

DATABASE DESIGN

ER to Relational model Mapping

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Database Design

How to obtain a good relational database schema

- Deriving new relational schema from ER-diagrams
- Normal forms: use of constraints in evaluating existing relational schema

E-R Diagram to Relational Schema

General approach is straightforward

- Each entity set maps to a new table
- Each attribute maps to a new table column
- Each relationship set maps to either new table columns or to a new table

Terminology

Primary Key:

A **set** of attributes that **uniquely** identify a particular entity (or relationship).

Representing Strong Entity Sets

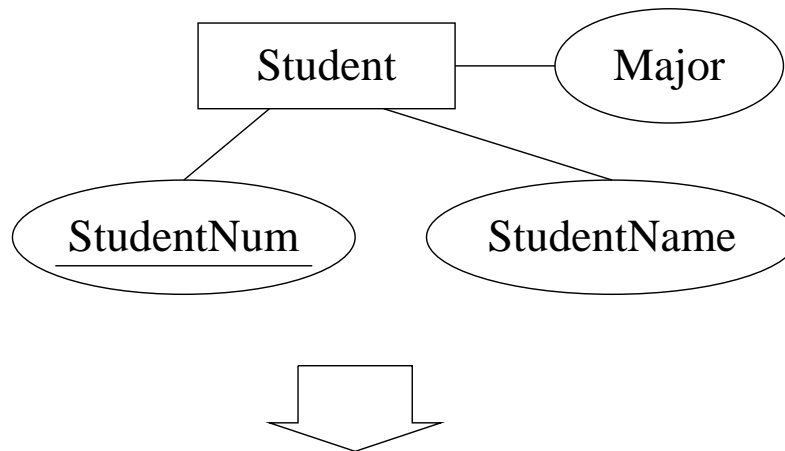
Entity set E with attributes a_1, \dots, a_n

→ table E with attributes a_1, \dots, a_n

Entity of type $E \leftrightarrow$ row in table E

Primary key of entity set → primary key of table

Example:



Student

<u>StudentNum</u>	StudentName	Major
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Representing Weak Entity Sets

