Enterprise Semantic Use Cases

or

Unleashing the Power of Logics...

Mike Ullrich 마이크 울리히
Director Business Development
ontoprise GmbH, Germany 독일
Agenda

- Introduction
- Motivation
- Customer Case: Service Management
- Customer Case: Control Unit Analysis
- Customer Case: Semantic PLM
- Customer Case: Sea Vessel Inspection
- Summary
know how to use Know-how!

Ontoprise is the leading semantic software company. Our goal is to make a company’s know-how visible and re-usable.

**Founded:** 1999  
**Team:** ~ 50 Employees  
**Headquarter:** Karlsruhe  

**Market:** 9 out of the 20 largest German companies are our customers  
Strategic Partner for Oracle and Software AG
Agenda

- Introduction
- Motivation
- Customer Case: Service Management
- Customer Case: Control Unit Analysis
- Customer Case: Semantic PLM
- Customer Case: Sea Vessel Inspection
- Summary
What is it?
What is it?

„Semantics is about Meaning and Context of Information“
Semantics = All About Meaning

An Ontology is a shared conceptualization of a domain [Tom Gruber].

Semantics (Meaning)

Ontology

- Railroad Object
  - Train
  - Track
  - Steam Train
    - Mogul
      - Mogul Train
      - Mogul Emperor
      - Mogul Ski Race
An Ontology is a **shared** conceptualization of a domain [Tom Gruber].

- **Semantics (Meaning)**
- **Relations**
- **Rules**

```
IF gagewidth = 1435 THEN suitable for standard gage ELSE narrow gage
```
Semantic Web Layer

OntoBroker OWL

From information **use** to knowledge **re-use**
„If I knew that we have already implemented this component from this vendor somewhere else, I had calculated differently.“

„With this error message, I always exchange the complete PC. Is there another way?“

„While I am still busy collecting all the information from all systems most of the customers already ran out of patience“
Three steps to Success!

1. **Access existing Information (Search)**
   - Integration of distributed Sources
   - Improves Search Results by means of background knowledge

2. **Share Expert Knowledge (FAQ)**
   - (Semi-) automatic Structuring of Service Contents
   - Reliant and intuitive FAQ System for Service Department

3. **Knowledge-based Diagnosis (Guide)**
   - Guided Error Analysis
   - Precise Solution of Service case
   - Integration and Interoperability with other service systems (e.g. SAP CS, Remedy)
Agenda

- Introduction
- Motivation
- Customer Case: Service Management
- Customer Case: Control Unit Analysis
- Customer Case: Semantic PLM
- Customer Case: Sea Vessel Inspection
- Summary
Semantic Integration and Search

**Vector Informatik**
- Vector Informatik offers tools, software components and engineering services for connecting electronic systems in automotives and other branches

**Goal**
- Integration of Information, which are spread over many systems
- Support search and research
- Shorter times to answer questions
- Reduction of redundant work
- Optimized support for solving support issues

**Implementation**
- Corporatwide Semantic Search System
- Integration of Remedy and Clearquest
- Integration Intranet
- Integration File Server
Some questions about Lin and Flexray

Datum: 28.08.2006

Kunde: HRain Tech. Application Dept., Frau Herr HHain Tech Co. Ltd (Internal Use), in BEIJING

Produkt: CANoe, LINcable

Version: 5.2

Produktdetails: pro, 6255000

Problembeschreibung:
1. Is the CAN cable the same as the LIN cable? I want to connect two LINpiggies in a CANcaseXL with the CANcables or CANcableXL. I want to test the LINpiggies. Are there the test tools in the Vector Driver Disk just like loop3.exe? 3. When I put LINpiggie in the CANcaseXL and connect the CANcaseXL with PC or Notebook, I find there are some strange things in the Hardware Configuration. You can see it in the attachment. The icons of CAN1 and CAN2 are different from that with CANpiggie. What does this mean? Is this normal? 4. The FlexCard has two cables. Each cable has a male D-sub connector. I want to make a cable with two female D-sub connectors and use it to connect the two channels of the FlexCard. So maybe I can use one channel to send message and the other channel to receive message. Does it OK?

Lösung:
1. Is the CAN cable the same as the LIN cable? I want to connect two LINpiggies in a CANcaseXL with the CANcables or CANcableXL.

>>> We have no special LINcable, but you can use our CANcableXL for LIN connections. <<<

2. I want to test the LINpiggies. Are there the test tools in the Vector Driver Disk just like loop3.exe?

>>> No I am sorry there is no LIN testing tool like loop3.exe. Please use LIN demo configurations from CANalyzer or CANoe. By the way: It is not necessary to make a LIN Loop to test a LINpiggie. A LIN Bus is able to create the header and the response on one LIN channel. <<<

3. When I put LINpiggie in the CANcaseXL and connect the CANcaseXL with PC or Notebook, I find there are some strange things in the Hardware Configuration. You can see it in the attachment. The icons of CAN1 and CAN2 are different from that with CANpiggie. What does this mean? Is this normal?

