ENTWICKLUNG
BESCHLEUNIGEN

SERVICE
VERBESSERN

VERTRIEB
OPTIMIEREN

ontoprise
know how to use Know-how

Establishing Interoperability in Data Grids:

The Automotive Use Case in the SIMDAT project

www.ontoprise.de

**EGEE'06 in Geneva
September, 2006**

SIMDAT

Overview

- Quick Intro:
    - ontoprise GmbH
    - the SIMDAT project
- Ontologies in a nutshell
- Semantic technologies in SIMDAT
- Semantic integration
    - Basic approach
    - CAE-CAT use case
    - Semantic technologies and data grids
- Relation to commercial strategy of ontoprise

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Quick Introduction: ontoprise

ontoprise is the leading provider of semantic middleware and solutions helping companies to rapidly and cost-efficiently integrate data sources, accelerate engineering processes and generate seamless knowledge processes

know how to use Know how

Foundation:	1999
Team:	40 employees
Location:	Karlsruhe
Products:	OntoBroker™
	OntoStudio™
Applications:	SemanticMiner
	SemanticIntegrator
	SemanticGuide

SIMDAT

High recognition in the market

- „ontoprise has the most mature and balanced toolset"
  (Esther Dyson Report RELEASE 1.0, 2003)

- Technology leader
  (Gartner Group, Forrester Research)

- IST Prize Nominee 2004

- Innovationspreis 2005 der Initiative Mittelstand

- ontoprise is consortium member in the German „Leitprojekt" for SemanticWeb Technologies
  (SmartWeb)

- ontoprise is the lead partner in the largest industry project in the area of knowledge based systems worldwide
  (HALO, Vulcan Inc., USA)

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SIMDAT Facts

- IST Grid IP project

- 4 years

- Start date: September 1st, 2004

- 26 partners

- www.simdat.org

End Users

gsk · Audi · EADS · Met Office · RENAULT · EUMETSAT · METEO FRANCE · DWD · BAE SYSTEMS

Capability Providers

ESI GROUP · InforSense · MSC SOFTWARE · LMS · LION · ontoprise

Grid Technologists

FhG · NEC · intel · iT innovation · IBM · ORACLE · Universität Karlsruhe (TH)

SIMDAT - Overview

Four sectors of international economic importance:

Automotive

Pharmaceutical

Aerospace

Meteorology
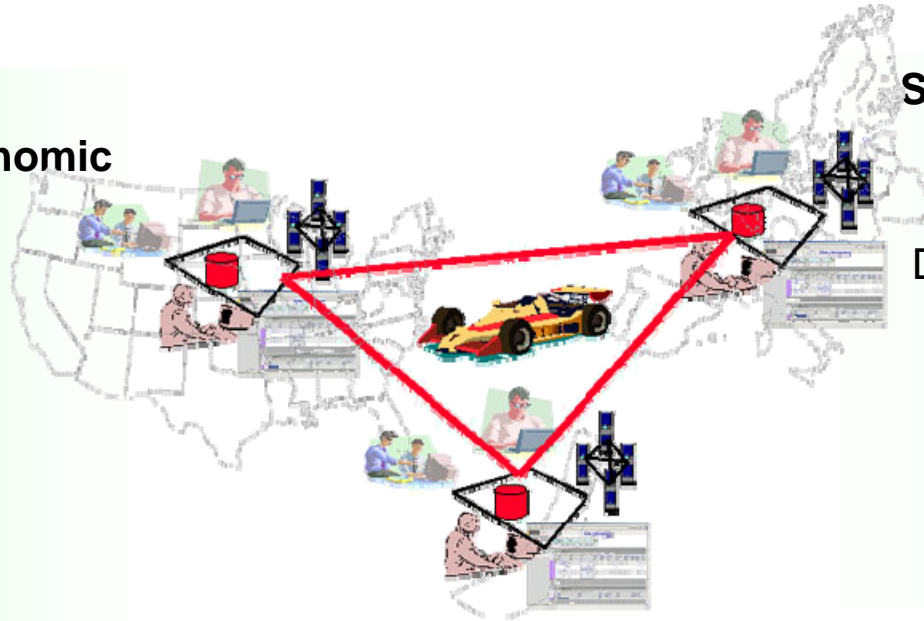
Seven Grid-technology development areas:

Grid infrastructure

Distributed Data Access

VO Administration

Workflows

Ontologies

Analysis Services

Knowledge Services

The solution of industrially relevant complex problems using data-centric Grid technology.

