

# Entity-Relationship Modeling

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- ## Objectives
- ▶ The basic concepts associated with the Entity-Relationship (ER) model, a high-level conceptual data model.
  - ▶ A diagrammatic technique for displaying an ER model.
  - ▶ How to identify problems called connection traps, which may occur when creating an ER model.

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- ## Concepts of the ER Model
- ▶ Entity types
  - ▶ Relationship types
  - ▶ Attributes

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- ## Entity Type
- ▶ Entity Type
    - An object or concept that is identified by the enterprise as having an independent existence.
  - ▶ Entity
    - An object or concept that is uniquely identifiable.

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## Examples of Entity Types

<i>Physical existence</i>	
Staff	Part
Property	Supplier
Customer	Product
<i>Conceptual existence</i>	
Viewing	Sale
Inspection	Work experience

## Examples of Entity

Staff Relation

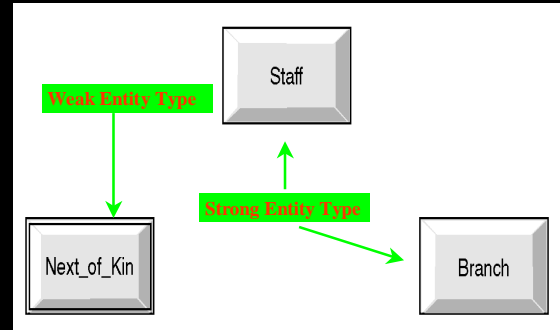
Staff_No	SName	SAddress	Position	Salary	Branch_No
SL21	John White	19 Taylor St, London	Manager	30000	B5
SG37	Ann Beech	81 George St, Glasgow	Snr Asst	12000	B3
SG14	David Ford	63 Ashby St, Glasgow	Deputy	18000	B3
SA9	Mary Howe	2 Elm Pl, Aberdeen	Assistant	9000	B7
SG5	Susan Brand	5 Gt Western Rd, Glasgow	Manager	24000	B3
SLA1	Julie Lee	28 Malvern St, Kilburn	Assistant	9000	B5

## Entity Type

- ▶ **Strong Entity Type (parent, owner, dominant)**
  - An entity type that is not existence-dependent on some other entity type.
- ▶ **Weak Entity Type (child, dependent, subordinate)**
  - An entity type that is existence-dependent on some other entity type.

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## Diagrammatic Representation of Strong and Weak Entity Types

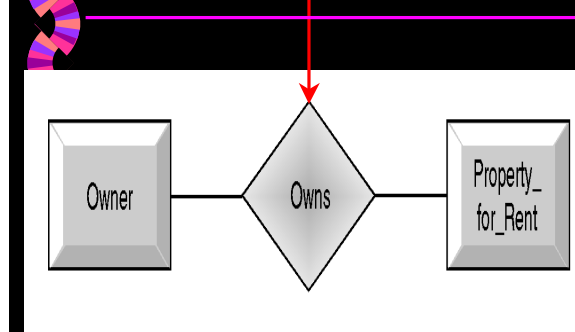


## Relationship Types

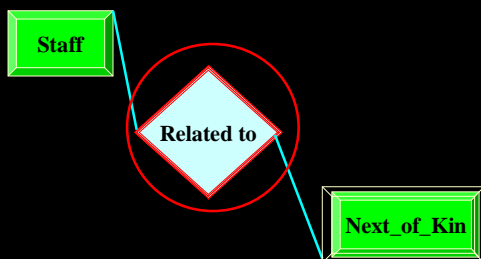
- ▶ **Relationship Type**
  - A meaningful association among entity types.
- ▶ **Relationship**
  - An association of entities where the association includes one entity from each participating entity type.

