

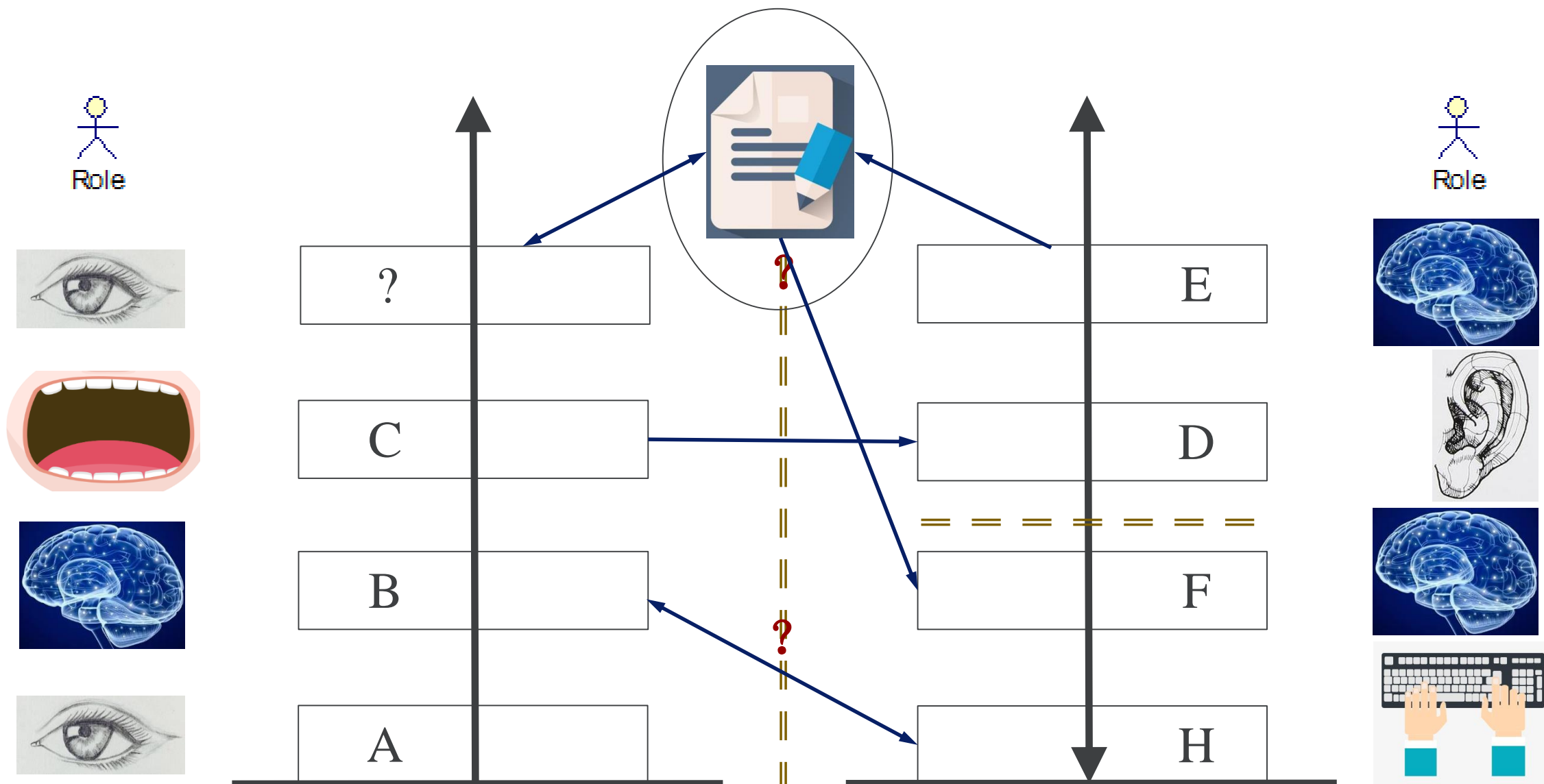
数据库概念设计

讲解人：陆伟 教授

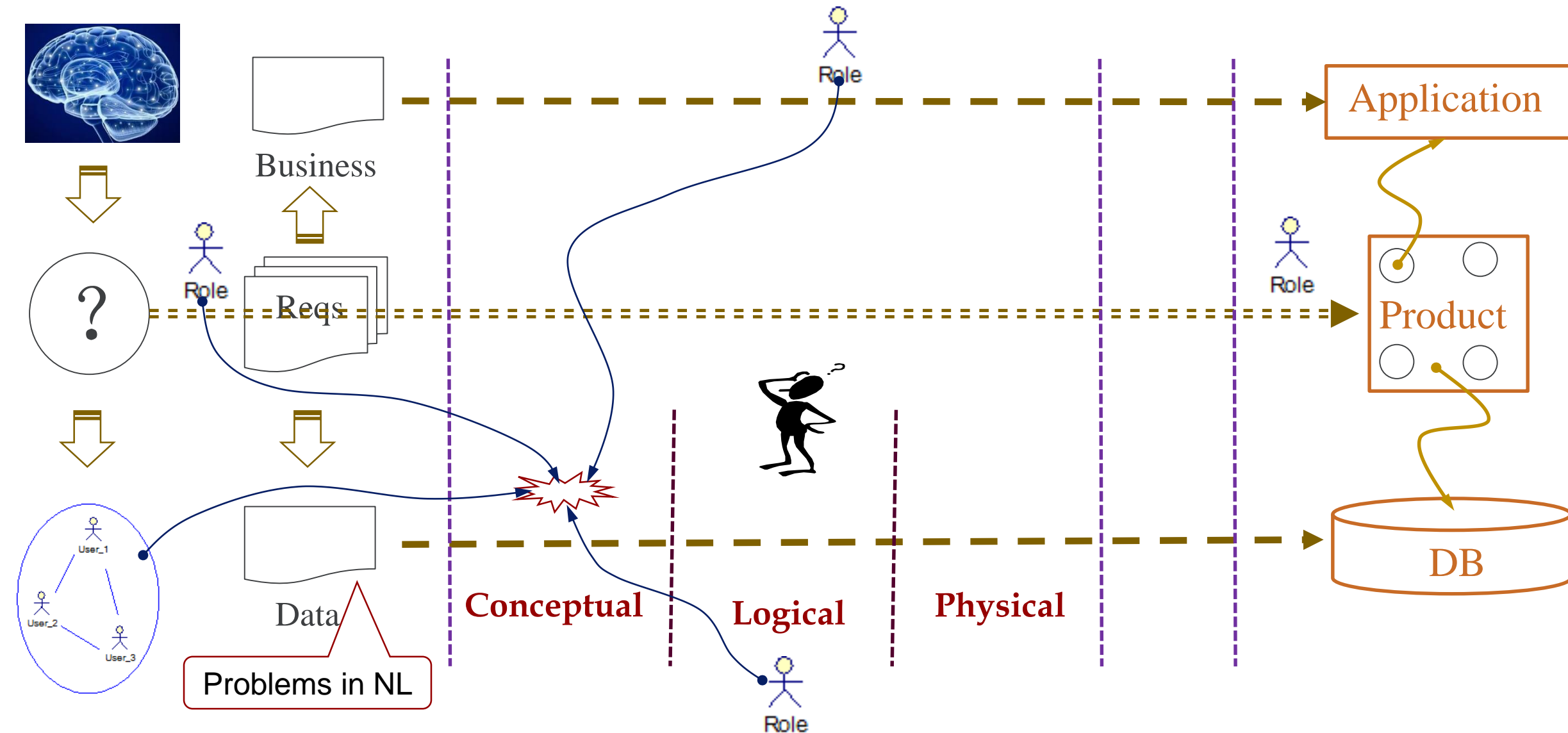
关于数据库设计的困难所在

- ❑ Once the requirements collection and analysis stage of the database application lifecycle is complete and we have documented the requirements for the database application, we are ready to begin the database design stage.
- ❑ One of the most difficult aspects of database design is the fact that **designers, programmers, and end-users trend to view data and its use in different ways.**
- ❑ Unless we gain a **common understanding** that reflects how the enterprise operates, the design we produce will fail to meet the users' requirements.

关于数据库设计的困难原因分析



我们该如何做？—数据库设计阶段划分



数据库概念设计

- ❑ To ensure that we get a precise understanding of the nature of the data and how it is used by the enterprise, **a model** is needed for communication.
- ❑ Requirements for the model
 - Non-technical
 - Free of ambiguities (无二义)
- ❑ The **Entity-Relationship (ER) model** provides a **semi-formal** notation for creating a high-level **conceptual schema**.
- ❑ The diagrammatic notations for representing ER model
 - **Unified Modeling Language (UML)**
 - The Crow's Feet Notation – The Chen Notation

实体-联系(ER)模型

□ Entity

- An *entity* is an object in the real world that is uniquely identifiable and has independent existence.