CAE Process Chain expands CAE Network

PDM/CAD	Preprocessing	Solving	Postprocessing

distributed Data Bases

Information Management

AUDI

External Engineering Companies

VW Group

External System Developers

World

System Suppliers

Inquiries

Transparency

Access Control

Search

Reliability

Load Balancing

Notifications

Accounting
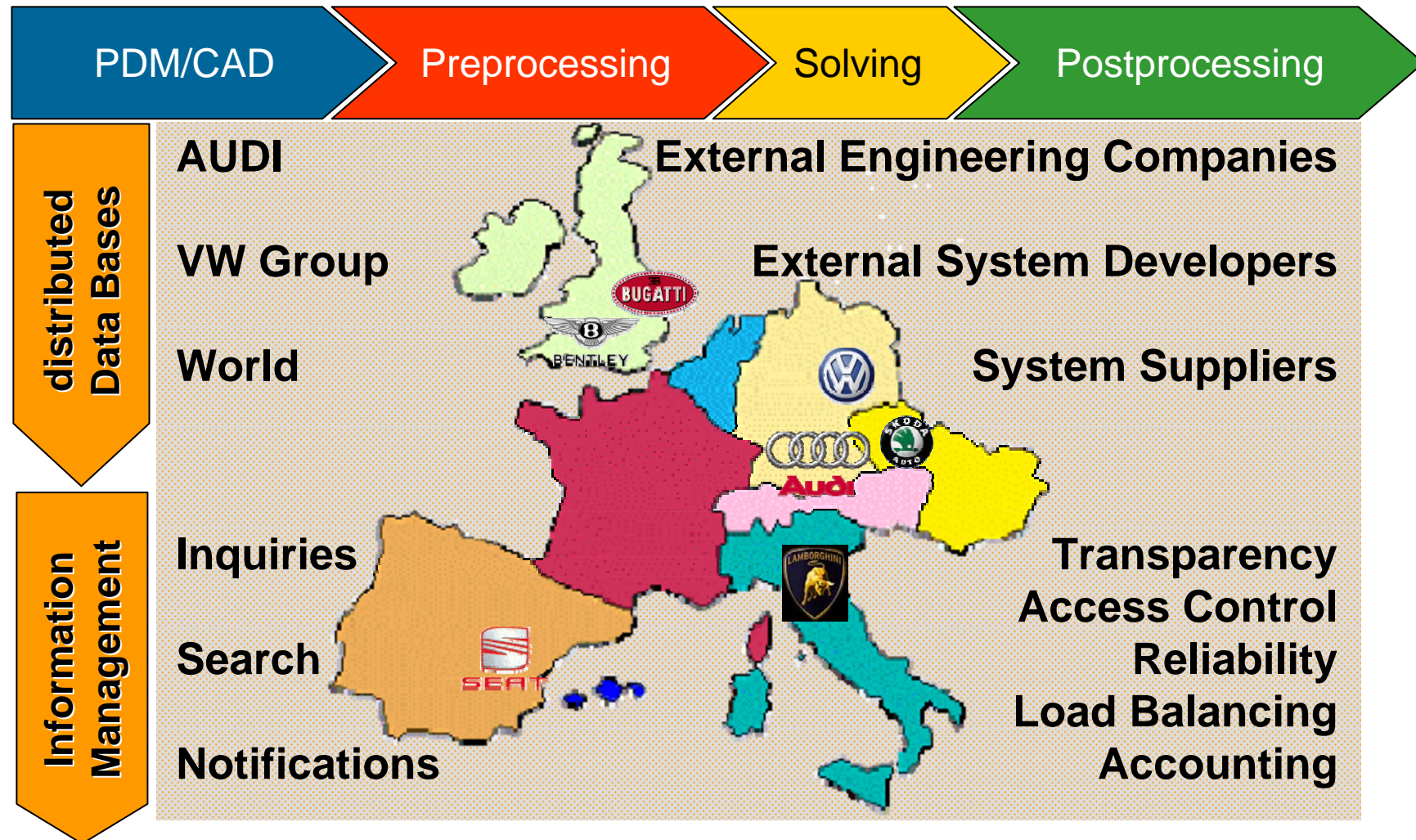
Problem Solving Environments

| PDM/CAD | Preprocessing | Solving | Postprocessing |

Architecture
Fully Web-integrated
Server based
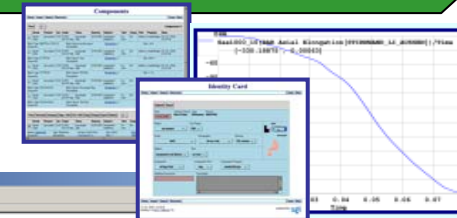
Integration
CAE/CAD/CAT Data
Applications

Standardization
Reporting
Knowledge Base

Workflow
Result Comparison
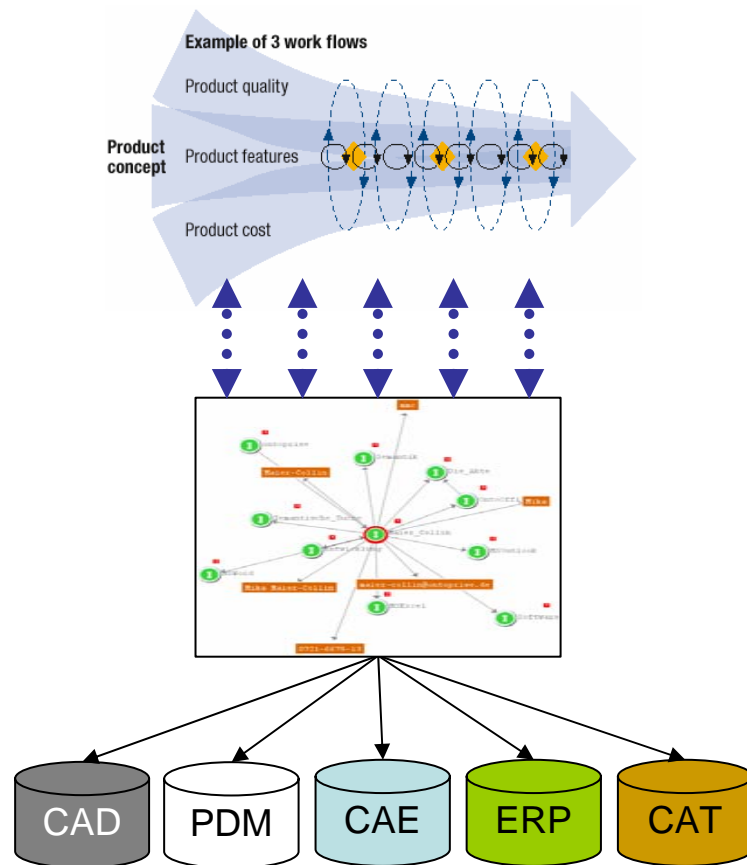Variant Computation
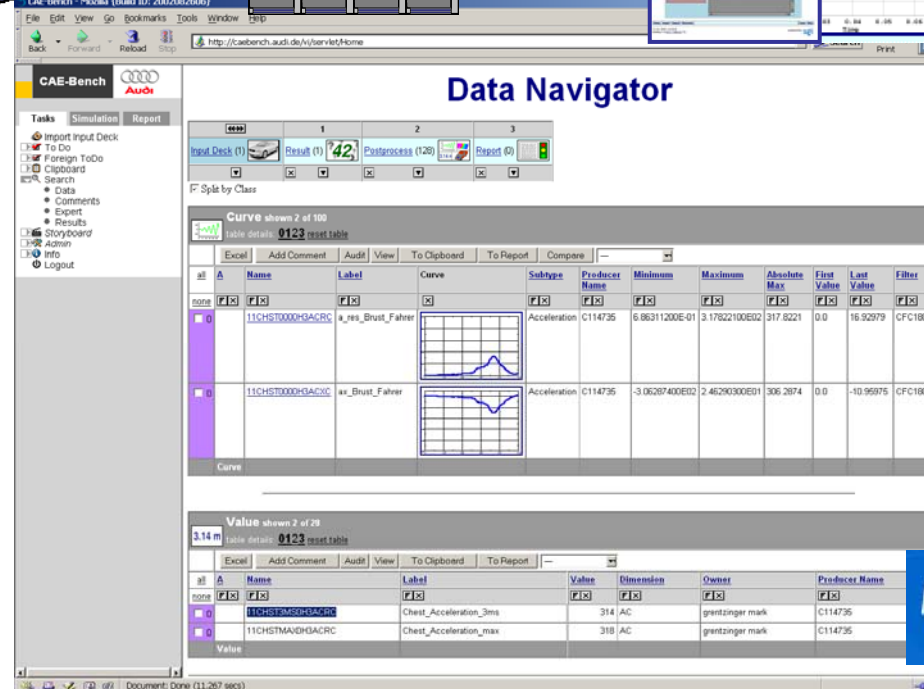
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Ontologies in a nutshell

