Overview of the (E)ER Model Notation


Basic Notation Elements

**Entity types** are the units of information represented by a database.  
*Example: A database stores information about customers and products.*

**Relationship types** describe relationships between entities.  
*Example: Customers buy products.*

**Attributes** represent properties of entities or relationships.  
*Example: A customer has a name.*

**Primary Keys (Key Attributes)** are attributes that uniquely identify an entity of an entity type.  
*Example: The customer ID uniquely identifies each customer.*

**Optional Attributes** represent properties of entities or relationships that may exist, but don’t need to.  
*Example: A customer may specify his phone number, but he doesn’t have to.*

**Multi-Value Attributes** may be specified multiple times.  
*Example: A customer is able to have multiple phone numbers.*

**Structured Attributes** consist of multiple sub-attributes.  
*Example: The customer address consists of street, zip code and city.*

**Derived Attributes** can be derived from other attributes.  
*Example: The retail price of a product is calculated from the net price and additional taxes.*
Depending or Weak Entities are functionally determined by another entity. The dependent entity type doesn’t have any attributes that may be used to uniquely identify an entity of this type. A primary key, or respectively a set of attributes forming one, always consists of the key attributes of the entity type it depends on, too.

Example: A vintage always belongs to a wine, since it has a specific residual sweetness. If the wine doesn’t exists, the vintage doesn’t exist, either. But, since there are multiple wines with a vintage in the same year, only the combination of wine name and vintage year are able to uniquely identify a vintage.

IS-Relationships, also called specialization-/generalization-relationships, semantically correspond to injective functional relationships.

Example: A sparkling wine is a special wine. Through this definition the sparkling wine inherits the attributes name and color of a wine.

Cardinalities

Cardinalities describe, how often entities of an entity type may have a relation to another entity.

Example: A specific product is delivered by a specific supplier. Therefore, each product has a relationship to exactly one supplier. On the other hand, a supplier may offer multiple or no products at all. In the course of this, a supplier can have a relationship with multiple products.

\([\text{min}, \text{max}]\) notation: Minimal and maximum quantity is specified.
Alternative representation: *Note the “reversed” assignment of the cardinalities!*

Enhanced/Extended Notation Elements

**Specialization**

**Partitioning**

**Total Partitioning**

**Multiple Specialization**

**Generalization**

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