Carnegie Mellon University

Katia Sycara

katia@cs.cmu.edu

Carnegie Mellon University

http://www.cs.cmu.edu/~softagents

Overview

- **Goals for 2004: Tools and Standards**
- **OWL-S Editor and Integrated Development Environment**
- **Enhancements to other OWL-S Tools**
- **Additional Research Activities**

OWL-S Editor and IDE

- **Implementation of OWL-S WS requires:**
  1. **Implementation of WS logic**
  2. **Generation of WSDL description**
  3. **Generation of OWL-S description**
  4. **Deployment of WS**
  5. **Advertisement with registries such as UDDI**

OWL-S Editor and IDE

- **Implementation of client requires**
  1. **Interpretation of OWL-S specification**
  2. **Generation of messages to the WS**

OWL-S IDE addresses both aspects

OWL-S IDE

1. **Support programmers in their generation of OWL-S starting from Java code**
   - **Exploit Apache's Java2WSDL and CMU's WSDL2OWL-S to generate OWL-S descriptions**
   - **Produces:**
     - ✓ **Grounding**
     - ✓ **Schematic Process model**
     - ✓ **Schematic Profile**
     - ✓ **WSDL description**

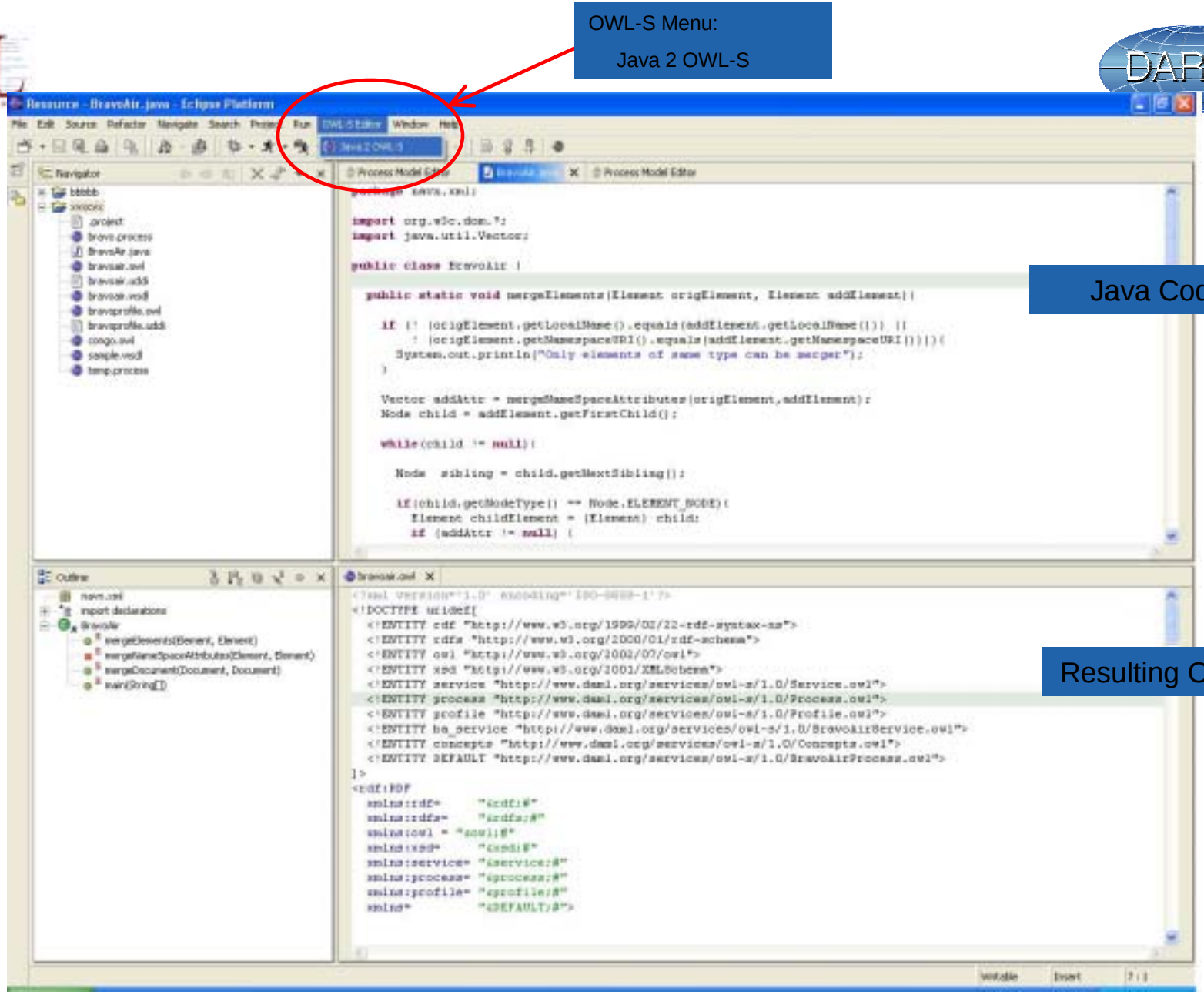
OWL-S IDE

Editing and Validation Tools

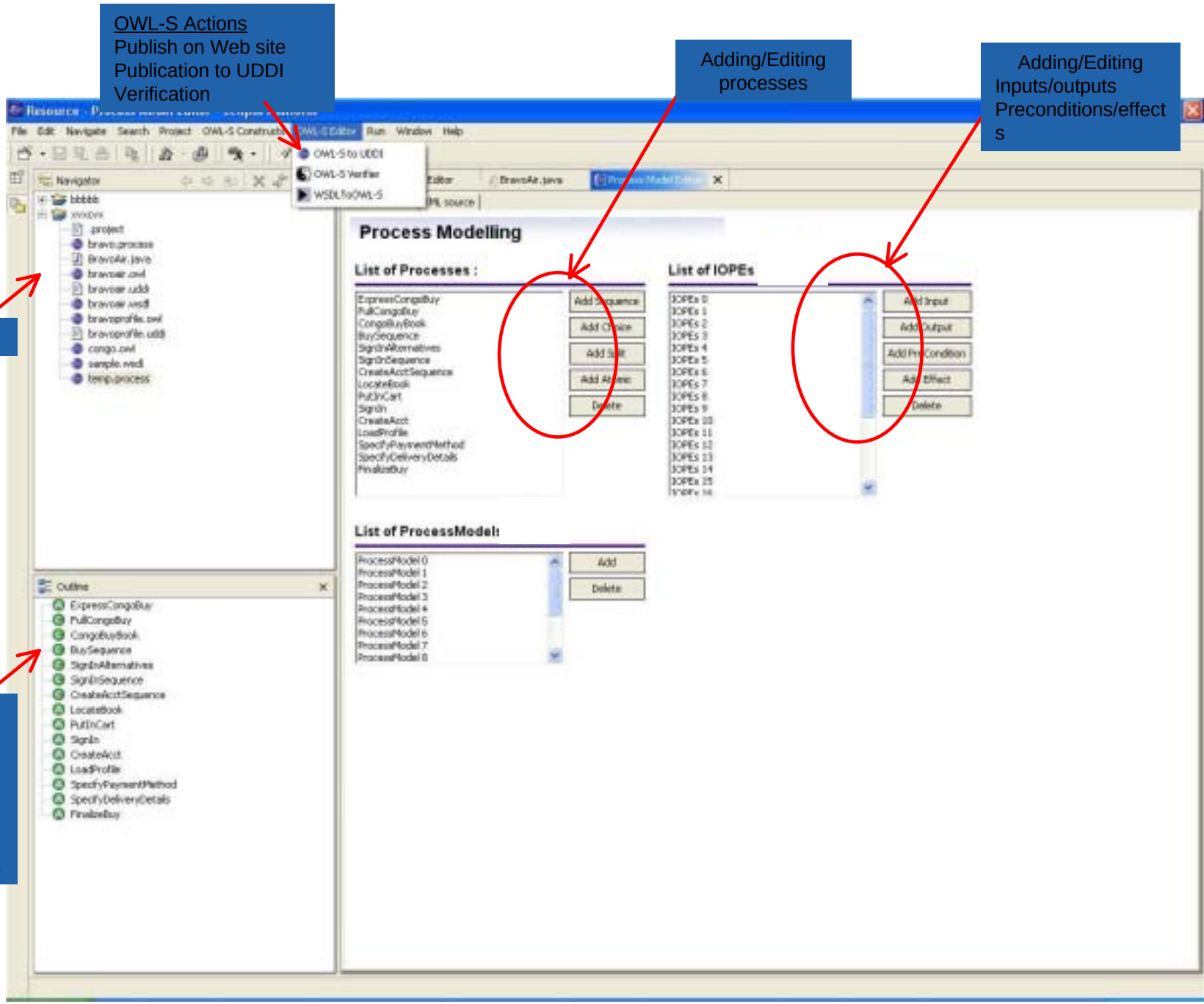
- **Form based Profile and Process Editor**
  - ✓ **Guarantees Syntactic correctness**
  - ◆ **Validation of data flow**
- **Management tools**
  - ✓ **Automatic publishing OWL-S description files on Web site**
  - • **Automatic generation of OWL-S client code**

