Relationship notations

Pre-conference Workshop
Paris, 2017-11-27

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Refined Design principles of Identity Relationship Management

- **Provable**
  The exisitence of a given relation must be provable.

- **Constrainable**
  either part of the relation must be able to set a constraint on the use of the relationship.

- **Mutable**
  relationships might change, or be forever (A was made by B)

- **Revocable**
  The ending and revocation of relations

- **Delegable**
  Changing the actors

- **Scalable**
  be able to scale up to the very top of the view

See WG Doc on Identity Relationship Management

The onward journey

- Relationship Manager
  - Hard for the entities in a relation to manage their relation themself
  - Need for a managing ‚instance' to orchestrate

- Relationship Notation
  - Standardized method to represent relationships

Notation ‚Language'

- Notations
  - A system of […] used to represent and express […] facts.

- Language
  - A system of […] used to represent and express […] facts.
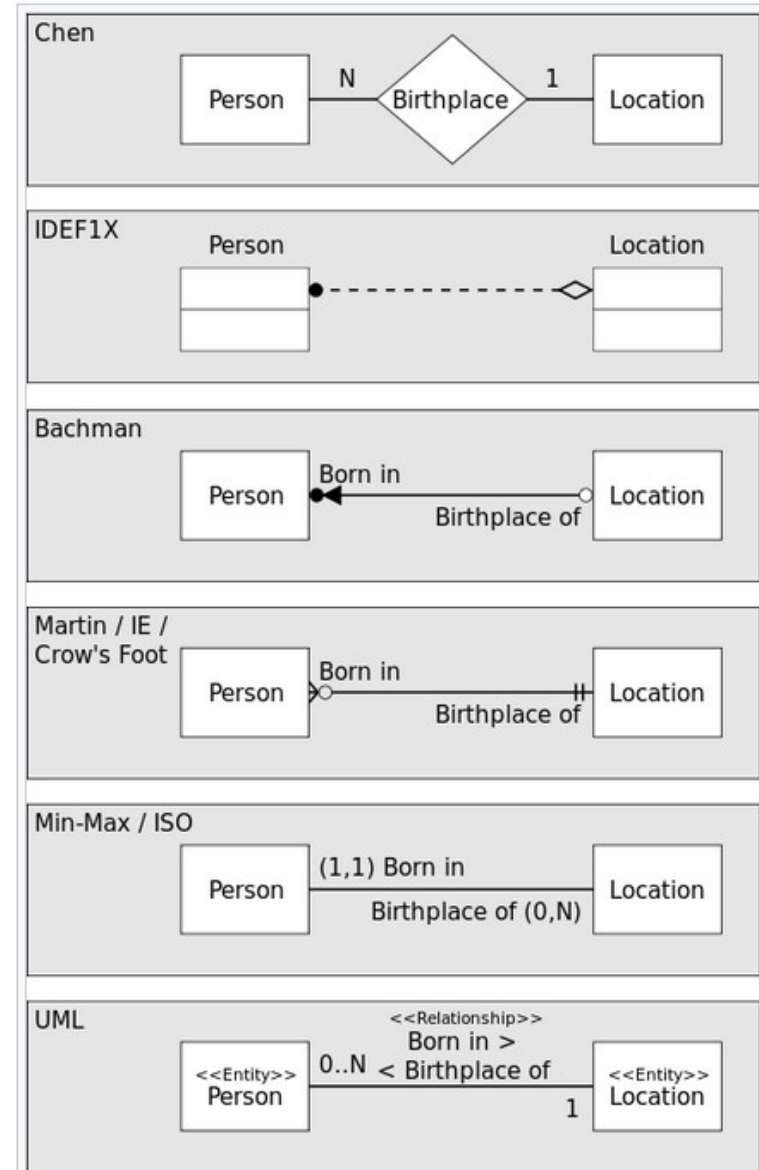
‚Notation Language' is a ‚tautology'

On Entity Relations

- Entity relation models are quite common in DB Design

- Q: Why do we need something new?

- A: Disconnected Entities

On ER Models

- Graphical Notation
- Great for humans
- Hard for machines

-

Requirements Relation Notation

- Support the six design principles

- Machine-interpretable and human-understandable.

- Support disconnected and remote entities, concepts and domains.

- Standard oriented.

