Entities, Entity Types, and Attributes

Topics List

- Concepts of the ER Model
- Entities and Entity types
- Attributes
- Types of Attributes
- Keys

Concepts of the ER Model

- Entities and Entity types
- Relationships and Relationship types
- Attributes

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Entities and Entity types

- **Entities** are instances of people, places, things, or events that are of interest to us. For example, a customer who has placed an order.

- An **Entity type** defines a collection or set of entities that have the same properties (attributes). For example, *Customer* entity type.

- Entity types are named after the entities that belong to the set of interest. It is a common convention that the names of Entity types are singular and that, at least, the first letter is capitalised.

Entities and Entity types

- Examples,
  - An entity type named *Student* defines a collection of student entities.
  - An entity type named *Invoice* defines a collection of invoice entities.
  - An entity type named *Product* defines a collection of product entities.

Entities and Entity types

- We represent an entity type by drawing a rectangular shaped box with the name of the entity type at the top (with a line underneath).

Entities and Entity types

- Some entity types are physical while others are conceptual.

Physical existence	
Staff	Part
Property	Supplier
Customer	Product
Conceptual existence	
Viewing	Sale
Inspection	Work experience

Entities and Entity types

What Should an Entity Type Be?

- Should be:
  - An object that will have many instances in the database.
  - An object that will be composed of multiple attributes.
  - An object that we are trying to model.

- Should not be:
  - A user of the database.
  - An output of the database system (e.g. a report).

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Attributes

- Attributes are the characteristics that describe entity and relationship types.

- For example, a Student entity may be described by attributes including: student number, name, address, date of birth, course, year, etc...

- Whereas an Invoice entity may be described by attributes including: invoice number, invoice date, etc…

Attributes

Attribute Domain

- There exists a domain or range of values that can be assigned to attributes (***Attribute Domain)***.

- Examples:
  - A student's name cannot be a numeric value. It must be alphabetic.
  - A student's age cannot be negative.
  - An exam mark must be numeric and in the range 0 – 100 (assuming no negative marking).

Attributes

Naming Convention

- A common convention for naming attributes is to use singular nouns. A naming convention may require one of the following:
  - All characters are in upper case.
  - All characters are in lower case.
  - Only the first character is in upper case.
  - Each part of a multipart name has the first character capitalised.

Attributes

Naming Convention

- Another convention is for attribute names to have a prefix that indicates the entity the attribute describes. Subsequent characters are sufficiently descriptive to identify the attribute. Some examples of attribute names:
  - empLname = employee last name.
  - stuGpa = student grade point average.
  - prodCode = product code.
  - invNum = invoice number.

Attributes

Naming Convention and Representation

- In practice a naming convention is important, and you should expect the organisation you are working for to have a standard approach for naming things appearing in a model.

- We represent attributes by placing them with the entity type underneath the name (of the entity type).

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Attributes

Types of Attributes

- **Simple or Atomic Attribute**: An attribute composed of a single component with an independent existence. Simple or atomic attributes cannot be broken down further or subdivided.

- For Example: *PPS Number* of an employee, as it cannot be subdivided.

Attributes

Types of Attributes

- **Composite Attribute**: An attribute is considered composite if it comprises two or more other attributes.

- For Example: *Name* which can be divided into *first name*, *last name* and/or *middle initial/name*.

- **Question**
  - *Can you name any other attributes that can be divided (decomposed) further?*

Attributes

Types of Attributes

- **Single-valued Attribute**: An attribute is considered single-valued if there is at most one value associated with it at any one point in time.

- For Example: *Date of Birth* as each person has one Date of Birth.

- **Multi-valued Attribute**: An attribute is considered multi-valued if there can be many values associated with it at any one point in time.

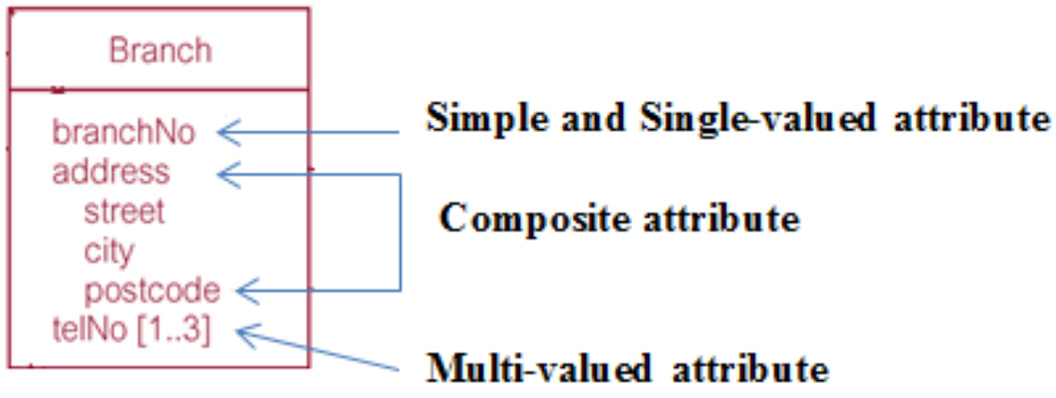
- For Example: *Phone Number* where a person might have more than one occurrence.

Attributes

Types of Attributes

- **Derived Attribute**: An attribute that represents a value that is derivable from the value of a related attribute, or set of attributes, not necessarily in the same entity type.

- For Example: *Age* can be derived from the attribute *Date of Birth.*



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Keys

- A database is used to store data for retrieval. An attribute that may be used to find a particular entity occurrence is called a **key**.

- An attribute is a **key** if values of the attribute uniquely identify instances of a corresponding entity set. A key is an attribute or collection of attributes that uniquely identifies an entity occurrence.

- For example, the *studentId* value for each student makes him/her identifiable among students.

Keys

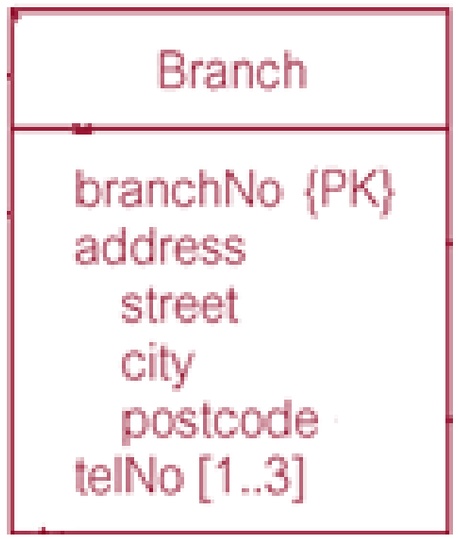
- **Candidate Key** − An attribute or minimal set of attributes that uniquely identifies an entity. An entity type may have more than one candidate key. A candidate key is a key that contains only the minimum number of attributes necessary for unique identification of each entity occurrence.

- **Primary Key** − A primary key is one of the candidate keys chosen by the database designer to uniquely identify the entity type.

- ***Alternate key***: The candidate keys that are not selected as the primary key of the entity.

Keys

- This example shows a Entity type *Branch*, with *branchNo* chosen as the primary key.



- To denote the primary key value, add the following beside the chosen attribute(s) **{PK}**

Keys

- **Exercise**
  - Write down 5 or more attributes for a Book entity type. Select candidate keys from the set of attributes and then choose a primary key field.