7. ER to Relational Data Model Mapping

One technique for database design is to first design a conceptual schema using a high-level data model, and then map it to a conceptual schema in the DBMS data model for the chosen DBMS.

• Here we see a way to do this mapping from the ER to the relational data model.

• We follow the 7 step process given in E/N 6.8 (or 12.1.1 in 1st Edition), augmented with a step for specialised entities.

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Step 1 : For each regular (not weak) entity type E, create a relation R with

    Attributes : All simple attributes (and simple components of composite attributes) of E.

    Key : Choose one of the keys of E as the primary key for the relation.

Step 1a : For each specialised entity type E, with parent entity type P, create a relation R with

> **Attributes** : The attributes of the key of P, plus the simple attributes of E.
>
> **Key** : The key of P.

Step 2 : For each weak entity type W, with owner entity type E, create a relation R with

Attributes : All simple attributes (and simple components of composite attributes) of W, and include as a foreign key the prime attributes of the relation derived from E.

Key : The foreign key plus the partial key of W.

Step 3 : For each 1:1 relationship type B. Let E and F be the
participating entity types. Let S and T be the corresponding
relations.

- Choose one of S and T (prefer one that participates
  totally), say S.

- Add the attributes of the primary key of T to S as a foreign
  key.

- Add the simple attributes (and simple components of
  composite attributes) of B as attributes of S.

(Alternative: merge the two entity types and the relationship
into a single relation, especially if both participate totally and
do not participate in other relationships).

Step 4 : For each regular 1:N relationship type B. Let E and F be
the participating entity types.

Let E by the entity type on the 1 side, F the one on the N side.

Let S and T be the corresponding relations.

Add the attributes of the primary key of S to T as a foreign key.

Add to T any simple attributes (or simple components of
composite attributes) of the relationship.

(Notice that this doesn't add any new tuples, just attributes.)

Step 5 : For each N:M relationship type B. Create a new relation
R. Let E and F be the participating entity types. Let S and T
be the corresponding relations.

    Attributes : The key of S and the key of T as foreign keys,
        plus the simple attributes (and simple components of
        composite attributes) of B.

    Key : The key of S and the key of T.

Step 6 : For each multivalued attribute A. Create a new relation R. Let A be an attribute of E.

    Attributes :

        1. A (if A is a simple attribute) together with the key of E as a foreign key.
        2. The simple components of A (if A is a composite attribute), together with the key of E as a foreign key.

    Key : All attributes.

Step 7 : For each n-ary relationship type ($n > 2$). Create a new
relation with

Attributes : as for Step 5.

Key : as for Step 5, except that if one of the participating
entity types has participation ratio 1, its key can be used as
a key for the new relation.

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See E/N Fig 3.2, Fig 6.5 and Fig 6.19 (or Fig 12.1, Fig 12.2 and Fig 12.3 in 1st Edition) for examples.