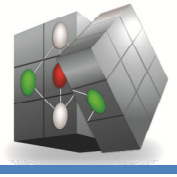
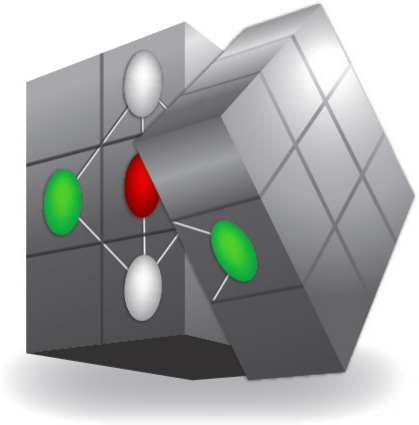
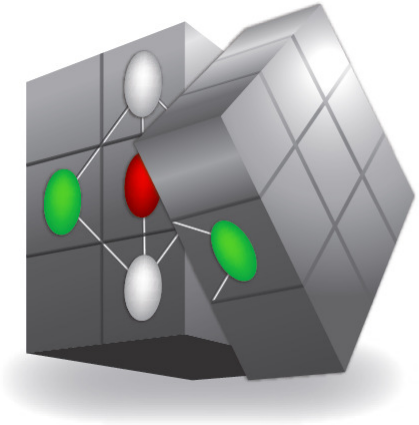




cubist

Your Business Intelligence

Project Overview

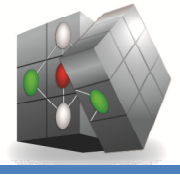


cubist

Your Business Intelligence

CUBIST in a nutshell: Developing an approach for semantic and user-friendly Business Intelligence by

- **augmenting Semantic Technologies with BI capabilities, and**
- **providing conceptually relevant and user friendly visual analytics.**



Motivation

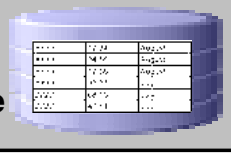
- Increased proportion of unstructured data (>80%)
  - Not accessible for classical BI solutions
  - Can be better leveraged by means of Semantic Technologies (ST)
- Insufficient user interfaces for Business Intelligence (BI)
  - Improved visual analytics, based on Formal Concept Analysis (FCA), for qualitative Data Analysis
  - Complementing to existing approaches for quantitative Data Analysis

CUBIST Main Idea
From classical to semantic BI

Classical Business Intelligence

restricted queries / analytics

Data Warehouse



ETL

databases

Output

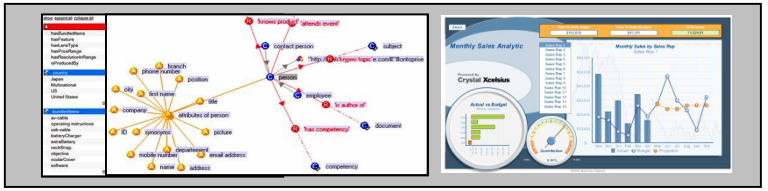
User Interaction

Store

Gathering Information

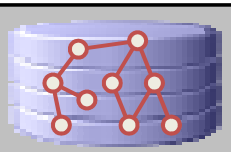
Data sources

Semantic Business Intelligence



flexible and visual queries / analytics

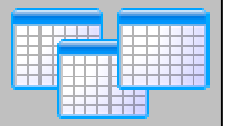
Triple Store



Semantic ETL

databases

Forums, blogs



Office docs

CUBIST Main Idea
From classical to semantic BI

CUBIST: Developing an approach for semantic and user-friendly BI

Providing conceptually relevant and user friendly visual analytics.