Our (incomplete) working definition:

Ontology

- **Concept**

- **Instance**

- **Relation**

- **Rule** (➔ new facts)

Additional Info:
Parts that migh be damaged:
PumpWheel W002, ...
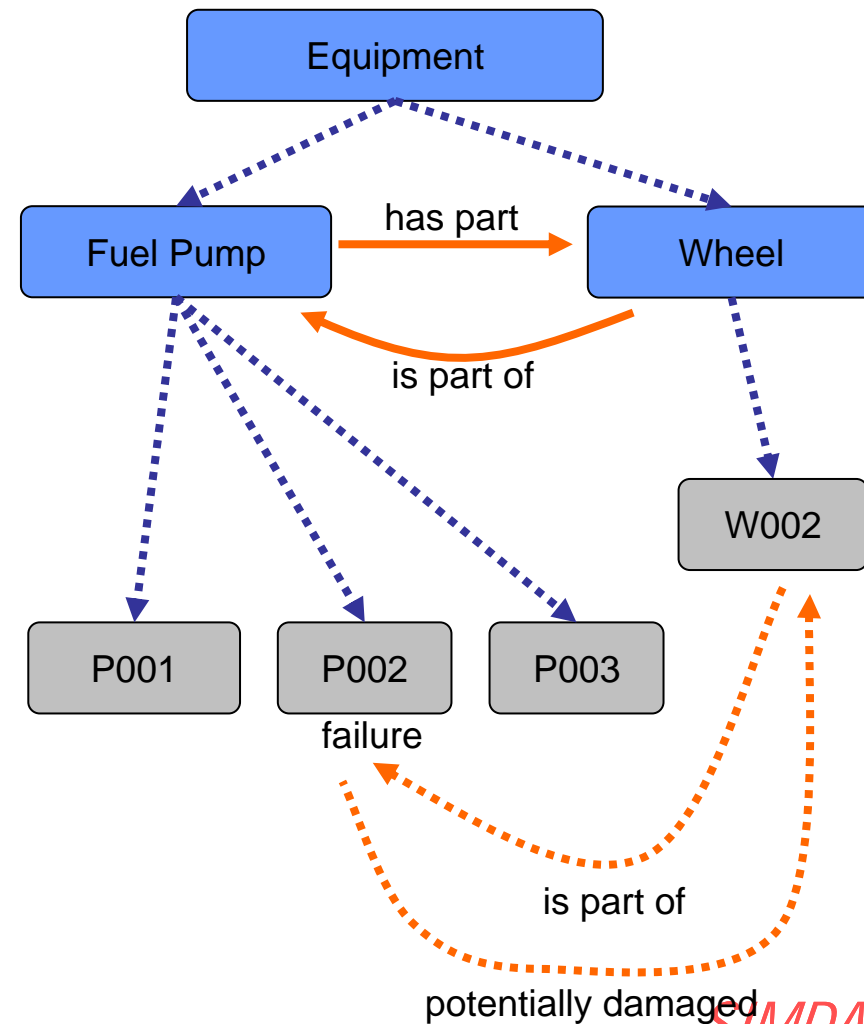
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Why Semantic Technologies in a Grid Project?

- A "grid-enabled" infrastructure needs:
  - Discovery of distributed resources
    ("Where is the resource capable of …");
  - Meaningful access to distributed resources
    ("How is resource X to be interpreted?")
  - Efficient problem-solving based on distributed resources ("How can resources X,Y, Z be combined to achieve …");
  - Resolution of conflicts introduced by distributed, heterogeneous resources
- Semantic technologies provide:
  - A methodology to describe the different kinds of resources based and their interdependencies in a comprehensible, machine-readable way (based on resource metadata);
  - A framework to annotate resources, query for resources, mediate between resources and combine resources based on their semantic description;
  - A way to ensure the **interoperability of resources based on their semantics**;

Semantic Middleware:

- Integration of information
  (rather than applications)

