SCHOOL OF
COMPUTER AND SECURITY SCIENCE

AUSTRALIA ECU EDITH COWAN UNIVERSITY

CSG1207/CSI5135: Systems and Database Design
Workshop 03

Background

Entity relationship modelling allows us to design and model a database in a visual manner. ER diagrams consist of entities, the relationships between them (1:1, 1:M, M:M) and the attributes of those relationships. Other aspects of ER modelling, such as cardinality, allow us to depict more detail and information in diagrams.

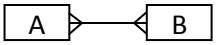
An ER diagram can be created from a problem statement, or from a normalised set of relations. Both normalisation and ER modelling are database design methods/techniques – they allow us to design and model the structure of a database and ensure that it conforms to the principles of relational databases. An entity in a physical ER diagram corresponds to a normalised relation, and vice versa. As we will explore in upcoming weeks, they also correspond to actual tables in an implemented database.

Task 1

Answer the following review questions:

1. Briefly describe the following components/concepts of ER modelling, and how they relate to each other: Entity, Relationship, Attribute.

2. Describe the process of resolving a M:M relationship, using the following as an example:

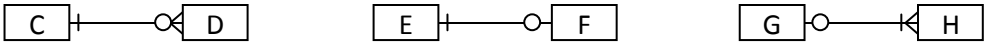


3. What are the differences between logical and physical ER diagrams, and why do these differences exist?

4. Using an example, explain why 1:1 relationships are uncommon in databases.

5. What are the pros and cons of including names for relationships between entities?

6. Describe the information presented in the following three examples:



Task 2

Create physical ER diagrams for the normalised relations (3NF) from Task 3 of the second workshop (which were drawn from Tasks 2, 3 and 4 of the first workshop). If you have not completed the first or second workshop, do them now or use the solutions provided.

State any assumptions you make that influence your diagrams.

Task 3

Create a physical ER diagram from the following set of normalised relations:

Player (Username, Password, DoB, Real Name, Hobbies**)**
Game (Game ID, Name, Description**)**
Play (Play#, *Game ID*, Start Time, Duration, *Winner***)**
Play Player (*Play#*, *Username*)

You have the following information about the scenario:

> *The database is for an online board game website. There is a record in the Play entity for each game that is started, and a record is added to the Play Player entity when a Player joins a game that has been started. The Winner foreign key in the Play entity refers to a Username in the Player entity.*

Task 4

Create a logical ER diagram for the following problem description, and then convert it to a physical ER diagram. Remember to include cardinality on all relationships. State any assumptions you make that influence your diagrams.

> *I run a small computer consultancy firm with a number of employees. As well as basic information about the employees (name, DoB, contact details, etc) I need to be able to keep track of what type of role they are able to perform, such as Hardware Technician, Programmer, Software Installer. Most employees can perform multiple roles, and each role has an associated hourly pay.*
>
> *I need to keep name and contact details of any customers that have a contract with us. A customer can have multiple contracts at the same time, but each contract is only associated with one customer. Each contract has a name, a description, a starting date, and a job type – e.g. System Development, Software Upgrade. No details of job types need to be stored other than their name – it simply makes searching easier. Each contract also has a single employee designated as the project leader. One employee may be the project leader of multiple contracts.*

As an additional challenge, try to incorporate the following into your ER diagrams. This can be implemented in a number of ways.

> *I need to be able to record the work done by each employee on each contract. The database must record the employee who did work, the contract it was performed on, the date it was performed on, and the hours of work performed. To determine pay, the role which the employee was performing must also be recorded.*

Task 5

In this week's lecture, we created an ER diagram for the following problem statement:

> *In a given housing unit at any one time, there may be a given number of tenants. Each of these tenants owns specific appliances, however it is possible for certain appliances to be jointly owned by two or more tenants.*
>
> *The strata company requires a database that will allow tenants to track which appliances they have ownership of, and their value, to allow the fair distribution of property when a unit is vacated. At the moment, each tenant fills out a form with his or her driver's licence details along with the serial number, brand, description and cost of any appliance they own.*

The solution we arrived at was based on these three assumptions:

- A tenant will only ever live in one unit
- Ownership of the unit is NOT important/relevant
- Every tenant has a driver's license (as an identifying field)

Attempt to create a physical ER diagram which does *not* make these assumptions. That is, the database must account for a tenant living in more than one unit, each unit has an owner (who is a tenant), and not all tenants have a driver's license.

State any assumptions or decisions you have made in order to incorporate these elements.