TU Košice - Research and experience in area of SOA and related projects

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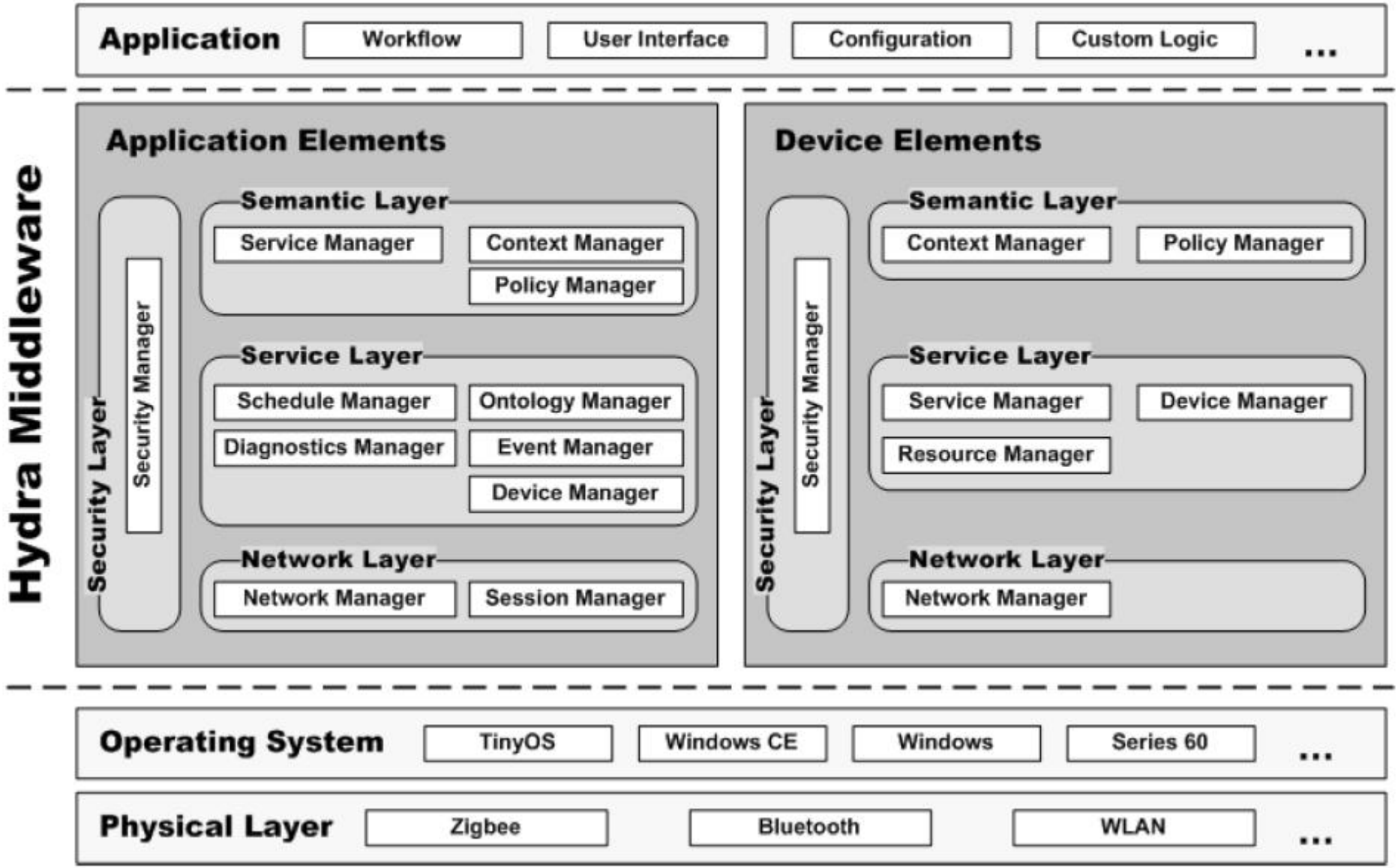
HYDRA Project

- Networked Embedded System Middleware for Heterogeneous Physical Devices in a Distributed Architecture
- www.hydramiddleware.eu
- Start: 1st. July 2006
- Duration : 4 Years
- 13 Partners from 9 countries (9 companies, 3 universities, research institute)
- Project vision:

  To create the most widely deployed middleware for intelligent networked embedded systems that will allow producers to develop cost-effective and innovative embedded applications for new and already existing devices.

