ENTITY RELATIONSHIP DIAGRAMS

Elements and Definitions
(Part II)

Entity-Relationship Diagram

- Entity Types
- Relation Types

ER Diagrams - Relationship Type

- generalisation of
  a set of real-life relations
- a set of associations / connections
  among entity types
- can have attributes
- label: describe the association
- specified in the data dictionary

A (binary) relationship type:

An example for actual relations of the
"involved in" relationship type:

<table>
<thead>
<tr>
<th>EMPLOYEE</th>
<th>involved_in</th>
<th>PROJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>e1</td>
<td>i1</td>
<td>p1</td>
</tr>
<tr>
<td>e2</td>
<td>i2</td>
<td>p1</td>
</tr>
<tr>
<td>e3</td>
<td>i3</td>
<td>p2</td>
</tr>
<tr>
<td>e4</td>
<td>i4</td>
<td>p3</td>
</tr>
</tbody>
</table>

Specifying cardinalities:

An employee may be involved in no project at all
or in many of them.

A project must have at least one employees involved
(and may have more than one employee).
Relationship Types and Cardinalities

- the cardinality ratio is a constraint on the number of relationships (of a specific type) and entity can have
- the cardinality ratio is specified in terms of minimal and maximal participation per entity in a relationship type: \((\text{min}, \text{max})\)

Given cardinality ratios:

![Diagram](image1)

Valid example for cardinality ratio \((0, N) - (1, M)\):

![Diagram](image2)

Valid example for cardinality ratio \((0, N) - (1, M)\):

![Diagram](image3)

Valid example for cardinality ratio \((0, N) - (1, M)\):

![Diagram](image4)
Valid example for cardinality ratio (0,2) - (1,M)?

1. EMPLOYEE involved_in PROJECT
   - e1 - l1 - p1
   - e2 - l2 - p2
   - e3 - l3 - p2
   - e4 - l4 - p3
   - e5 - l5 - p4

Valid example for cardinality ratio (0,2) - (1,M)?

1. EMPLOYEE involved_in PROJECT
   - e1 - l1 - p1
   - e2 - l2 - p2
   - e3 - l3 - p3
   - e4 - l4 - p4
   - e5 - l5 - p5

Relationship Types and Attributes

- relationship types can have attributes:
  - attributes that describe the association, and not each entity as a single element
  - the value of the attribute is determined by the combination of participating entities
- typical for ( . , N ) to ( . , M ) relationship types

The relationship type "involved in" with attributes:

- StartDate
- % of Hours

EMPLOYEE involved in PROJECT

End of Section 9c

coming up: an example