

**BT2102 Data Management and Visualisation**

**Assignment 1 (Group):  
IRS Database Design**

**Total marks: 20**

**BACKGROUND INFORMATION**

A locker rental company in Singapore has seen an increase in the number of renters (those who rent a locker from the company) recently. In order to streamline and quicken the rental process and to reduce the workload of the staff, the company management has decided to incorporate a new **Integrated Rental System**. A database system (named “IRS”) is needed urgently to manage its locker rental operations efficiently and effectively.

**PROBLEM DOMAIN INFORMATION**

The following are descriptions of entities of interest in the problem domain.

**Company Members**

Information gathered includes: **name** (title, first name, middle name, last name), **address** (street address, suburb, city, country, postal code), **NRIC**, email address, telephone number, date of birth, date of registration and active status (whether the member is active or not: an inactive member is one who has not rent a locker or made a reservation in the last 1 year).

**Locker**

The company offers **two categories of lockers**. The “Short-Term Rental category” refers to lockers that could be rented by member for a short period (less than three months). The “Long-Term Rental category” refers to lockers that could be rented by member over a long period of time (greater or equal to three months). **All lockers are housed inside warehouses**. The company has **ten warehouses located at different places on the island**.

The **details of the lockers include locker ID, warehouse ID, locker name, warehouse address, warehouse sector, locker category, and locker size**. Locker ID is the unique number that identifies every locker owned by the company. To help renter quickly locate a locker within a warehouse, each warehouse is divided into five sectors each identified by a letter (‘A’ – ‘E’). Each locker in a warehouse is given a name which is the combination of the sector and an integer (e.g., ‘A14’, ‘E23’). Finally, **sector ‘A’, ‘B’, and ‘C’ houses the “Short-Term Rental category” lockers, while sector ‘D’ and ‘E’ houses the “Long-Term Rental category” lockers**. Locker size is recorded as its dimension (i.e., length, width, and height).

**Reservations**

To improve rental performance, the company plans to launch an online reservation service which allows members to **reserve a locker for up to 30 days in advance**. **Only lockers in “Short-Term Rental category” can be reserved**. To reserve a locker, the member **needs to first select a warehouse and period of rental (start date and end date)**. The member can only reserve a locker that is not being rented or reserved for the selected period of time.

**Rentals**

If a locker is not currently being rented and reserved, any member could rent the locker. **A rental contract would be signed which specifies the member, locker, warehouse, start date, end date, rental fee, and security deposit**. Rental fee must be paid upon signing the contract along with the collection of security deposit. In addition, the company **allows members to extend rental contract**

end date, if there are no reservations for the respective locker by other members. In any case, the extension of rental to a “Short-Term Rental category” locker cannot exceed three months, while the extension of rental to a “Long-Term Rental category” locker must be longer than three months.

### **Fines**

The company charges a fine of \$1 per locker per day if the member fails to return a locker on the end date specified on the rental contract. If the member has any unpaid fines, the member is not allowed to make any further rental or reservations as well as any current reservations will automatically be cancelled by the system. As a result, the system needs to identify the fines associated with each member and whether the fines are paid. Fine details include fine amount and fine creation date.

### **Payments**

The acceptable payment mode includes credit card and online payment. If the member is associated with multiple fines, the member can settle all the fines in a single payment. Once all fines are settled, the security deposit will be returned to the member. However, fines and security deposit should be handled as separate payments. The database should record the payment date and time, payment amount, card type, card number, card holder name, and expiry date of the card.

## **WHAT YOU ARE REQUIRED TO DO?**

1. Develop a conceptual data model using the **entity-relationship modelling approach** for the IRS database. It should capture the entities, relationships, attributes, and keys of the model. For each relationship, consider the multiplicity constraint and show the optionality and cardinality attributes of this constraint. The steps to produce the conceptual data model include:
  - a. Identify entities and attributes
  - b. Identify relationships and their attributes
  - c. Determine cardinality of relationships
2. Develop a logical data model based on the conceptual data model created in step 1 to produce a relational schema suitable for implementation in a MySQL database management system. Refine the schema by normalization, or combining schemas where possible. The steps to produce the logical data model include:
  - a. Create relational schema for strong entities
  - b. Create relational schema for relationships
  - c. Refine relational schema
  - d. Produce the final relational schema
3. State all assumptions and design decisions.

## **EVALUATION**

1. You are required to make a PowerPoint presentation of the **process** (i.e. the steps involved as indicated above) to produce the conceptual data model and logical data model.
2. Name the file as “GRP\_XX\_AS1.pptx” (for example, file name for group 9 is “GRP\_09\_AS1.pptx” and for group 19 is “GRP\_19\_AS1.pptx”). Upload the file to “Assignment 1 Submission” folder in LumiNUS Files by the assignment due date.
3. There is no requirement for your group to make a presentation of the assignment.
4. Please be reminded that plagiarism is a serious offence. Disciplinary actions will be taken against those caught cheating.