Databases and Information Retrieval (SIT103)
Tutorial 2 - Database Designing

Objectives

At the end of this tutorial you should be able to:

- understand and explain the concepts of conceptual modelling of databases; in particular, the use of Entity-Relationship (ER) models to capture the data aspects of real-world situations
- describe data relationships
- define cardinality and use cardinality notation
- draw Entity Relationship Diagrams (ERD) based on the requirements provided.

Introduction

Every organization has some information needs. For an example, library keeps information about members, books, loans, authors and publishers. A company needs to save information about employees, departments, work flows and salaries. These piece of facts we call as *data*.

Organisation can keep data in various media and they can be stored in different formats. A *database* is a collection of organised data and relationships.

To manage the database, we use a software called Database Management System (DBMS). DBMS is a program that stores, retrieves and modifies data in the database on request. There are four main types of databases e.g. *hierarchical*, *network*, *relational* and *object relational*.
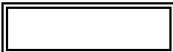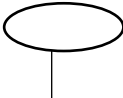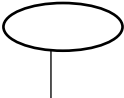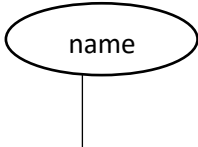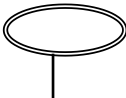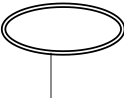
Today we are going to learn how to design a database and how to map into the relational model.

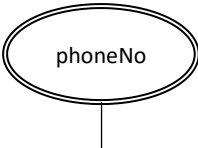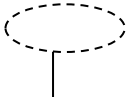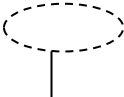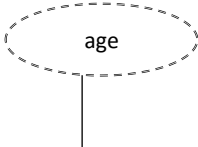Before developing any object, there is a plan e.g. house – house plan, Plain – Plain model and etc. However, in each modelling we follow typical symbols and rules and they enable anyone to understand if they have similar knowledge in the domain. Similarly, as students we who learn databases should be able to design the database before developing the database.

In that journey, the first step is to identifying symbols of entities, attributes and relationships.

Entity Relationship Diagram (ERD)

There are well-known ERD notations as Chen's notations and Crow's Foot Notation (What we follow in the unit). Following table shows how the notations for both modelling types.

Items	Chen's Notations	Crow's Notations	Examples
Entity			Student
			Customer
Week Entity			Dependant
			Dependant
Attribute			name
Multivalued Attribute			phoneNo
Derived Attributes			age

Identifying Relationship
 With a weak entity

A — ◇ ◀ B
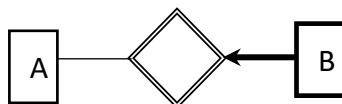
B is the weak entity and without A B will not survive.

A — ◇ ◀ B
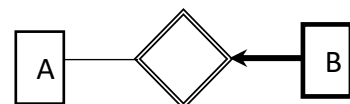
or

———+———
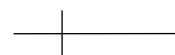
Multiplicity of one, Mandatory

| Attribute –Key Attribute | name | name | name |

| Attribute Partial Key Attribute | name | name | name |
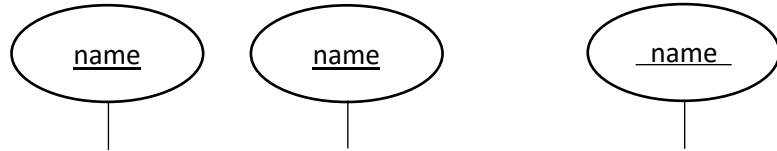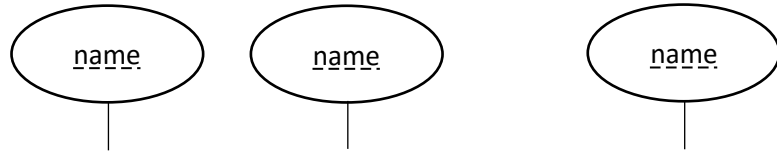
Underlined using a dashed line

| Relationships – General | ◇ | | enrol |

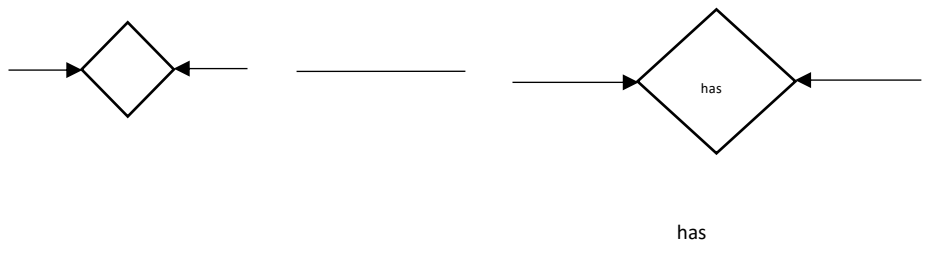enrol

| Relationships Associative | | | enrol |

An entity used in a many-to-many
relationship (represents an extra table).
All relationships for the associative entity should be many

| Cardinality – One to One
Arrow is pointing to the
One side.
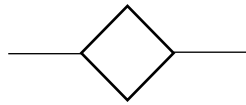Can also mention as (1:1) | →◇← | | has |

has

| Cardinality – One to Many

Arrow is pointing to the
One side.
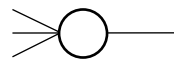Can also mention as (1:M) | →◇— | ⟩— |