Weak entity set $E \rightarrow$ table E

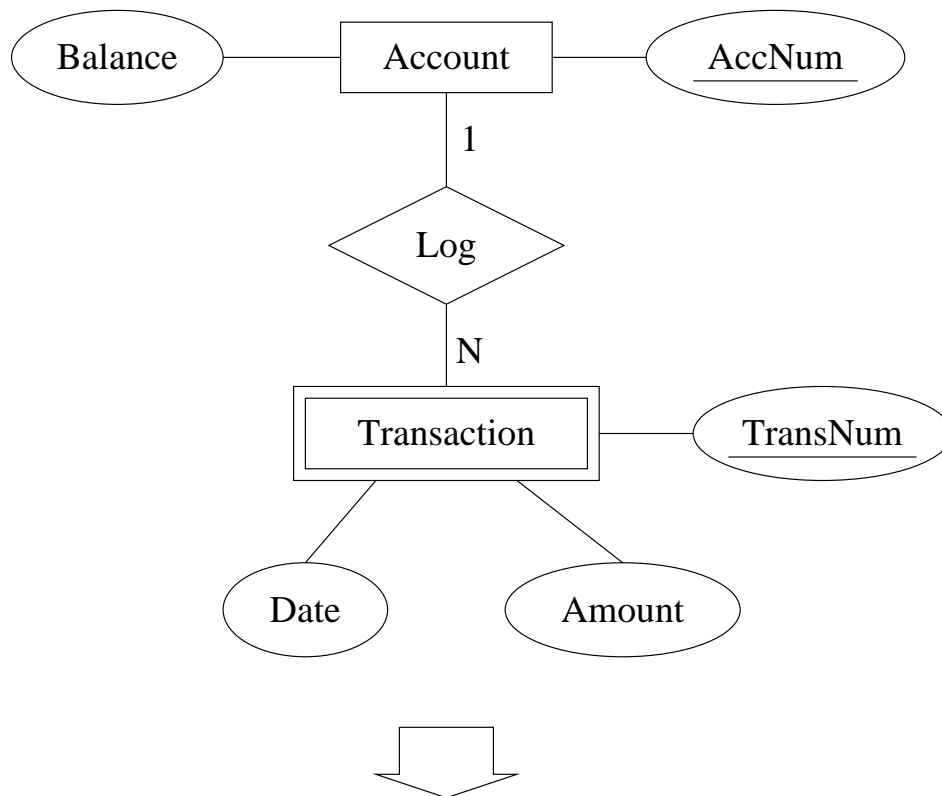
Columns of table E should include

- Attributes of the weak entity set
- Attributes of the identifying relationship set
- Primary key attributes of entity set for dominating entities

Primary key of weak entity set \rightarrow primary key of table

Representing Weak Entity Sets (cont.)

Example:



Account

<u>AccNum</u>	Balance
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Transaction

<u>TransNum</u>	<u>AccNum</u>	Date	Amount
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Representing Relationship Sets

If the relationship set is an identifying relationship set for a weak entity set then no action needed

If we can deduce the general cardinality constraint (1,1) for a component entity set E then add following columns to table E

- Attributes of the relationship set
- Primary key attributes of remaining component entity sets

Otherwise: relationship set $R \rightarrow$ table R

Representing Relationship Sets (cont.)

Columns of table R should include

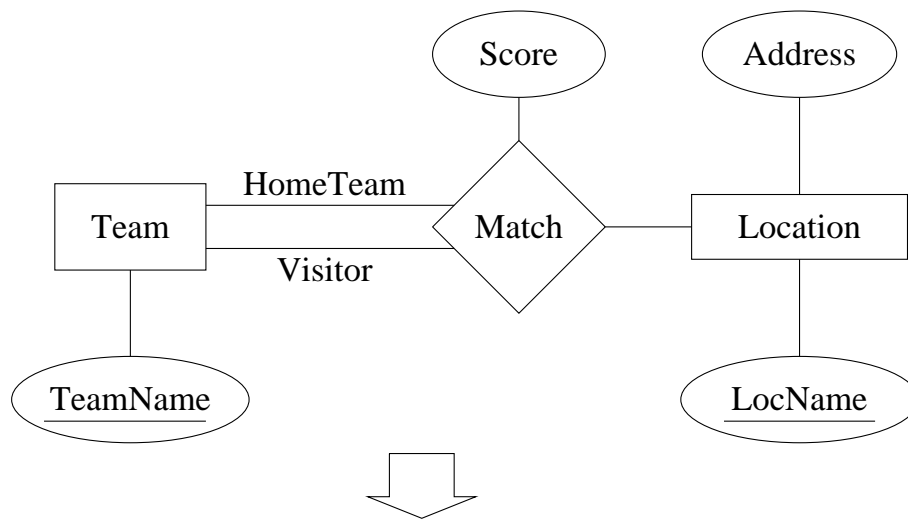
- Attributes of the relationship set
- Primary key attributes of each component entity set

Primary key of table R determined as follows

- If we can deduce the general cardinality constraint $(0,1)$ for a component entity set E , then choose the primary key attributes for E
- Otherwise, choose primary key attributes of each component entity

Representing Relationship Sets (cont.)

