Objectives :To learn ER to relational Mapping Algorithm

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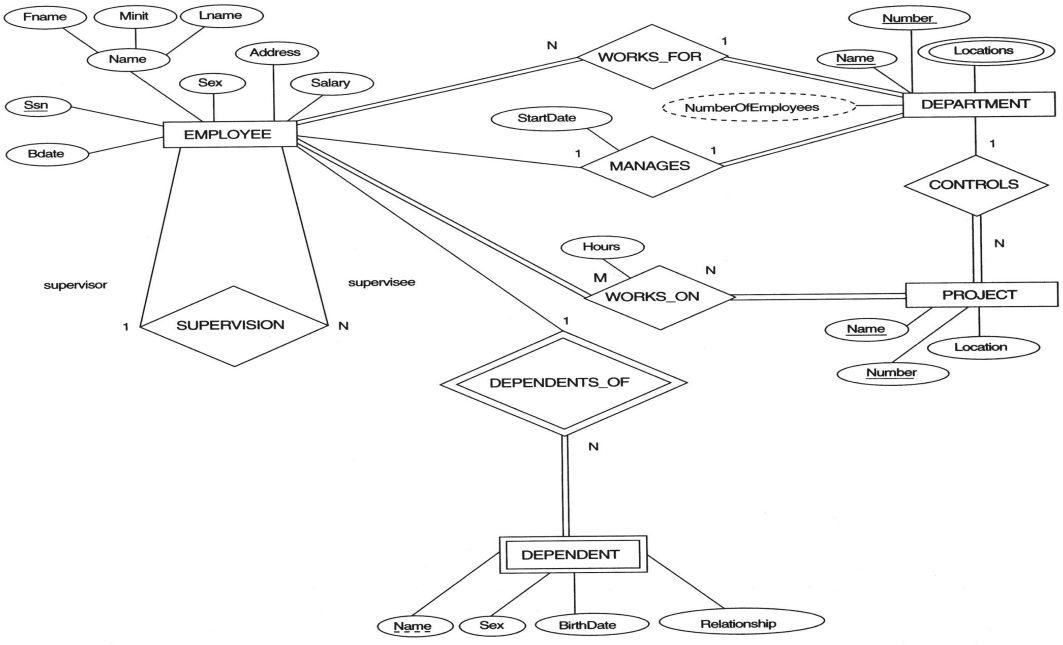
Relational database Design using ER to Relational Mapping

ER-to-Relational Mapping Algorithm

Step 1: Mapping of Regular Entity Types
Step 2: Mapping of Weak Entity Types
Step 3: Mapping of Binary 1:1 Relation Types
Step 4: Mapping of Binary 1: N Relationship Types.
Step 5: Mapping of Binary M:N Relationship Types.
Step 6: Mapping of Multivalued attributes.
Step 7: Mapping of N-ary Relationship Types

Consider the ER conceptual schema diagram for the COMPANY database



***Step 1:** Mapping of Regular Entity Types.*

- **For each regular (strong) entity type in the ER schema, create a relation R that includes all the simple attributes of E.**
- **Choose one of the key attributes of E as the primary key for the relation.**

Example:

- **We create the relations EMPLOYEE, DEPARTMENT, and PROJECT in the relational schema corresponding to the regular entities in the ER diagram.**

- **SSN, DNUMBER, and PNUMBER are the primary keys for the relations EMPLOYEE, DEPARTMENT, and PROJECT as shown**

Step 2: Mapping of Weak Entity Types

- **For each weak entity type W in the ER schema with owner entity type E, create a relation R and include all attributes of the weak entity as attributes of the new relation R.**
- **Then, include the primary key of the owner entity as foreign key attributes of R.**
- **The primary key of R is the *combination of* the primary key(s) of the owner(s) and the partial key of the weak entity type W, if any.**

Example:

- **Create the relation DEPENDENT in this step to correspond to the weak entity type DEPENDENT. Include the primary key SSN of the EMPLOYEE relation as a foreign key attribute of DEPENDENT (renamed to ESSN).**
- **The primary key of the DEPENDENT relation is the combination {ESSN, DEPENDENT_NAME} because DEPENDENT_NAME is the partial key of DEPENDENT.**

Step 3: Mapping of 1:1 Relation Types

For each 1:1 relationship type identify the entities participating in the relationship. There are two possible approaches below:

(1) Foreign Key approach:

- **Choose one of the relations and include a foreign key in one relation (S) which is the primary key of the other relation (T). It is better to choose an entity type with *total participation* in the relationship in the role of S.**
- **Example: 1:1 relation MANAGES is mapped by choosing the participating entity type DEPARTMENT to serve in the role of S, because its participation in the MANAGES relationship type is total.**

(2) Merged relation option:

- **An alternate mapping of a 1:1 relationship type is possible by merging the two entity types and the relationship into a single relation. This may be appropriate when *both participations are total.***

Step 4: Mapping of Binary 1:N Relationship Types.

- ***For each regular 1:N relationship type R, identify the relation S, which is the entity on the N-side of the relationship.***
- ***Include as foreign key in S the primary key of the relation which is on the 1 side of the relationship.***
- ***Include any simple attributes of the 1:N relation type as attributes of S.***

Example:

- ***1:N relationship types WORKS_FOR, CONTROLS, and SUPERVISION in the figure. For WORKS_FOR we include the primary key DNUMBER of the DEPARTMENT relation as foreign key in the EMPLOYEE relation and call it DNO.***

Step 5: Mapping of Binary M:N Relationship Types.