Cardinality – Many to Many

Can also mention
as(N:M)

Cardinality

Multiplicity of Many
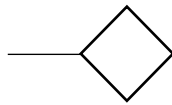
Optional
(zero, or one or many)

Cardinality

Multiplicity of many

A

B
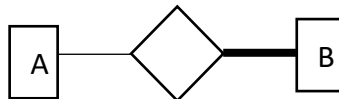
 Multiplicity M:N
The dark thick line shows that the
entity B strongly attached (A is
mandatory for B) to entity A.

Mandatory (One or many)

Cardinality

Multiplicity 1:M

A

B

optional

Multiplicity of one

optional (zero, or one)

Cardinality

Multiplicity 1:M

A

B

mandatory

Multiplicity of one

mandatory (one and only one)

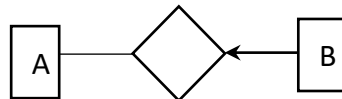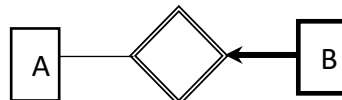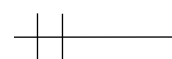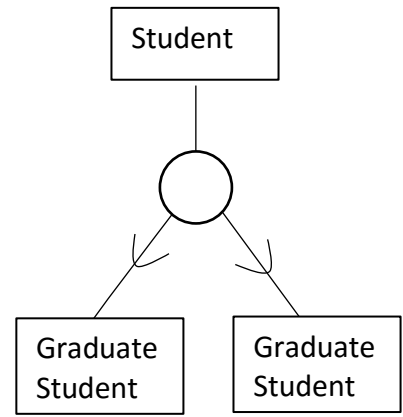Inheritance

```
        ┌─────────┐                              ┌─────────┐
        │ Student │                              │ Student │
        └────┬────┘                              └────┬────┘
             │                                        │
            ╱ ╲                                       ○
           ╱ISA╲                                     ╱ ╲
          ╱─────╲                                   ╱   ╲
         ╱       ╲                                  ↙     ↘