□ Entity Type

- Entities having the same properties are grouped together to form an *entity type*.
- Can be objects with a *physical (or real) existence* or *conceptual existence*.

□ Diagrammatic representation of entity types

- Each entity type is shown as a rectangle labeled with the name of the entity, which is normally a singular noun.

Student

Course

实体-联系(ER)模型

□ Relationship

- A *relationship* is a meaningful association between two or more entities.

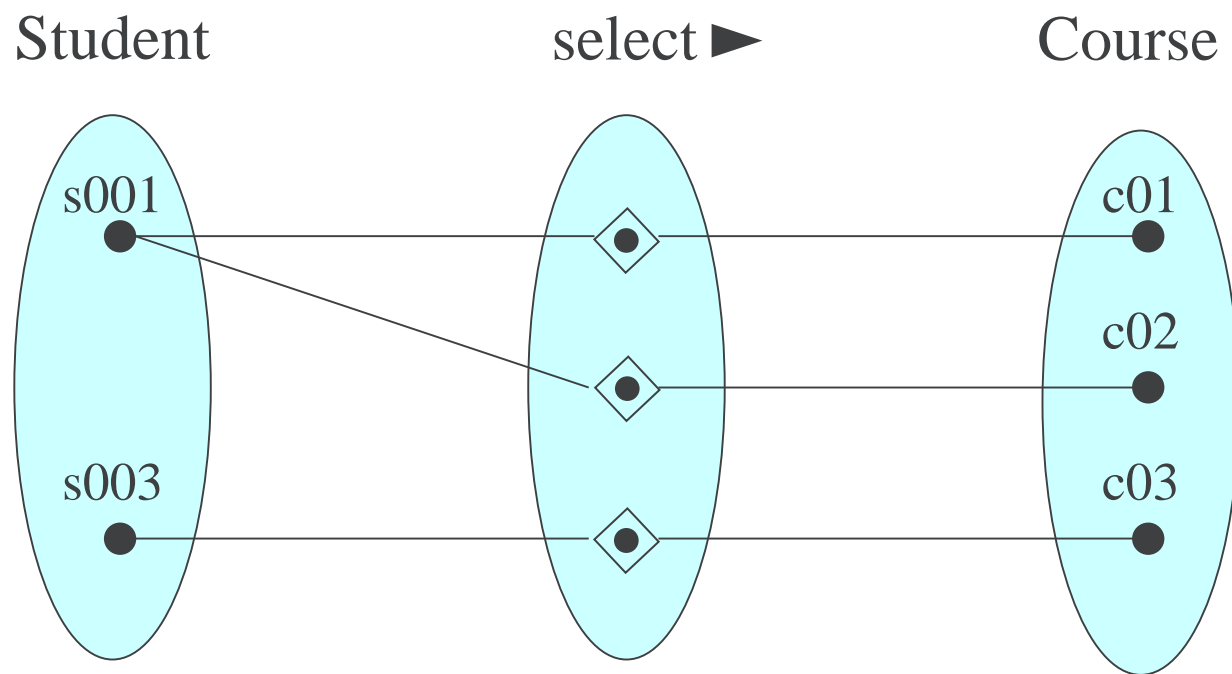
□ Relationship Type

- A *relationship type* is a grouping of similar relationships.

□ Diagrammatic representation of relationship types



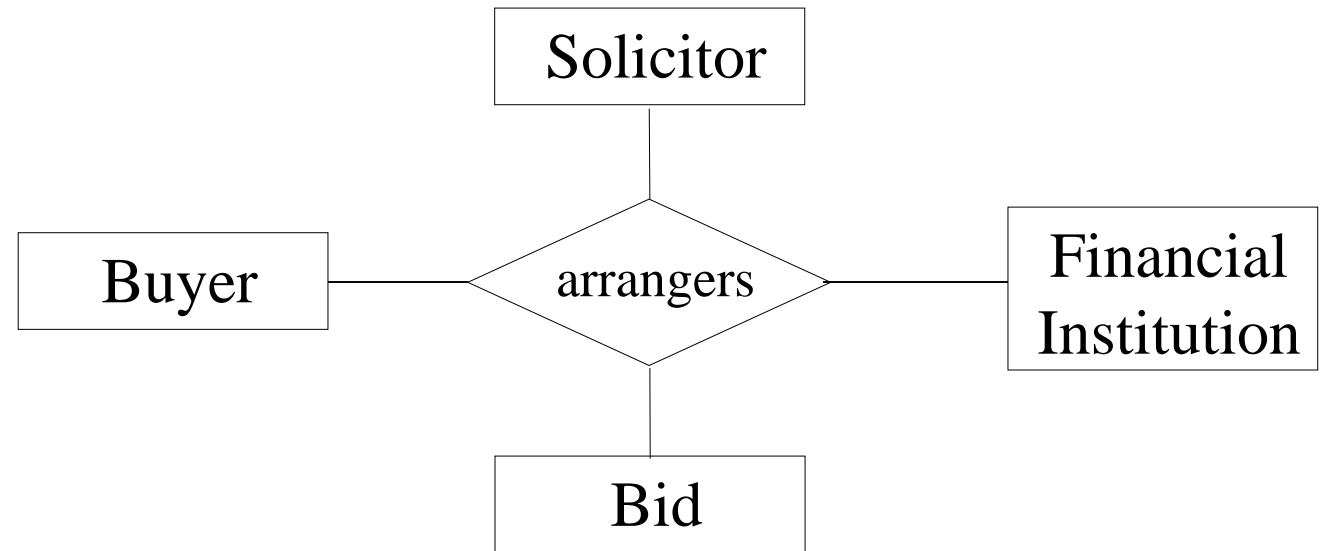
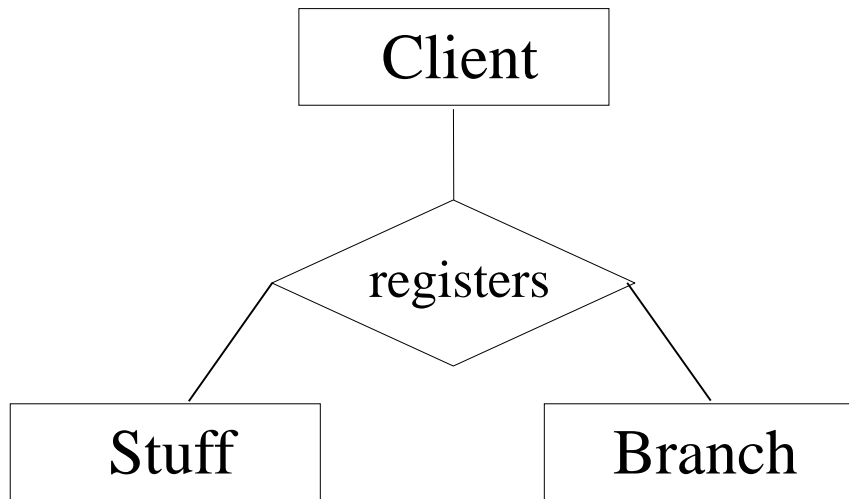
关于语义网



实体-联系(ER)模型

□ Degree of Relationship Type

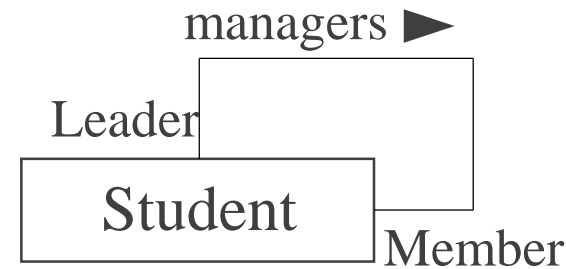
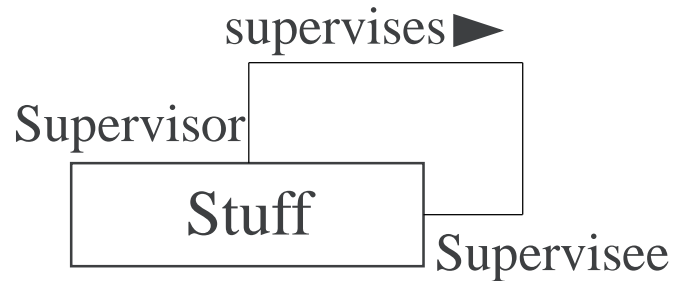
- The number of participating entity types in a relationship.
- The majority of the relationships in a database are binary.



