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Preliminary Report of Public Experiment of Semantic Service Matchmaker With UDDI Business Registry

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1. Introduction

- UDDI is a standard, but restricted to **keyword** search!
- Semantic Service Matchmaker enhance it with **ontology and rules**.
- **Compliance** with the standard specs. like SOAP, WSDL, UDDI is the key issue.
- Goal is to **seamlessly combine** semantic search with the standards
- **Public Experiment** with **NTT** was initiated to evaluate the scalability and feasibility.

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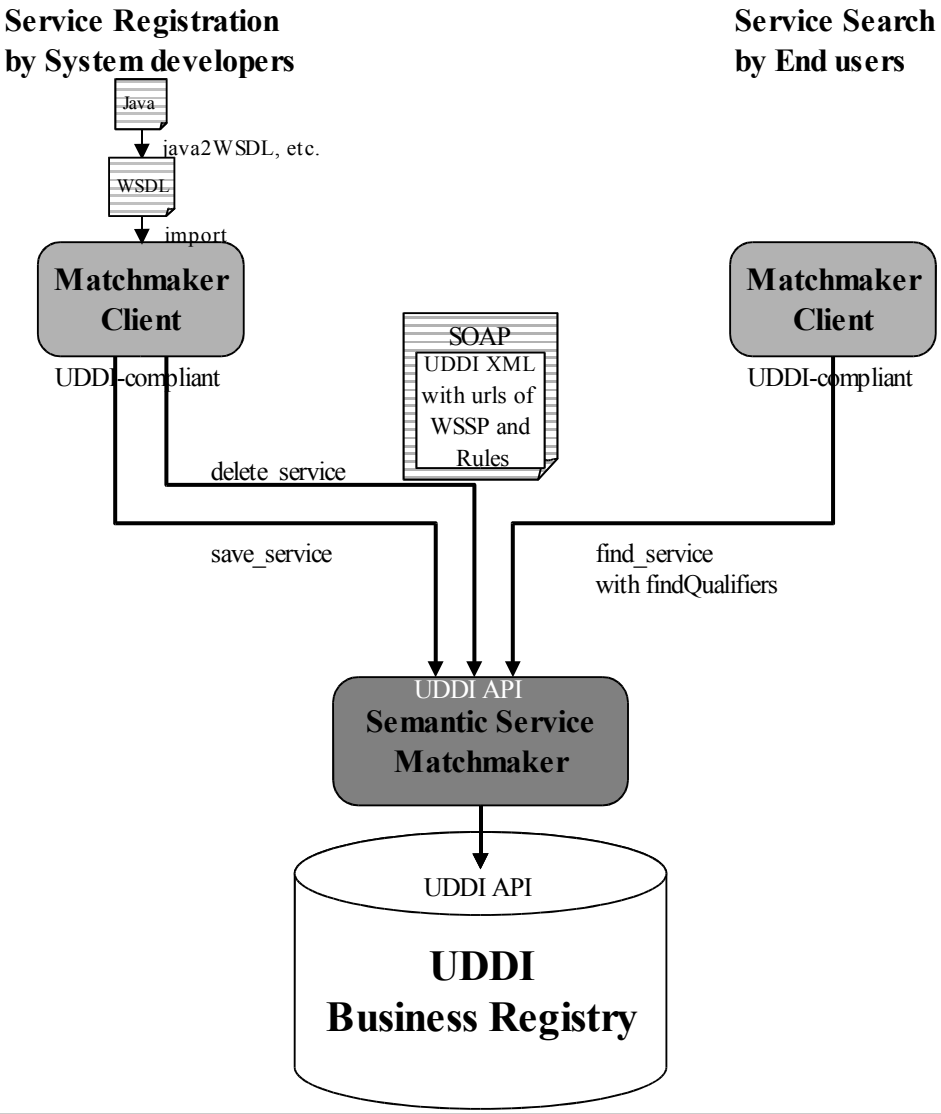
2. Architecture



3. How to use

- Registration
  1. **Client** generates semantic service description called WSSP from WSDL
  2. **Matchmaker** extracts the semantic annotation.
  3. **UDDI** registers the service through Matchmaker
- Search
  1. **Client** sends a query to Matchmaker
  2. **Matchmaker** searches for “similar” services.
  3. Matchmaker gets the detailed info. from **UDDI**, get back to Client.

