

Data and Process Modelling

Lab 3. Relational Mapping in NORMA

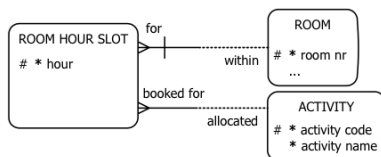
Marco Montali

KRDB Research Centre for Knowledge and Data
Faculty of Computer Science
Free University of Bozen-Bolzano

A.Y. 2014/2015



E-R: Abstract Representation of Data

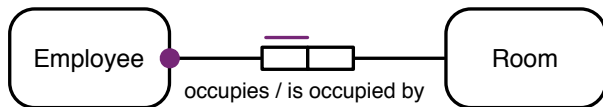


- Introduced by Peter Chen (1976).
- The most widely used approach to data modeling.
- Key notions:
 - ▶ entities, relationships, attributes;
 - ▶ identification and multiplicity constraints.
- Independent from the target software platform.
- Lack of dynamic modeling.
- Close to relational database schemas → logical relational modeling!
- Different notations/dialects:
 - ▶ Chen, Barker, IE, IDEF1X, EXPRESS ...

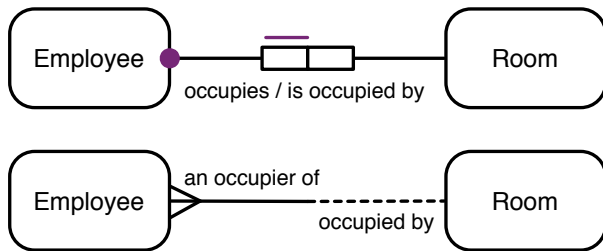
Barker Notation

- Proposed by Richard Barker in 1990.
- Used by Oracle in its CASE tools (together with UML).
- Entity types represented as rounded rectangles.
- Attributes compactly modeled inside the entity types.
- Annotations are attached to attributes to model their participation: * for mandatory, \circ for optional, # for stating that the attribute is part of the entity's PK.
- Relationships restricted to binaries (not the case for all E-R dialects).
- Constraints on roles modeled by graphical elements on the relationships.
 - ▶ Participation: solid half-line for mandatory, dotted half-line for optional.
 - ▶ Cardinality: crow's foot (fork) for many, absence of crow's foot for one.
- Verbalization of relationship R between A and B:
Each A (must | may) be R (one and only one B | one or more B-plural-form)

Simple Example



Simple Example



ORM-Barker Correspondences

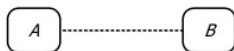
$n:1$
both roles optional



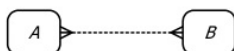
$1:n$
both roles optional



$1:1$
both roles optional



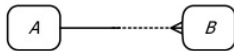
$m:n$
both roles optional



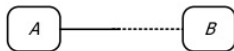
$n:1$
first role mandatory



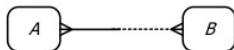
$1:n$
first role mandatory



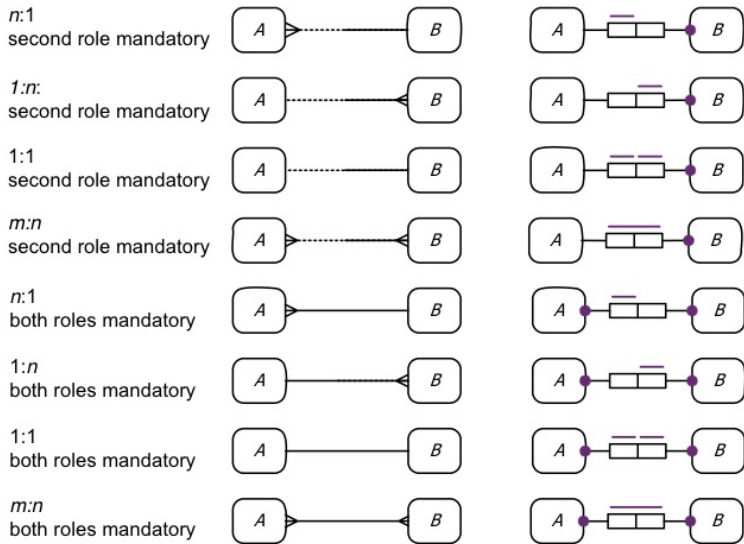
$1:1$
first role mandatory



$m:n$
first role mandatory

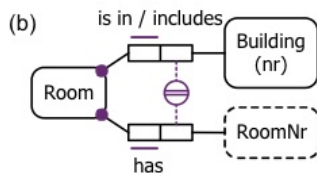
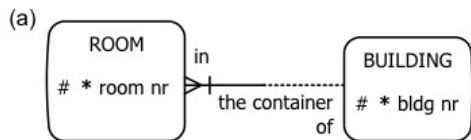


ORM-Barker Correspondences



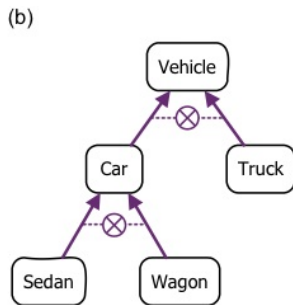
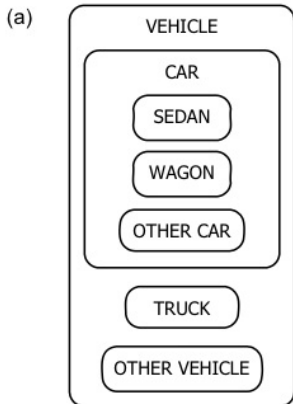
Identification Bars

- Used in Barker notation to denote that the relationship is a component of the PK for the entity type at that end.