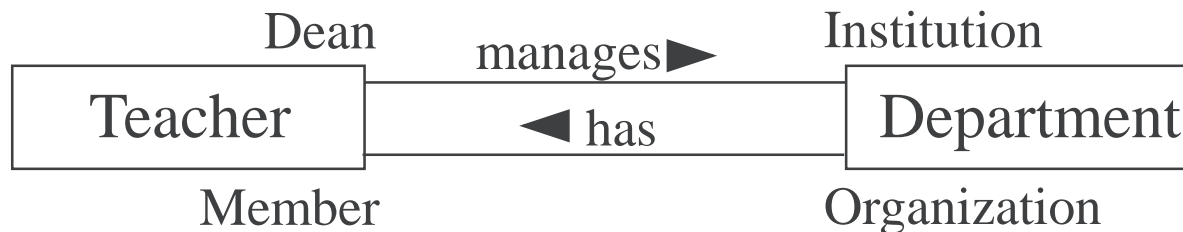
实体-联系(ER)模型

□ Recursive Relationship

- A relationship type where the same entity type participates more than once in different roles.

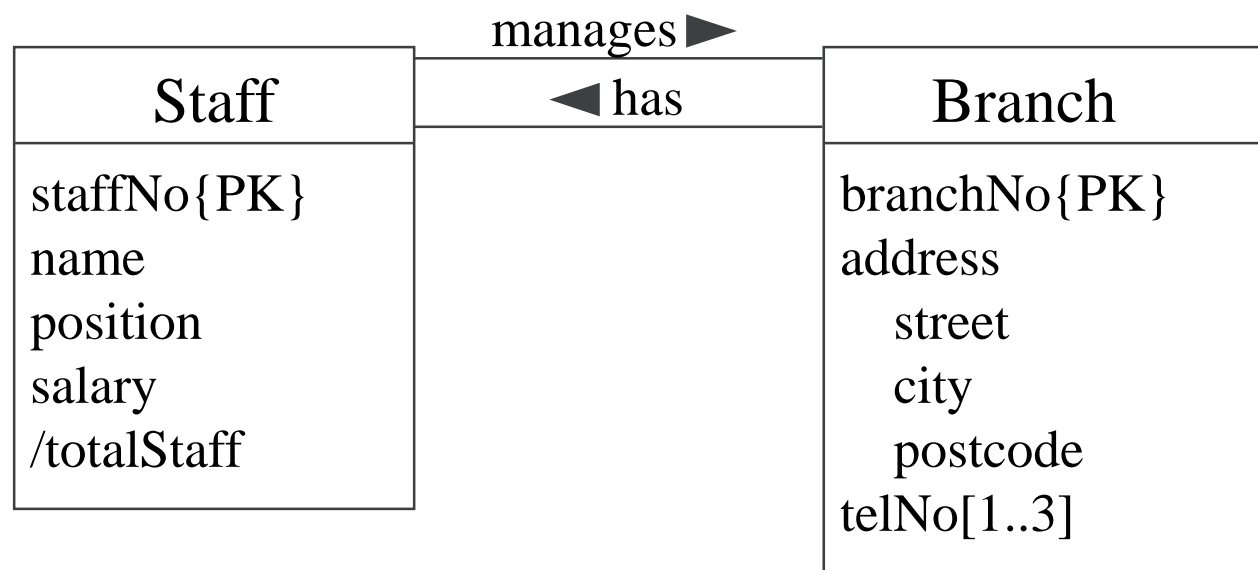


- Two entities may be associated through more than one relationship. Role may be used.



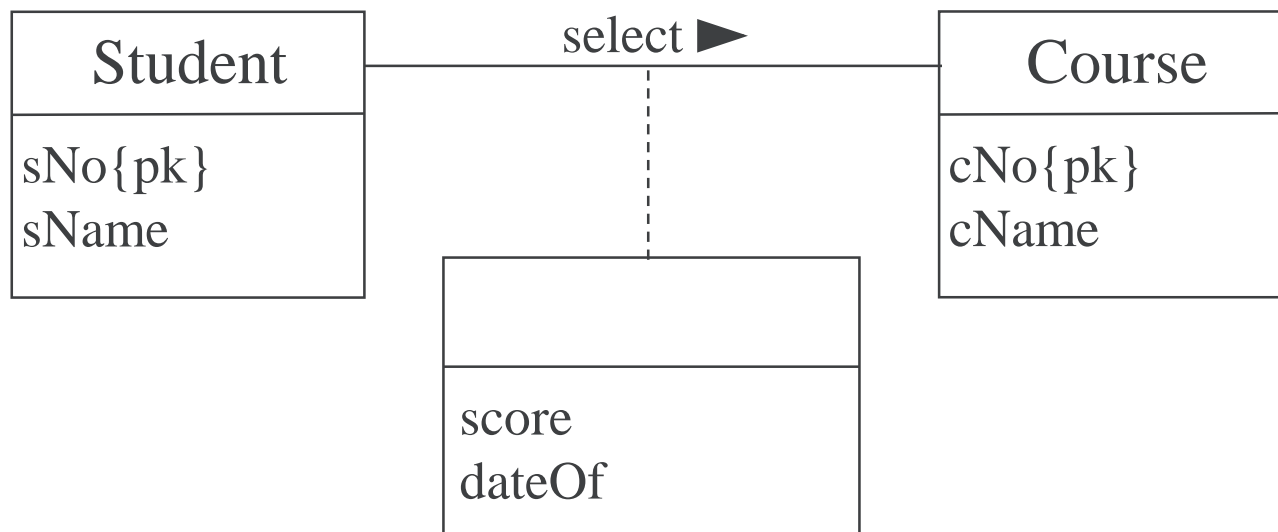
实体-联系(ER)模型

□ 关于属性(Attributes)的表示



实体-联系(ER)模型

□ 关于联系型的属性



实体-联系(ER)模型

□ 关于强实体和弱实体

- Strong Entity Type: Entity type that is not existence-dependent on some other entity type.
- Weak Entity Type: Entity type that is existence-dependent on some other entity type.



实体-联系(ER)模型

□ 联系型的约束

- Some questions can't be answer by the model we discuss above.



1. 一名教师必须至少属于一个部门吗？可以属于多个部门吗？
 2. 一个部门可以拥有多名教师吗？可以不拥有教师吗？
- The constraints on relationships can be used to express restrictions on relationships that exist in the real world which can help us answer these questions.

实体-联系(ER)模型

□ 联系型的约束

- In ER model, we can capture business rules using two types of multiplicity constraints, namely, *cardinality ratio* and *participation*.

