Practical Database Concepts

Lecture 3 & 4: Entity Relationship Modeling
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Overview of the lecture

- Why Entity–Relationship Model?
- Basic elements of the Entity–Relationship model
  - Concepts
  - Build an Entity–Relationship Model
  - Convert ER model to Relational Database Model
- Using Tools
  - LucidChart
  - Oracle Data Modeler

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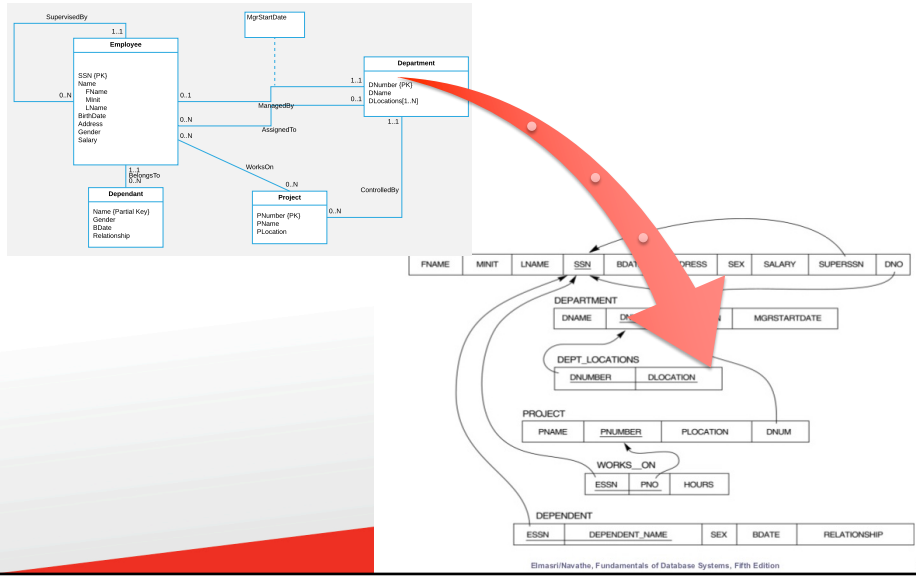
Mapping ER Model to Relational Model



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Step 1: Map Strong Entities

- For each regular (strong) entity type, create a relation holding all the simple attributes in the entity.
- The primary key of the entity type becomes the primary key of the relation.
- Composite attributes should be separated into their component (simple) attributes.
- Example:

  Employee (SSN, fname, minit, lname, bdate, address, gender, salary)

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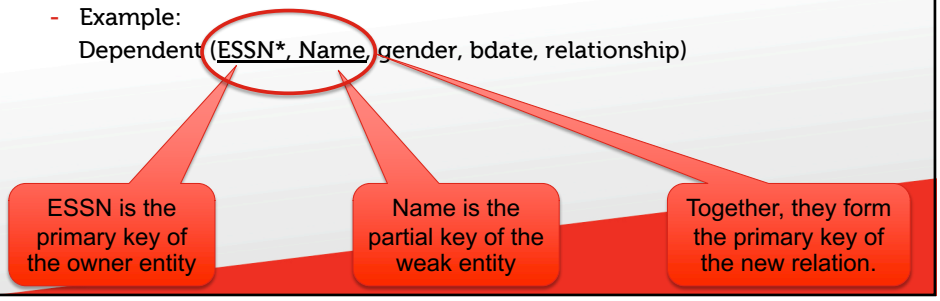
Step 2: Map Weak Entities

- For each weak entity type, create a relation holding all the simple attributes in the entity.
- Add the primary key attributes of the owner entity into this new relation.
- These primary key attributes along with the partial key attributes form the primary key for this new relation.
- Example:
  Dependent (ESSN*, Name, gender, bdate, relationship)



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Step 3: Map 1:1 Relationships

- 1:N relationships are mapped into relations with the help of a foreign key.
- For each 1:1 relationship, identify one entity that has mandatory participation (assuming at least one is mandatory).
- Copy the primary key of the opposite entity to the relation representing the mandatory-participating entity.
- If there are attributes associated with the relationship, copy them in the same way.