- Manage complex dependencies

- Manage Know-How

- Flexible and dynamic solutions

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Semantic Information Integration
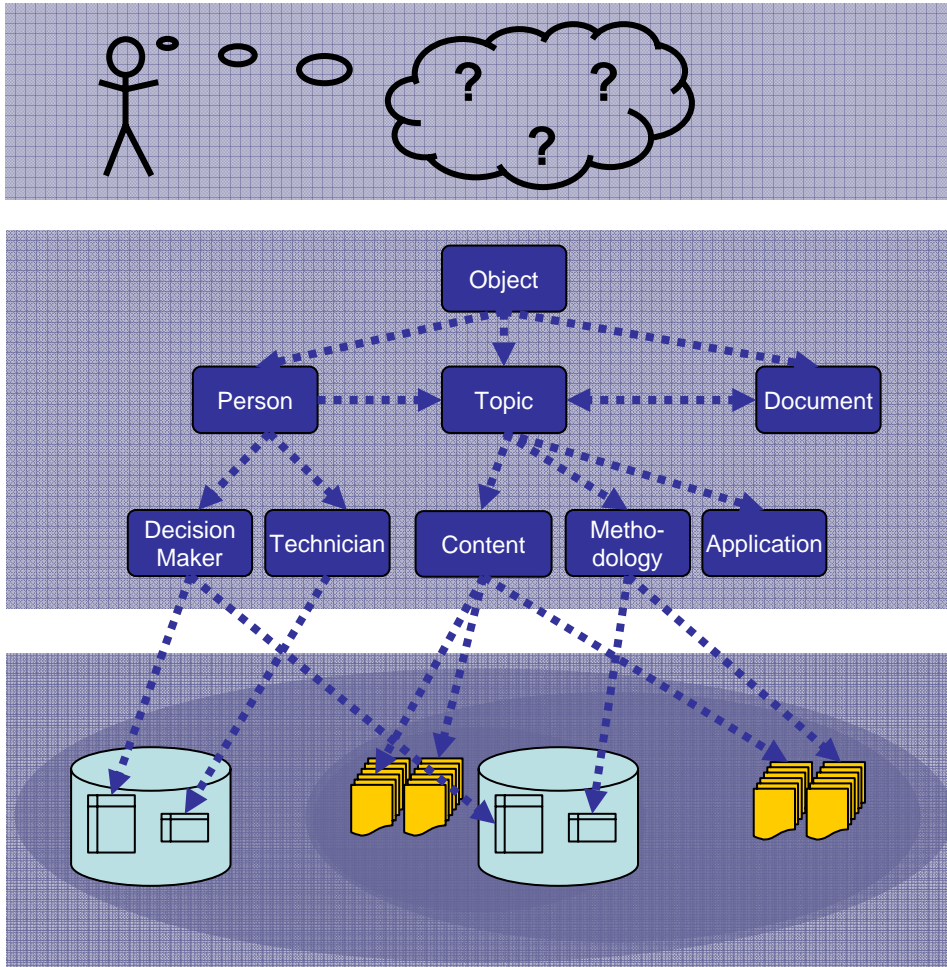
- **Users keep their established software tools**

- **A knowledge model (ontology) both integrates and structures the information**

- **The ontology is enriched with specific expertise**

- **The ontology empowers a context-aware and easy-to-use search and navigationsystem**

- **All information to stay in the original place**

Our approach: Integration Layers

"On which terms do we agree?"
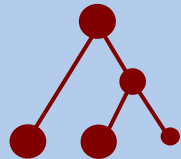
Information Integration

Semantics: User Domain Models

"Which language do we use?"

Data Integration: Data + Metadata

Syntactic: SQL, XQuery, XPath

"How do we communicate?"

Communication/Connectivity
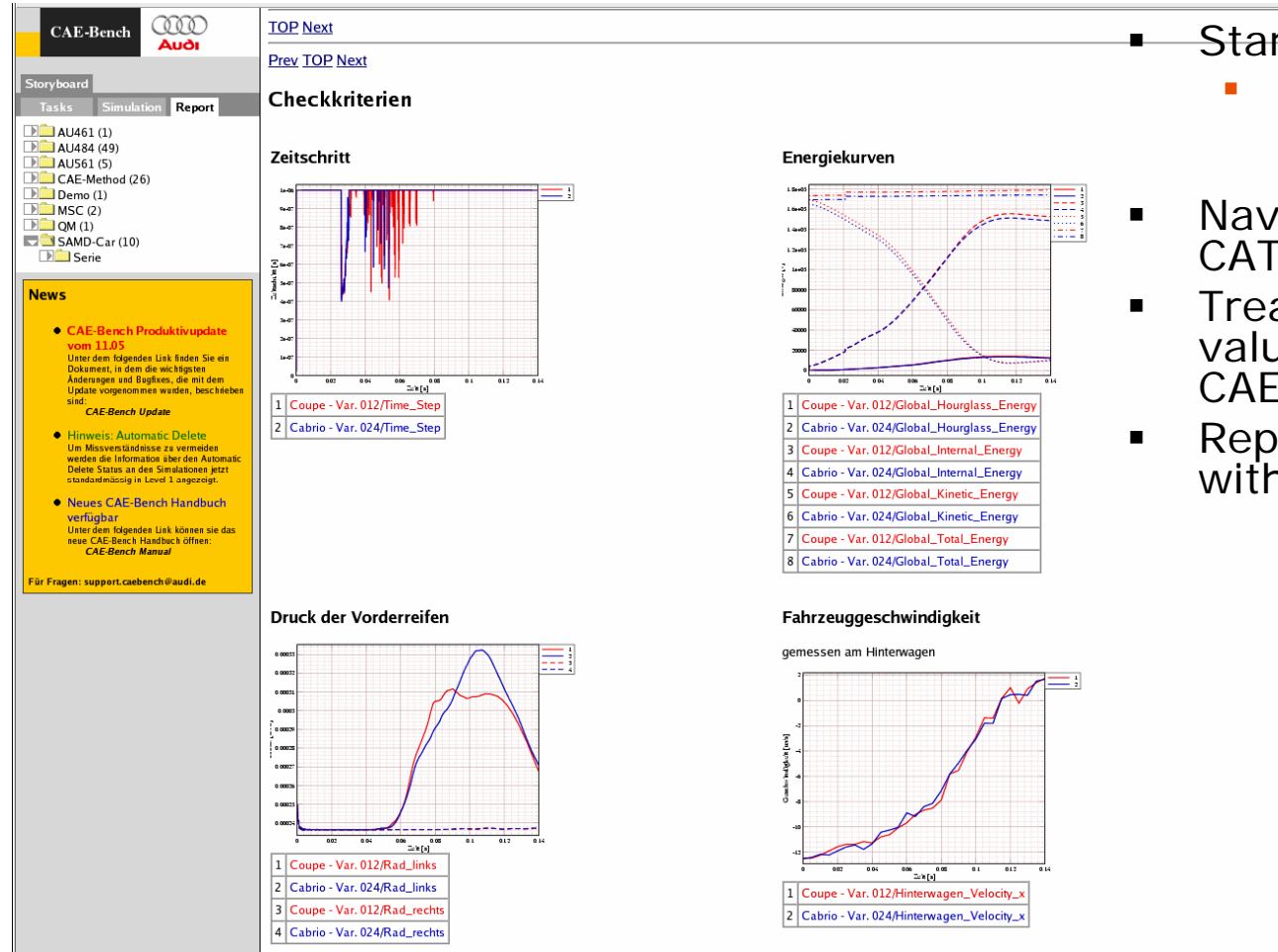
Web services, API wrappers,…