- Cardinality ratio: 联系双方实体参与联系的个体数量关系

1 : 1 1 : n m : n

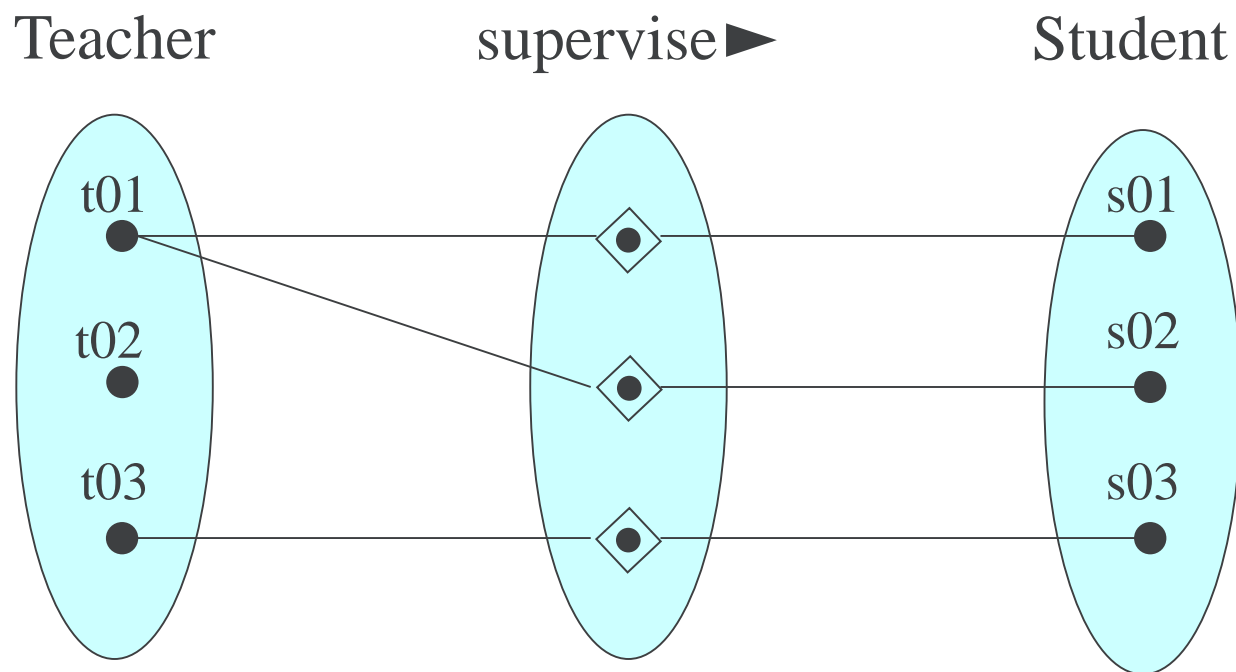
- Participation: 联系双方实体参与联系的个体参与情况

Mandatory participation

Optional participation

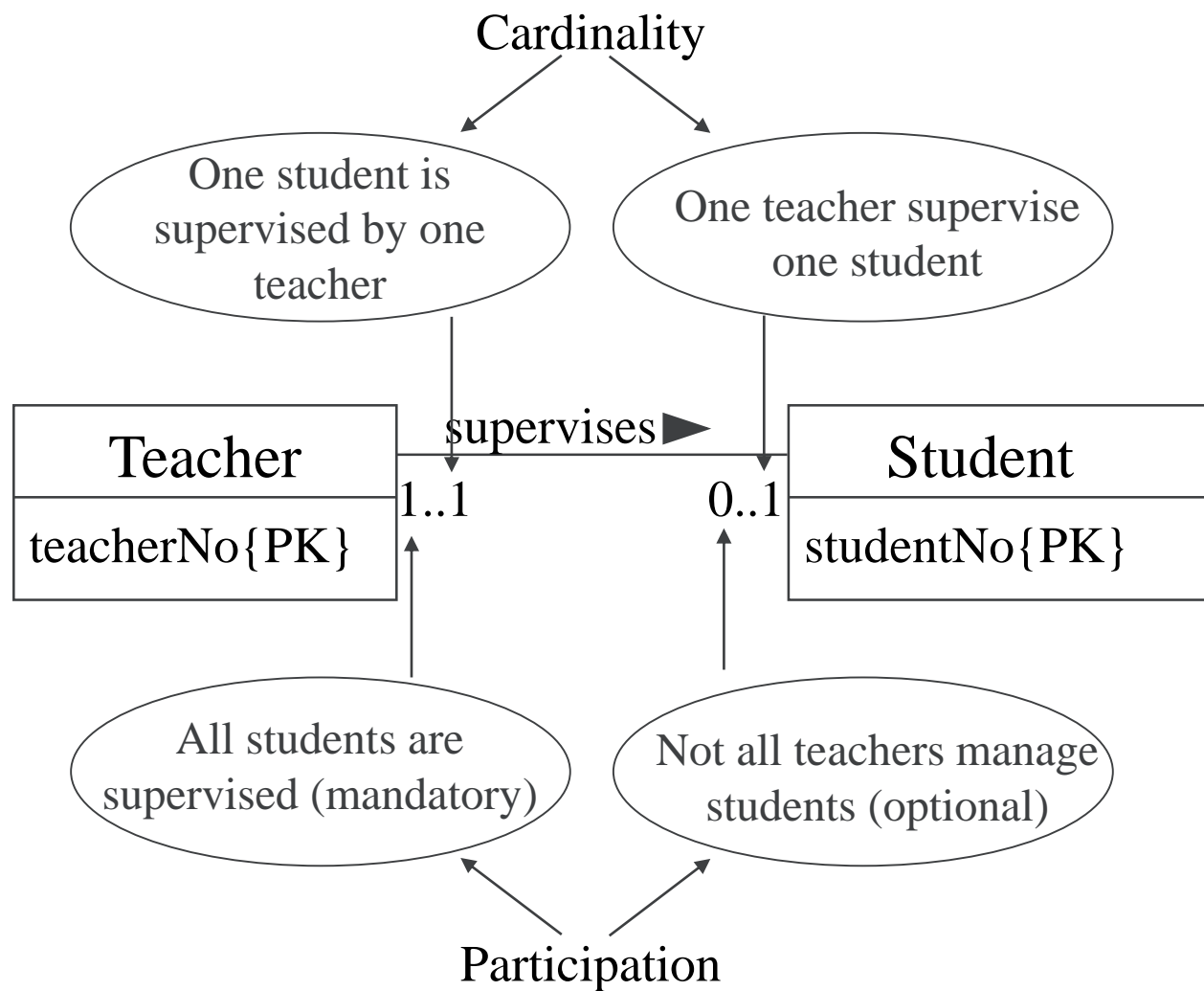
实体-联系(ER)模型

□ 联系型的约束



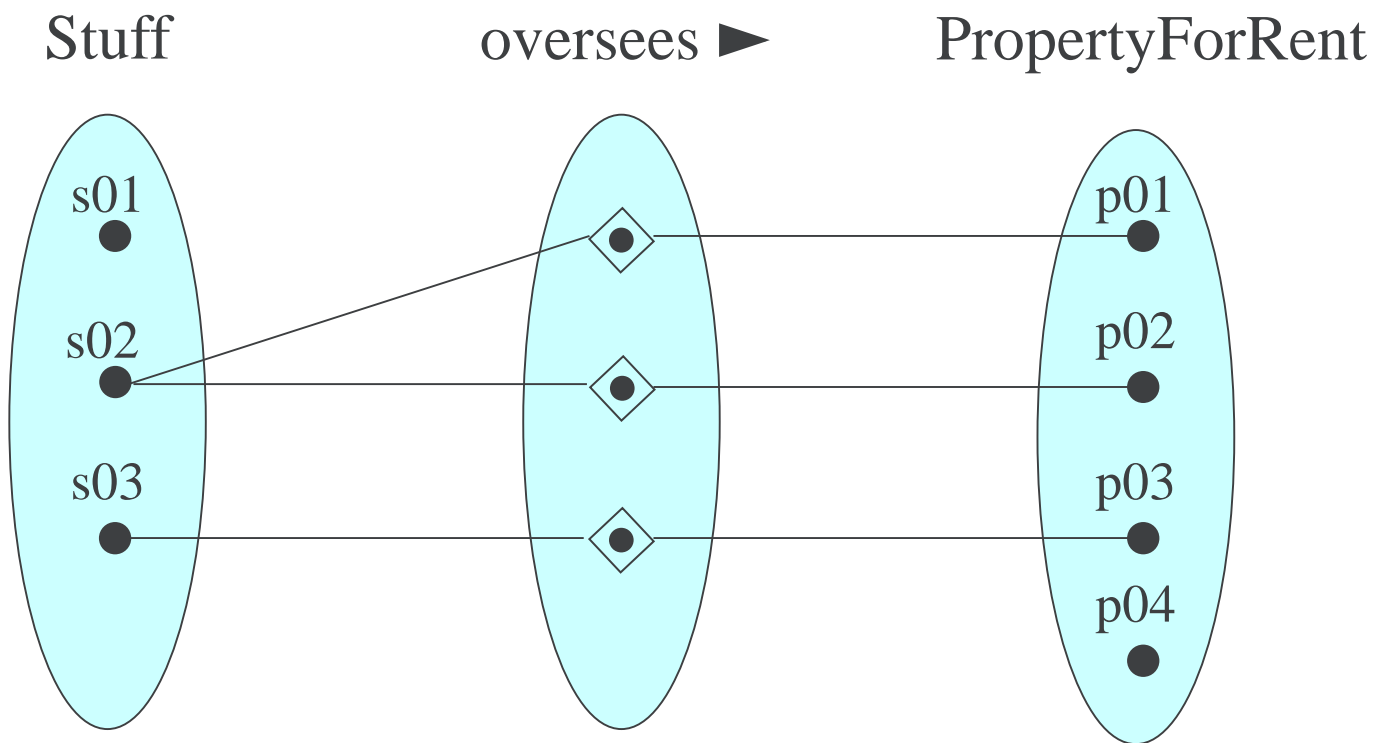
实体-联系(ER)模型

□ 联系型的约束



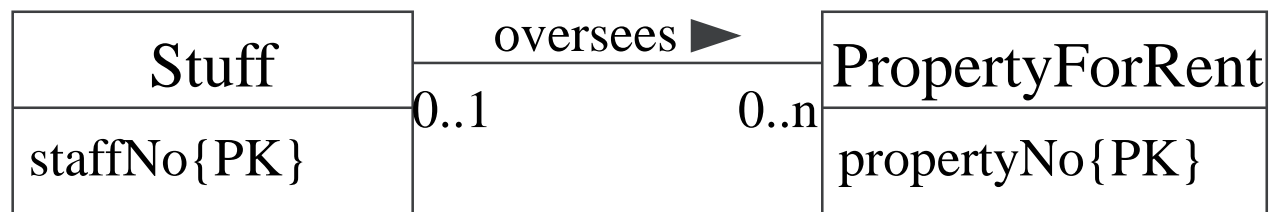
