Business Model Ontologies in OLAP Cubes

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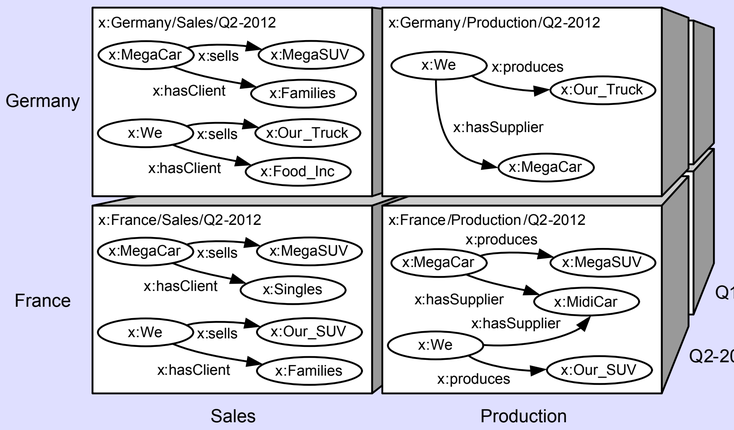
Introduction

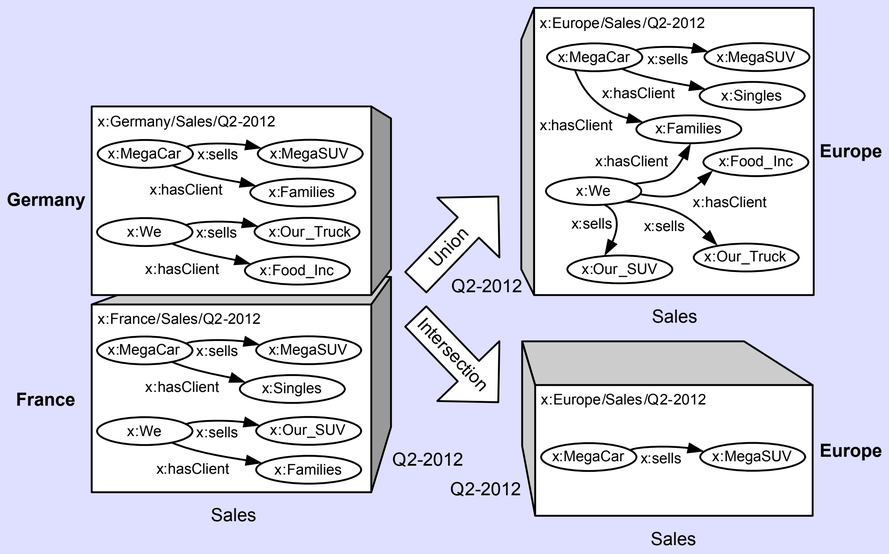
Business model ontologies capture the complex interdependencies between business objects. The analysis of the hence formalized knowledge eludes traditional OLAP systems which operate on numeric measures. Many real-world facts, however, do not boil down to a single number but are more accurately represented by business model ontologies. We adopt business model ontologies for the representation of non-numeric measures in OLAP cubes. We propose modeling guidelines and adapt traditional OLAP operations for ontology-valued measures.

1. Ontology-valued Measures



Ontology-valued measures formalize **complex real-world business events** that are inadequately represented by numeric measures alone, for example, competitor analyses, production processes. Different **business model ontologies** can be used for the representation of ontology-valued measures, for example, **Resource-Event-Agent (REA) or e^{3}value**, encoded as RDF data. Dimensions set the context for the knowledge represented by ontologies, yielding **cubes of contextualized RDF data**. The **shared facts** at more abstract levels of granularity describe common knowledge shared across different cells of the cube in order to facilitate the analysis with OLAP.

2. OLAP with Ontology-valued Measures: Merge



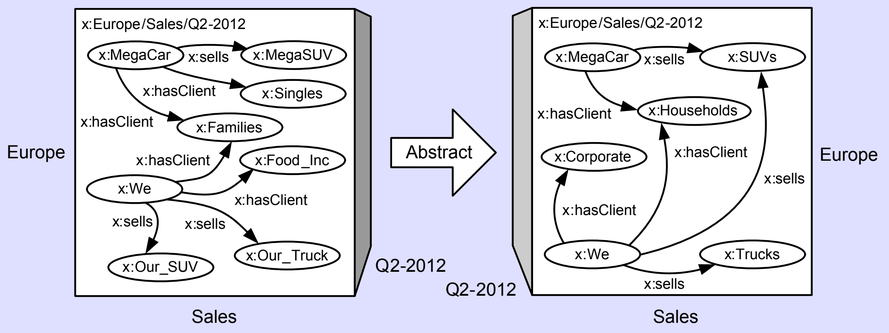
OLAP operations on ontology-valued measures that are **encoded as RDF data** are performed using **SPARQL**.

Two variants exist for the merge operation which **aggregates knowledge represented in different cells of the cube** along the dimension hierarchies.

The first merge variant combines the knowledge represented in selected cells of the cube by performing a simple **union of RDF triples**.

The second merge variant selects only knowledge that is valid in all of a set of selected cells by performing the **intersection of RDF triples**.

3. OLAP with Ontology-valued Measures: Abstraction



Besides the aggregation of facts along dimension hierarchies, the entities represented in an ontology may be viewed at a higher level of abstraction where groups of entities are represented by single entities.

Abstraction replaces sets of RDF triples by more 'abstract' RDF triples.

Shared facts represent additional background knowledge about a business domain. For example, a shared fact establishes the grouping of families and singles to the households category.

Acknowledgments

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References

1. Schütz, C.; Neumayr, B.; Schrefl, M.: Business Model Ontologies in OLAP Cubes. In C. Salinesi, M.C. Norrie, and O. Pastor (Eds.): CAiSE 2013, LNCS 7908, pp. 514–529, 2013.