Example:



Team

<u>TeamName</u>

Location

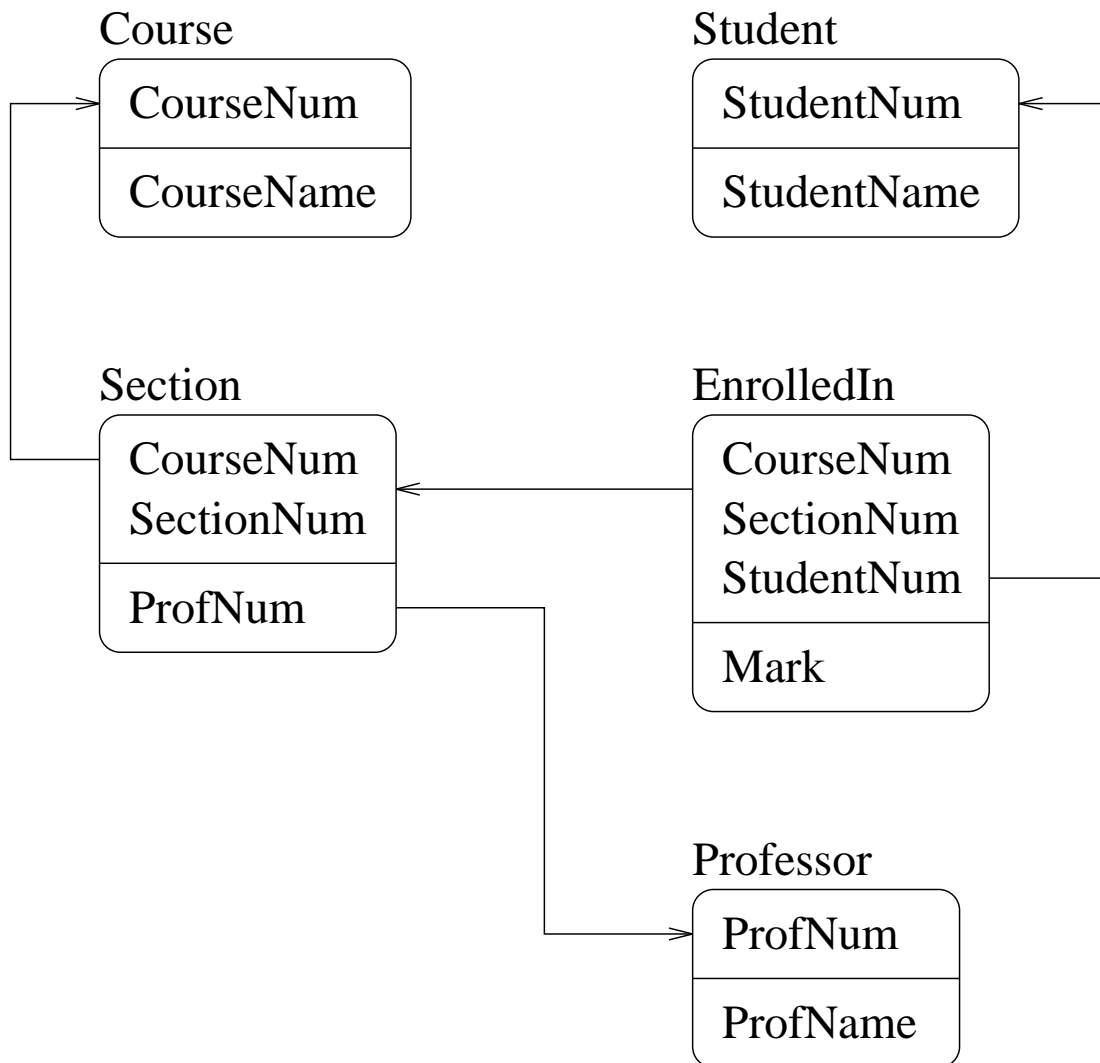
<u>LocName</u>	Address
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Match

<u>HomeTeamName</u>	VisitorTeamName	<u>LocName</u>	Score
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Note that the role name of a component entity set should be prepended to its primary key attributes, if supplied