实体-联系(ER)模型

联系型的约束



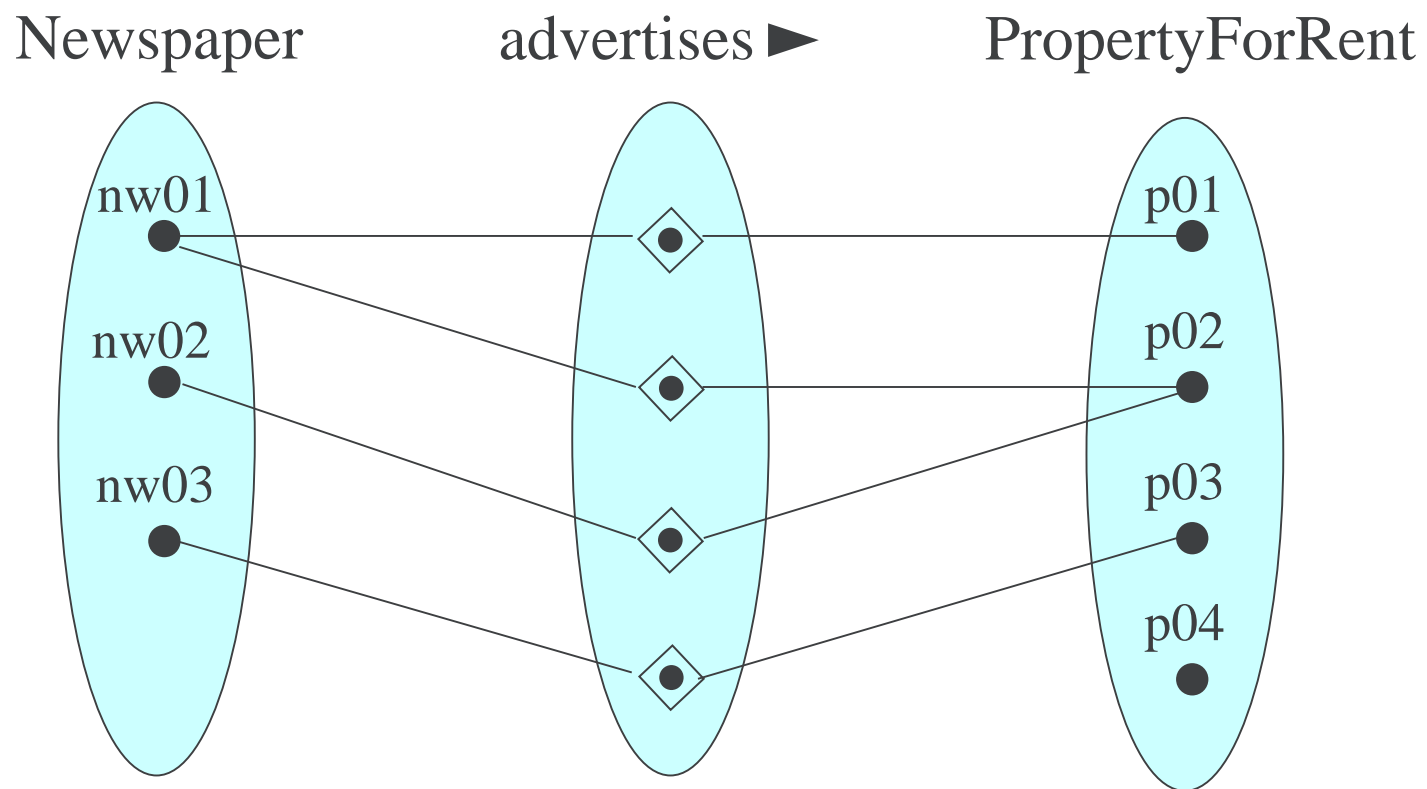
实体-联系(ER)模型

□ 联系型的约束



实体-联系(ER)模型

□ 联系型的约束



实体-联系(ER)模型

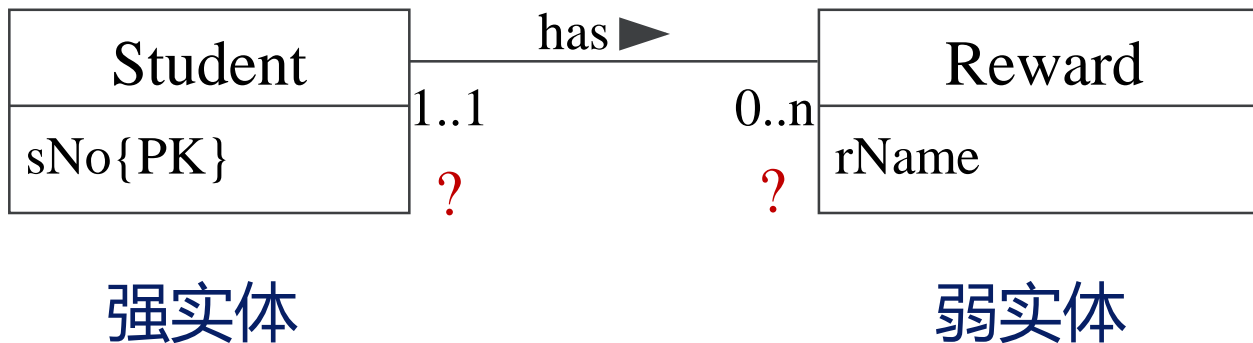
□ 联系型的约束



实体-联系(ER)模型

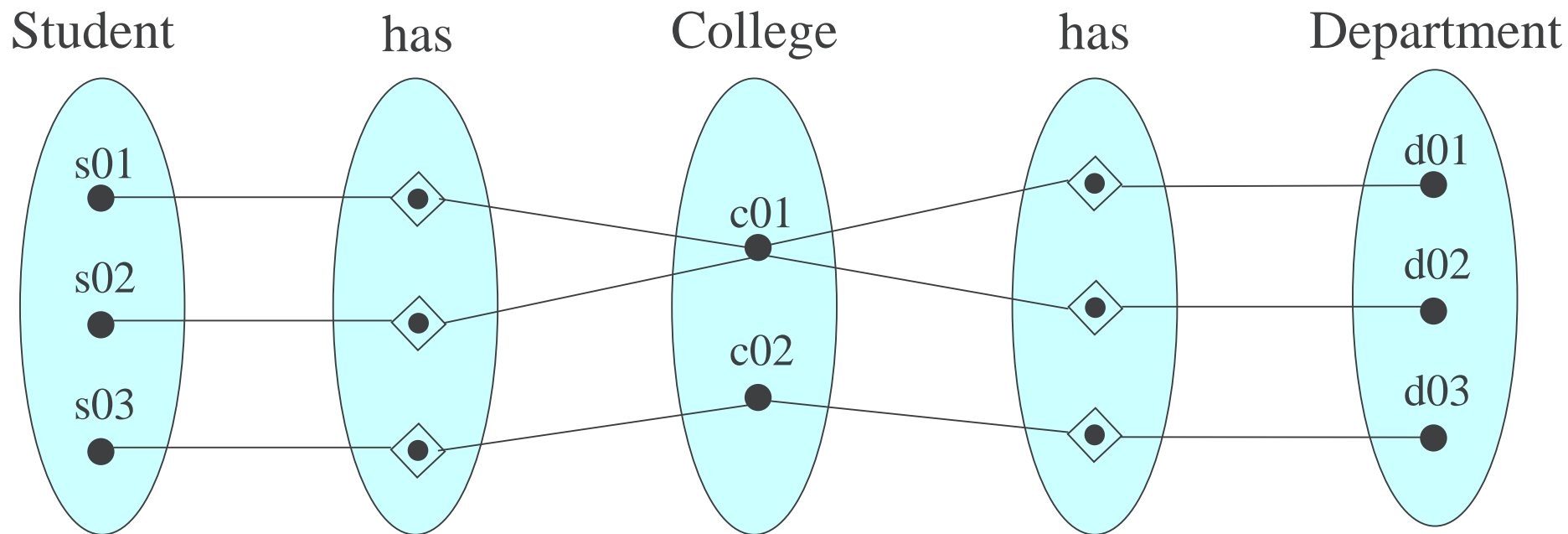
□ 联系型的约束

关于强实体和弱实体之间联系的约束问题



实体-联系(ER)模型

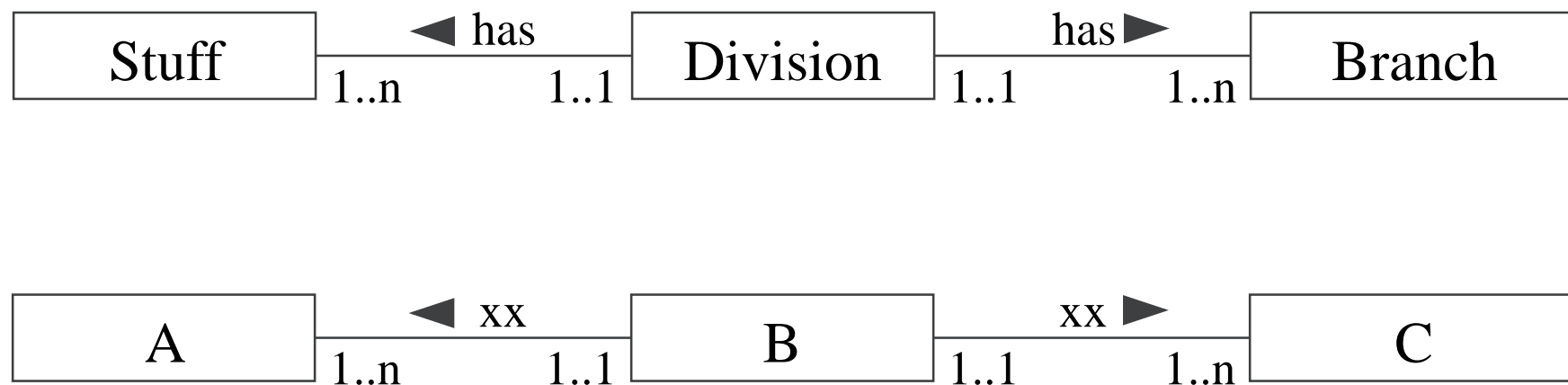
ER建模中的常见问题之一 扇形陷阱(Fan Trap)问题



s01同学属于哪一个学院?

