to any regional subtopic

[5 marks]

e) Finally, show and explain how you can implement durable subscriptions?

[5 marks]

[30 marks in total]

Question 2. Investigate and report how cloud-based systems (select one of Amazon WS, Microsoft Azure, Google Cloud Platform, etc) balance the trade-offs of the PACELC theorem, and what approaches they take to guarantee Consistency, Availability and Partition Tolerance.

Your report should be approximately 800 words long and should be properly referenced.

[30 marks]

Question 3. Discuss mitigation strategies for the following Fallacies of Distributed Computing.

a) The Network is Reliable

b) The Network is Homogeneous

[10 marks in total]

Question 4. [**Answer any two** of the following three questions]

a) Compare and contrast RESTful Web Services with Remote Procedure Calls (RPCs). What are their similarities and what are their differences?

[15 marks]

b) Conceptually demonstrate a simple client-server application/scenario with an implementation technology of your choice. Your solution should mention and depict the relations and interactions among the following components: client-part, server-part, middleware and registry. In this scenario, what is the use of middleware and registry?

[15 marks]

c) How do components communicate in a distributed system? Identify and compare two different implementations that are based on different messaging paradigms (e.g RPC, publish-subscribe).

[15 marks]