ODBC, JDBC, …

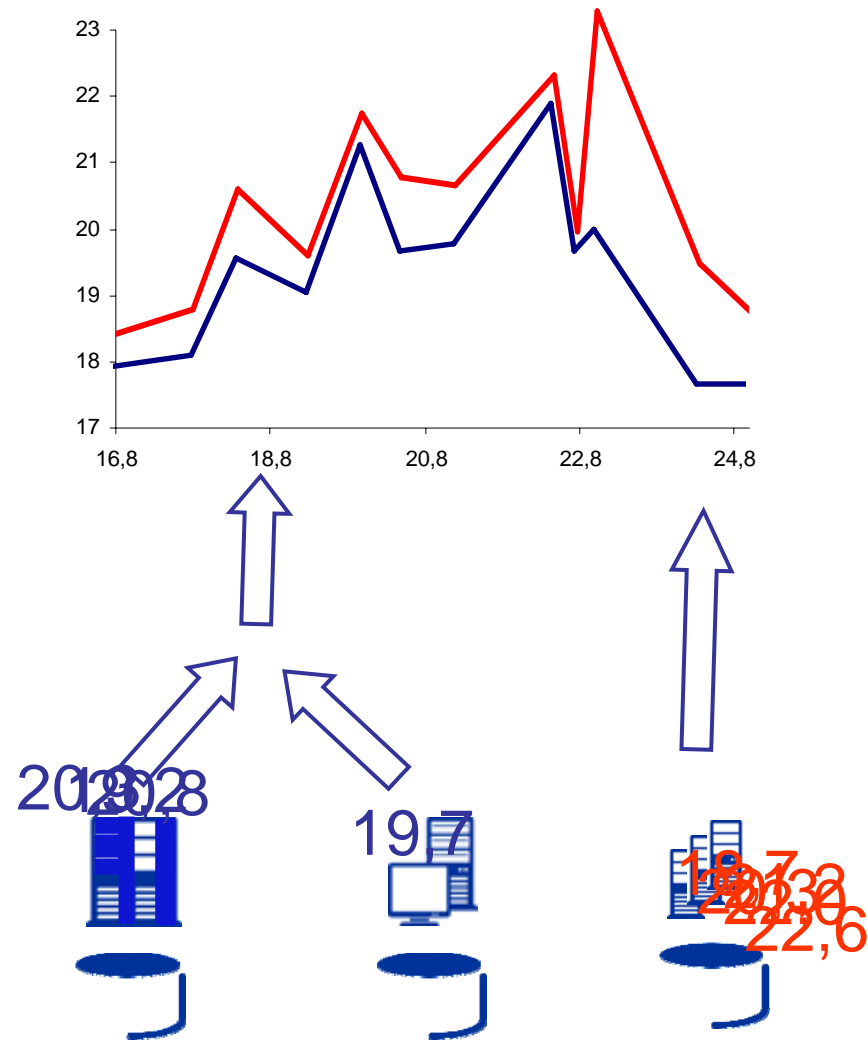**Network protocols, …**

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- Starting point:
  - 2 data management systems (CAE and CAT)
- Navigate through CAE and CAT projects
- Treat CAT curves and values like CAE curves and values
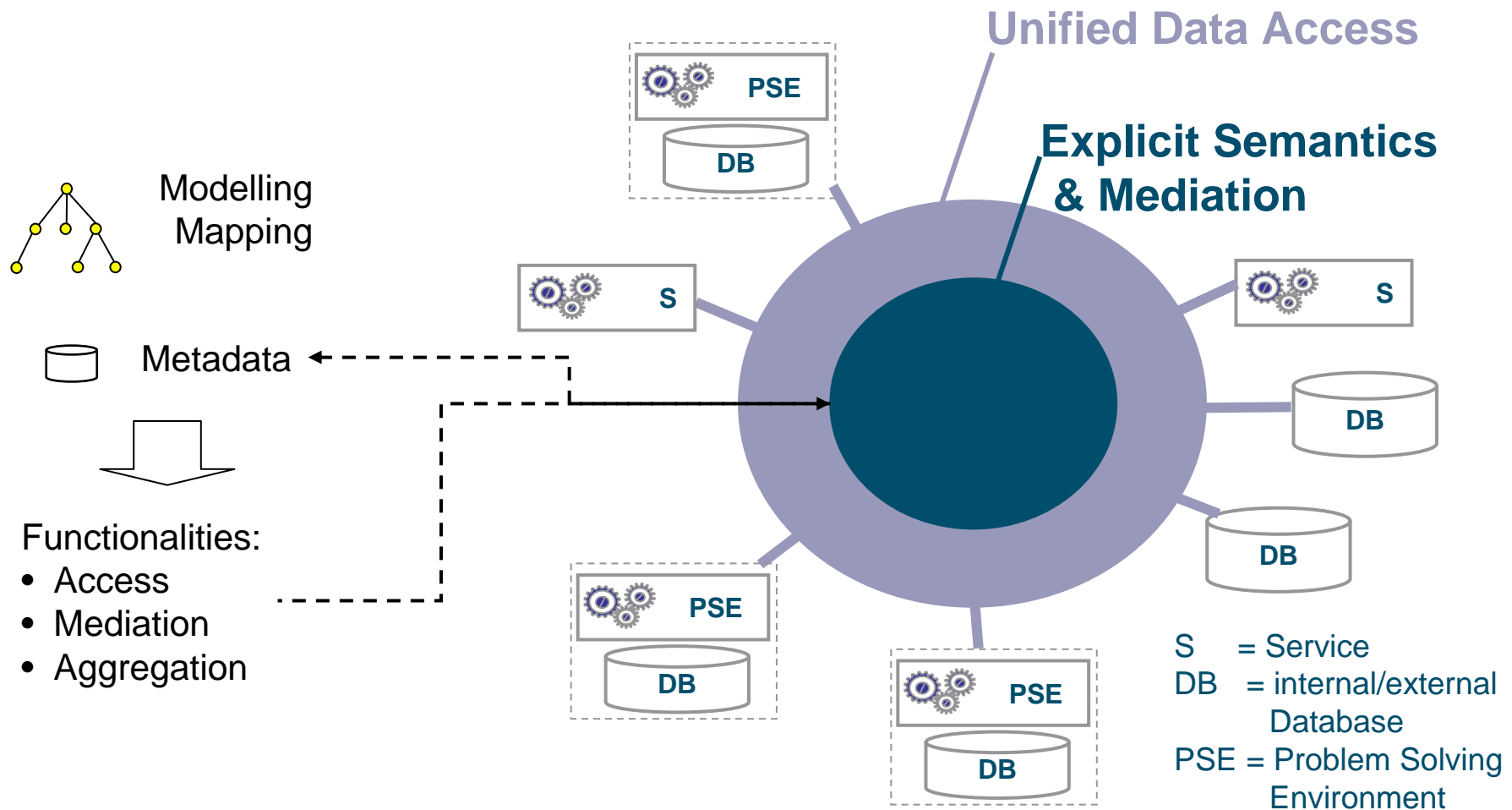- Reports for CAE and CAT with their own colors