实体-联系(ER)模型

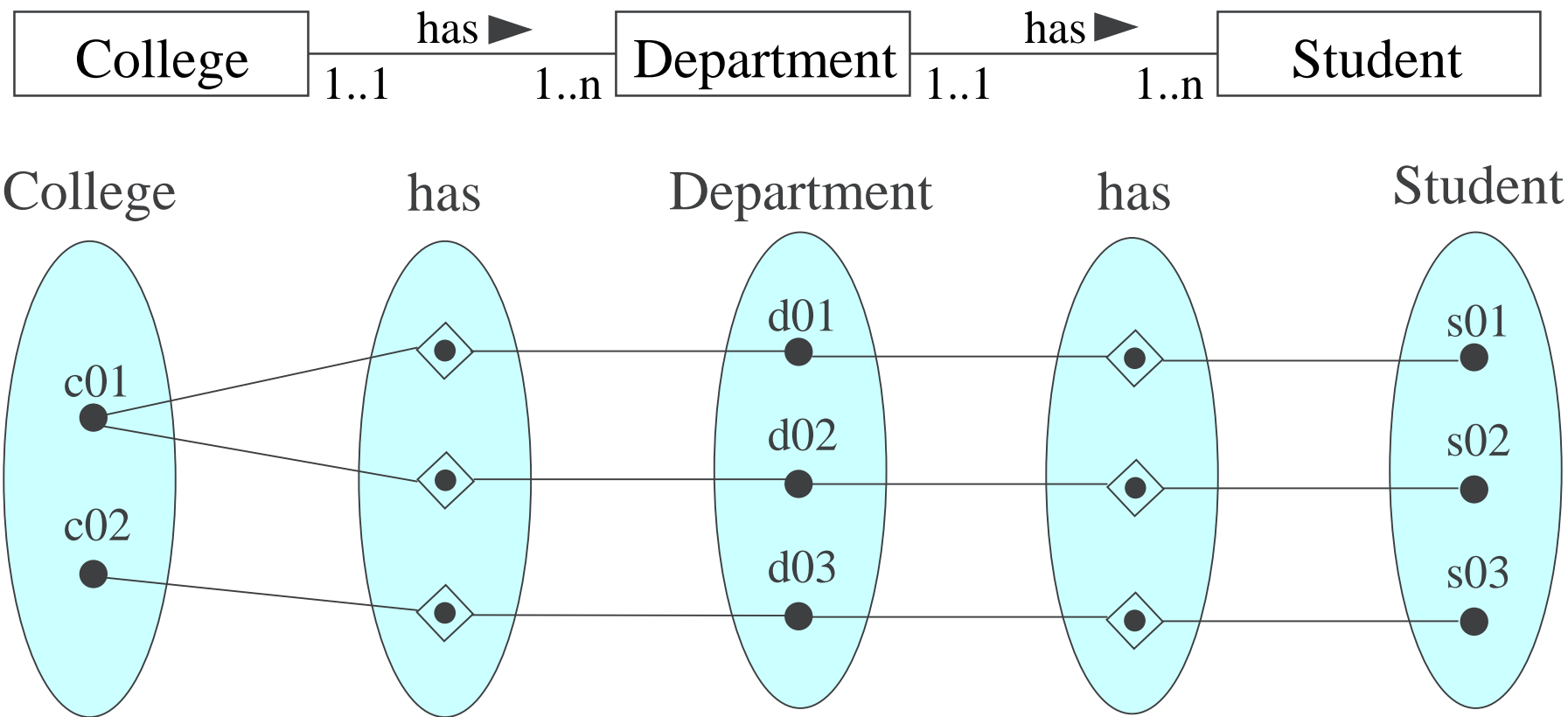
□ ER建模中的常见问题之一 扇形陷阱(Fan Trap)问题



讨论：一般什么情况下可能会产生扇形陷阱的问题？

实体-联系(ER)模型

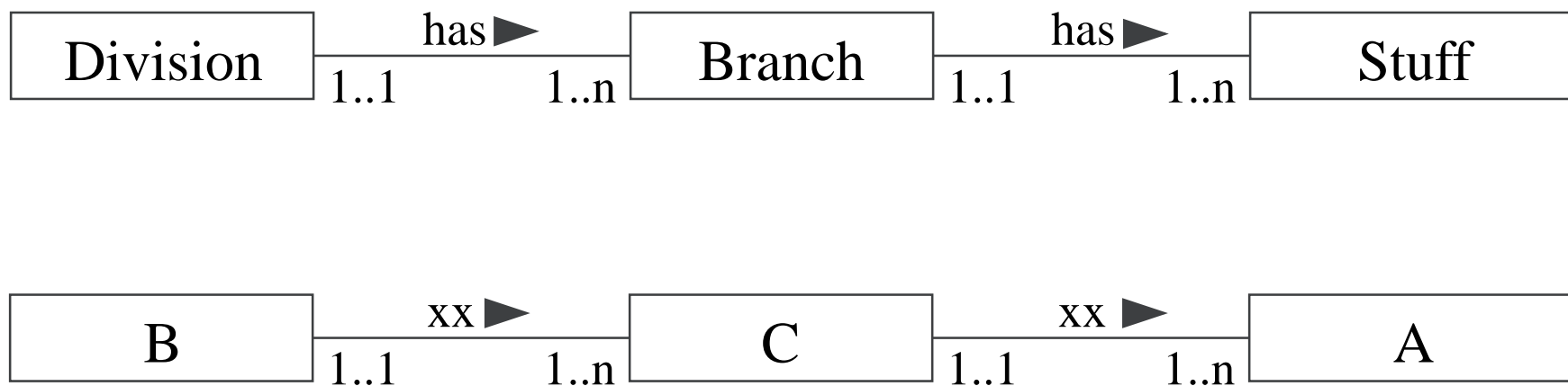
ER建模中的常见问题之一 扇形陷阱问题的解决



调整ER模型中实体型联系次序

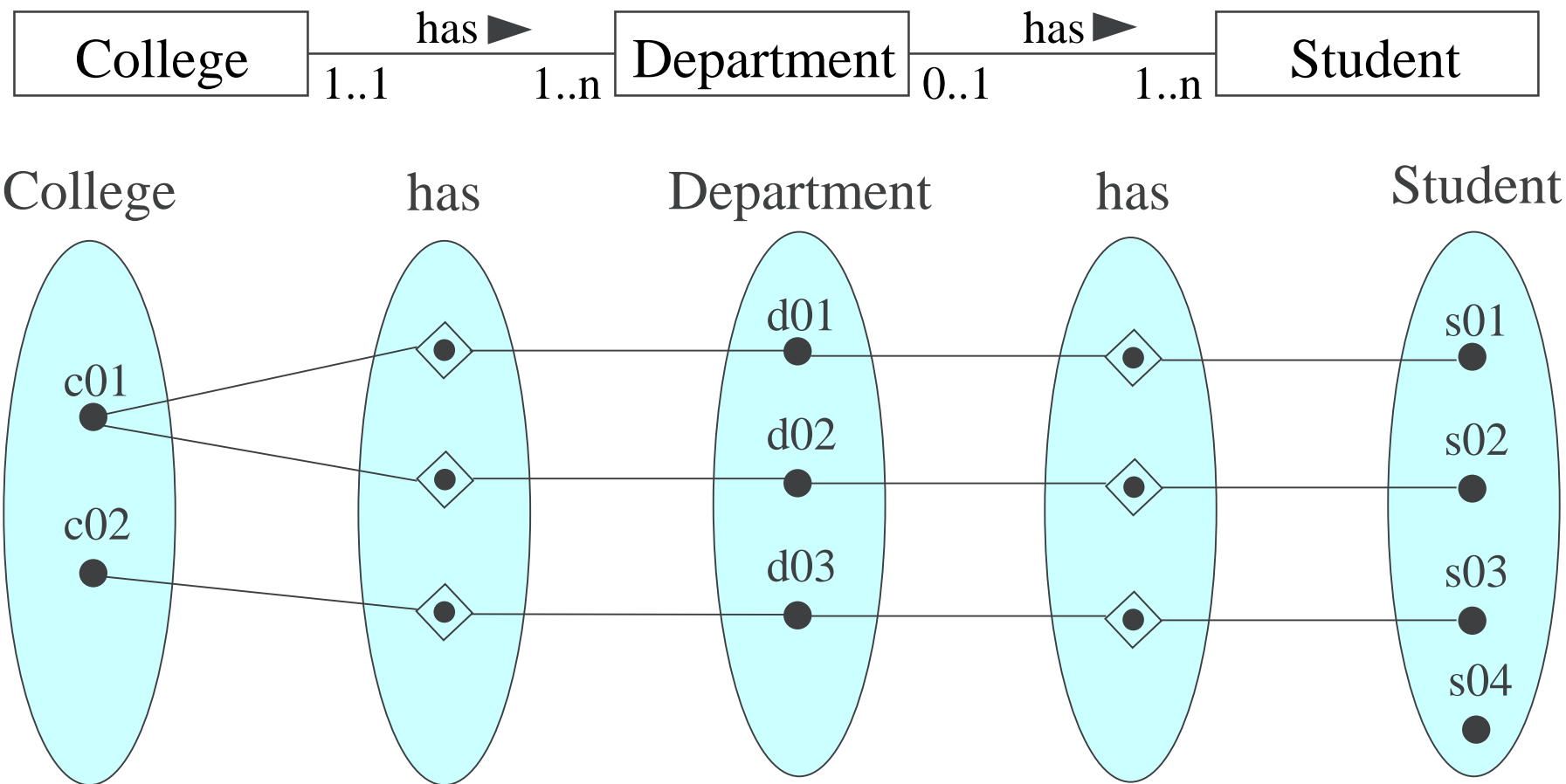
实体-联系(ER)模型

ER建模中的常见问题之一 扇形陷阱问题的解决



