

Basic concepts

An entity is a thing capable of an existence. An entity usually refers to some aspect of the real world, which can be distinguished from other aspects of the real world (a person, place, customer transaction, order, etc.).

An entity is represented by a box shape on the diagram. An entity has two compartments where properties (columns) of the entity can be specified. The upper compartment holds the primary key properties of the entity; the lower compartment holds other properties.

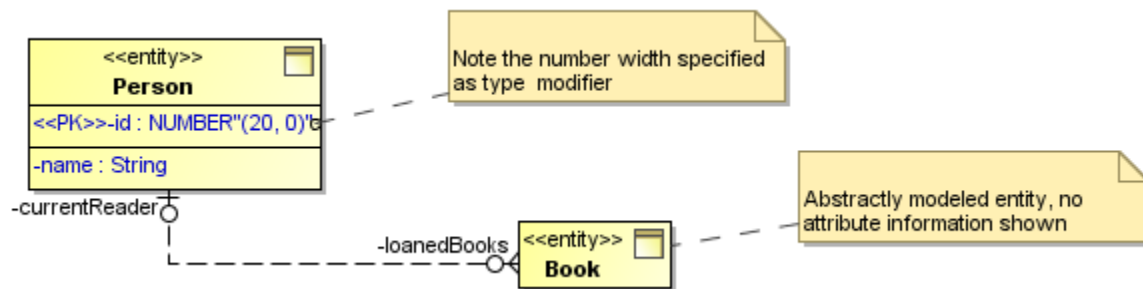
A relationship between entities describes how entities are associated. Relationships are represented by lines, connecting entities. Relationship end adornments indicate multiplicities of these ends. Multiplicity is the number of entity instances that can be associated with a number of another entity instances. Relationship multiplicity is represented by three symbols, the so-called “crow's foot notation” or “Information Engineering notation”.

The following table shows symbols of the relationship multiplicity.

Name	Value	Notation
Zero	Zero	○
Vertical	One	
Crow's foot	Many	<

Multiplicity lower bounds and upper bounds are paired into one adornment, as shown in the following table. Note that any lower bound, which is more than 0 is treated as 1 (this also includes lower bounds greater than 1, such as 2.). Also, any upper bound which is greater than 1 is treated as Many (this also includes upper bounds less than unlimited, such as 7.).

Min	Max	Read as	Figure
0	1	One (optional)	○—
1	1	One (mandatory)	
0	Many	Many (optional)	○—<
1	Many	Many (mandatory)	<



Basic ER diagram example.



Note

- Some authors use **Entity Type** term to signify the description of a set of entities and **Entity Instance** term to signify concrete exemplar from that set. **Entity** term used in this manual corresponds to **Entity Type**.
- Data modeling world frequently uses term **Cardinality** to denote the allowable numbers of entity instances, which can be associated. But with the rise of the UML, the more correct term **Multiplicity** was introduced and term **Cardinality** is only used to denote concrete numbers of entity instances, which are associated. Hence in the example Person [0..1]-----
- [0..*] Book, the ranges [0..1] and [0..*] are called multiplicities. And if we have person “John Doe” associated with books “Moby Dick” and “Origin of Species”, we have a cardinality of 2 for loaned books role (and 1 on an opposite end - current reader role). Note that cardinality is always concrete number while multiplicity denotes range of possible cardinalities.