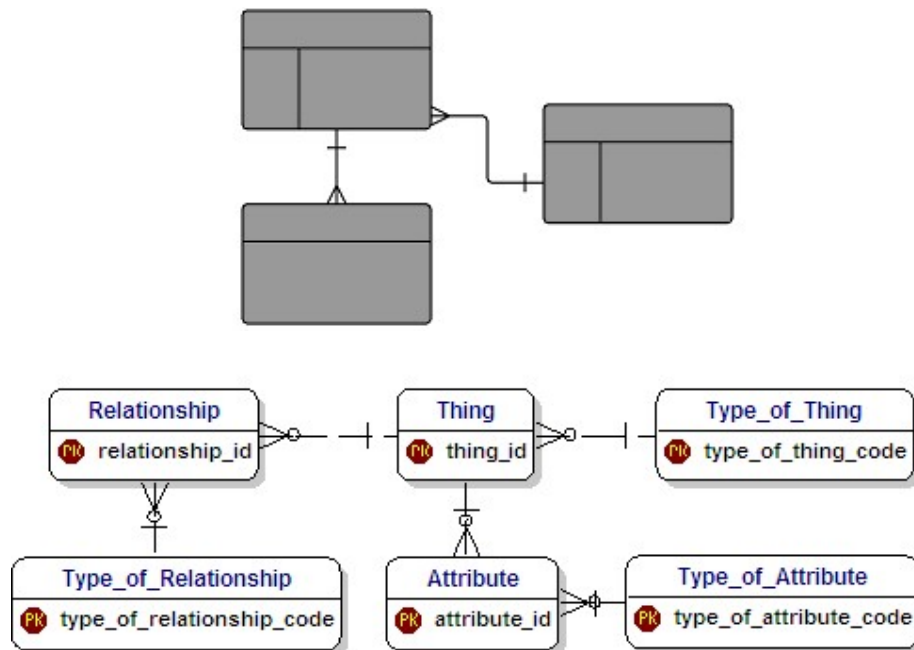# ER Diagram Symbols and Meaning

It's easy to properly represent database structure when you have the correct symbols. If you get confused while creating your entity-relationship diagram, simply consult the below sections —it will get you back on the right track. 😊

Data Models

Before we look at specific symbols, it's important to understand the various levels of ERDs. There are several ways to model entity-relationship diagrams. The most high-level type is a **conceptual data model**; the next highest is the **logical data model**, and the lowest-level (and therefore most detailed) type is the **physical data model**.

Feature	Conceptual	Logical	Physical
Entity names	X	X	
Entity relationships	X	X	
Attributes		X	
Primary keys		X	X
Foreign keys		X	X
Table names			X
Column names			X
Column data types			X

CONCEPTUAL DATA MODEL

This ER model establishes a broad view of what should be included in the model set. Conceptual data models:

- Include important entities and the relationship between them.
- Do not specify attributes.
- Do not specify primary keys.

Conceptual ERDs can be used as the foundation for logical data models. They may also be used to form commonality relationships between ER models as a basis for data model integration.

LOGICAL DATA MODEL

This model contains more detail than the conceptual ER model, without regard to how information will be physically implemented in the database. Logical data models:

- Include all entities and relationships between them.
- Specify attributes for each entity.
- Specify primary key for each entity.
- Specify foreign keys, which identify the relationship between different entities.
- Involve normalization, which is the process of removing redundancy in a table so that the table is easier to modify. Normalization typically occurs by dividing an entity table into two or more tables and defining relationships between the tables.

PHYSICAL DATA MODEL

The physical data model represents the process of adding information to the database. This model shows all table structures, including column name, column data type, column constraints, primary key, foreign key, and relationships between tables. Physical data models:

- Specify all tables and columns.
- Include foreign keys to identify relationships between tables.
- May include demoralization, depending on user requirements.
- May be significantly differing from the logical data model.
- Will differ depending on which DBMS (database management system) is used.

Conceptual ERD Symbols

These symbols are generally used for conceptual data models, although some aspects may spill over into logical data models. They can be found in the UML Entity Relationship and Entity Relationship shape library of lucid charts.

ENTITIES

Entities are objects or concepts that represent important data. They are typically nouns, e.g. Customer, Supervisor, Location, Promotion etc.

- **Strong entities** exist independently from other entity types. They always possess one or more attributes that uniquely distinguish each occurrence of the entity.
- **Weak entities** depend on some other entity type. They don't possess unique attributes (also known as a primary key) and have no meaning in the diagram without depending on another entity. This other entity is known as the owner.

- **Associative entities** are entities that associate the instances of one or more entity types. They also contain attributes that are unique to the relationship between those entity instances.
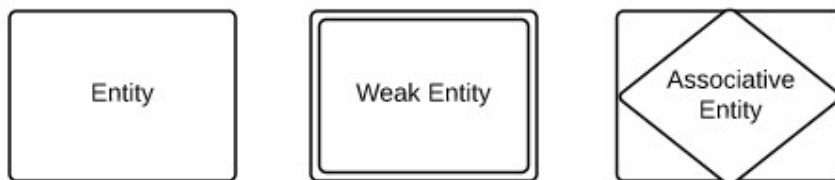
RELATIONSHIPS

- Relationships are meaningful associations between or among entities. They are usually verbs, e.g. assign, associate, or track. A relationship provides useful information that could not be discerned with just the entity types.
- Weak relationships or identifying relationships are connections that exist between a weak entity type and its owner.
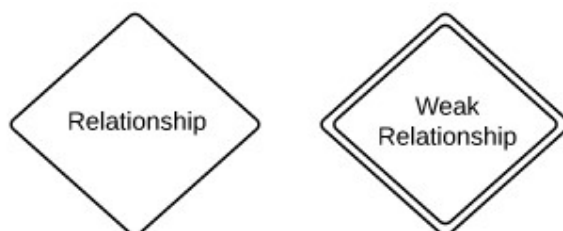
ATTRIBUTES

- **Attributes** are characteristics of an entity, a many-to-many relationship, or a one-to-one relationship.
- **Multivalued** attributes are those that are capable of taking on more than one value.
- **Derived** attributes are attributes whose value can be calculated from related attribute values.

Physical ERD Symbols

The symbols below are used at the most granular level of ERDs: physical data models, although some elements are also used for logical data models.

- Tables are another way of representing entities.
- Fields represent attributes of the entity.
- Keys are one way to categorize attributes. A primary key is an attribute or combination of attributes that uniquely identifies one and only one instance of an entity. The primary key becomes a foreign key in any entity type to which it's related through a one-to-one or one-to-many relationship.
- Types may refer to the type of data associated with the corresponding field in a table. Types can also refer to entity types, which describe the structure of an entity; e.g., a book's entity types are author, title, and published date.

Entity
Field
Field
Field

Entity	
Key	Field
Key	Field
Key	Field

Entity	
Field	Type
Field	Type
Field	Type

Entity		
Key	Field	Type
Key	Field	Type
Key	Field	Type

ERD Notation

- Relationships illustrate an association between two tables. In the physical data model, relationships are represented by stylized lines.
- Cardinality and ordinality, respectively, refer to the maximum number of times an instance in one entity can be associated with instances in the related entity, and the minimum number of times an instance in one entity can be associated with an instance in the related entity. Cardinality and ordinalityare represented by the styling of a line and its endpoint, as denoted by the chosen notation style.

One

Many

One (and only one)

Zero or one

One or many

Zero or many