>>> In your CANoe/CANalyzer configuration are CAN channels activated (configuration -> options -> channel usage). Please deactivate the CAN channels, if you do not use them. <<<
Examplary Search and Editorial Workflow

Guided Search query
- Automatic Selection of Sources
- Manual Selection of Sources

Clipboard
- Annotation Clipboard

Annotation
- Annotate Documents

Automatic Annotations
- Manual Annotations

Suggestions
- Add local Documents

Offering
- Ontology

Knowledge container
- Publishing

External

Documents Hits

© 2007 ontoprise GmbH
www.ontoprise.de
Agenda

- Introduction
- Motivation
- Customer Case: Service Management
- Customer Case: Control Unit Analysis
- Customer Case: Semantic PLM
- Customer Case: Sea Vessel Inspection
- Summary
Motivation

Situation

- Increasing complexity in car manufacturing
- shorter development cycles
- higher quality measures
- Distributed knowledge, many teams, heterogeneous data sources
- Complexity and Logics coded into application

Ontologies

- Carving out the logics into a separate layer
- Integrate contents from heterogeneous sources
- allow to separate and combine substructures
Automatic Analysis of Control Units for Audi

Challenges

- Majority of innovations is in electronical equipment
- Increasing complexity in development and integration
- Shorter development cycles
- Increasing quality measures

Goals

- Introduction of efficient testing methods to reduce manual work
- Manage complexity
- Increase transparency

Solution

- Ontology-based Analysis of Control Units
Challenges with Control Units

An Actuator activation should not take longer than 2 ms.

Two actuators of the same cylinder may never be activated at the same time.

Documentation
Requirement Specification, Descriptions, Functional Framework
(Word, Excel, PDF)
Shared Knowledge vs. Black Box

- Classical Applications are Black Box as the Logic is programmed into the application code.

  Ontologies make logic transparent and explainable
  Therefore every user can get insight into the logic
Steps – Collection of Rules

Documentation
Requirement Specification, Descriptions, Functional Framework

Reverse Engineering from Functional Frames

Collection of Rules (natural language)

Expert Knowledge about Control Unit

Interviews
Vorgehen – Ontologie- und Regelerstellung

Collection of Rules (natural language)

Ontology

Semantic Rules

Rule 1

Rule 2

Rule 3

Rule n

Advantages:
• Rules are incrementally extendable
• Rules are not hidden in code
• Every rule contains ist natural language explanation
Vorgehen – Anwendung auf Messung

Tests Measurements → OntoBroker

Ontology and Rules

Result of Analysis
System displays errors and explanations

![Image of a computer screen showing a simulation interface with error messages and data tables.]

- The system displays errors and explanations.
- The interface includes a table with columns labeled 'Index', 'Time', 'EngineSpeed', 'state', 'TOC', 'TOIL', 'T AST', 'PIAF', 'Attribute 1', 'Attribute 6', and 'Attribute 7'.
- Error messages are displayed in a separate window, explaining constraints and states.
- The website www.ontoprise.de is mentioned at the bottom of the page.
System displays errors and explanations

```
Constraint-Verletzung: in Situation S2 liegt immer noch Zustand STATE_4 vor. In der letzten Situation lag bereits STATE_4 vor und die Drehzahl war größer als der Motorordrehzahlschwellwert (5000.0 > 4000.0). Deshalb hätte ein Zustandsübergang erfolgen müssen.
```

Anzahl der aufgetretenen Fehler: 1
Agenda

- Introduction
- Motivation
- Customer Case: Service Management
- Customer Case: Control Unit Analysis
- Customer Case: Semantic PLM
- Customer Case: Sea Vessel Inspection
- Summary
Automotive Supplier: Semantic PLM

**Goal**

- Large number of variants
  - decrease the development speed
  - produce complexity
  - are costly in production

**The project**

- Modelling of major parts, structures and logics
- Integration of Agile PLM system
- Automatic Classification of parts from PLM system into partonomic structure
- Answer questions like: „Which part is combined with which other part in which project?“
### Semantische PLM Suche