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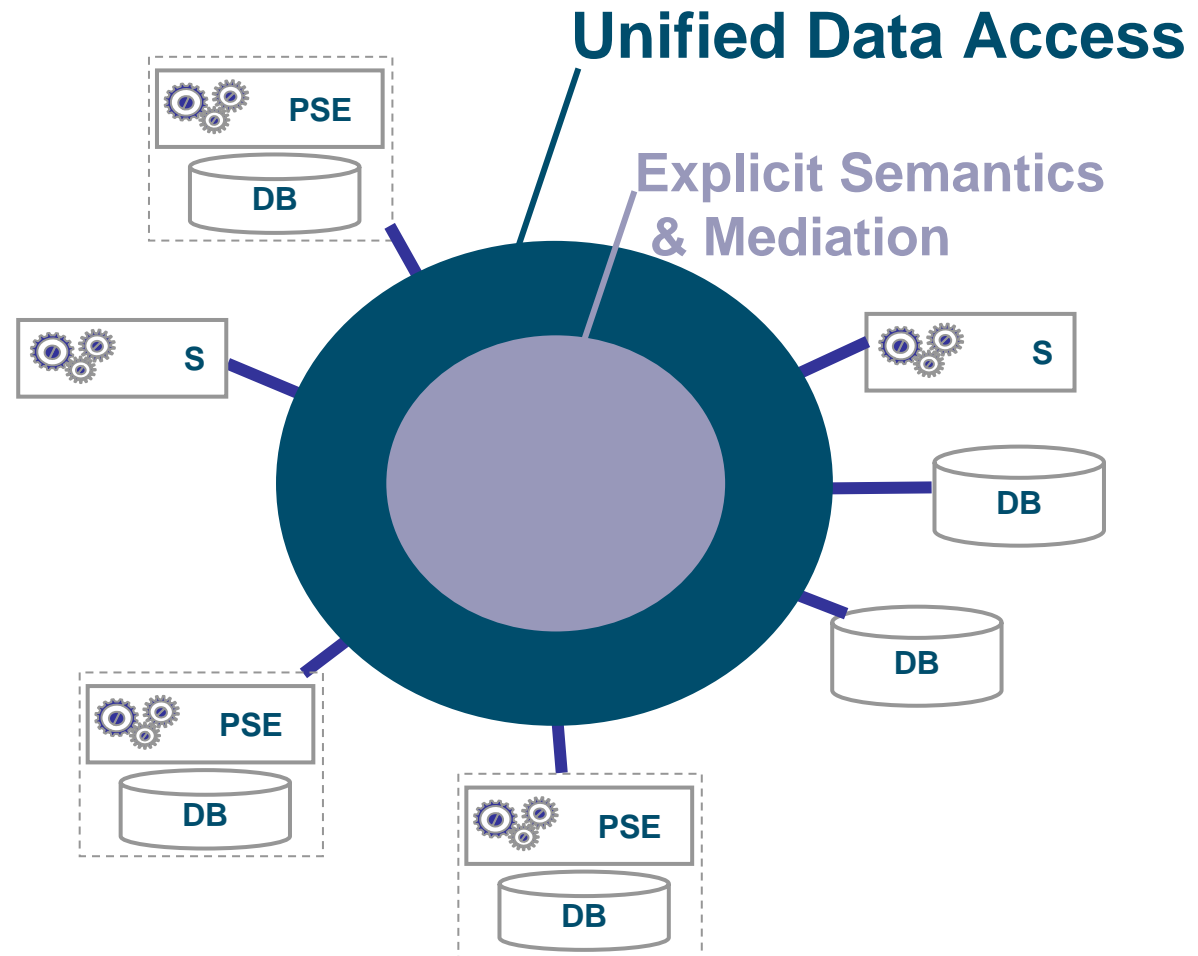
SIMDAT: Semantic Integration + Data Grids