Example Translation



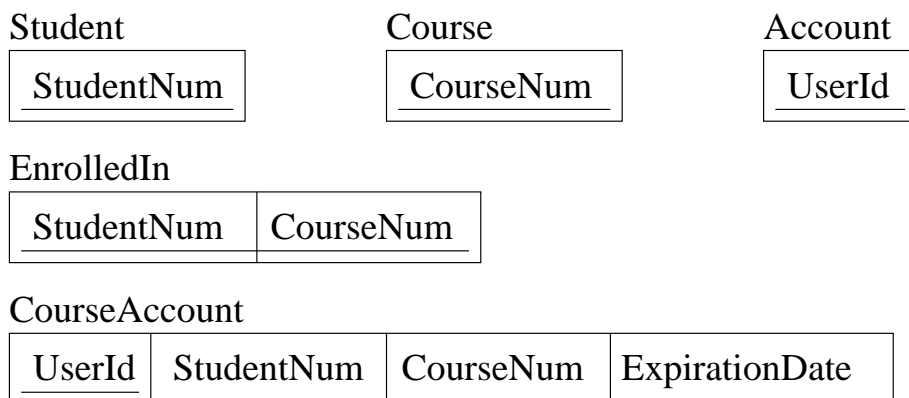
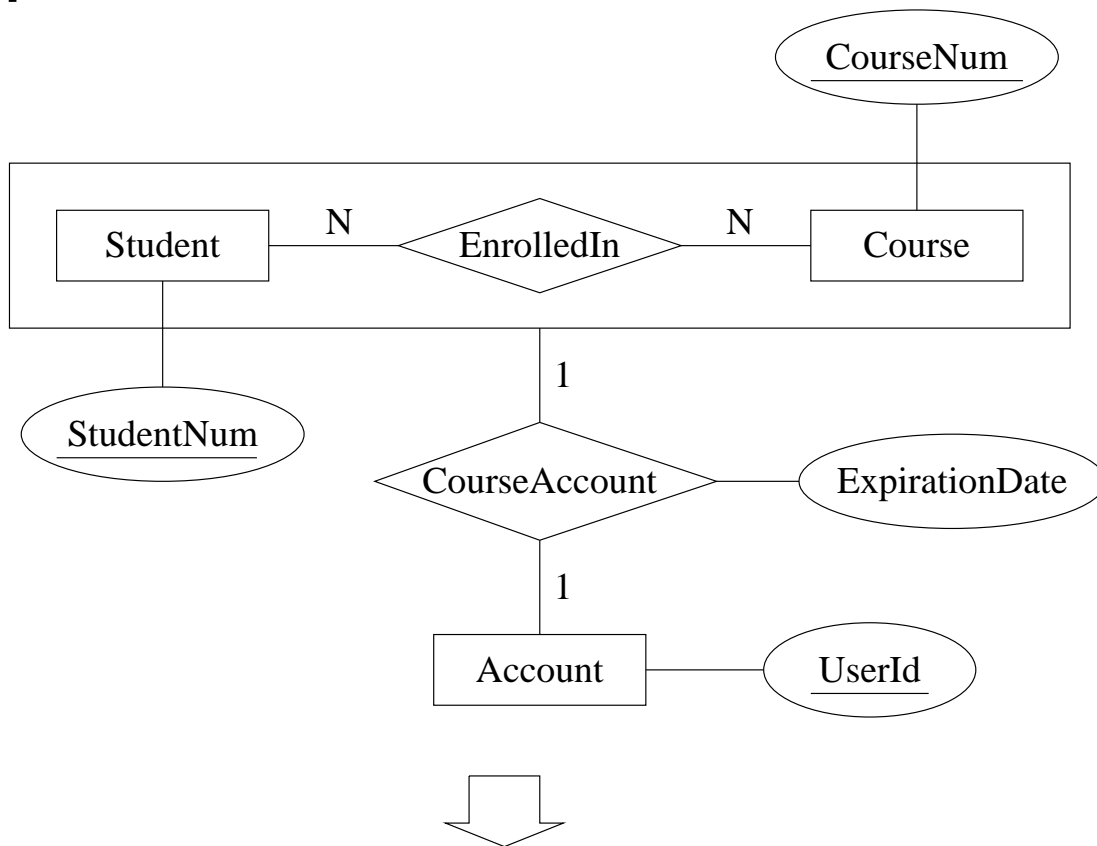
Representing Aggregation

Tabular representation of aggregation of R
= tabular representation for relationship set R

To represent relationship set involving aggregation of R ,
treat the aggregation like an entity set whose primary key
is the **primary key** of the table for R

Representing Aggregation (cont.)