<table>
<thead>
<tr>
<th>Bezeichnung</th>
<th>Art.-Nr.</th>
<th>Kunde</th>
<th>Proj.-Nr.</th>
<th>Projektleiter</th>
<th>Kombinationen</th>
</tr>
</thead>
<tbody>
<tr>
<td>HÜSE</td>
<td>124457</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Autobahntunnel</td>
<td>Leerer_2</td>
<td>128</td>
<td>Leerer_3</td>
<td>Rohr 40% Unteres Lenkrohr 234507</td>
</tr>
<tr>
<td></td>
<td>Autobahntunnel</td>
<td>Leerer_3</td>
<td>129</td>
<td>Leerer_4</td>
<td>31% Rohr 234568</td>
</tr>
<tr>
<td></td>
<td>Autobahntunnel</td>
<td>Leerer_3</td>
<td>130</td>
<td>Leerer_4</td>
<td>22% Unteres Lenkrohr 234508</td>
</tr>
<tr>
<td></td>
<td>Autobahntunnel</td>
<td>Leerer_3</td>
<td>131</td>
<td>Leerer_4</td>
<td>5% ROHR 2009 234570</td>
</tr>
<tr>
<td></td>
<td>Autobahntunnel</td>
<td>Leerer_3</td>
<td>132</td>
<td>Leerer_4</td>
<td>Weiße 55% Weiße 234571</td>
</tr>
<tr>
<td></td>
<td>Autobahntunnel</td>
<td>Leerer_3</td>
<td>133</td>
<td>Leerer_4</td>
<td>20% Weiße komplett 234572</td>
</tr>
<tr>
<td></td>
<td>Autobahntunnel</td>
<td>Leerer_3</td>
<td>134</td>
<td>Leerer_4</td>
<td>15% Weiße komplett 234573</td>
</tr>
<tr>
<td></td>
<td>Autobahntunnel</td>
<td>Leerer_3</td>
<td>135</td>
<td>Leerer_4</td>
<td>6% WELLE 1009 234574</td>
</tr>
<tr>
<td>HÜSE AUF PROFILROHR</td>
<td>124456</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Autobahntunnel</td>
<td>Leerer_1</td>
<td>123</td>
<td>Leerer_1</td>
<td>Weiße 47% Weiße 234536</td>
</tr>
<tr>
<td></td>
<td>Autobahntunnel</td>
<td>Leerer_1</td>
<td>124</td>
<td>Leerer_1</td>
<td>18% Weiße 234537</td>
</tr>
<tr>
<td></td>
<td>Autobahntunnel</td>
<td>Leerer_1</td>
<td>126</td>
<td>Leerer_1</td>
<td>13% Weiße 234538</td>
</tr>
<tr>
<td></td>
<td>Autobahntunnel</td>
<td>Leerer_2</td>
<td>126</td>
<td>Leerer_2</td>
<td>13% WELLE 234539</td>
</tr>
</tbody>
</table>

Suchbegriff: Hülse, Oder meinnt Sie: Hülse komplett?
Agenda

- Introduction
- Motivation
- Customer Case: Service Management
- Customer Case: Control Unit Analysis
- Customer Case: Semantic PLM
- Customer Case: Sea Vessel Inspection
- Summary
Based in Paris, France.

Specializes in
- Ontology management
- Taxonomy management
- Business repositories
- Semantic representation of knowledge.

Mondeca integrated Ontoprise reasoning engine into ITM software to enable:
- automatic generation and maintenance of knowledge links into an ontology
- cased base filtering of content and knowledge to build intelligent publication system
Pilot project with client on Administration of Ships

The Client is a company with a large number of Ships to manage

In the range of 7000 Ships in different categories

Details of the ships are proportionately large and administrating the ships for shipping, logistics, security, maintenance etc. any purpose for that matter is a relatively complex system.
The Ontology – is important

• Classification of ship
  - Type
  - Subclasses
  - Purpose
  
  • Partonomy
  # Electrical Equipment and Power Supply
  # Communications Systems and Equipment
  # Security
    * Fire Fighting
    * Detection
    * Insulation
  # Water Treatment
    * Desalination
    * Sanitation
    * Waste Water
  
• Classification of Inspections
  
  # bulk carriers
    * tankers
      o chemical
      o crude oil
      o gas carriers
      o LNG, LPG
      o product
Currently we have Experts who have the `know-how` to use and integrate a huge number of regulations.

- It’s relevant to extract the regulations for the maintenance so that the experts can concentrate on more productive work than just already known maintenance issues.

- A typical case would be
  
  *If the ship is more than 90m long*  
  *And if the ship weighs more than 20 tons*  
  *And if the ship is more than 10 years old*  
  *And if the ship has not been Serviced for last 2 years*

  Then

  *Inspection `IS-10154` applies.*
IF the ship is longer than 90m and
IF it weighs more than 20 tons and
IF it is older than 10 years and
IF it has not been serviced in the last two years
THEN Inspection “IS-10154” is due.
Agenda

- Introduction
- Motivation
- Customer Case: Service Management
- Customer Case: Control Unit Analysis
- Customer Case: Semantic PLM
- Customer Case: Sea Vessel Inspection
- Summary
Conclusion

**Ontologies ...**

- increase the transparency
  - by *carving out* logics from applications and data
  - because all results are *explained* in natural language
  - because ontologies are creatable, maintainable and *understandable*
    by domain experts

- make complexity manageable
  - because informal and distributed knowledge is formalized and therefore made *machine processable*
  - because knowledge can be structured and *re-used*
  - because they have *powerful modelling primitives*

- help to build flexible systems that can adapt to changes quickly
  - because they are *combinable* with other technologies
  - because the representation is on the *knowledge level*
Combine Agility with strong Decision Support

- Degree of Decision Support
  - low
  - high

- Number of Usage Scenarios (Re-Usability)
  - limited
  - flexible, agile

- Tools:
  - Search
  - Taxonomies
  - TopicMaps
  - DMS
  - Meta Data Management
  - Information Extraction
  - ETL (Extract, Transform, Load)
  - Business Rules
  - Ontology & Rules
  - Information Extraction
  - Business Rules
  - Ontology & Rules
Thank you for your Attention

- Director Business Development
  - Mike Ullrich
    mike.ullrich@ontoprise.de,
    +49 721 509809-33