Unified Data Access

PSE

DB

Explicit Semantics & Mediation

Modelling Mapping

S

S

Metadata

DB

Functionalities:
- Access
- Mediation
- Aggregation

DB

PSE

DB

PSE

DB

S = Service
DB = internal/external Database
PSE = Problem Solving Environment

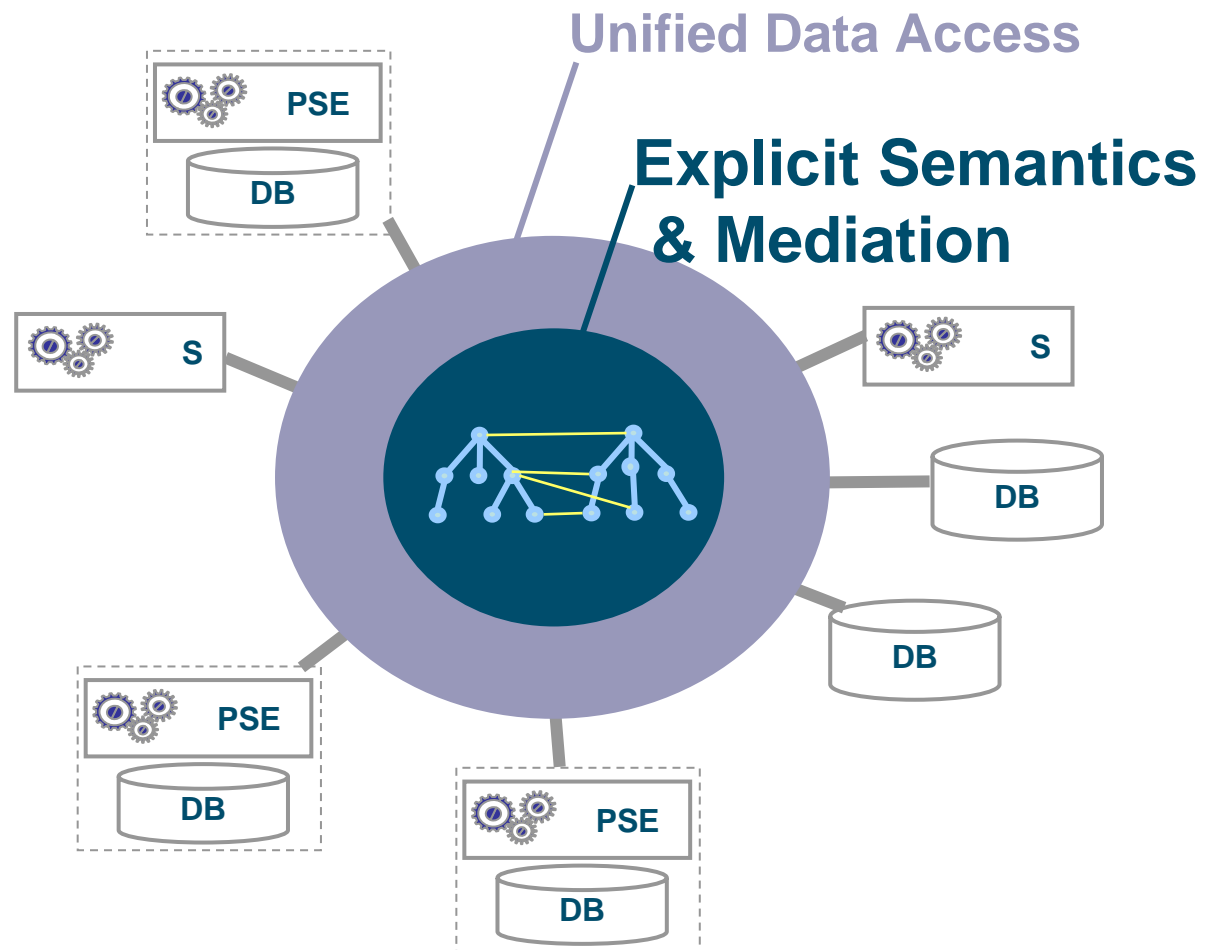*SIMDAT*

Semantic Integration & Data Grids – **How?**

- Establish **service oriented** data access layer

- Support **distributed sources**

- Use industry-accepted **WS-standards**

- Adopt existing solutions for data access [OGSA-DAI]

Unified Data Access

Explicit Semantics & Mediation

PSE

DB

S

S

DB

DB

PSE

DB

PSE

DB

SIMDAT

Semantic Integration & Data Grids – **How?**

- Reflect local domain models using **ontologies**

- Extract/describe domain models

- Use **explicit semantics**

- **Map** models

Unified Data Access

Explicit Semantics & Mediation

PSE

DB

S

S

DB

DB

PSE

DB

PSE

DB

SIMDAT

Mediation in the SIMDAT prototype

- **Engineering-time:**
  - Use ontology engineering tools
  - Create **mappings** between models using **rules**

