NGEE ANN POLYTECHNIC

Advanced Databases (ADB)

October 2021

SCHOOL OF INFOCOMM TECHNOLOGY

Diploma in Information Technology

ADB Assignment 2
(40% of ADB Module)

24 January – 04 February 2022 (2 Weeks)
Deadline: 07 February 2022, 9:00 am

HARDCOPY: Submit to tutor at 2:00 pm on 7 February 2022

SOFTCOPY report in the MeL > Discussion Board

Penalty for late submission:

- **10%** of the marks will be deducted for each day (inclusive of Saturdays, Sundays and public holidays) after the deadline.
- **NO** submission will be accepted after 14 February 2022, 9:00 am.

ADB ASSIGNMENT (WEEK 15 TO WEEK 16)

1. OBJECTIVES

This assignment assesses the student's ability to perform the following:

(i) Demonstrate the appropriate steps in designing a cloud database to support business processes and operations of a given business application – an online Learning Management System (LMS);
(ii) Apply appropriate denormalisation and partitioning (fragmentation) techniques to construct a distributed database to satisfy the given requirements of the system;
(iii) Apply necessary data placement strategies;
(iv) Identify suitable cloud storage technologies/solutions, relational and/or non-relational (SQL and/or NoSQL), to suit the data requirements of the system;
(v) Implement the cloud database using the identified cloud storages in Microsoft Azure platform;
(vi) Demonstrate, with necessary data, how the final cloud database design will meet the requirements of the system;
(vii) Demonstrate how business requirements are being met through formulating SQL/LINQ queries.

2. SCOPE

You should treat this assignment as a consulting project carried out by a team of developers for the LMS. In the earlier checkpoint submitted in week 12, your team has completed an initial study of business operations and their requirements and modelled the business domain data requirements using the Entity Relationship (ER) model.

Based on your tutor’s feedback on your checkpoint submission, you have fine-tuned your business write-ups, ER model and business queries and are now ready to move on to the final stage of converting your design into an operational cloud database.

Your team is required to submit a report and do a presentation-cum-demo to the client and his IT Manager (both roles to be played by your tutor) on the final design and the implementation of the proposed cloud database for the LMS.

Additional requirements:

The client (the local University) would like to add additional requirements to the proposed LMS.

Due to the growing demand for higher education across the globe, the University is planning to open branch campuses overseas, especially due to travel restrictions as there is no sign of COVID-19 relenting, and the desire to tap new revenue sources. In addition to the local University, which is the main campus, the LMS should also support all the overseas branch campuses and further enhance its functionalities to:

- Facilitate the local University to offer some of its course in other countries. Some of these courses will be conducted by tutors from the corresponding country.
- Allow the local University to monitor the academic performances of students taking courses in overseas branch campuses;

A distributed database system is ideal for supporting the LMS to support branch campuses globally. While the system should support the customisability for local usage at overseas branch campuses, certain features are common to all campuses. You may find out instances that are suitable for storing data locally and distributed database environments for the LMS.

The LMS would like to gain from the benefits of cloud computing technologies to improve its effectiveness and uptime to provide a solid reliable learning platform. Some of the challenges the university aims to overcome by using cloud computing include:

- A well-designed data model to ensure optimal performance and accessibility of data across all applications.
- Maintaining a highly available, resilient, and scalable IT infrastructure to guarantee business continuity.
- Cutting high IT costs if the university has to maintain their own IT infrastructure resources.

Report submission:

Your report should address the following key aspects:

(i) The detailed design process of the cloud database and final implementation. State the necessary justifications at appropriate places where you make important decisions (e.g., data placement, fragmentation strategies, and choosing appropriate data storage technologies (SQL/NoSQL) based on the nature of data and/or processes);

(ii) How your final cloud database design meets and supports the requirements of the proposed LMS through efficient database operations.

Presentation-cum-demo:

The presentation-cum-demo (scheduled in week 17) should cover these aspects:

(i) A team presentation (not more than 30 minutes) on the work done in designing the cloud database as consultants to the client and his IT Manager;

(ii) Demonstrate the role of each team member in the cloud database design, implementation process and how his/her queries are supported, in terms of efficiency, by the design;

(iii) Each team member will also be required to answer questions, related to his/her work, from the tutor during the presentation.

3. DELIVERABLES

3.1 REPORT

Each team is required to submit a single team report. The report should include the following:

3.1.1 TEAM (30%)

(i) Final business domain write-up;
(ii) Final ER model and the list of mapped relations;
(iii) How your cloud database design meets the requirements of the entire system;
(iv) Evidence (screenshots) of implementation of cloud storages (in Microsoft Azure environment).

3.1.2 INDIVIDUAL (70%)

(i) Appropriate application of denormalisation to improve the efficiency of queries and reduce joins;
(ii) Data placement strategy, including any partitioning (fragmentation) and replication to support the features and functions of the system and its users around the world;
(iii) Selection of cloud storage strategies (SQL/NoSQL) – clear explanation, with justifications, for chosen cloud storage solutions to store various types of data;
(iv) Design/schema and content of each cloud storage used for the individual part;
(v) Implementation of business queries using LINQ/SQL.

3.2 PRESENTATION & DEMONSTRATION

Each team is required to do a 30-minute presentation on the work done for the client followed by demonstrations of queries and Q&A. Each team member is expected to demonstrate that his/her contribution to the assignment. Your tutor, role playing as both client and IT Manager, may ask ad hoc questions during the demonstration and Q&A session to get a clearer understanding of the team member's individual contribution.

Your tutor will inform your presentation and demonstration schedule in due course.

4. REPORT SUBMISSION PROCEDURE

You are required to submit your HARDCOPY report by 2:00 pm on 7 February 2022 using the cover sheet attached. **SOFTCOPY report** should be deposited by the team leader in MeL > Discussion Board by **7 February 2022, 9:00 am**.

10% of the marks will be deducted for each day (inclusive of Saturdays and Sundays) after the deadline.

NO submission will be accepted after **14 February 2022, 9:00 am**.

Important Note:

Students from the same team may be given different grades if the tutor is so convinced by evidence of widely unequal contribution by the members.

PLAGIARISM WARNING:

If a student is found to have submitted work not done by him/her, he/she will NOT be awarded any marks for this assignment. Disciplinary action may also be taken. Similar action will be taken for any student who allows other student(s) to copy his/her work.

Ngee Ann Polytechnic Plagiarism Policy is available at:
https://www1.np.edu.sg/clte/antiplagiarism/policy.htm

NGEE ANN POLYTECHNIC

Advanced Databases (ADB)

October 2021

SCHOOL OF INFOCOMM TECHNOLOGY

Diploma in Information Technology

ADB Assignment 2
(40% of ADB Module)

24 January – 04 February 2022 (2 Weeks)
Deadline: 07 February 2022, 9:00 am

ADB Class group				
Team Number			**Team Grade**	
Tutor				
Members	**Student No.**	**Student Name**	**Individual Grade**	