- *For each M:N relationship type, create a new relation S to represent the relationship.*
- *Include as foreign key attributes in S the primary keys of the entities on each side of the relationship; the combination of the two primary keys will form the primary key of S.*
- *Also include any simple attributes of the M:N relationship type as attributes of S.*

Example:

- *The M:N relationship type WORKS_ON from the ER diagram is mapped by creating a relation WORKS_ON in the relational database schema. The primary keys of the PROJECT and EMPLOYEE relations are included as foreign keys in WORKS_ON and renamed PNO and ESSN, respectively.*
- *Attribute HOURS in WORKS_ON represents the HOURS attribute of the relation type. The primary key of the WORKS_ON relation is the combination of the foreign key attributes {ESSN, PNO}*

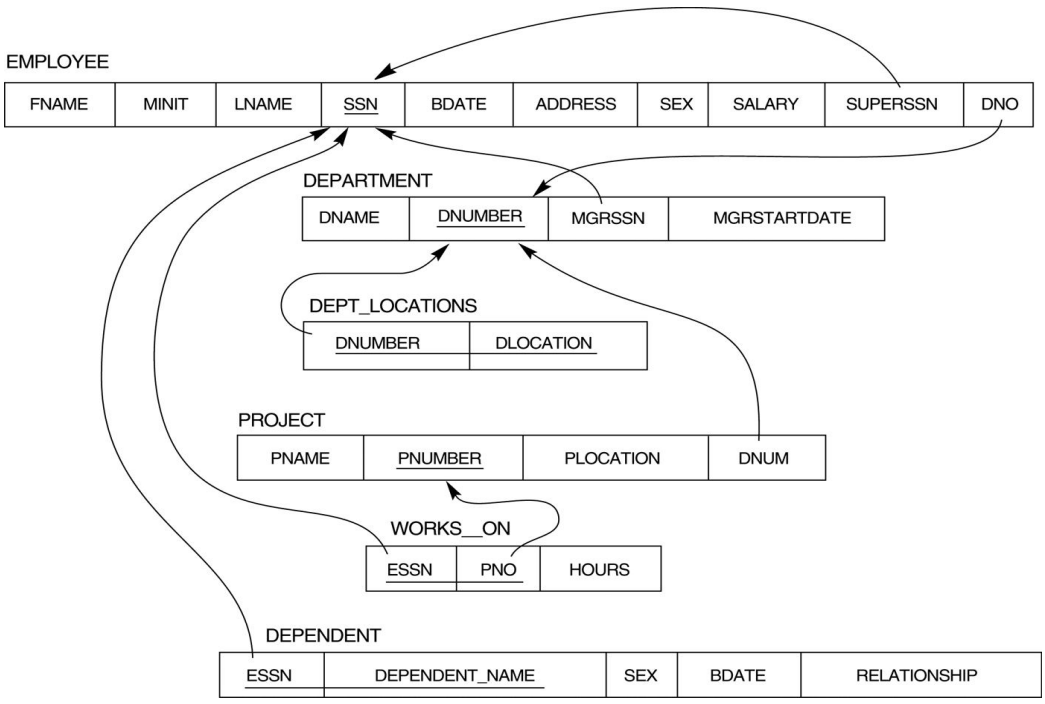
Step 6: Mapping of Multivalued attributes.

- *For each multivalued attribute A, create a new relation. This relation will include an attribute corresponding to the multi-valued attribute, plus the primary key attribute of the relation that has the multi-valued attribute, K.*
- *The primary key attribute of the relation is the foreign key representing the relationship between the entity and the multi-valued relation.*
- *The primary key of R is the combination of A and K.*

Example:

- *The relation DEPT_LOCATIONS is created. The attribute DLOCATION represents the multivalued attribute LOCATIONS of DEPARTMENT, while DNUMBER-as foreign key-represents the primary key of the DEPARTMENT relation. The primary key of R is the combination of {DNUMBER, DLOCATION}.*

Result of mapping the COMPANY ER schema into a relational schema



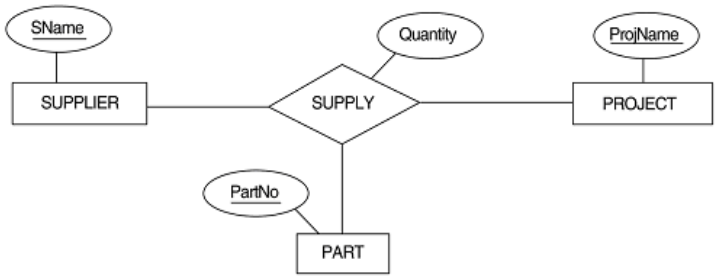
Step 7: ***Mapping of N-ary Relationship Types.***

(Non-binary relationships)

- **For each n-ary relationship type R, where n>2, create a new relation S to represent the relationship.**
- **Include as foreign key attributes in S the primary keys of the relations that represent the participating entities.**
- **Also include any simple attributes of the n-ary relationship type as attributes of S.**

Example:

- **The relationship type SUPPY in the ER on the next slide. This can be mapped to the relation SUPPLY shown in the relational schema, whose primary key is the combination of the three foreign keys {SNAME, PARTNO, PROJNAME}**



Mapping the *n*-ary relationship type SUPPLY from the above figure, we have as follows

SUPPLIER

SNAME	. . .

PROJECT

PROJNAME	. . .

PART

PARTNO	. . .

SUPPLY

SNAME	PROJNAME	PARTNO	QUANTITY