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## Diagrammatic Representation of Relationship Type



## Diagrammatic Representation of Weak Relationship Type



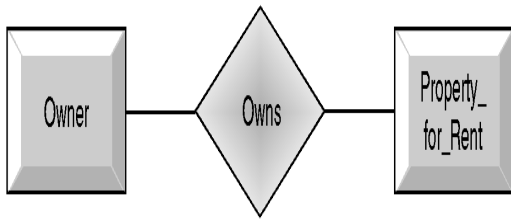
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## Degree of a Relationship

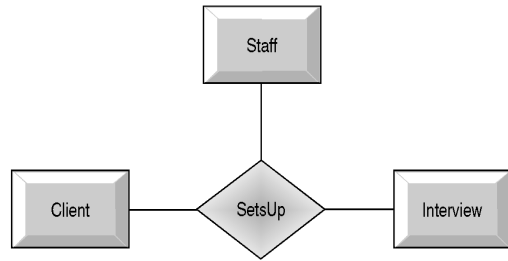
- ▶ **Degree of a Relationship**
  - The number of participating entities in a relationship.
  - The entities involved in a particular relationship are referred to as participants.
  - The number of participants in a relationship is called the degree.

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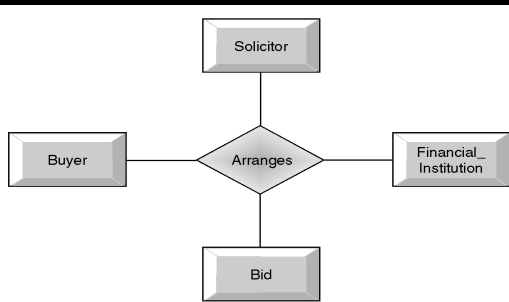
## Binary Relationship called Owns



## Ternary Relationship called SetsUp



## Quaternary Relationship called Arranges



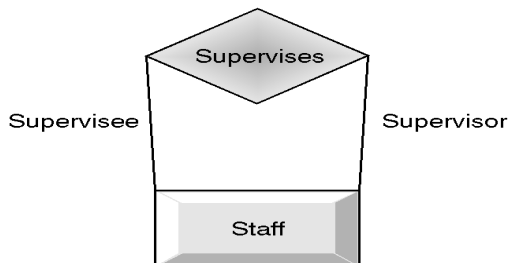
## Recursive (Unary) Relationship

### Recursive Relationship

- A relationship where the same entity participates more than once in a different roles.

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## Recursive Relationship called Supervises



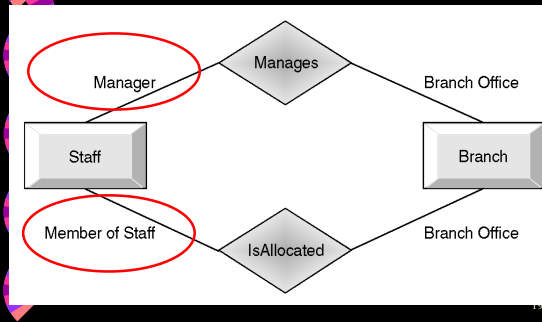
## Recursive (Unary) Relationship

### Role name

- To indicate the purpose that each participating entity play in a relationship

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## Entities associated through two distinct Relationships



## Attributes

### Attribute

- A property of an entity or a relationship type.

## Examples of Attribute

Staff Relation

Staff_No	SName	SAddress	Position	Salary	Branch_No
SL21	John White	19 Taylor St, London	Manager	30000	B5
SG37	Ann Beech	81 George St, Glasgow	Snr Asst	12000	B3
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## Attributes

### Attribute Domain

- A set of values that may be assigned to a single-valued attribute.

