UNIVERSITY OF WESTMINSTER

5COSC020W DATABASE SYSTEMS

2022-2023 Tutorial 01

Conceptual Database Design – Entity-Relationship Modelling

MODEL ANSWER

Tutorial 01 Exercise 01

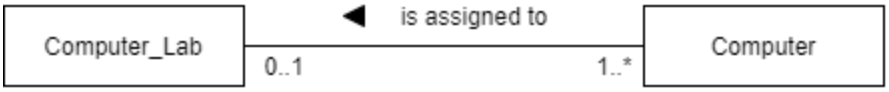
For each of the conceptual Entity Relationship Diagrams (ERDs) below, explain in detail the multiplicities (i.e. participation and cardinality) by **writing 4 separate statements** to explain the 4 digits on both sides of the relationships. For every statement, also give an example to support the produced statement.

Model Answer

This exercise aims to develop the students' understanding of multiplicity i.e. cardinality and participation.
Ask the students to go through the Lecture 01 slides on Blackboard and/or view the Panopto video and clarify what these concepts are.

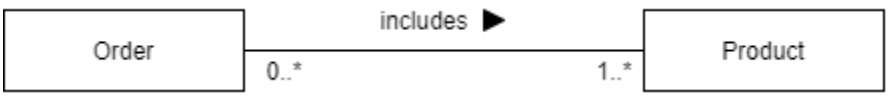
- Multiplicity: number (or range) of possible occurrences of an entity type that may relate to a single occurrence of an associated entity type through a particular relationship
- Cardinality: describes maximum number of possible relationship occurrences for an entity participating in a given relationship type.
- Participation: determines whether all or only some entity occurrences participate in a relationship.

Question 1.1.



- One computer lab has at least one computer. One computer lab needs to contain at least one computer to be classified as a computer lab; otherwise, it would not be considered to be a computer lab, it would merely be a standard classroom
- One computer lab may have many computers. A computer needs to accommodate many students and therefore should have many computers that can be used by the students to work in the lab.
- One computer may not be assigned to a computer lab. This may be that this a brand-new computer and it has not been assigned to a lab yet. Or it may be that this a malfunctioning computer and it is not temporally assigned to a lab as it is away for maintenance.
- One computer can only be assigned to up to one computer lab. It is not possible for a computer to be assigned to several labs as a computer cannot be physically shared between several locations.

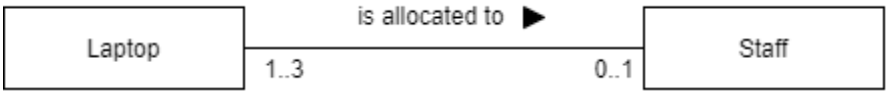
Question 1.2.



- One order includes at least one product. An order needs to have at least one product on it for it to be considered an order, otherwise it is simply not an order.
- One order can include many products. An order may include several products that are being purchased at the same time i.e. as part of the same order.
- One product may not be included in any orders at all. It is possible for a product not to appear on any orders. This may be as this a brand-new product that has not been ordered by anyone yet or this might be that this is a very unpopular product that no one wants to purchase.

- One product can appear on many orders. A generic product may be a very popular product and therefore is being purchased by many different people who all add it on their orders.

Question 1.3.



- One member of staff is allocated (i.e. given) at least one laptop computer. It is perhaps a business rule of the company. In this firm, every member of staff needs to be given at least one laptop to do their work.
- One member of staff can be allocated up to 3 laptops. Particular members of staff may need to use separate laptops for separate projects for security reasons. Or they may need to use different laptops with different Operating Systems for their work. In any case, the maximum number of laptops they can be given is 3.
- One laptop may not be allocated to anyone in particular. It might be that this is a new computer and that therefore it has not been allocated to any member of staff or it might be that this computer is currently in storage and not assigned to anyone.
- One laptop can be allocated to up to one member of staff. It is not possible for a laptop to appear against the name of several employees i.e. shared by many employees.

Question 1.4.

- One employee may not be assigned any company car. An employee may not need a company car as part of their jobs.
- One employee may be assigned up to one car. It might be a business rule: it is not possible for an employee to be assigned more than one company car for their corporate usage.
- One car may not be assigned to any employees. It may be a brand new company car that has not be assigned to any employees yet, or it might be a vehicle that us currently being serviced, or simply a vehicle that is not currently being used by any members of staff.
- One car can be assigned to a maximum of two employees. This means that a company car can be given to up to 2 employees in the sense that if the car is shared between 2 employees. In this case, both their names need to appear against this car on the system. However, not more than 2 people for one car.

