Database Management System (DBMS)

Lecture-8

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E-R Model

Entity Sets An entity is a "thing" or "object" in the real world that is distinguishable from all other objects. For example, each person in an enterprise is an entity.

Attributes Attributes are descriptive properties possessed by each member of an entity set. For example, possible attributes of the customer entity set are customer-id, customer-name, customer-street, and customer-city.

Types of attributes

An attribute, as used in the E-R model, can be characterized by the following attribute types.

Simple and composite attributes

An attribute is said to be simple attribute if it can not be divided into parts. An attribute which can be divide into parts is said to be composite attribute.

For example, an attribute **name** and address are the composite attributes. An attribute **roll-number** is a simple attribute.

Single-valued and multi-valued attributes
The attribute for which we have a single value for each entity is called a single valued attribute and the attributes for which we have a set of values for a particular entity is called a multi-valued attribute.
For example, loan-number, age are single valued attributes whereas mobile-no, dependent-name are multi-valued attributes.

Derived attribute

If the value for the attribute is derived from the values of other related attributes, then this attribute is said to be derived attribute. **For example,** Age attribute is derived from attribute date-of-birth, Experience attribute deried from date-of-joining etc. The value of the derived attribute is not stored but is computed when required.
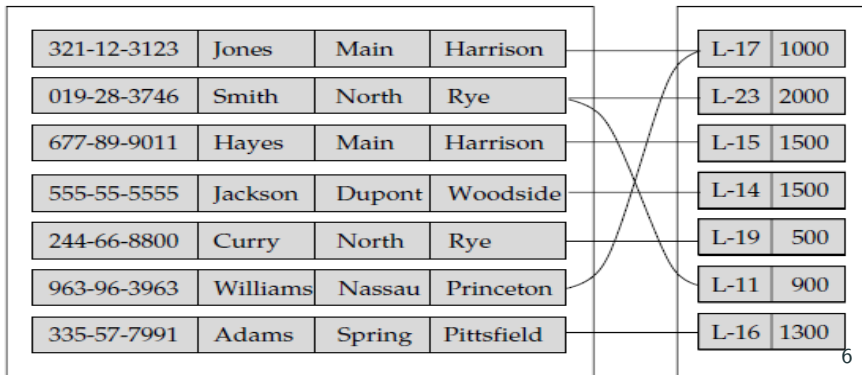
Null values: An attributes takes null value when an entity does not have a value for it(for example middle-name) or if the value is not known.

Relationship set

- **A relationship** is an association among several entities.
- **For example,** we can define a relationship that associates customer Hayes with loan L-15. This relationship specifies that Hayes is a customer with loan number L-15.
- A relationship set is a set of relationships of the same type.
- It is a mathematical relation on more than one entity sets. If $E_1, E_2, ..., E_n$ are entity sets, then a relationship set R is a subset of $\{(e_1, e_2, ..., e_n)!e_1 \in E_1, e_2 \in E_2, ..., e_n \in E_n\}$ where $(e_1, e_2, ..., e_n)$ is a relationship. Here, entity sets $E_1, E_2, ..., E_n$ participate in relationship R.

E-R model

Example: Consider the two entity sets customer and loan in following Figure. We define the relationship set borrower to denote the association between customers and the bank loans that the customers have.

321-12-3123	Jones	Main	Harrison		L-17	1000
019-28-3746	Smith	North	Rye		L-23	2000
677-89-9011	Hayes	Main	Harrison		L-15	1500
555-55-5555	Jackson	Dupont	Woodside		L-14	1500
244-66-8800	Curry	North	Rye		L-19	500
963-96-3963	Williams	Nassau	Princeton		L-11	900
335-57-7991	Adams	Spring	Pittsfield		L-16	1300

E-R model

Descriptive attributes: A relationship set may have some new attributes which are not presents in the entity sets are called descriptive attributes. It describes about the relationship set.

Example: Consider a relationship set depositor with entity sets customer and account.We could associate the attribute access-date to that relationship to specify the most recent date on which a customer accessed an account.

Ternary relationship: The relationship between three entity sets is known as a ternary relationship. For example, the relationship works-on between the entity sets employee, branch and job can be a ternary relationship.

Degree of relationship: The number of entity sets that participate in a relationship set is known as degree of relationship.

Constraints

An E-R enterprise schema may define certain constraints to which the contents of a database must conform. In this section, we examine mapping cardinalities and participation constraints, which are two of the most important types of constraints.

Mapping cardinality

Mapping cardinalities express the number of entities to which another entity can be associated via a relationship set.

E-R model

For a binary relationship set R between entity sets A and B, the mapping cardinality must be one of the following:

- **One to one:** An entity in A is associated with at most one entity in B, and an entity in B is associated with at most one entity in A.
- **One to many:** An entity in A is associated with any number (zero or more) of entities in B. An entity in B, however, can be associated with at most one entity in A.
- **Many to one:** An entity in A is associated with at most one entity in B. An entity in B, however, can be associated with any number (zero or more) of entities in A.
- **Many to many:** An entity in A is associated with any number (zero or more) of entities in B, and an entity in B is associated with any number (zero or more) of entities in A.
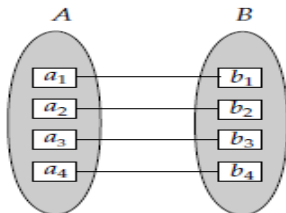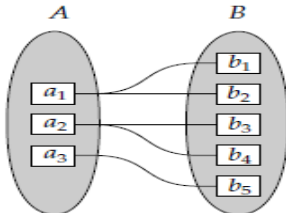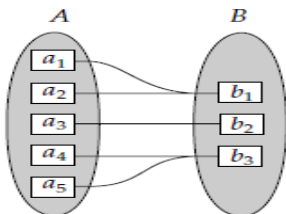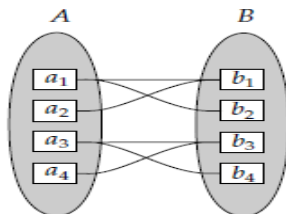
(a) One to one

(b) One to many

(c) Many to one

(d) Many to many

Participation Constraints

- The participation of an entity set E in a relationship set R is said to be **total** if every entity in E participates in at least one relationship in R.
- If only some entities in E participate in relationships in R, the participation of entity set E in relationship R is said to be **partial**.

E-R model

Example: Consider relationship borrower between two entity sets customer and loan. Participation of loan entity set in this relationship borrower is the total. And participation of customer entity set in this relationship borrower is the partial.