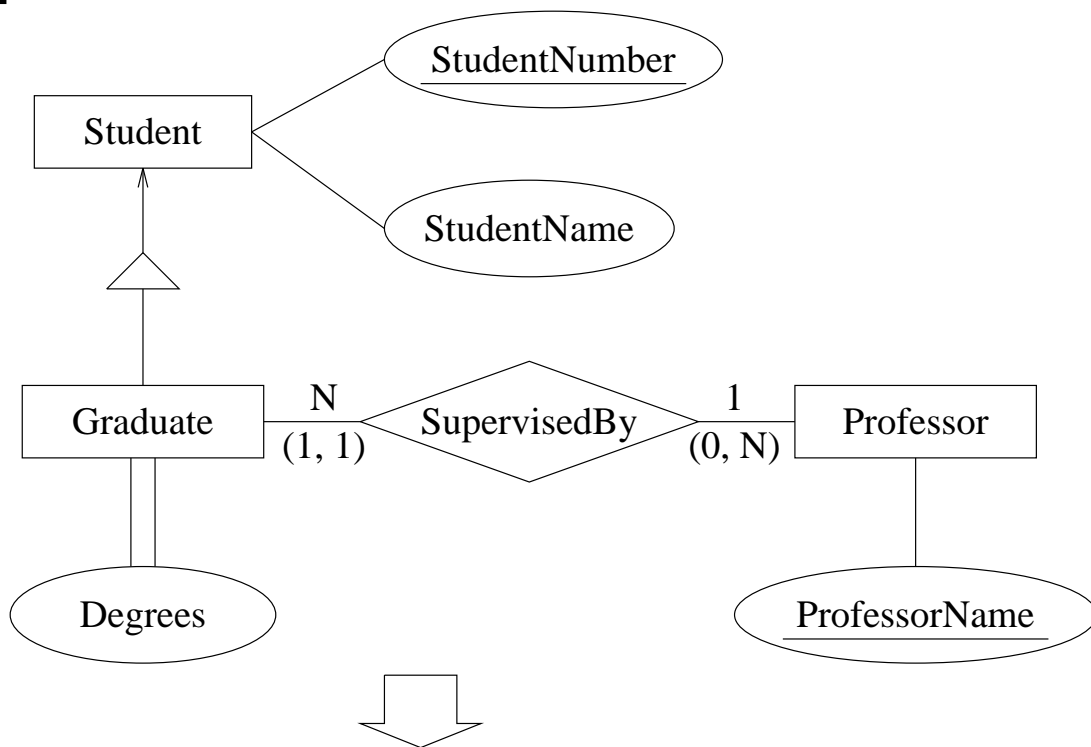
Example:



Representing Specialization

Create table for higher-level entity set, and treat specialized entity subsets like weak entity sets

Example:



Student

<u>StudentNumber</u>	StudentName
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Professor

<u>ProfessorName</u>

Graduate

<u>StudentNumber</u>	ProfessorName
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Degree

<u>StudentNumber</u>	Degree
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Representing Generalization

