Data Bases

Conceptual Model

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Objective

- **Symbolic** and **reduced representation** of a problem
  $\Rightarrow$ **Conceptual Representation**
  ($\neq$ implementation, physical representation).

- Major **Categories**:

  - **Object oriented** models ($\sim$ UML).

  - **Entity-Association** models

Important Entity-Association models

- **Merise** (presented in this lecture).
- Chen.
- Bachman.
- Teorey.

Entity-Association Model (EA)

Graphical representation of a set of **entities**, their **associations** and their **attributes**.

Entity Type

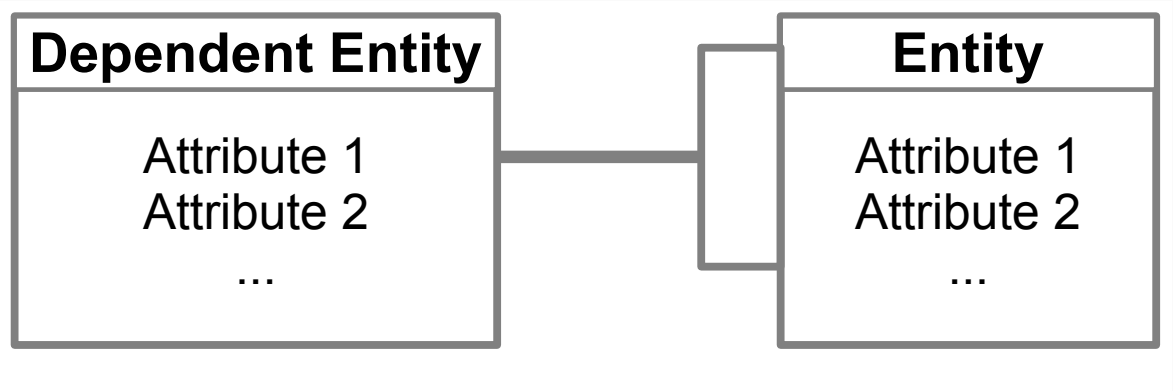
- Conceptual representation of an **object** with:
  - Its own **identity**.
  - Its own **properties**.

- Usually **Entity Types** are simply referred as **Entities**.

Dependent Entity

- Its **existence** is **conditioned** by the **existence** of at least **another entity**.

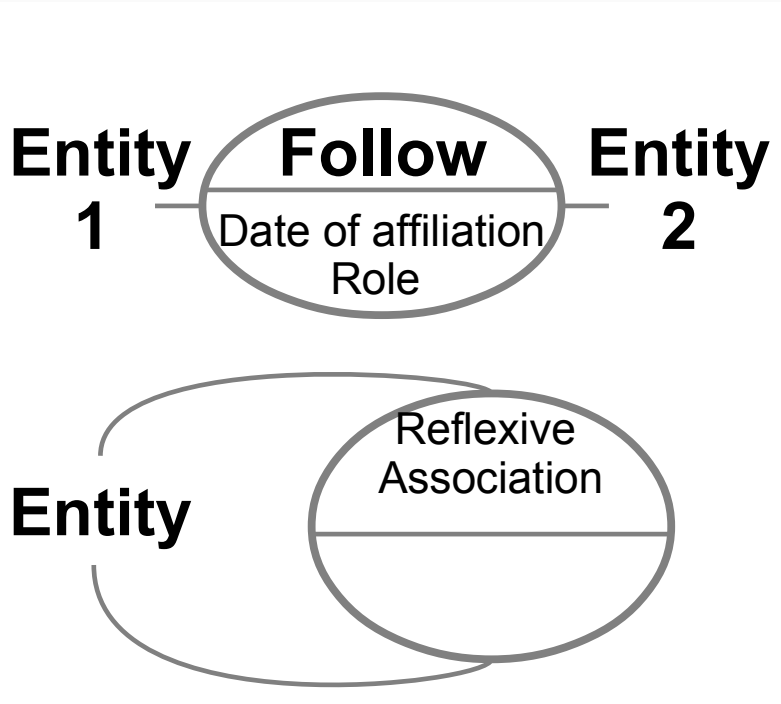
- Also called **Dominated** entity.



Association

Semantic (conceptual) **link between entities**.

- Associations involving **more than 2 entities** (n-ary with $n > 2$) are possible but are **not recommended**.
- **Reflexive** associations are **allowed**.



Exercise

- Propose an example with **2 entities** and **1 association**
- Propose an example with **3 entities** and **1 association**
- Propose an example with a **reflexive association.**
- Propose an example with **one dominated entity**.

Properties, Attributes and Domains

- **Property** $\mapsto$ **elementary information** describing **independently** an **entity** or an **association**.

- **Attribute** $\mapsto$ **Describe** the **properties** associated to **entities** or **associations**.

- **Attribute** $\in$ **domain**:
  Set of **possible values** that an attribute can take.
  $\sim$**"types" in programming**. (e.g., STRING, INT, ...).