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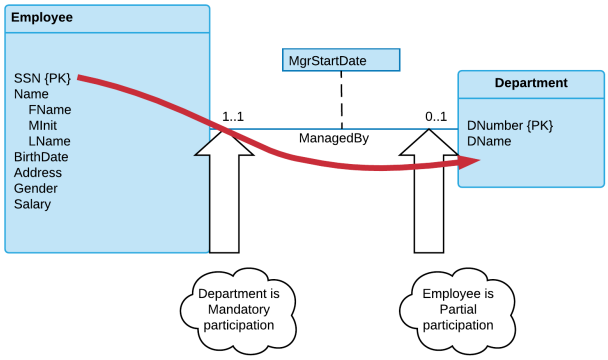

- E.g:
  "ManagedBy" is a 1:1 relationship. Dept entity is in a mandatory participation. So, copy primary key of the Employee into Dept relation.

  Department (Dnumber, Dname, MGR_SSN, MGR_StartDate)

Primary Key of Employee (which is partially participating)

It becomes a foreign key referencing to the other relation

Attributes of the "managed_by relationship

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Step 4: Map 1:N Relationships

- 1:N relationships are mapped into relations with the help of a foreign key.
- For each 1:N relationship, identify the entity that is on the one side of the cardinality.
- Copy the primary key of the one-side entity to the relation representing the N-side entity.
- This will become a foreign key within the N-side.

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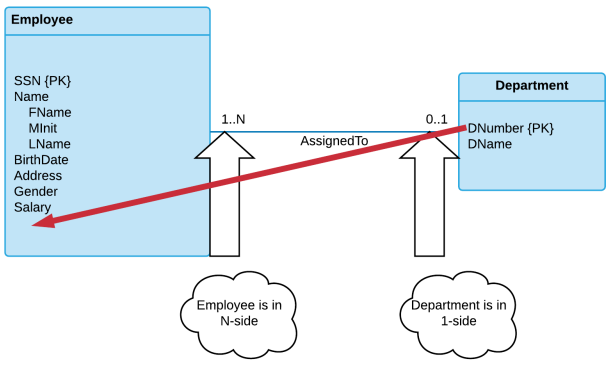

- Example:

  "AssignedTo" is a 1:N relationship. Employee is on the N-side. So, copy primary key of the Dept into Employee relation.

Employee (SSN, fname, minit, lname, bdate, address, gender, salary, DNo*)

Primary Key of Dept (which is 1-side of the relationship)

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Step 5: Map M:N Relationships

- For each M:N (many-to-many) relationship, create a new relation.
- Copy the primary key of each of the participating entities to the new relation.
- They -- together – become the primary key of the new relation
- Each of these atrtributes also act as foreign keys referencing to their original relations.
- Any attributes of the relationship become simple attributes of the new relation.

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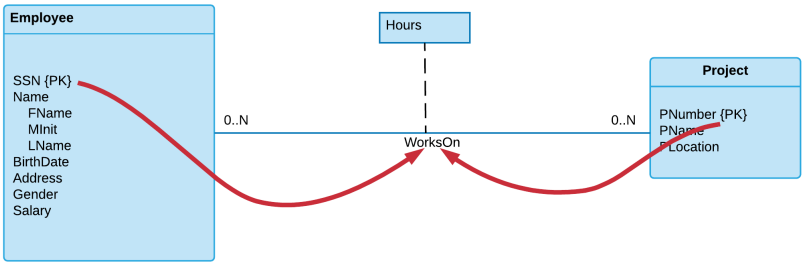

- Example:
  WorksOn (ESSN*, Pno*, Hours)

ESSN is the primary key of Employee, Pno is the primary key of Project. Together they form the primary key of WorksOn relation

Hours is an attribute of the relationship.

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Step 6: Multi-valued Attributes

- For each multi-valued attribute, create a new relation.
- This new relation will include the corresponding attribute, along with the primary key of the owner entity.
- These attributes together forms the primary key of the new relation.
- Owners primary key acts as a foreign key referencing to the owner relation.

- Example:
  DeptLocations (DNo*, DLocation)

Dno is the primary key of the owner entity “Dept”.

DLocation was a multi-valued attribute within Dept Entiity.

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