- **Runtime:**
  - Provide query-interface for domain models
  - Mediate queries based on **reasoning engines**
  - Use optimization techniques (query minimization)
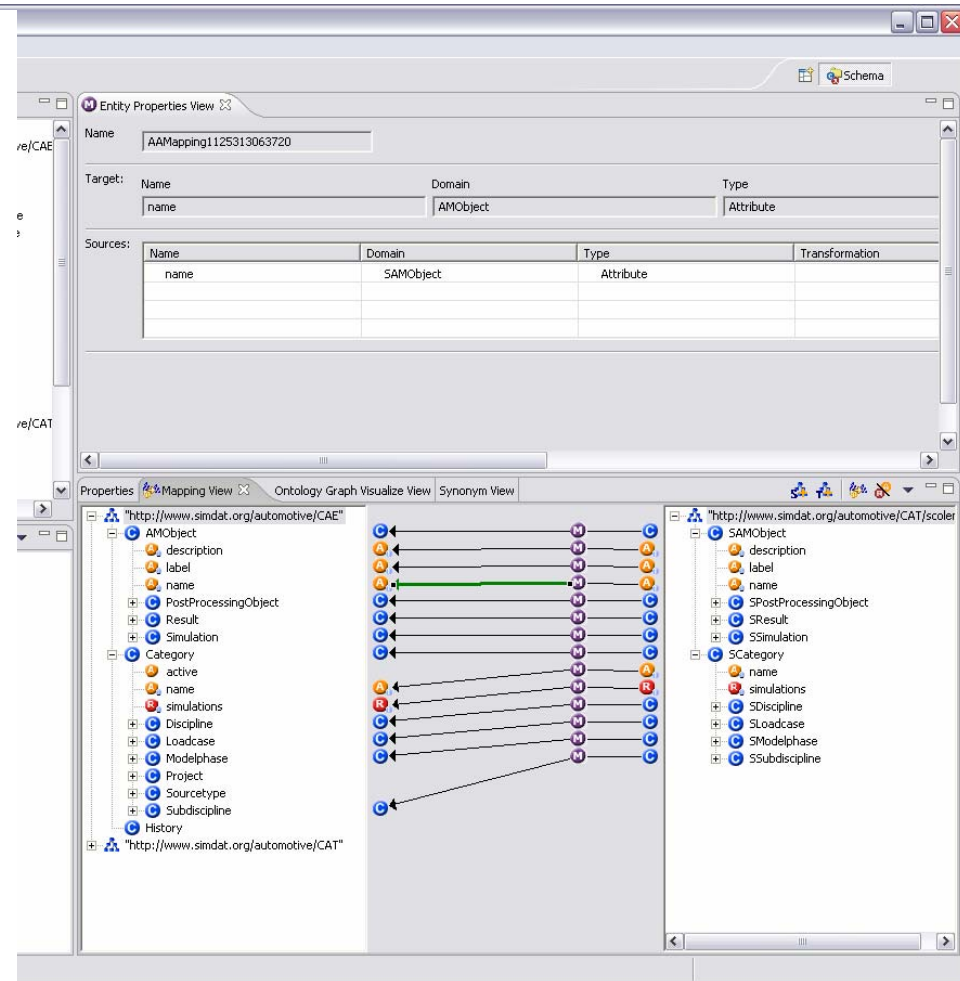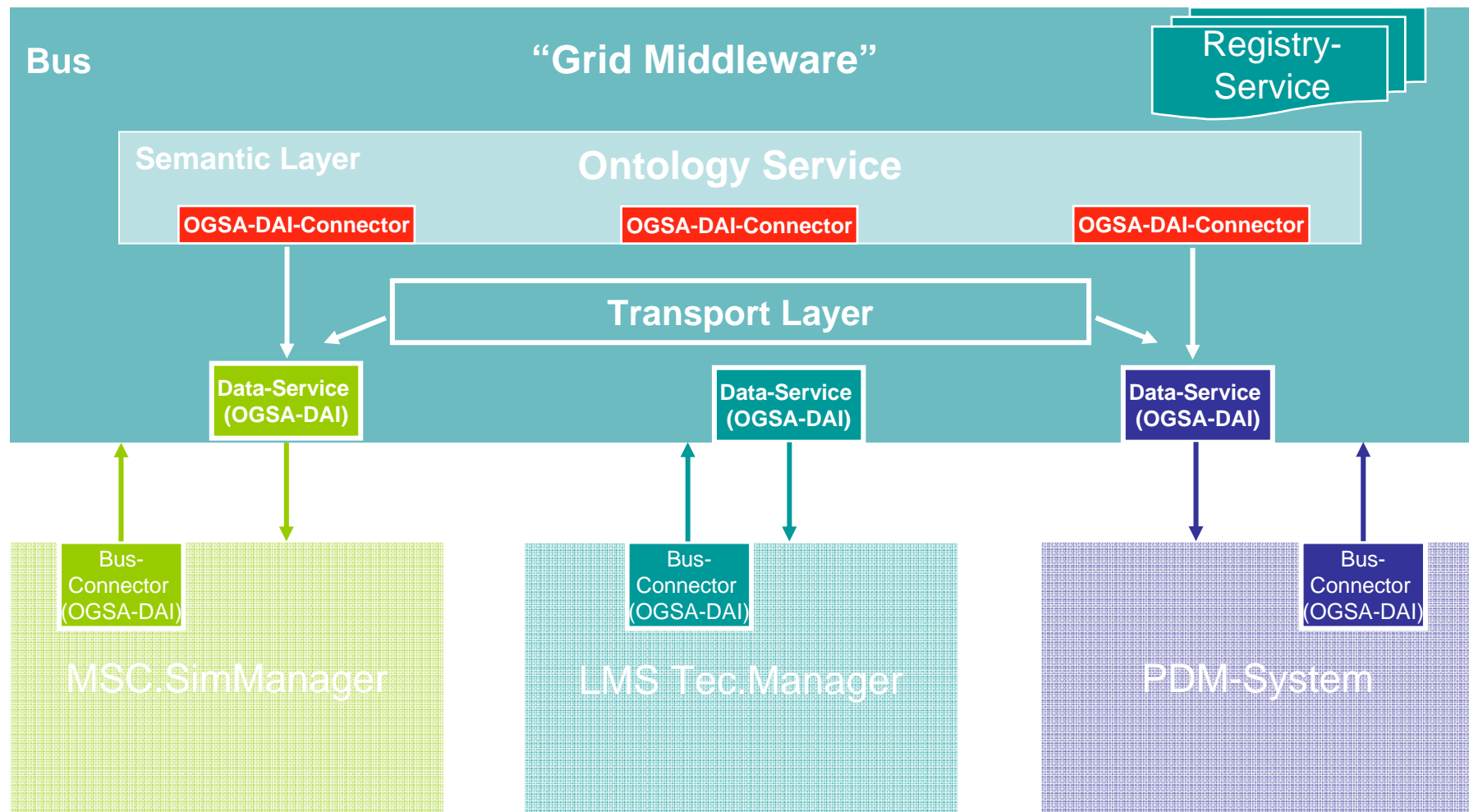
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"Software AG's partnership with Ontoprise allows us to provide customers with a first-class product which embraces innovative technology"

Jonathan Airey
Vice President, XML Business Integration at Software AG

Enterprise
Information Integrator

Studio

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SOFTWARE AG

Thank you for your attention!

Questions?

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