Tutorial 01 Exercise 02

Create a basic conceptual ERD for each of the following descriptions. Make sure you include the entity names, relationship names, reading directions and multiplicities (i.e., participation and cardinality).

To create a diagram for each description:

- Access draw.io on https://www.diagrams.net/, click ‘Start’ and ‘Create New Diagram’
- Create an ERD for each description below.
- Export your ERD as a PNG and copy and paste it underneath each description.

Model Answer

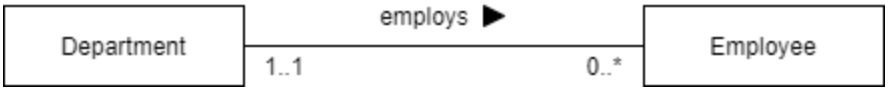
This exercise aims to engage the students with the design of simple ERDs.

Description 2.1.

Each company operates four departments, and each department belongs to one company.

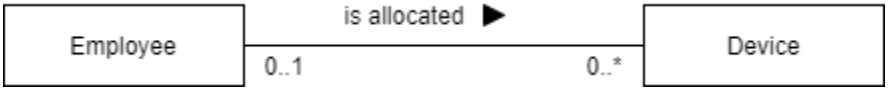
Description 2.2.

Each department in part 2.1. employs one or more employees, and each employee works for one department.



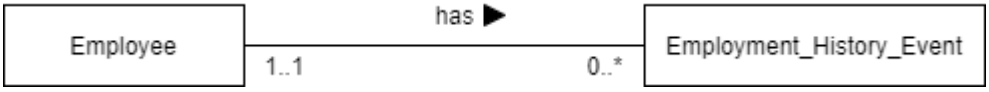
Description 2.3.

Each of the employees in part 2.2. may or may not be allocated one or more devices, and each device may or may not be allocated to an employee.



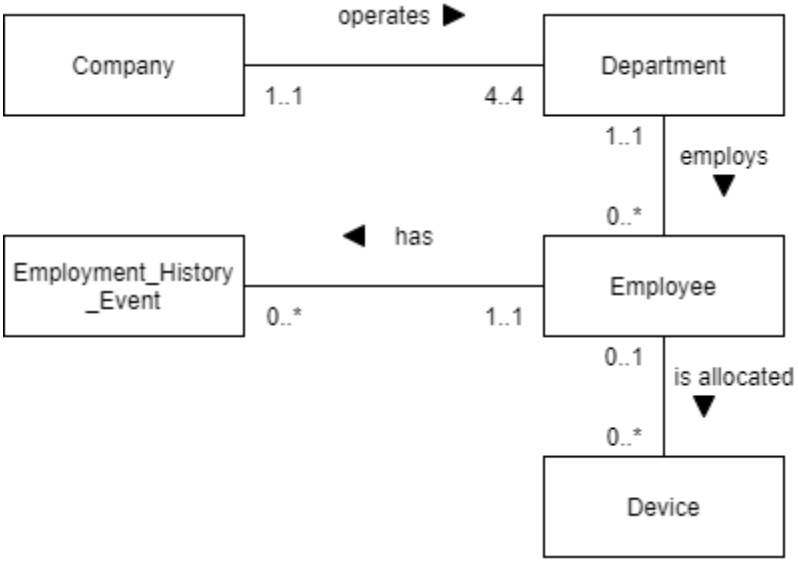
Description 2.4.

Each employee in part 2.3. may or may not have employment history events.



Description 2.5.

Represent all the conceptual ERDs described in 2.1., 2.2., 2.3, and 2.4. as a single conceptual ERD.



Tutorial 01 Exercise 03

Create a basic conceptual ERD for the following scenario. Include entities, attributes, primary keys, relationships and multiplicities.

STUFFY is an online retailer that sells a large number of products to the general public. Customers can view the products on offer, select a specific product and view the product details such as description and price. Then, customers can place an order for several products and repeat this process until they decide to finalise their order and check out. Subsequently, shipments need to be organised so that the correct items of the ordered products are sent to the right customer.

To create a diagram:

- Access draw.io on https://www.diagrams.net/, click 'Start' and 'Create New Diagram'
- Create an ERD based on the scenario above.

- Export your ERD as a PNG and copy and paste it below.

Model Answer

This exercise aims to engage the students with the design of a simple ERD from scratch.
See possible model answer below.