Conceptual Design

Projet base de donnèes – ENS Cachan

KOLČÁK Juraj
juraj.kolcak@lsv.fr

26 janvier 2018

Introduction

Motivation

- Complete understanding of the database structure, meaning, interrelationships and constraints.
- Conceptual schema is independent of DBMS choice.
- The more abstract diagrams and concepts are easier to comprehend.

Introduction

Formalism
The standard model used for conceptual analysis is the
Entity-Relationship (ER) model.

Principle

- Entities represent the concepts of the universe.
- Entities are characterised by a set of attributes.
- Facts connecting individual concepts in the universe are modelled as relationships between the corresponding entities.

Entity Types

Definition

Numerous entities generally share the same set of attributes (but not their values!). We say that such entities are of the same entity type. All entities of single entity type are known as entity set of a given type.

Attributes

- Simple vs. Composite
- Single-valued vs. Multi-valued
- Stored vs. Derived

Entity Keys

Definition

Key is a subset of attributes of a given entity type such that each entity in the corresponding entity set has unique values for the attributes in the key.

Primary Key

A single key is elected for each entity type as primary key. Primary key serves as unique identifier of entities of given type. As a general rule, the smallest possible key is selected as primary key.

Relationship Types

Definition

Just as entities, relationships share a lot of common properties (in particular, they connect entities of the same types). Relationships with the same characterisations share relationship type and belong to the same relationship set.

Properties

- Degree, number of connected entity types.
- Cardinality, more on next slide.
- Attributes, same as for entity types.
- Role names.

Relationship Types

Binary Ratios

- **1 :1** – Each entity of type 1 is connected to a single entity of type 2 and vice versa.
- **1 :N** – Each entity of type 1 can be connected to a single entity of type 2, but entity of type 2 can be connected to multiple entities of type 1.
- **N :M** – Entities of both types can have arbitrarily many connections.

Participation Constraint

Sometimes, it is useful to specify minimal cardinality, resulting in total participation. A particular case are weak entity types – entity types whose association with a different entity type serves as the primary key.