

# The Entity Relationship Model

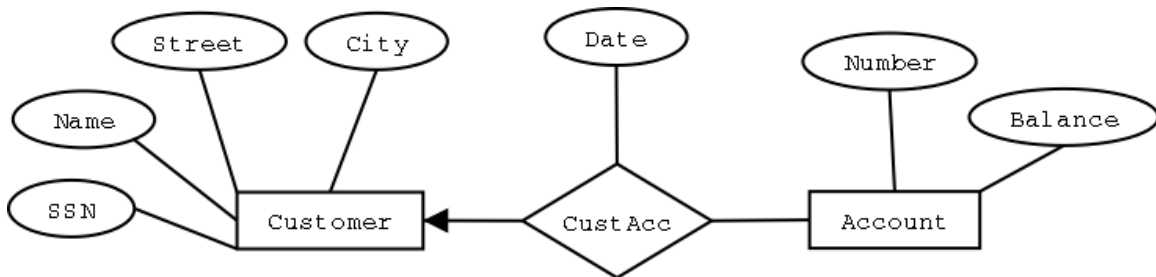
## Entity Relationship Diagrams

The ER (entity-relationship) data model views the real world as collections of basic objects (entity sets) and relationships among these objects and is intended primarily for the DB design process. Entity sets are sets of objects that share common characteristics or attributes. The members of entity sets are called entities.

We can express the overall logical structure of a database graphically with an ER diagram. Its components are:

- **rectangles** representing entity sets.
- **ellipses** representing attributes.
- **diamonds** representing relationship sets.
- **lines** linking attributes to entity sets and entity sets to relationship sets.

Lines may be directed (have an arrow on the end) to signify cardinalities for relationship sets. Cardinalities express the number of entities to which an entity can be associated via a relationship. The arrow head points to the entity that "one" refers to.



The above is a ER diagram of a simple customer account database. It consists of two entity sets, namely Customer and Account. Each of the entity sets Customer and Account are further described by additional attributes. In addition, the entity sets share a one-to-many relationship CustAcc, that is, one customer can have many accounts. The relationship itself has an attribute (also called descriptive attribute), namely Date. Relationships are called relationship sets because relationships contain the set of all

relationships of the individual entities within the participating entity sets.

## Representation of Entity Sets

We use tables to represent entity sets. Each table has one column for each attribute of an entity set. Each row in a table corresponds to an entity of the entity set. Differences between entities in a table are expressed in terms of differences between attribute values. A **primary key** is an attribute that uniquely identifies entities in an entity set.

From the example in the previous section we can define the following entities as tables:

Customer:

<i>SSN (PK)</i>	<i>Name</i>	<i>Street</i>	<i>City</i>

Account:

<i>Number (PK)</i>	<i>Balance</i>

Here PK denotes the primary key of the entity set.

## Representation of Relationship Sets

Let  $R$  be a relationship set involving entity sets  $E_1, E_2, \dots, E_m$ .

The table corresponding to the relationship set  $R$  has the following columns:

$$\bigcup_{i=1}^m \text{primaryKey}(E_i)$$

If the relationship has  $k$  descriptive attributes  $a_1 \dots a_k$ , we add them as well:

$$\left[ \bigcup_{i=1}^m \text{primaryKey}(E_i) \right] \cup \{a_1, a_2, a_3, \dots, a_k\}$$

The relationship set CustAcc from the previous section can be represented as follows:

CustAcc:

<i>SSN</i>	<i>Number</i>	<i>Date</i>

Here, SSN is the primary key of the entity set Customer, Number is the primary key of the entity set Account, and Date is a descriptive attribute of the relationship set.

## References and Acknowledgments

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<http://www.cs.sfu.ca/CC/354/zaiane/material/notes/Chapter2/node1.html>

"An Introduction to Database Systems", 5<sup>th</sup> Edition, C. J. Date, Addison-Wesley, 1991.