实体-联系(ER)模型

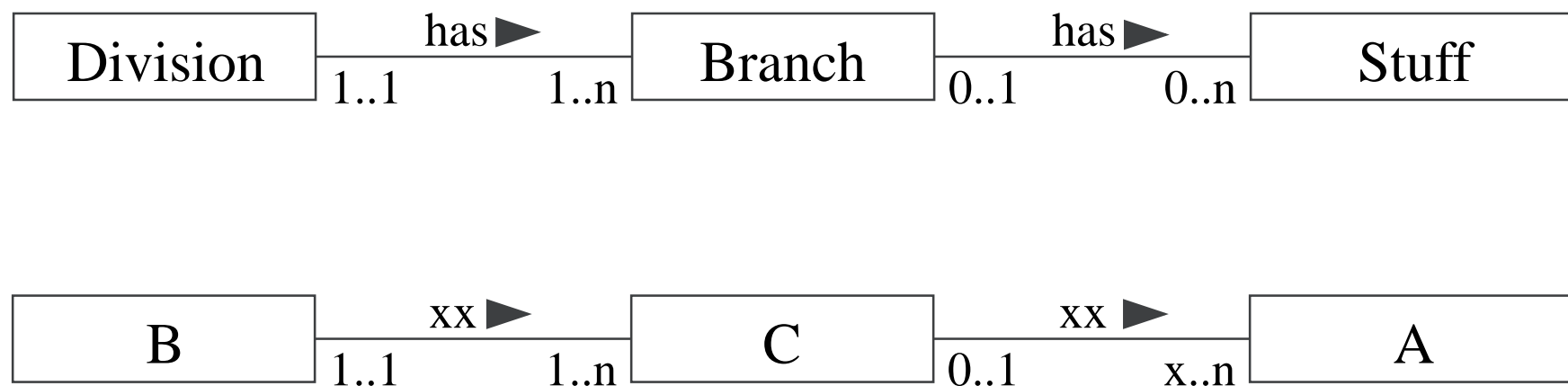
ER建模中的常见问题之一 深坑陷阱(Chasm Trap)问题



学生s04属于哪个学校?

实体-联系(ER)模型

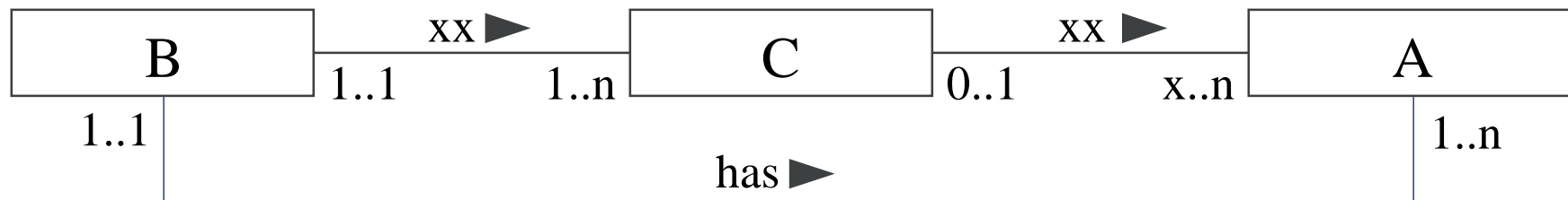
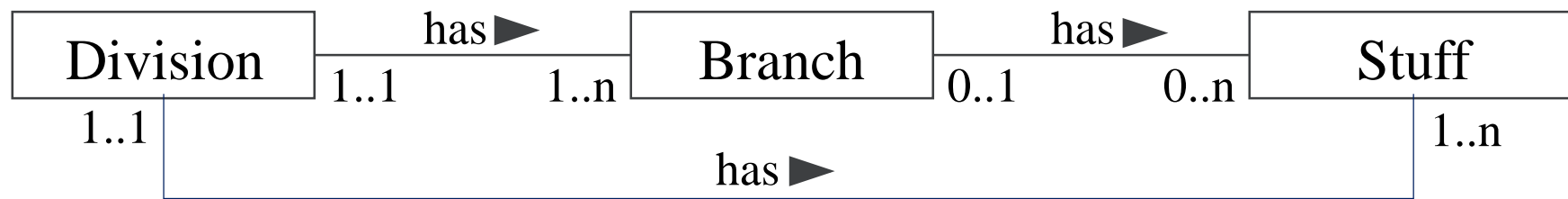
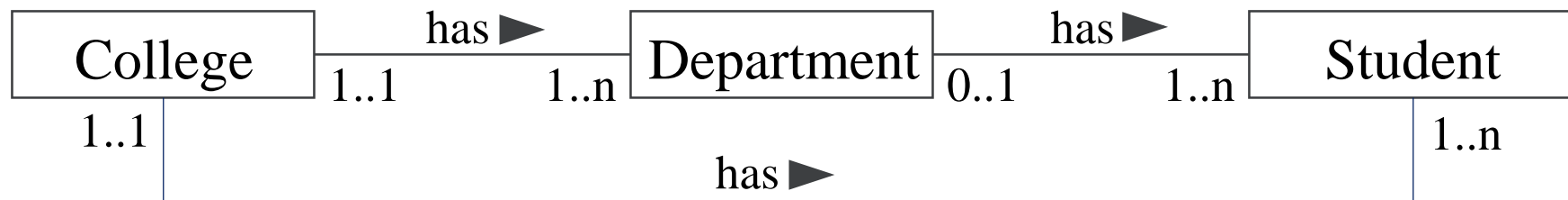
ER建模中的常见问题之一 深坑陷阱(Chasm Trap)问题



