

IS5102

Database Management Systems

Lecture 4: E-R Diagrams

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(with thanks to Susmit Sarkar)

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- ▶ Consolidating E-R Models
- ▶ Refinements to Weak Entities
- ▶ Specialisation, Generalisation
- ▶ Some common pitfalls

Designate subgroups within an entity set

Lower-level entities **inherit** all attributes and relationships of higher-level entities

Additionally, **lower-level** entity sets that have (additional) attributes or participate in relationships not applicable to **higher-level** entity set

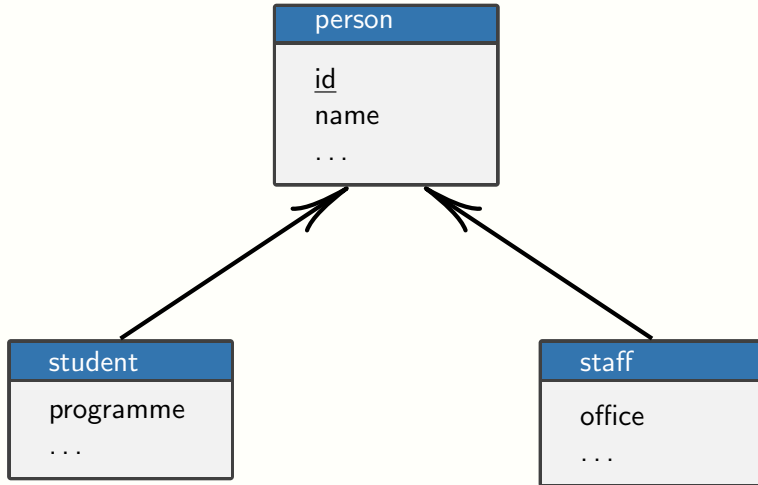
lower-level and **higher-level** entity sets are also called **subclass** and **superclass**

A lower-level entity set may have several higher-level entity sets (**multiple inheritance**)

Combine a number of entity sets sharing features into higher-level entity set

Specialisation and **Generalisation** are inverses of each other

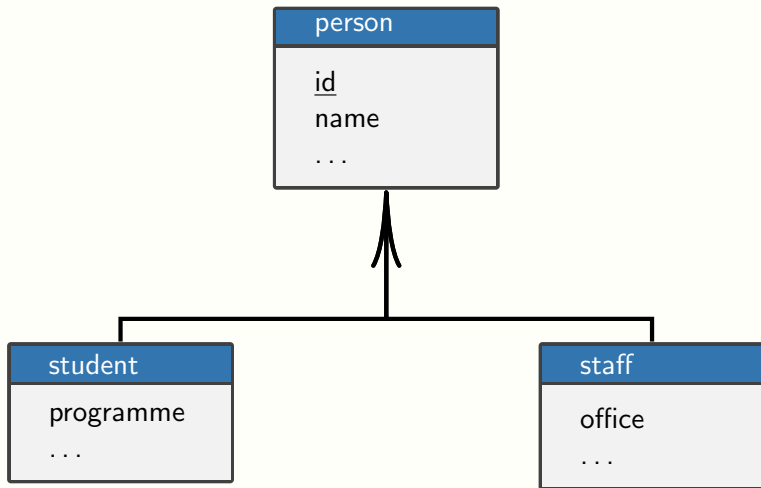
Specialisation/Generalisation Example



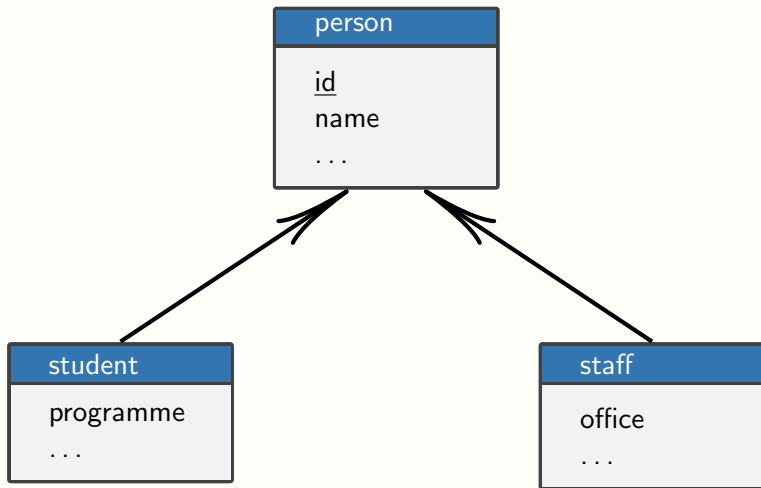
Overlapping constraint: An entity can belong to more than one lower-level entity set