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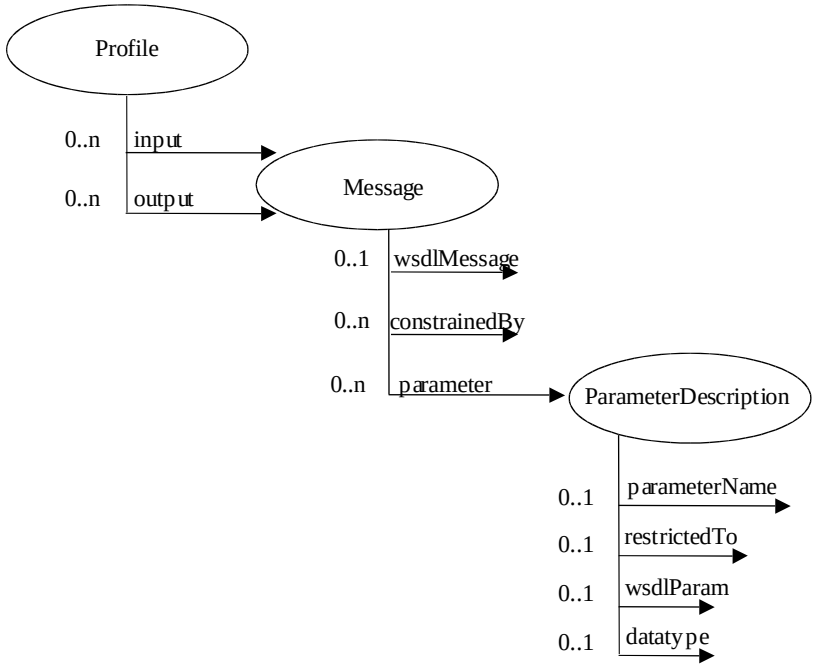
4. Service Description

- **WSSP** - Web Service Semantic Profile
  - WSDL - Programming Interface
    - Name and Datatype of **inputs and outputs**.
    - No semantics for the service capabilities
  - WSSP - Metadata for WSDL
    - Additional description which includes **pointers for ontology and rules** to inputs and outputs.

4. Service Description

- WSDL
  - I/O parameters
- WSSP
  - **restrictedTo**
    - RDFS
    - DAML+OIL
    - OWL
  - **constrainedBy**
    - RDF RuleML



