Database Management System 6
ER Modeling...

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Keys

Keys

A key allows us to identify a set of attributes that suffice to distinguish entities from each other

- A key is a property of the entity set, rather than of the individual entities

- A super key is a set of one or more attributes that allow us to identify uniquely an entity in an entity set

- The minimal super keys are called candidate keys

- Primary key is a candidate key that is chosen by the database designer as the principal means of identifying entities within an entity set. The primary key can be represented by underlying the attribute name. *The primary key should be chosen such that its attributes are never or very rarely changed*

- The remaining candidate keys except the primary key are called as alternate keys

Keys...

Keys...

- If none of the columns is a candidate for the primary key in a table, sometimes database designers use an extra column as a primary key instead of using a composite key. Such key is known as the surrogate key
- Foreign key is the set of attributes which is used for referring to another entity set having the primary key. *In ER diagram, foreign key can not be represented*
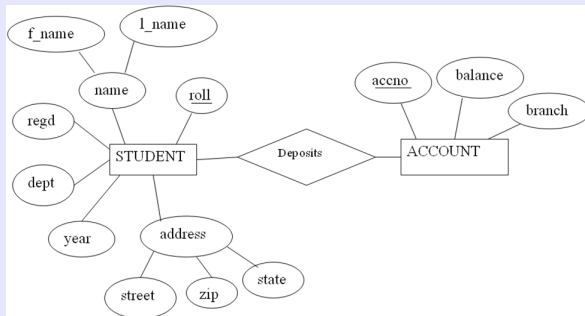
Keys for Relationship sets

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Let R be a relationship set involving entity sets E_1, E_2, ... E_n. Let PK(E_i) denotes the set of attributes that forms the primary key for entity set E_i

- If the relationship set R has no descriptive attributes associated with it, then the set of attributes $PK(E_1) \cup PK(E_2) \cup ... \cup PK(E_n)$ describes an individual relationship in set R

- If the relationship set R has attributes a_1, a_2 ... a_m associated with it, then the set of attributes $PK(E_1) \cup PK(E_2) \cup ... \cup PK(E_n) \cup \{a_1, a_2, ... a_m\}$ describes an individual relationship in set R
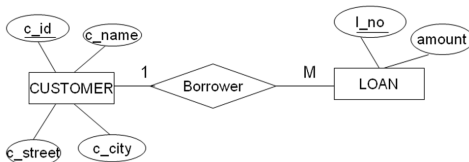
Keys for Relationship sets...

M:N relationship

The primary key of the relationship set consists of the union of the primary keys of the entity sets
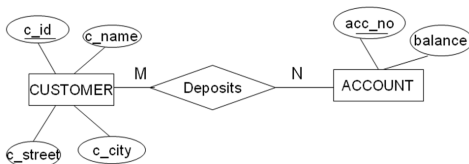
1:M relationship

The primary key of the relationship set is the primary key of the many side entity set

Keys for Relationship sets...

1:1 relationship

The primary key of the relationship set is either the primary key of any entity set
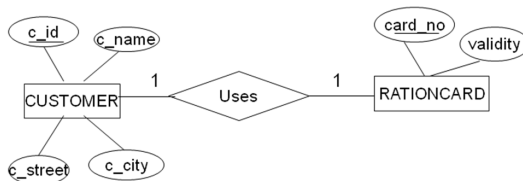
Relationship Types

Relationship Types

A relationship type is a meaningful association among entity types. The **degree** of a relationship type is defined as the number of entity sets participating in that relationship type
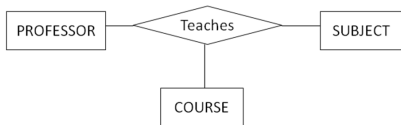
Binary relationship

A relationship type is said to be binary when two entity sets are involved

Ternary relationship

Relationship types that involve three entity sets are defined as ternary relationships
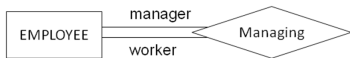
Relationship Types...

Quaternary relationship

A relationship of degree four can be referred to as a quaternary relationship
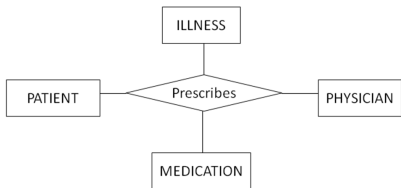
Recursive relationship

The participation of an entity set in a relationship type can be indicated by its role name. When used in recursive relationship types, role names describe the functionality of the participation
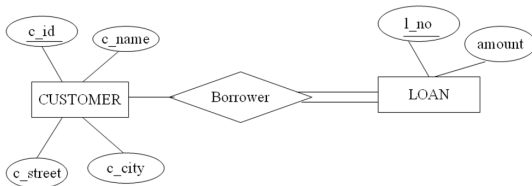
Participation Constraints

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The participation constraint for an entity set in a binary relationship type is based on whether an entity of that entity set needs to be related to an entity of the other entity set through this relationship type

- **Total participation**: If, in order to exist, every entity must participate in the relationship, then participation of the entity set in that relationship type is total or mandatory. The total participation is represented by double lines

- **Partial participation**: If an entity can exist without participating in the relationship, then participation of the entity type in that relationship type is partial or optional

l..h Representation

l..h Representation

An edge between an entity set and a binary relationship set can have an associated minimum and maximum cardinality; shown as *l..h*, where *l* is the minimum and *h* is the maximum cardinality

- A minimum value of 1 indicates total participation of the entity set in the relationship set
- A maximum value of 1 indicates that the entity participates in at most one relationship, while a maximum value * indicates no limit
- 1..* indicates total participation or double line
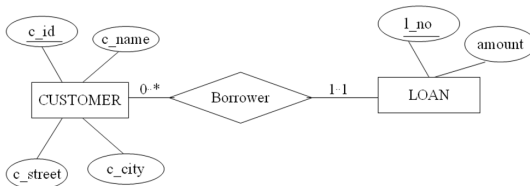
Mapping Cardinality Representation (Crow's Foot Notation)

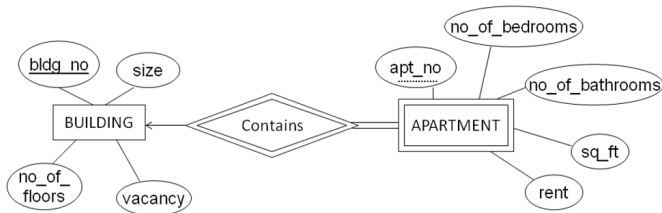## Mapping Cardinality Representation (Crow's Foot Notation)

Strong Entity sets and Weak Entity sets

Strong Entity sets and Weak Entity sets

An entity set where the entities have independent existence (that is, each entity is unique) is referred to as a strong or base entity set. On the other hand, the entity set that does not have independent existence, that is, an entity set that does not have its own unique identifier is known as weak entity set

- For a weak entity set to be meaningful, it must be associated with another strong entity set called **identifying or owner entity set**
- The relationship associating the weak entity set with the identifying entity set is called the **identifying relationship**
- The identifying relationship is usually many-to-one from the weak entity set to the identifying entity set and the participation of the weak entity set in the relationship is total participation

Strong Entity sets and Weak Entity sets...

Strong Entity sets and Weak Entity sets...

- An attribute in a weak entity set, which in conjunction with a unique identifier of the parent entity set in the identifying relationship type uniquely identifies weak entities, is called the partial key of the weak entity set and is denoted by a dotted underline. The partial key of a weak entity set is sometimes referred to as a **discriminator**

- The primary key of a weak entity set is formed by the primary key of the identifying entity set, plus the weak entity set's discriminator