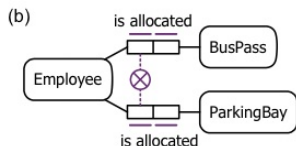
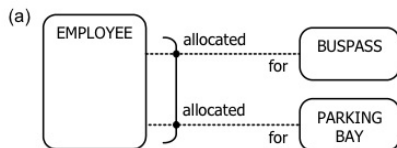
Subtyping

- Barker notation only supports partitions.
- Exclusive subtyping is implicitly supported by adding a further subtype to represent “other” cases.
- No support for overlapping subtypes.

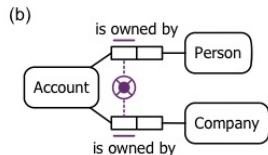
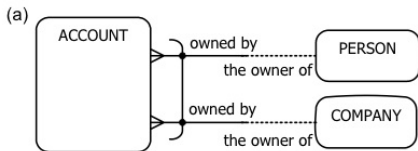


Exclusion Constraints

Modeled in Barker notation by connecting the half-lines of the involved relationships.



In case of exclusive-or (exclusion + disjunctive inclusion), then the half-lines are depicted as solid lines, and then connected as before.



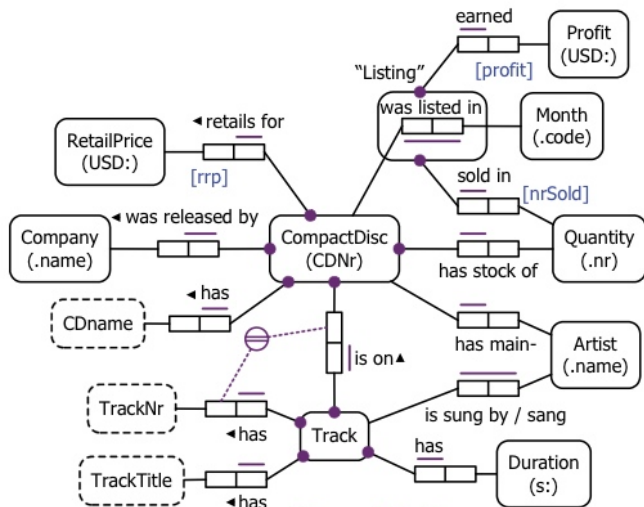
Topics

- Learn how to obtain an E-R representation starting from an ORM conceptual schema.
- Learn how to obtain the vertical layout modeling the relational schema resulting from the application of **Rmap** to an ORM conceptual schema
(see tutorial 8 on ormfoundation.net for details).
- Learn how to obtain the corresponding SQL code
(see tutorial 1 on ormfoundation.net for details).
- Apply these techniques to different examples, possibly with hierarchies.

Key Points

- To map an ORM schema to a corresponding E-R diagram in Barker notation, then just enable the “Barker Notation” view in the extension manager (right click in the main panel).
- Similarly for relational mapping.
- Observe that some constraints are “lost” in the translation process.
- To define different strategies for relational mapping of ORM hierarchies, then just click on the subtype and change the `AbsorptionChoice` property.

CD Shop ORM Conceptual Schema



- * **For each** Month,
totalQuantitySold = **sum**(listing.nrSold).
- * **For each** Month,
totalProfit = **sum**(listing.profit).

Skaters Schema

Problem

Build a relational schema corresponding to the ORM schema, following the **Rmap** procedure and adopting the **partition** strategy to deal with hierarchies. For each relation schema, highlight the primary key, alternative keys, mandatory and optional attributes. Furthermore, depict all relevant constraints, paying particular attention to foreign keys.

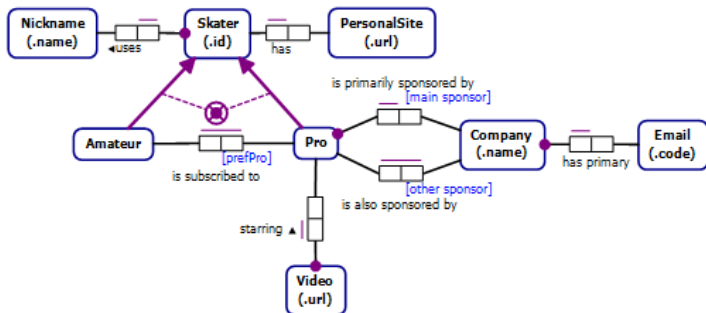
Task

Start by circling the elements of the schema that collapse into a unique table. For each relation schema that you produce, highlight the primary key, alternative keys, mandatory and optional attributes. Depict all relevant constraints, paying particular attention to foreign keys.

Skaters Schema

Problem

Build a relational schema corresponding to the ORM schema, following the **Rmap** procedure and adopting the **partition** strategy to deal with hierarchies. For each relation schema, highlight the primary key, alternative keys, mandatory and optional attributes. Furthermore, depict all relevant constraints, paying particular attention to foreign keys.



Program Committee Schema

Problem

Build a relational schema corresponding to the ORM schema, following the **Rmap** procedure and adopting:

- the **partition** strategy to deal with the PC Member hierarchy;
- the **absorption** strategy to deal with the Paper hierarchy.

Task

Start by circling the elements of the schema that collapse into a unique table. For each relation schema that you produce, highlight the primary key, alternative keys, mandatory and optional attributes. Depict all relevant constraints, paying particular attention to foreign keys.

Program Committee Schema

Problem

Build a relational schema corresponding to the ORM schema, following the **Rmap** procedure and adopting:

- the **partition** strategy to deal with the PC Member hierarchy;
- the **absorption** strategy to deal with the Paper hierarchy.