- Formal Concept Analysis / Galois Lattices
- Faceted navigation
- Graph-based navigation

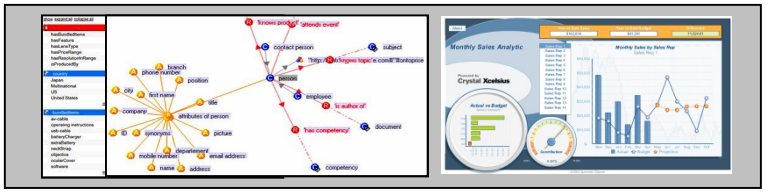
Augmenting Semantic Technologies with BI capabilities

- Triple store as persistency layer
- Flexible Data Warehouse design
- Extending SPARQL with OLAP functionalities
- Reasoning / Deriving implicit facts

Federating data from both unstructured and structured sources

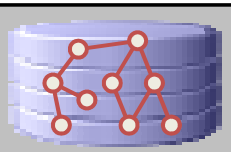
- Enhanced ETL
- Text Mining
- Information Extraction

Semantic Business Intelligence

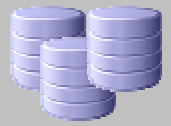


flexible and visual queries / analytics

Triple Store

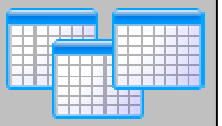


Semantic ETL

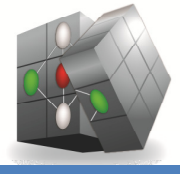


databases

Forums, blogs



Office docs



Comparing classical BI with ST

Feature	Classical BI	Semantic Technologies
Federating data from unstructured and structured sources	bad	good
Explicit meaning of data / explicit relations	bad	good
Querying/accessing huge amounts of data	good	average
OLAP functionalities	good	bad
Agile DW schema	bad	good
Inferring implicit facts	bad	good
ETL flexibility	bad	average
Data reuse	bad	good
Use of external datasources / data location independence	bad/average	good

Research Challenges

UI challenges for FCA-based VA

- Look like keyword but semantic search front-ends
- Faceted navigation
- Graphical UI to build graph pattern queries

Technical challenges for FCA-based VA

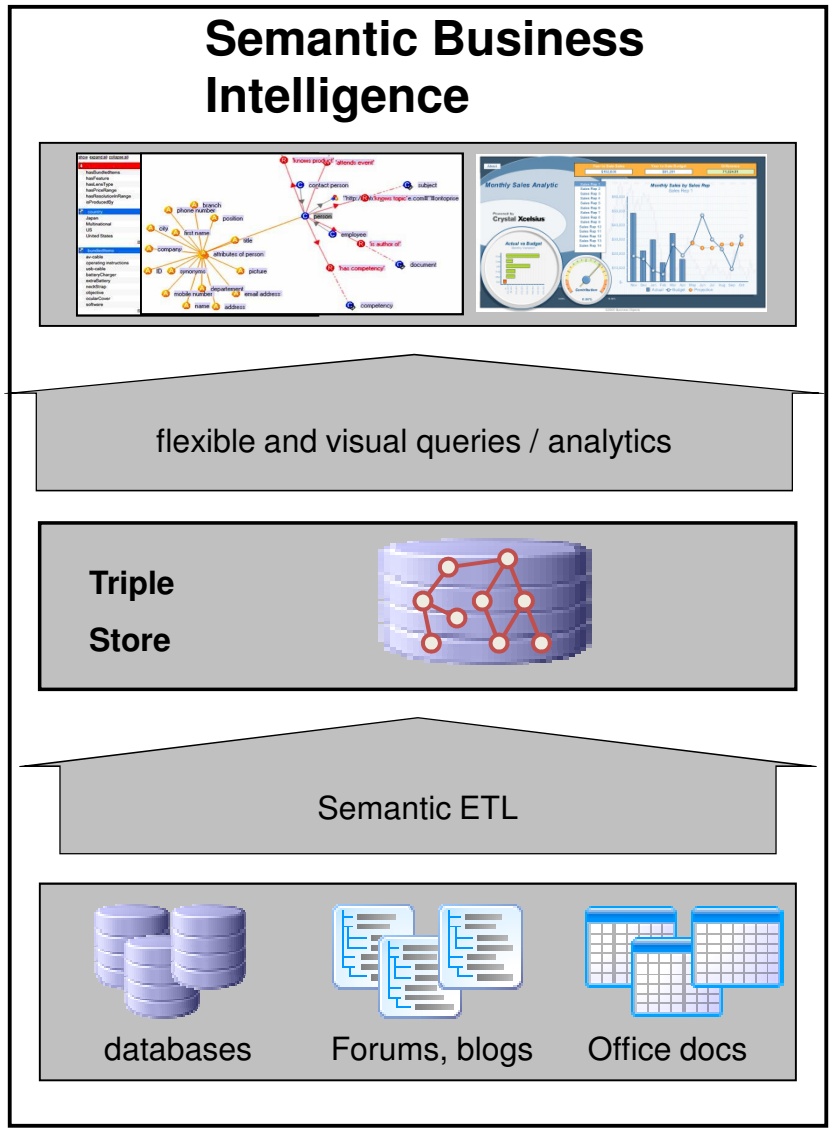
- Parallel processing algorithms
- Algorithms for many-core architectures
- Making use of Single Instruction-Multiple Data (SIMD) architecture