讨论：一般什么情况下可能会产生深坑陷阱的问题？

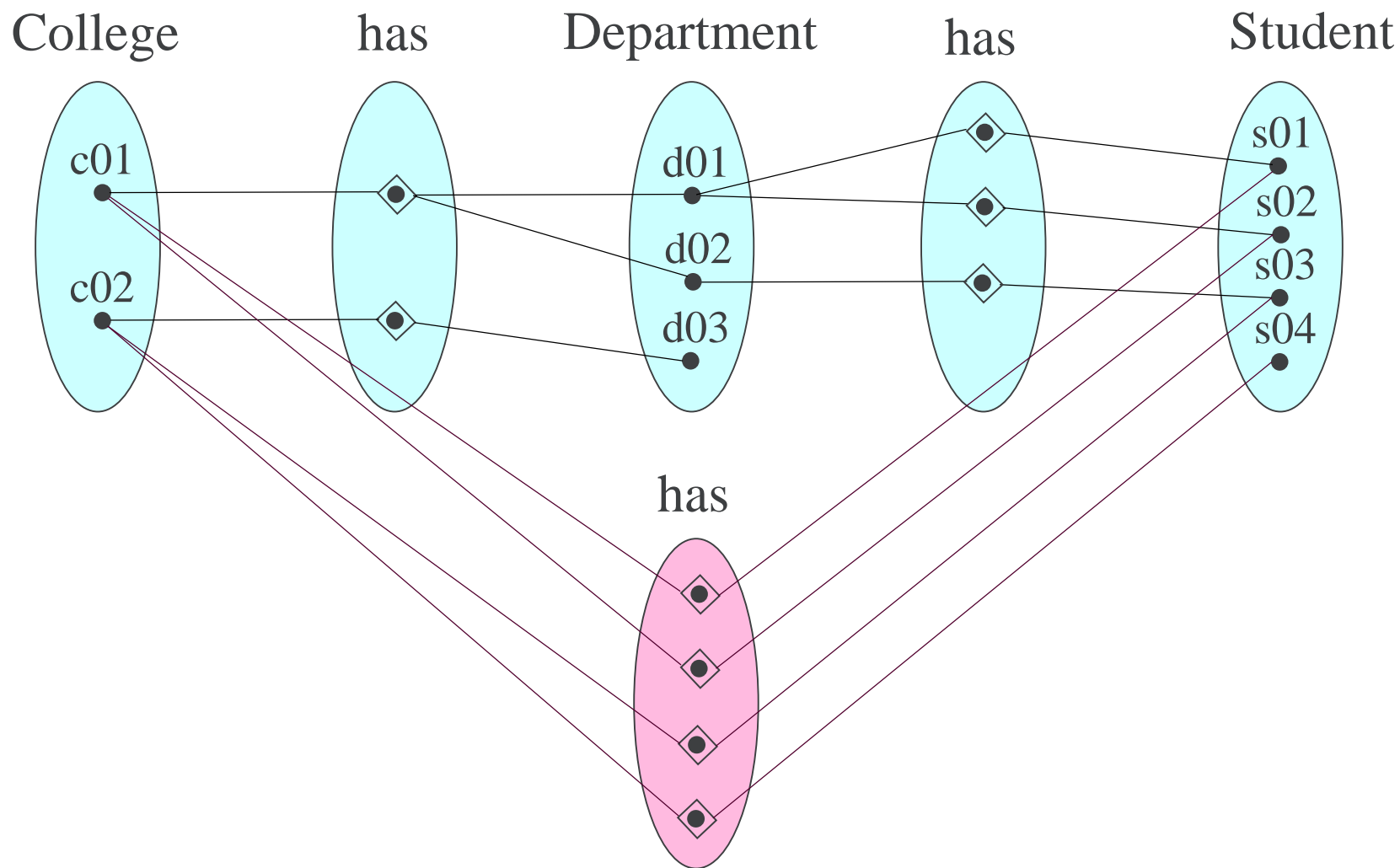
实体-联系(ER)模型

ER建模中的常见问题之一 深坑陷阱问题的解决



实体-联系(ER)模型

ER建模中的常见问题之一 深坑陷阱问题的解决



实体-联系(ER)模型

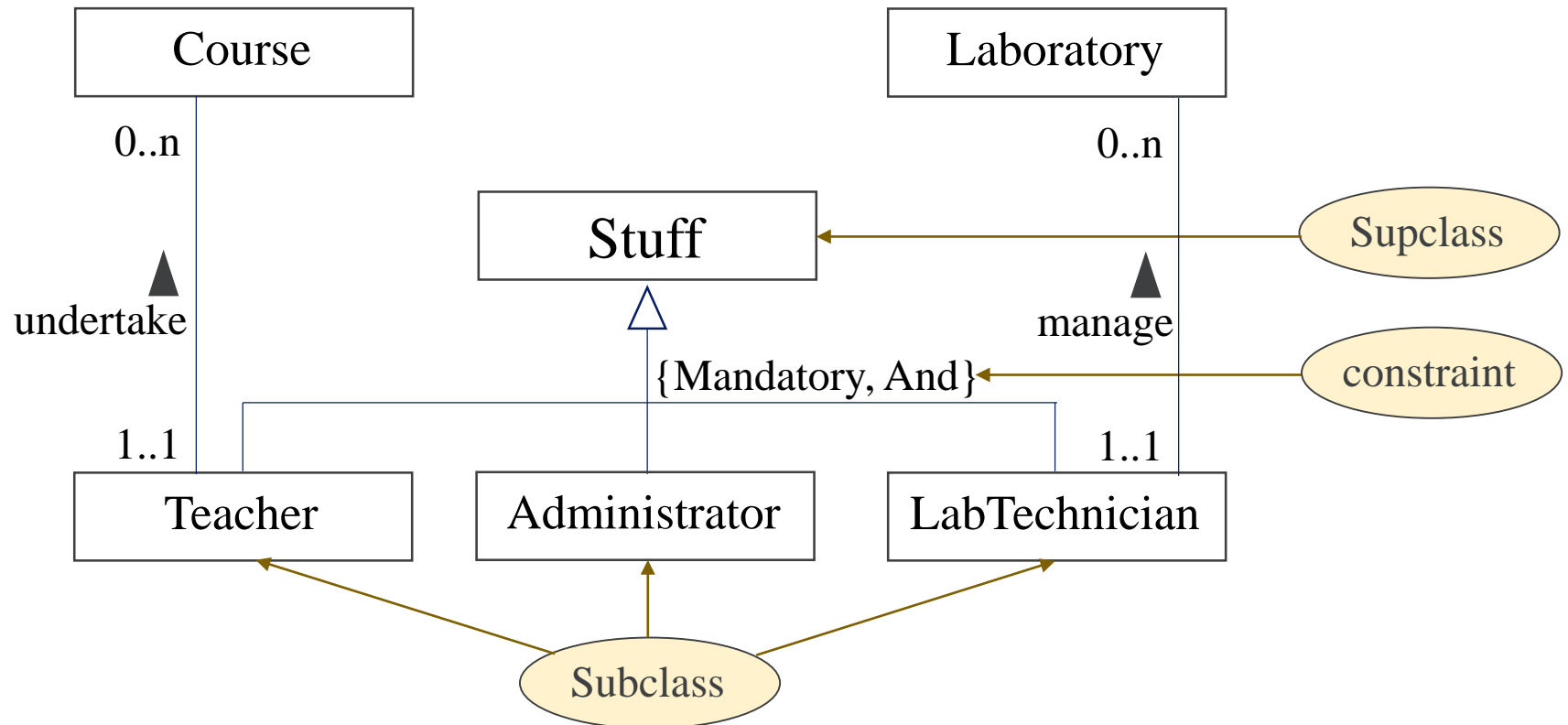
□ ER建模中的常见问题之一 总结与讨论

- 1、ER建模过程中扇形陷阱与深坑陷阱产生的一般场景
- 2、扇形陷阱与深坑陷阱的解决方法

实体-联系(ER)模型

□ 增强的ER模型(Enhanced Entity-Relationship Model)

- Semantic concepts are incorporated into the original ER model and called the Enhanced Entity-Relationship (EER) model.
- Examples of additional concept of EER model is called **specialization / generalization**.



关于本讲内容



祝各位学习愉快!

感谢观看！

讲解人：陆伟 教授