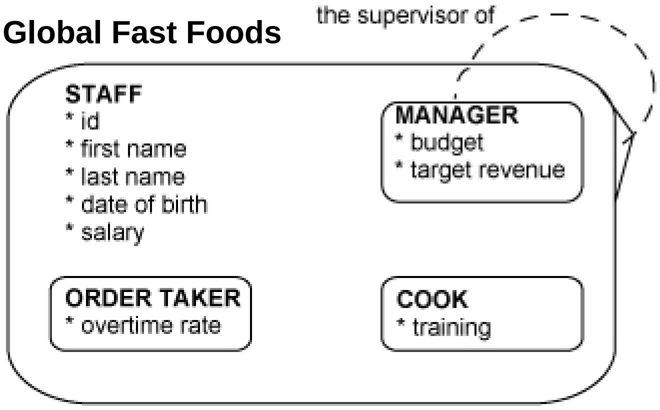
Database Design
9-4: Subtype Mapping
Practice Solutions
Try It / Solve It

1. Transform the PARTNER supertype in the DJs model, using the supertype or single-table implementation.

   Solution: After going through the activity, you may want to conduct the following discussion to check for understanding:
   - Remind students that they need a discriminator column. What would this column be named? (**Answer:** pnr_type.) What are the allowable values for this column? (**Answer:** EPR, DJ, MNR.)
   - Remind students that they need a check constraint. What would it check for? (**Answer:** (pnr_type = 'EPR' and expertise is not null and specialty is null and authorized_expense_limit is null) or (pnr_type = 'DJ' and expertise is null and specialty is not null and authorized_expense_limit is null) or (pnr_type ='MNR' and expertise is null and specialty is null and authorized_expense_limit is not null).)
   - What does the foreign-key column pnr_id refer to? (**Answer:** the PARTNERS table.)
   - What relationship was it mapped from? (**Answer:** the recursive relationship in PARTNER.)
   - What does it represent? (**Answer:** the id of the partner's manager.)

2. Transform the STAFF supertype in the Global Fast Foods model, using the subtype or two-table implementation.

   Solution:



After going through the activity, you may want to conduct the following discussion to check for understanding:

- What does the foreign-key column mnr_id refer to? (**Answer:** the MANAGERS table.)
- What relationship was it mapped from? (**Answer:** the recursive relationship in STAFF.)
- What does it represent? (**Answer:** the id of the manager.)

3. Identify the database rules for each part of the database implementations below.

   Supertype implementations
   - Table
   - Column
   - Identifiers
   - Relationship
   - Integrity constraint rules

   Subtype implementations
   - Table
   - Column
   - Identifiers
   - Relationship
   - Integrity constraint rules

   Arc implementations
   - Table
   - Column
   - Identifiers
   - Relationship
   - Integrity constraint rules

Solution:

Supertype implementations

Table: Only one table is created, independent of the number of subtypes.

Column: The single table gets a column for all the attributes of the supertype, with the original optionality.

Identifiers: Unique identifiers transform into primary and unique keys.

Relationship: Relationships at the supertype level transform as usual. Relationships at subtype level are implemented as optional foreign-key columns.

Integrity constraint rules: A check constraint is needed to ensure that for each particular subtype, all columns that come from mandatory attributes are not null.

Subtype implementations

Table: One table per first-level subtype.

Column: Each table gets a column for all attributes of the supertype with the original optionality.

Identifiers: The primary UID at the supertype level creates a primary key for each table. Secondary UIDs of the supertype become unique keys in each table.

Relationship: All tables get a foreign key for a relationship at the supertype level, with the original optionality.

Arc implementations

Table: As many tables are created as there are subtypes, as well as one for the supertype.

Column: Each table gets a column for all attributes of the entity it is based on, with the original optionality.

Identifiers: The primary UID of the supertype level creates a primary key for each of the tables. All other unique identifiers become unique keys in their corresponding tables.

Relationship: All tables get a foreign key for a relevant relationship at the entity level, with the original optionality.

Integrity constraint rules: Two additional columns are created in the table based on the supertype. They are foreign-key columns referring to the tables that implement the subtypes. The columns are optional because the foreign keys are in an arc. An additional check constraint is needed to implement the arc. The foreign-key columns are also unique keys because they implement a mandatory 1:1 relationship.