## Examples of Attribute Domain

Staff Relation

Attribute Domain : 9000 -30000

Staff_No	SName	SAddress	Position	Salary	Branch_No
SL21	John White	19 Taylor St, London	Manager	30000	B5
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## Types of Attributes

- Simple Attribute vs. Composite Attribute
- Single-Valued Attribute vs. Multi-Valued Attribute
- Derived Attribute

## Attributes

### Simple Attribute

- An attribute composed of a single component with an independent existence.
- Cannot be further subdivided as a meaningful information.
- Ex. Sex, Salary

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## Attributes

### Composite Attribute

- An attribute composed of multiple components each with an independent existence.
- Can be further divided.
- Ex. Address can be divided into Street#, City, State, Zip

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## Attributes

### Single-valued Attribute

- An attribute that holds a single-value for a single entity.
- Customer#, Branch#

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## Attributes

### Multi-valued Attribute

- An attribute that holds multiple values for a single entity.
- Tel\_No : 234-5678 and 456-7839

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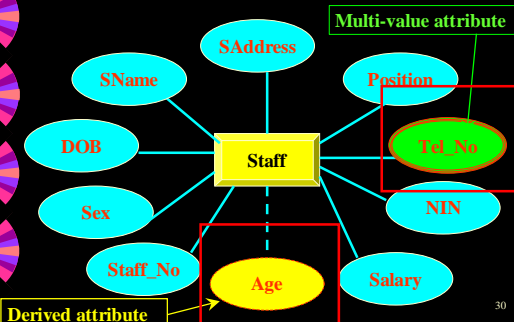
## Attributes

### Derived Attribute

- An attribute that represents a value that is derivable from the value of a related attribute or set of attributes, not necessarily in the same entity.
- Age attribute might be derived from DOB (Date of Birth) attribute

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## Diagrammatic Representation of Attributes



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## Types of Key

- ▶ Candidate Key
- ▶ Primary Key
- ▶ Composite Key

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## Keys

- ▶ Candidate Key
  - An attribute or set of attributes that uniquely identifies individual occurrences of an entity type.
  - Staff: Staff\_No, >>>>>

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## Diagrammatic Representation of Attributes



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## Keys

- ▶ Candidate Key
  - An attribute or set of attributes that uniquely identifies individual occurrences of an entity type.
  - Staff: Staff\_No, NIN (National Insurance Number), SName+Tel\_No, SName+DOB

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## Keys

- ▶ Primary Key
  - The candidate key selected to be a primary key
  - The consideration is based on:
    - attribute length (minimal)
    - current and future certainty of uniqueness
  - Staff\_No

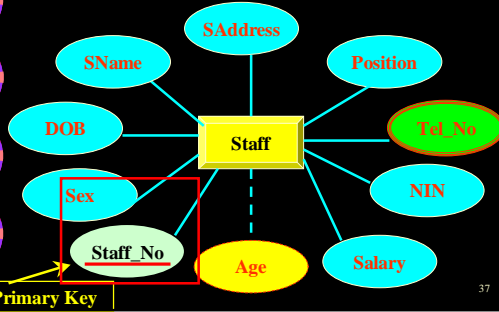
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## Keys

- ▶ Composite Key
  - A candidate key that consists of two or more attributes.
  - Staff: SName+Tel\_No, SName+DOB

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## Diagrammatic Representation of Primary Key



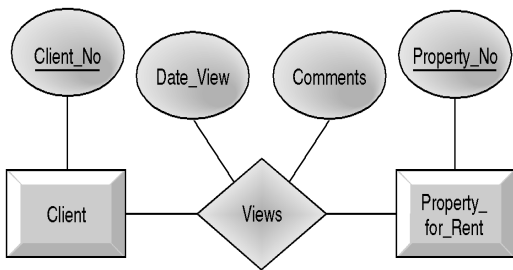
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## Attribute on Relationships

- ▶ A relationship can also have its own attribute.
- ▶ The presence of one or more attributes assigned to a relationship may indicate that the relationship conceals an unidentified entity.
- ▶ For example, the presence of the Date\_View and Comments attributes on the Views relationship may indicate the presence of an entity called Viewing.

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## Relationship called Views with attributes



## Diagrammatic Representation of Entities, Relationships, and Primary Key Attributes