Create a table for each lower-level entity set only

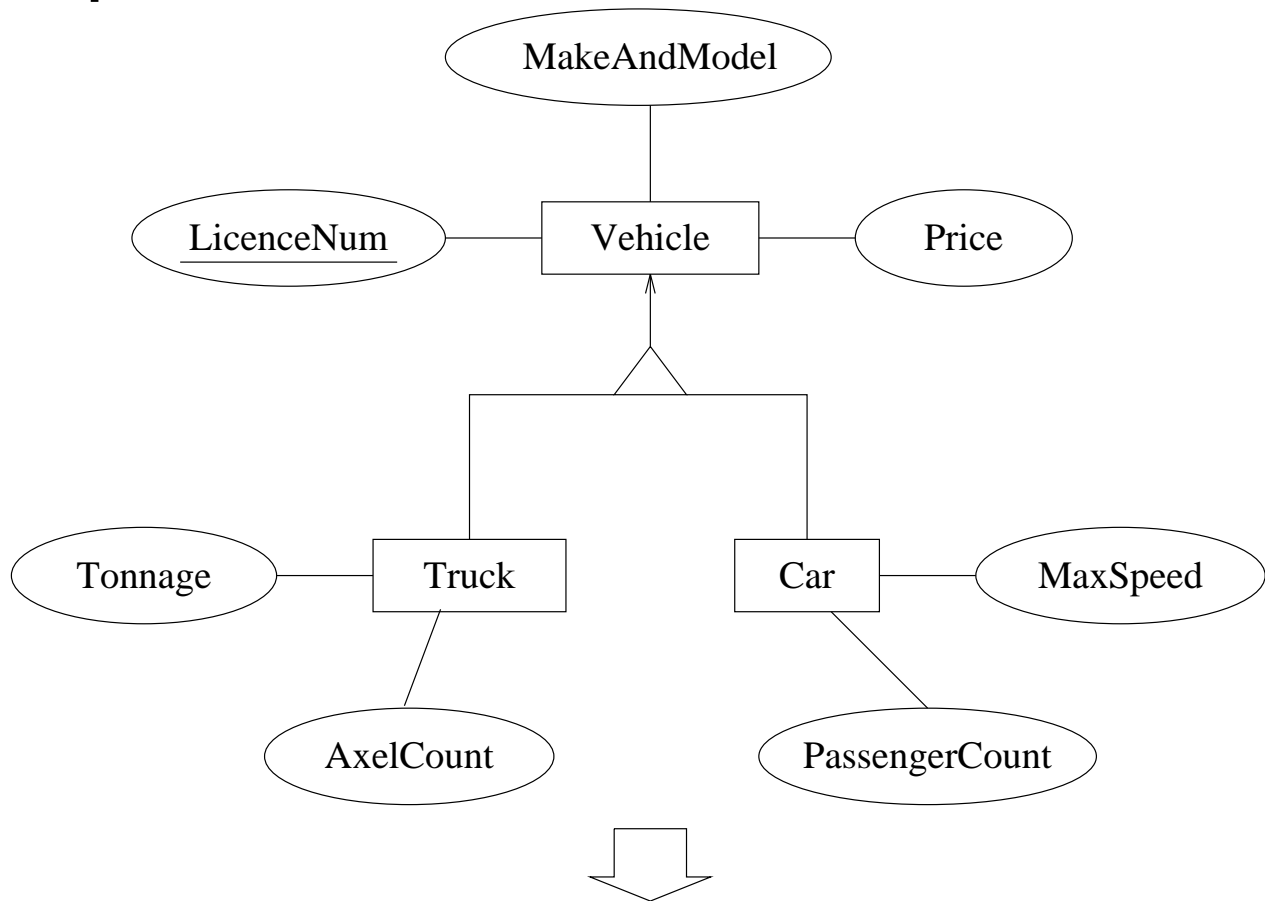
Columns of new tables should include

- Attributes of lower level entity set
- Attributes of the superset

The higher-level entity set can be defined as a view on the tables for the lower-level entity sets

Representing Generalization (cont.)

Example:



Truck

LicenceNum	MakeAndModel	Price	Tonnage	AxelCount
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Car

LicenceNum	MakeAndModel	Price	MaxSpeed	PassengerCount
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