Ontological Re-Classifications of Instances

Radek Marik

February 2008
Enterprise IT Management (EITM)
Communication Language

Each side uses its own language that might be similar to each other.

A  B
> Time (15:00:00)  > Time (15:00:00)
> Name (Svejnar)  > Name (Vaclav Klaus)
> Computer (PC box)  > Machine (PC box)
> Process  > Router

A reference to an instance
Reference to a common third party
Instance-Based Communication

Source Ontology

Bridge Ontology

Target Ontology

Objects
Use Case – Symmetrical Arrangement

1. Objects and their unique identifications (URI)
2. Source ontology model
3. Target ontology model
4. (Machine) creating a bridge ontology by ontology alignment

> Mapping simplified by constraints between instances
> URI ... URL
Use Case – Unsymmetrical Arrangement

1. Instances classified regarding the source ontology
2. Source ontology
3. Target ontology
4. (Human) creating a bridge ontology in step by step way
   a) To cover instances as fast as possible
   b) To cover relations

> Mapping using constraints in the bridge and between instances
Source Ontology and Instances

\[ \text{hasEmployee} \equiv \text{belongsToDepartment}^{-1} \]

\[
\begin{align*}
    \text{DEPARTMENT} & \sqsubseteq \exists \text{prop:hasEmployee.EMPLOYEE} \\
    \text{EMPLOYEE} & \sqsubseteq \exists \text{prop:belongsToDepartment.DEPARTMENT} \\
    \text{SOFTWAREARCHITECT} & \sqsubseteq \text{EMPLOYEE} \\
    \text{PRODUCTMANAGER} & \sqsubseteq \text{EMPLOYEE} \\
    \text{ACCOUNTANT} & \sqsubseteq \text{EMPLOYEE} \\
    \text{SOFTWAREENGINEER} & \sqsubseteq \text{EMPLOYEE} \\
    \text{ACCOUNTANT(Employee_1)} & \\
    \text{PRODUCTMANAGER(Employee_2)} & \\
    \text{PRODUCTMANAGER(Employee_3)} & \\
    \text{SOFTWAREENGINEER(Employee_4)} & \\
    \text{SOFTWAREARCHITECT(Employee_5)} & \\
    \text{DEPARTMENT(Department_1)} & \\
    \text{DEPARTMENT(Department_2)} &
\end{align*}
\]
prop:belongsToDepartment(\textit{Employee}_1, \textit{Department}_1) 
prop:belongsToDepartment(\textit{Employee}_2, \textit{Department}_1) 
prop:belongsToDepartment(\textit{Employee}_3, \textit{Department}_2) 
prop:belongsToDepartment(\textit{Employee}_4, \textit{Department}_2) 
prop:belongsToDepartment(\textit{Employee}_5, \textit{Department}_2)
Target Ontology

\[
\text{DEPARTMENT} \sqsubseteq \exists \text{prop:hasEmployee.EMPLOYEE}
\]
\[
\text{SALEDEPARTMENT} \equiv \exists \text{prop:hasEmployee.BUSINESSMAN \sqcap DEPARTMENT}
\]
\[
\text{DEVELOPMENTDEPARTMENT} \equiv \exists \text{prop:hasEmployee.DEVELOPER \sqcap DEPARTMENT}
\]
\[
\text{EMPLOYEE} \sqsubseteq \exists \text{prop:belongsToDepartment.DEPARTMENT}
\]
\[
\text{DEVELOPER} \sqsubseteq \text{EMPLOYEE}
\]
\[
\text{BUSINESSMAN} \sqsubseteq \text{EMPLOYEE}
\]
Bridge Ontology

\[ \text{EmployeeBridge} \equiv \text{raw:Employee} \]
\[ \text{EmployeeBridge} \equiv \text{tgt:Employee} \]
\[ \text{AccountantBridge} \sqsubseteq \text{EmployeeBridge} \]
\[ \text{AccountantBridge} \sqsubseteq \text{tgt:Businessman} \]
\[ \text{AccountantBridge} \equiv \text{raw:Accountant} \]
\[ \text{SoftwareEngineerBridge} \sqsubseteq \text{EmployeeBridge} \]
\[ \text{SoftwareEngineerBridge} \sqsubseteq \text{tgt:Developer} \]
\[ \text{SoftwareEngineerBridge} \equiv \text{raw:SoftwareEngineer} \]
\[ \text{DepartmentBridge} \equiv \text{raw:Department} \]
\[ \text{DepartmentBridge} \equiv \text{tgt:Department} \]
\[ \text{SaleDepartmentBridge} \sqsubseteq \text{DepartmentBridge} \]
\[ \text{SaleDepartmentBridge} \equiv \text{tgt:SaleDepartment} \]
\[ \text{DevelopmentDepartmentBridge} \sqsubseteq \text{DepartmentBridge} \]
\[ \text{DevelopmentDepartmentBridge} \equiv \text{tgt:DevelopmentDepartment} \]

\[ \text{SaleDepartmentBridge} \sqsubseteq \forall \text{prop:hasEmployee. tgt:Businessman} \]
\[ \text{DevelopmentDepartmentBridge} \sqsubseteq \forall \text{prop:hasEmployee. tgt:Developer} \]
Source-Bridge-Target Mapping
Inference
Method Efficiency

> 12 T1 instance types
> 12 T2 set types
> 73 assignments between S1 and T1 (instance types)

<table>
<thead>
<tr>
<th>Entity</th>
<th>Source data count</th>
<th>Classified</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instances</td>
<td>16.456</td>
<td>15.197</td>
<td>92%</td>
</tr>
<tr>
<td>Sets</td>
<td>1.641</td>
<td>1.403</td>
<td>85%</td>
</tr>
<tr>
<td>Instance types</td>
<td>1.073</td>
<td>658</td>
<td>61%</td>
</tr>
<tr>
<td>Set types</td>
<td>787</td>
<td>599</td>
<td>76%</td>
</tr>
</tbody>
</table>
Run-time Performance
Pellet instance classification (ITC)
Conclusions

> Semi-automatic mapping
> Simple
> Very efficient
> Based on constraints between instances
This presentation was based on current information and resource allocations as of February 12, 2008 and is subject to change or withdrawal by CA at any time without notice. Notwithstanding anything in this presentation to the contrary, this presentation shall not serve to (i) affect the rights and/or obligations of CA or its licensees under any existing or future written license agreement or services agreement relating to any CA software product; or (ii) amend any product documentation or specifications for any CA software product. The development, release and timing of any features or functionality described in this presentation remain at CA’s sole discretion. Notwithstanding anything in this presentation to the contrary, upon the general availability of any future CA product release referenced in this presentation, CA will make such release available (i) for sale to new licensees of such product; and (ii) to existing licensees of such product on a when and if-available basis as part of CA maintenance and support, and in the form of a regularly scheduled major product release. Such releases may be made available to current licensees of such product who are current subscribers to CA maintenance and support on a when and if-available basis. In the event of a conflict between the terms of this paragraph and any other information contained in this presentation, the terms of this paragraph shall govern.
>Certain information in this presentation may outline CA’s general product direction. All information in this presentation is for your informational purposes only and may not be incorporated into any contract. CA assumes no responsibility for the accuracy or completeness of the information. To the extent permitted by applicable law, CA provides this document “as is” without warranty of any kind, including without limitation, any implied warranties or merchantability, fitness for a particular purpose, or non-infringement. In no event will CA be liable for any loss or damage, direct or indirect, from the use of this document, including, without limitation, lost profits, lost investment, business interruption, goodwill, or lost data, even if CA is expressly advised of the possibility of such damages.
Questions & Answers