

Lecture 5 – From (E)ER to the Relational Model

1DL301 Database Design I

Jan Kudlicka (jan.kudlicka@it.uu.se)

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VOX AULAE



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To be able to convert an ER model into a relational schema. In particular to be able to convert:

- entities (strong and weak)
- attributes (single- and multi-valued)
- relationships (1:1, 1:N, N:N)
- super- and sub-types



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(STRONG) ENTITIES AND (SIMPLE) ATTRIBUTES





Employee(<u>ssn</u>, first_name, last_name, date_of_birth)

Table Employee

<u>ssn</u>	first_name	last_name	date_of_birth
•••			
	•••		•••

The conversion also includes the selection of appropriate data types for the attributes.

RELATIONSHIPS 1:N (INCLUDING 1:1)



WEAK RELATIONSHIPS

org_no Company has Ν Department title comment



Note: In the *Department* table, *company_org_no* and *title* together are the primary key!

RELATIONSHIPS N:N



How to translate attributes of relationships?



EXERCISE 1 – SOLUTION

Attributes of a 1:N relationship will become attributes in the relation (table) for the entity on the "N side":

Employee

•••

```
works_for_org_no FK
```

works_for_position

Attributes of a N:N relationship will become attributes in the relation (table) for the relationship:



COMMENTS ON RELATIONSHIPS

- 1:N relationship an extra attribute in the relation for the entity on the "N side". This attribute is a foreign key (FK) referencing the primary key of the other entity's relation (table).
- 1:1 relationship similar, an extra attribute may be added to any of the two relations. (Preferably where the participation is total.)
- Both 1:1 and 1:N can also use an own table (in the same way as N:N relationships).
- Total participation a NOT NULL constraint (not all total participation constraints can be modelled).

How to translate multi-valued attributes?



Hint: This ER diagram is equivalent to:



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SUMMARY

ER model Entity type

1:1 or 1:N relationship type N:N relationship type *n*-ary relationship type Simple attribute Composite attribute Multi-valued attribute Key attribute

Relational model

Entity relation (table) Foreign key (or relationship relation) Relationship relation and two FKs Relationship relation and *n* FKs Attribute Set of simple component attributes Relation and foreign key Primary key



The model above is equivalent to which option?





Which one cannot be used in this case?





Which one cannot be used in this case?



SUPER- AND SUB-TYPES

Option D from the exercises:



P(<u>attr_p</u>) C1(<u>attr_p</u>, attr_c1) with FK (attr_p) ref. P(attr_p) C2(<u>atrp_p</u>, attr_c2) with FK (attr_p) ref. P(attr_p)

Convert the movie database to the relational model.



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Three lectures on SQL queries will be organized as a tutorial. Bring your computer with you!