Based on popular Eclipse java IDE

- **Provide a a uniform environment for Java and OWL-S development**



Eclipse's Java IDE


OWL-S Actions
Publish on Web site
Publication to UDDI
Verification
Adding/Editing processes
Adding/Editing Inputs/outputs Preconditions/effects
Ontology files
Process Model tree
Display process/subproces relations
Inputs/outputs
Preconditions/effects
OWL-S to UDDI
OWL-S Verifier
WSDL to OWL-S
Process Modelling
List of Processes :
List of IOPEs
List of ProcessModel:
Add
Delete

Current Status

- **Completed development of**
  - **Transformation Java->OWL-S**
  - **Profile and Process Model editors**
  - **Advertising with UDDI**
  - **Generation of client code almost complete**

Work in Progress

- **Editor for Grounding**
  - **Facilitate generation of XSLT script that maps WSDL data types into OWL classes**
- **Surface Syntax editor**
- **Security and Policy annotations**
  - **Annotation of Atomic Processes and WSDL consistent with WS security**
- **Integration with Ontology Browsers to support selection of ontologies and concepts**
- **Integration with Inference Engines to support querying and inferencing**

Work in Progress

- **Graphic display of Process model**
- **Verification of OWL-S code**
  - **Detection of workflow errors**
  - **Verification of XSLT scripts**
- **Development process driven by the suggestions of the users**
- **The CMU editor does not only focus on the generation of OWL-S code but on the whole WS generation environment**

Tool Updates and Enhancements

OWL-S Development Tools

- Updated our WSDL2DAML-S Tool to WSDL2OWL-S. Available at http://www.daml.ri.cmu.edu/wsdl2owls
- Updated our DAML-S/UDDI matchmaker and DAML-S/UDDI mapping to OWL-S/UDDI matchmaker and OWL-S/UDDI mapping respectively.
- Developed and deployed our new OWL-S/UDDI matchmaker website. It provides a web interface for users to interact with our OWL-S/UDDI matchmaker. Available at http://www.daml.ri.cmu.edu/matchmaker.
- Initial implementation of process model verification tool using SPIN model checking tool.
- Complete implementation of OWL-S 1.1 API

OWL-S Broker

- Enhancements to our OWL-S Broker that mediates between OWL-S Web services. We enhanced our current algorithm for mapping queries to requests.

Additional Research Activities

- **Participated in the development of OWL-S 1.1**
- **Active participation in:**
  - **W3C Web Services Architecture WG**
  - **UDDI Technical committee**
  - **SWSI/SWSA**
- **Maintained in continuous operation the DAML-S/UDDI Matchmaker that was deployed in June 2002.**
- **Publications**

www.cs.cmu.edu/~softagents/publications

Plans

Place Tools on www.semwebcentral.org

Timeframe: initial set of tools within next month

Extra Slides

Applying SW Verification to OWL-S PM

Verification achieves two goals when applied to OWL-S PM:

1. **Pragmatic: SW verification provides a way to check on the validity of the OWL-S PM and Grounding.**
   - **Clients can verify automatically whether the Process Models and Grounding that they load are correct**
   - **Modelers can verify whether the OWL-S models that they construct are correct**
2. **Theoretical**
   - **Verification tools concentrate on control flow, but for semantic languages data flow, and logic consistency is also crucial**

Correctness Claims

1. **No deadlocks**
2. **Verification of the correctness of data flow:**
   - **All inputs receive a value either from outputs or from Grounding**
   - **Values received from the inputs are consistent with values generated by the outputs**
   - **Verification of correctness of XSLT transformations from XML types used in WSDL to ontological types used in OWL-S**
3. **No unreachable processes (every process is achievable by at least one execution trace)**
4. **Based on Spin verification engine**
5. **Current Status: complete description of the mapping from OWL-S to Spin modeling language. Ready for implementation**