BI enabled Triple Store

- No existing query language: extending SPARQL with OLAP functionalities
- Performance and scalability of triple store

Semantic ETL

- Quality of source data: particularly “noisy” unstructured data
- Quality of the extraction process: uncertainty of data has to be addressed
- Identity resolution
- Federating unstructured and structured sources

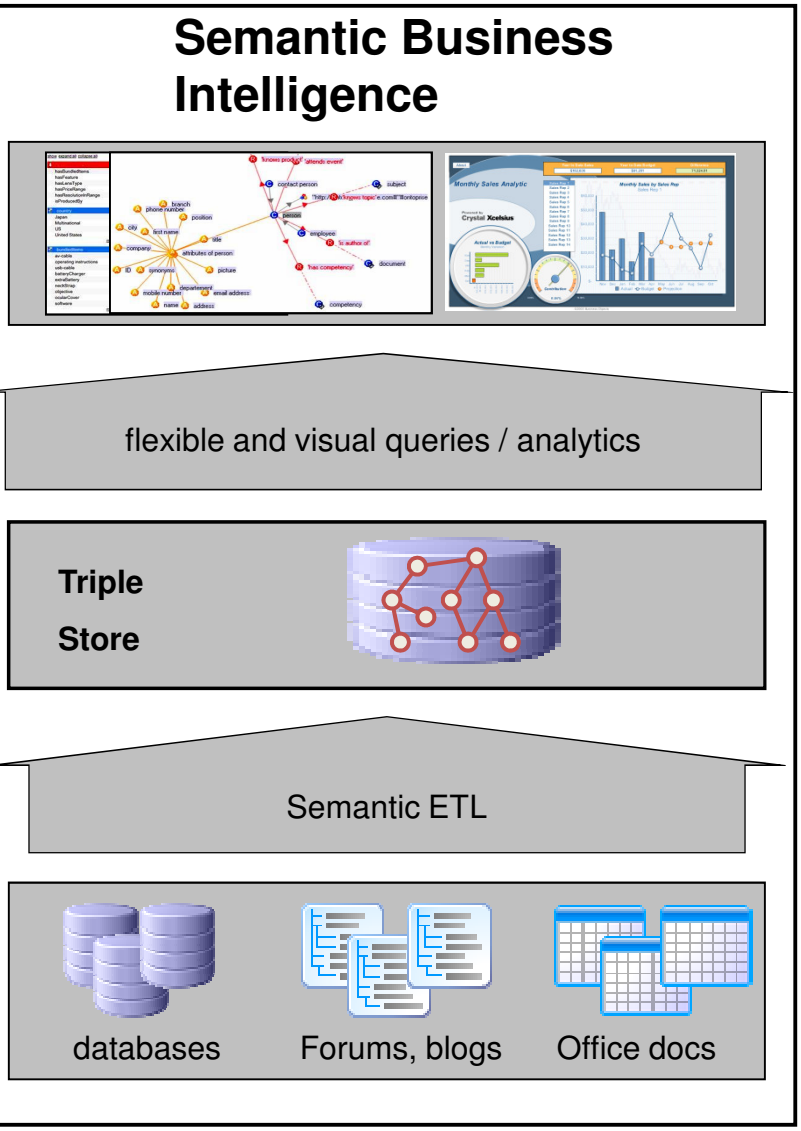


Expected Results

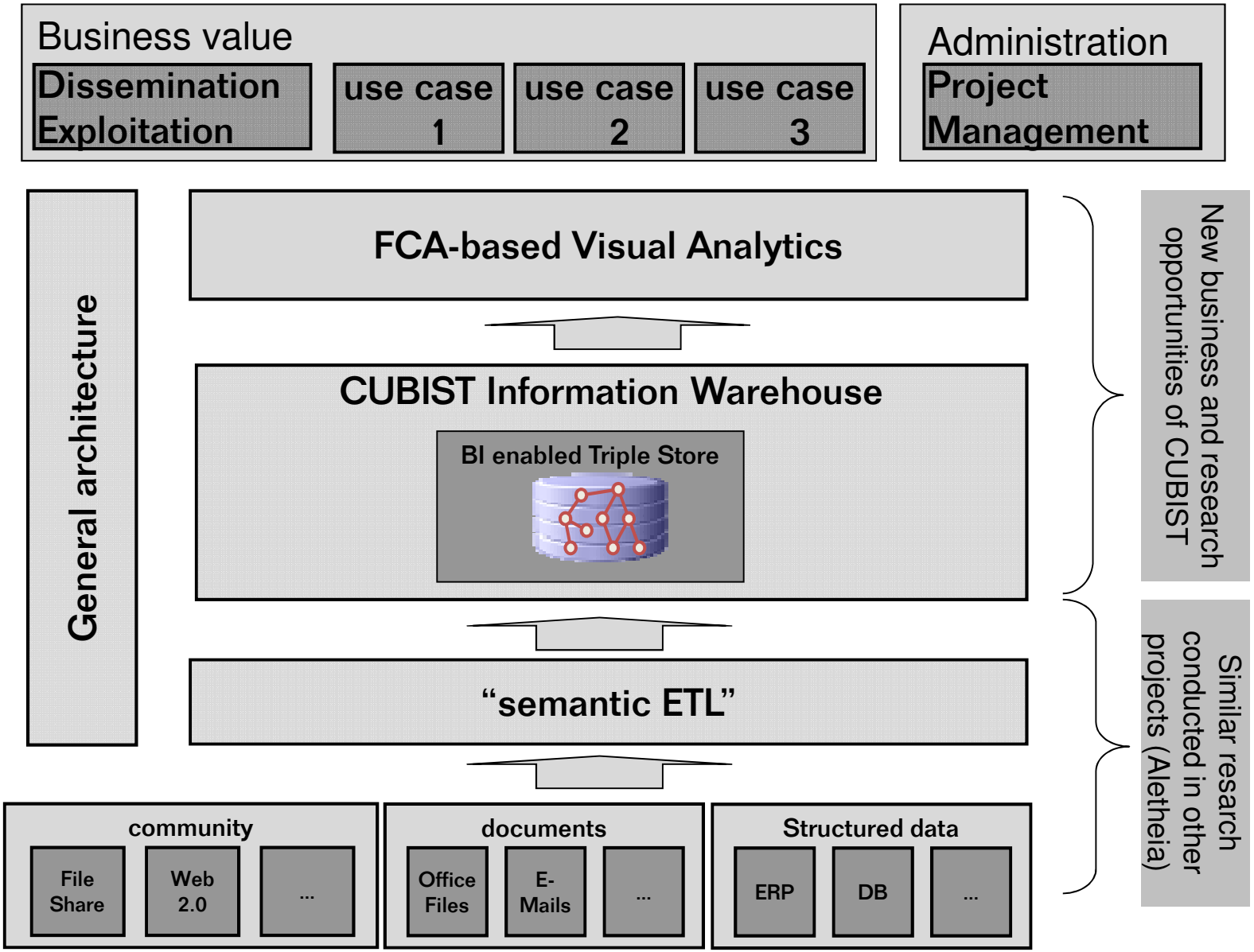
FCA-based VA
- Performance formal concept miner
- Large scale FCA capability
- FCA visualization of BI

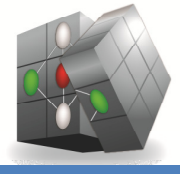
BI enabled Triple Store
- OLAP extensions for SPARQL
- Discovery mechanism for finding implicit information
- Triple store based information warehouse
- Integration of triple store with FCA

Semantic ETL
- Semantically enriched lineage information
- Error detection within extracted data and CUBIST information warehouse
- Semantic ETL component that provides SPARQL endpoints for various data sources



CUBIST Architecture





CUBIST – Project Details

Instrument

- Instrument: STREP
- Theme: ICT-2009-4.3
- Call: FP7 Call 5
- Lead: SAP Research
- Duration: 36 Months
- Start: 2010/10

Consortium

Technological Partners

- SAP (Germany)
  - Coordinator and technological partner
- Ontotext (Bulgaria)
  - Expertise in Semantic Technologies
- Sheffield Hallam University (UK)
  - Expertise in FCA
- Centrale Rechereche S.A. (France)
  - Expertise in FCA and Visual Analytics

Use Case Partners

- Heriot-Watt University (UK)
- Space Applications Services (Belgium)
- Innovantage (UK)

Thank You!