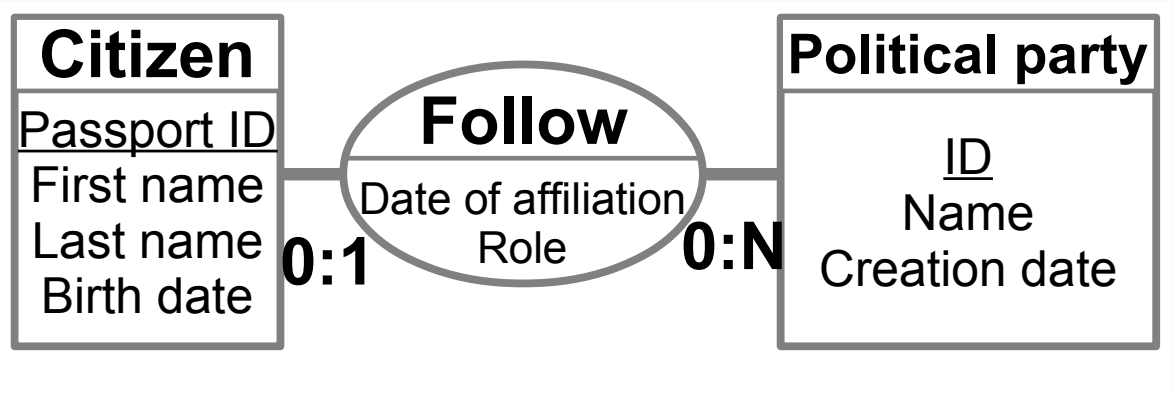
Key

Key of **entity** $E \mapsto$ **Minimal subset** of **attributes** of E **identifying uniquely** each **instance** of E.

- **Candidates keys** : **possible keys** of E
  - **Choose one key** : **Primary key** (underline it).
  - Other candidate keys: **Secondary keys**.
- **Composite key** $\mapsto$ **Combine different attributes** to **create a key** (example?).
- **No key** $\mapsto$ E is a **weak or dominated entity**.
- **Good primary key** $\mapsto$
  - Should **not** need to be **modified**.
  - **Small memory requirements** (performance).
  - It is always possible to **create** an **ID attribute**.

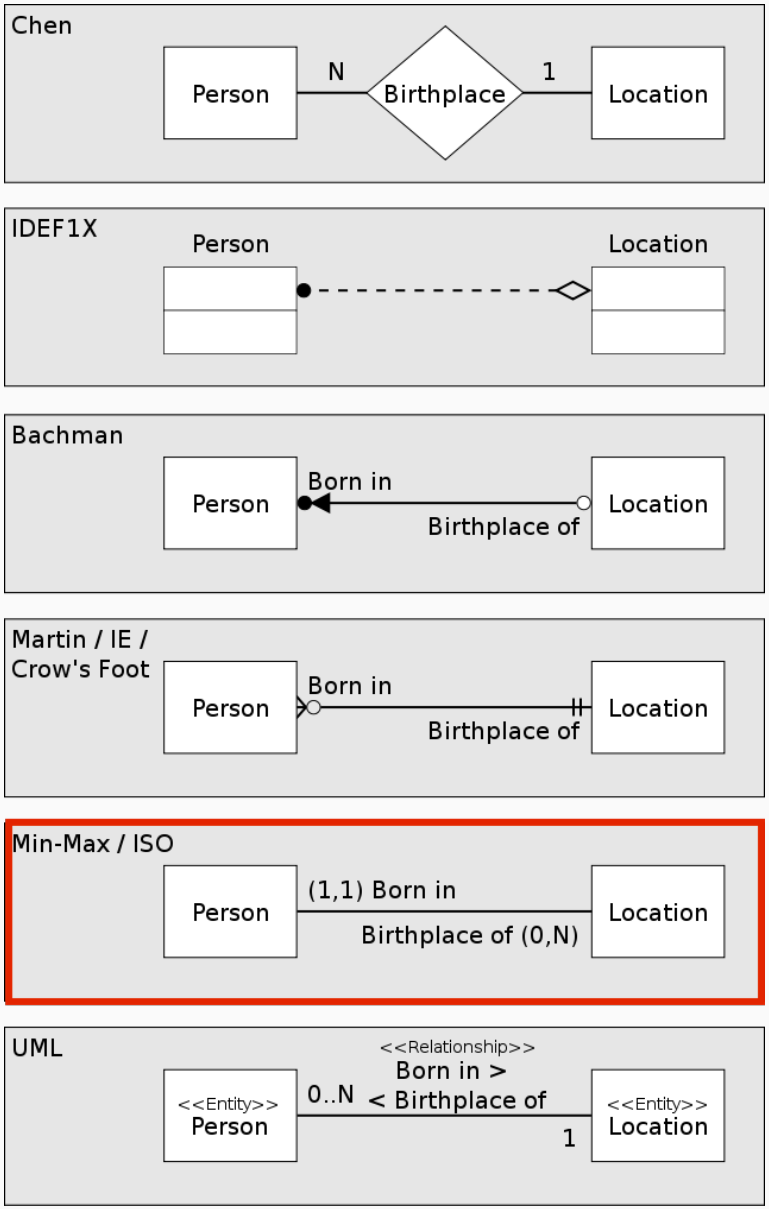
Cardinality

- **Cardinality**: express **how entities** are **associated**.
- **Quantifies** the **maximal** and **minimal nb. of times** an **entity** can **participate** in an **association**.



Exercise: Fill the cardinality of your previous examples.

Cardinality (different conventions)



Methodology

- Establish the **list of entities**.
- Establish the **attributes of each entity**.
- Choose a **key** for each **entity**.
- Establish the **associations** between **entities**.
- Determine the **attributes** of each **association**.
- Define the **cardinalities**.
- Check the **coherence** and **relevance** of the schema.

Conclusion

- Advantages
  - Simple.
  - Powerful and flexible.
  - Graphic representation.
  - Model quickly not too complex structures.
- Limitations
  - Hard to express too complex structures.
  - Conception of a schema $\rightarrow$ Experience...
  - Does not propose operations over the data.

Exercise

Propose an **ER model following these specifications**:

A TV series, identified by its name, is divided into several seasons. Each season has an identifier and a release date. Each season contains a number of episodes. Each episode, is identified by a number (restarting at each new season). Moreover, each episode has a title and it includes at least two actors. An actor has a unique INSEE number, a last name, a first name, and a salary that changes according to each episode.