Disjoint constraint: An entity can belong to only one lower-level entity set

Disjoint Specialisation/Generalisation Example



Overlapping Specialisation/Generalisation Example



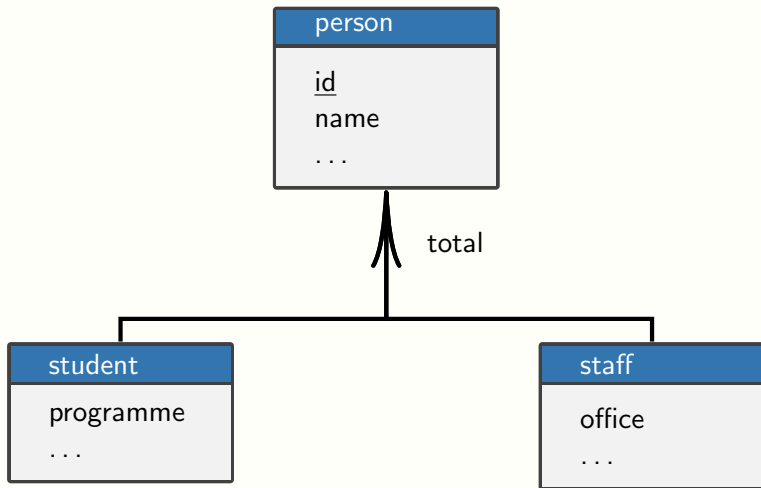
Note that there can be combinations (two specialisations are disjoint, but another one can overlap with both of those)

Completeness: specifying whether or not an entity in higher-level entity set must belong to at least one of lower-level entity sets

Partial specialisation/generalisation: an entity need not belong to any lower-level entity set

Total specialisation/generalisation: an entity must belong to at least one lower-level entity set

Total Disjoint Specialisation/Generalisation Example



Another type of constraint is related to determining which entities can be members of a given lower-level entity set

Condition-defined: membership depends on an explicitly stated condition

for example, **attribute-defined**

User-defined: a user makes a decision to assign an entity to a lower-level entity set

- ▶ Database Planning
- ▶ Requirement Collection and Analysis
- ▶ Database Design
- ▶ Database Selection
- ▶ Application Design
- ▶ Implementation
- ▶ Testing
- ▶ Management

Requirements Collection and Analysis

- ▶ **What** data is to be used;
- ▶ **How** that data is to be used

Often helpful to think of types of users

Each will have their own requirements on data

Can be used to create user views

Integration of user views subsequently

Typically, the objects (or nouns) are entities

... or sometimes attributes!

What are the natural groups?

Many different kinds of relationships (actions, subject-object, etc)

How do we identify our entities? (Keys)

Naturally occurring identifiers?

When does an entity (identify!) exist?

Scenario: An online shop

Questions

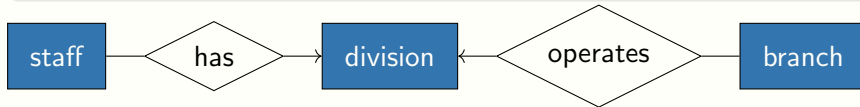
Who are the users of the database?

What example queries will they run?

What data needs to be recorded to answer those queries?

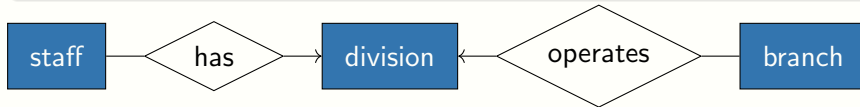
Fan Trap

When a model represents a relationship, but the pathway between entity occurrences is ambiguous.

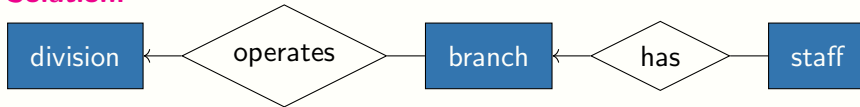


Fan Trap

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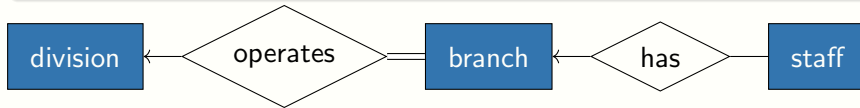


Solution:



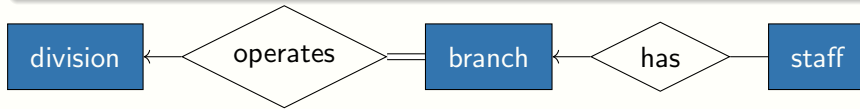
Chasm Trap

When a model suggests a relationship exists, but there is no pathway between certain entity occurrences.

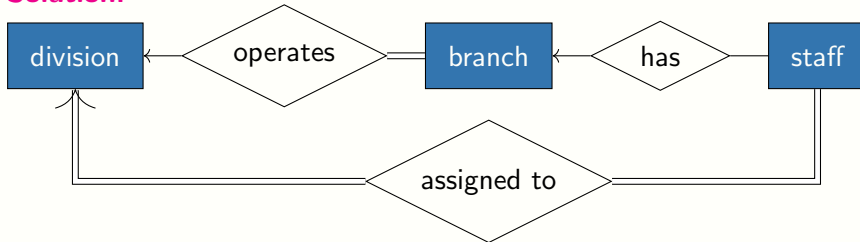


Chasm Trap

When a model suggests a relationship exists, but there is no pathway between certain entity occurrences.



Solution:



- ▶ Reading
 - ▶ Chapter 8, Database Design, 2nd Ed. Watt & Eng
 - ▶ Chapter 7, Database System Concepts, 6th Ed. Silberschatz, Korth & Sudarshan
 - ▶ Chapters 11-12: Database Systems, 6th Ed. Connolly & Begg
- ▶ Next Time: Relational Calculus and Algebra