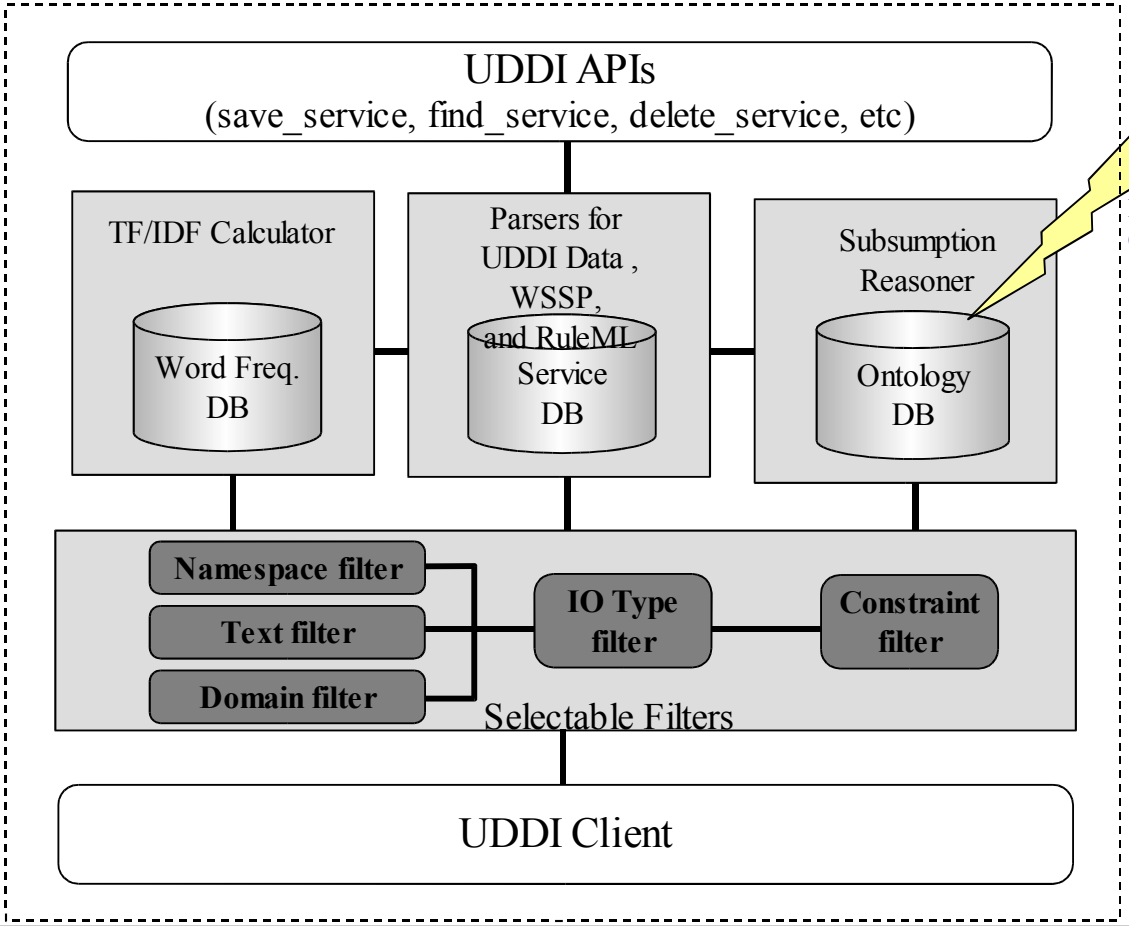
Structure of WSSP

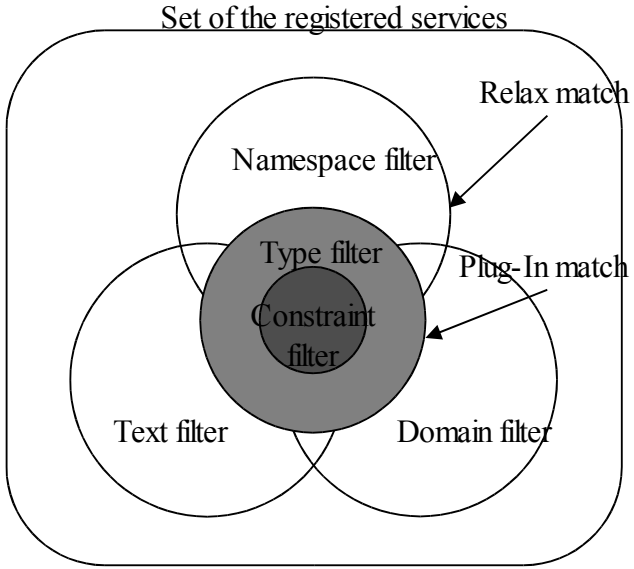
5. Semantic Matchmaker

- Degree - similarity and distance
  - Exact
    - Highest degree of matching: Equivalent
  - **Plug-In**
    - Provided Service is more general than the requested.
    - Sell Printed Materials Sell books
  - Relaxed
    - Weakest semantic interpretation.
    - Other kinds of Similarity explained below.