   ┌──────────┐ ┌──────────┐              ┌──────────┐ ┌──────────┐
   │ Graduate │ │ Graduate │              │ Graduate │ │ Graduate │
   │ Student  │ │ Student  │              │ Student  │ │ Student  │
   └──────────┘ └──────────┘              └──────────┘ └──────────┘
```
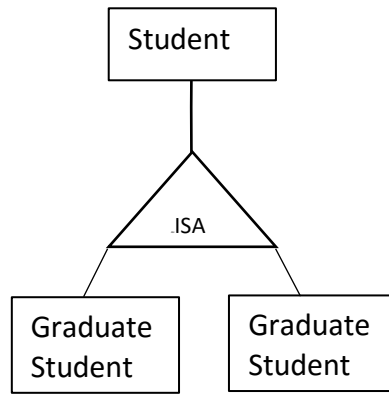
Sample ERD Diagram – Uses Crow's Foot Notations
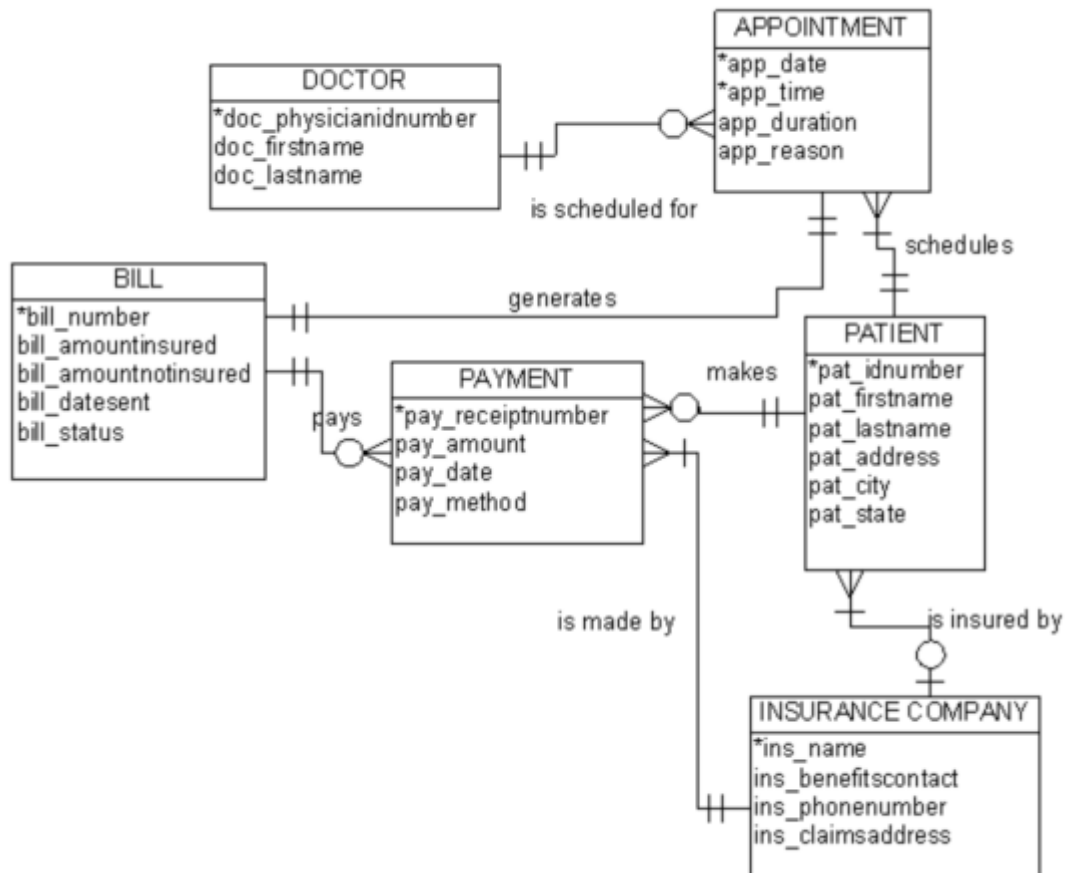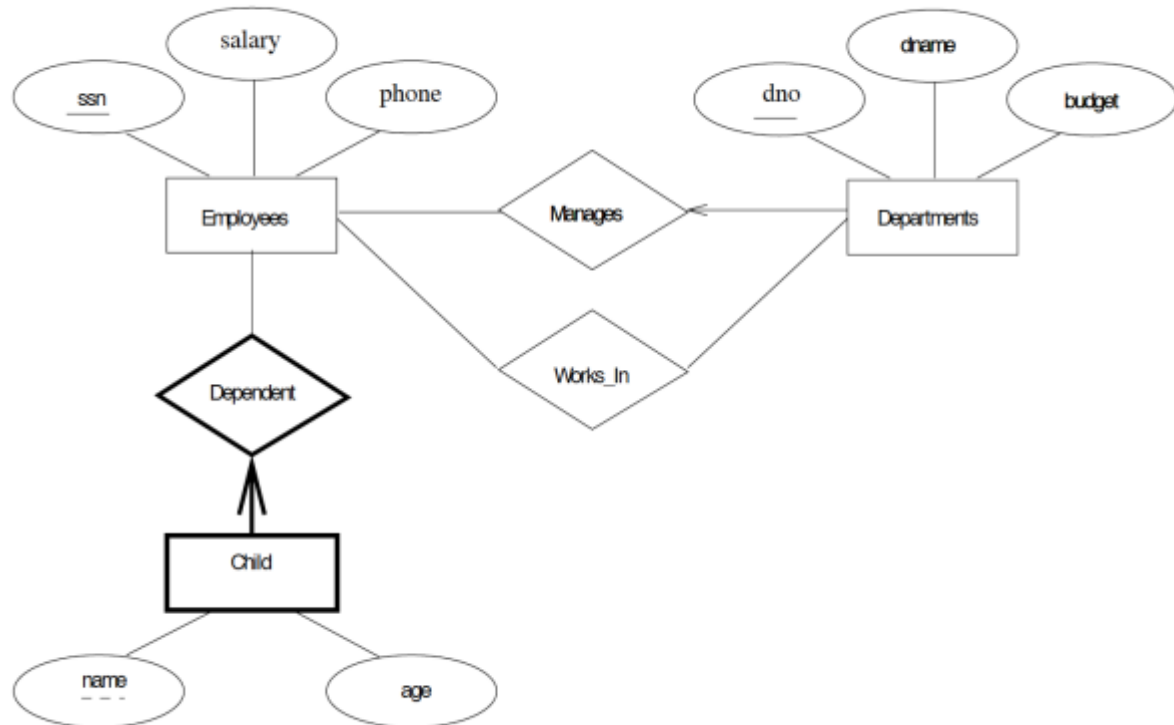
Sample ERD Diagram – Uses Chen's Notations

Tools

➢ Microsoft Visio 2013 – This is installed in all the machines in Deakin College labs. Check with Deakin university library whether you could obtain a free account for "Dreampark" where Microsoft has all their software are stored and shared. (*Check this with your Deakin College Librarian*)

➢ www.draw.io - This is an online tool and provide you with basic drawing options.

➢ Microsoft Word - This is installed in all the machines in Deakin College labs. And you can download for free MS Word 365 from the Dakin University website (www.deakin.edu.au/software)-

➢ https://my.vertabelo.com/model/BgMJr54PQM3AMVbRRBOp8nKS45VpC7sV - (online tool)

Please try the activities given in the page and if you have any questions talk to your Lecturer to clarify it.