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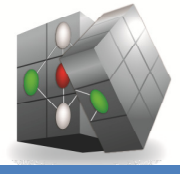
Appendix

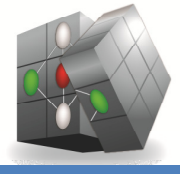
- FCA in three Minutes



What is Formal Concept Analysis?

Formal Concept Analysis is:

- a mathematization of the philosophical understanding of concepts
- a human-centered method for conceptually clustering and structuring data
- a method to visualize data and its inherent structures, implications and dependencies



FCA in three Minutes (i)

How can we describe the concept "BI products from SAP"?

- Extensionally by enumerating all ***objects***:
  - BO Xcelsius, BO Crystral Reports, …
- Intensionally through ***attributes***:
  - "is an SAP product", "is a BI tool", …

Generally, a ***concept*** is divided into two mutually dependent parts:

- Its ***extension*** are all objects that share all the attributes of the concept,
- Its ***intension*** are the attributes which precisely describe the objects of the concept.

The concepts form a hierarchy: A concept C1 is a ***subconcept*** of C2, iff

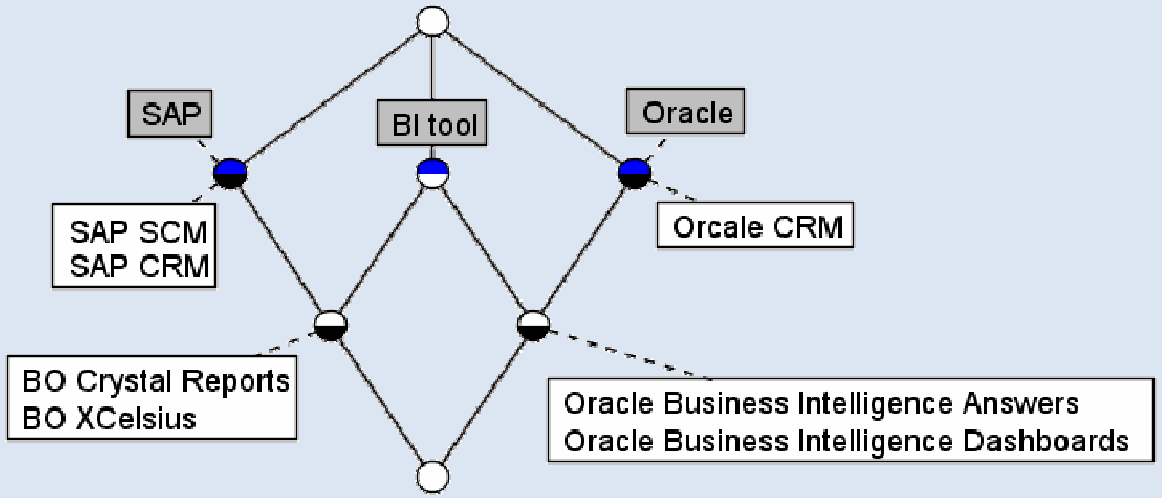
- the extension of C1 is a subset of the extension of C2
- the intension of C2 is a subset of the extension of C1

} equivalent

Theorem: For a given universe of discourse, the concept hierarchy is a complete lattice

FCA in three Minutes (ii)

A toy **formal context**

	SAP	Oracle	BI tool
BO XCelsius	X		X
BO Crystal Reports	X		X
SAP CRM	X		
SAP SCM	X		
Oracle Business Intelligence Dashboards		X	X
Oracle Business Intelligence Answers		X	X
Orcale CRM		X	
Oracle Fusion GRC		X	

Its derived **concept lattice**