5. Semantic Matchmaker

■ Filters and Criterion





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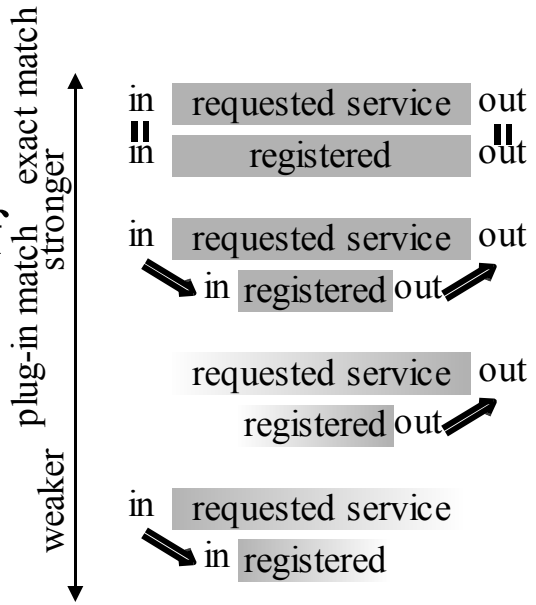
5. Semantic Matchmaker

- First 3 **Relaxed filters** for time reduction
  - Namespace Filter
    - determines if there is a share ontology
  - Text Filter
    - TF/IDF for human-readable sentences
  - Domain Filter
    - determines if they are in a certain size of a sub-tree.

5. Semantic Matchmaker

- Last 2 **Plug-In filters**
  - I/O Type Filter
    - check the subsumption relation of inputs' and outputs' ontology
    - Empty inputs match to every inputs' ontology
  - Constraints Filter
    - compare constraints, that is, rules and fact to check if the registered one is less constrained than the requested one.



$$match(R_I, A_I) \Leftarrow (\forall j, \exists i : (i \in R_I) \wedge (j \in A_I) \wedge subs(j, i)) \vee R_I = \emptyset$$

$$match(R_O, A_O) \Leftarrow \forall i, \exists j : (i \in R_O) \wedge (j \in A_O) \wedge subs(i, j)$$

6. Client Tools

■ Example WSDL - Product Selling Service

```
<?xml version="1.0" encoding="UTF-8" ?>
<wsdl:definitions targetNamespace="http://www.agent-net.com/wsmm/data/PartsSupplier21.wsdl" >
 <wsdl:types />
 <wsdl:message name="input">
  <wsdl:part name="input1" type="xsd:string" />
  <wsdl:part name="input2" type="xsd:integer" />
 </wsdl:message>
 <wsdl:message name="output">
  <wsdl:part name="output1" type="xsd:string" />
 </wsdl:message>
 <wsdl:portType name="TosItem">
  <wsdl:operation name="PartsSupplier">
  <wsdl:input name="input" message="impl:input" />
  <wsdl:output name="output" message="impl:output" />
 </wsdl:operation>
 </wsdl:portType>
 <wsdl:binding name="AxisServletSoapBinding" type="impl:TosItem">
 <wsdl:service name="Computer">
  <documentation>Computer</documentation>
  <wsdl:port name="PartsSupplier" binding="impl:AxisServletSoapBinding">
   <wsdlsoap:address location="http://www.agent-net.com:8080/axis/servlet/AxisServlet" />
  </wsdl:port>
 </wsdl:service>
 </wsdl:definitions>
```

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6. Client Tools – demo?

- Service Registration
- Service Search

(demo)

7. Evaluation

- Requirement for **design issue**

1. **Cost** of development and administration
   - Compliance to the standard
2. **Interoperability** to the current system
   - Compliance to the standard
3. Track **record** and Security
   - Public Experiment
4. **Usability** rather than advanced function
   - Client tools including Ontology Viewer and Rule Editor

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8. Conclusion

- **Initial** report on public experiment
  - on Semantic Service Matchmaker
  - with Public UDDI registry.
- Now working on...
  - collecting the records and feedback
  - measuring
    - **performance** in comparison with naive UDDI and with other matchmakers
    - **what kind of services** are mostly searched by the user,
    - **ratio of positive-fault**
    - user feedback about the **usability** of the tools, etc.