Symbols, Objects and concepts

- Allow sender and receiver to ‚understand‘

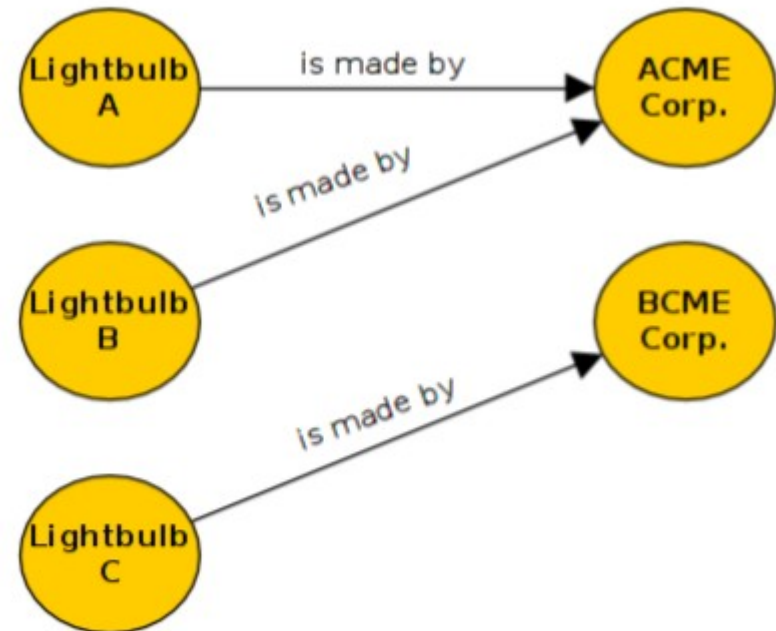This lightbulb is made by ACME Corporation

This lightbulb is made by ACME Corporation
subject   predicate   object

lightbulb:A   is_made_by   Corporation:ACME

- What means ‚lightbulb‘ or ‚is_made_by‘ ?

Graphs

- Graph Theory

- Describes a relation between a subject and an object

- Nodes (vertices, points)

- Edges (lines, arcs)

A Graph Notation

```
@prefix lb  <http://notationexamples.irm/lightbulb#> .
@prefix co: <http://notationexamples.irm/company#> .
@prefix pre: <http://notationexamples.irm/relations#> .
```

Uniform Resource Identifier

```
# three lightbulbs made by two different companies

lb:A pre:is_made_by co:ACME .
lb:B pre:is_made_by co:ACME .
lb:C pre:is_made_by co:BCME .
```

Resource Description Framework

- W3C Specification from 1999

- making statements about uniquely identifiable resources in the form of ‚subject-predicate-object', also known as ‚triple'.

- URI (IRI) bounds it to namespaces

- Namespaces can serve as ‚concept domain'

Vocabularies and Ontologies

- OWL (Web Ontology Language)

- Built on top of RDF

```
01  @prefix lb: <http://notationexamples.irm/lightbulb#> .
02  @prefix co: <http://notationexamples.irm/company#> .
03  @prefix pre: <http://notationexamples.irm/relations#> .
04  @prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
05  @prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
06  @prefix owl: <http://www.w3.org/2002/07/owl#>
07
08  # three lightbulbs made by two different companies
09
10  lb:A pre:is_made_by co:ACME .
11  lb:B pre:is_made_by co:ACME .
12  lb:C pre:is_made_by co:BCME .
13
14  #describing the predicate ,is_made_by'
15  pre:is_made_by rdf:type rdf:Property .
16  pre:is_made_by rdf:comment „the relation between a product and its producer" .
17  pre:is_made_by rdf:type owl:SymetricProperty .
18  pre:has_produced owl:inverseOf pre:is_made_by .
```

Query Language

- SQL is widely known

- SPARQL is the equivalent for ‚triplestore' systems, aka ‚Graph-Databases

- Allows for implicit and explicit queries

-
```
                                                        $ cat lb.rq
prefix lb: <http://notationexamples.irm/lightbulb#>
prefix co: <http://notationexamples.irm/company#>
prefix pre: <http://notationexamples.irm/relations#>
prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#>
prefix owl: <http://www.w3.org/2002/07/owl#>

SELECT ?lightbulb WHERE {?lightbulb pre:is_made_by co:ACME .}


-------------
| lightbulb |
=============
| lb:A      |
| lb:B      |
-------------
```

Query Language vs Notation

- SPARQL as query language, RDF/OWL as notation
  - standardized
  - machine interpretable (and still human readable with the help of ontologies)
  - supports disconnection (by caching the remote ontological definitions)
  - with the use of ontologies, it can provide any of the identified principles for IRM