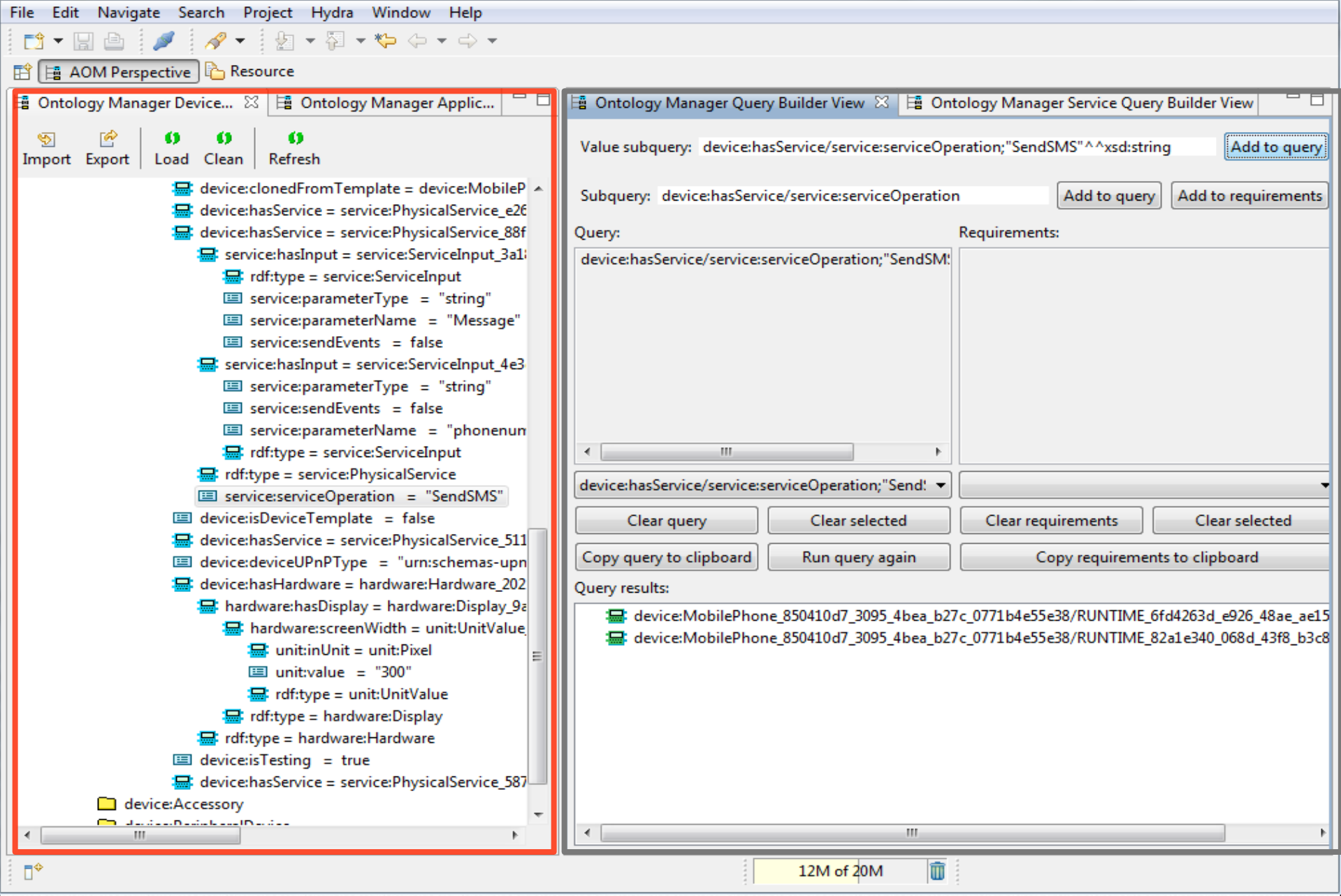
HYDRA Objectives

- Develop a middleware for based on a Service-oriented Architecture, to which the underlying communication layer is transparent, and consisting of:
  - Support for distributed as well as centralised architectures
  - Support for context and reflective properties of components of the middleware
  - Support for security and trust enabling components
- Develop a generic semantic model-based architecture supporting model-driven development of applications
- A toolkit (SDK, DDK) that will allow developers to develop applications on the middleware.
- *End Users* vs. *Developer Users*


Application
Workflow
User Interface
Configuration
Custom Logic
...
Hydra Middleware
Application Elements
Security Layer
Security Manager
Semantic Layer
Service Manager
Context Manager
Policy Manager
Service Layer
Schedule Manager
Ontology Manager
Diagnostics Manager
Event Manager
Device Manager
Network Layer
Network Manager
Session Manager
Device Elements
Security Layer
Security Manager
Semantic Layer
Context Manager
Policy Manager
Service Layer
Service Manager
Device Manager
Resource Manager
Network Layer
Network Manager
Operating System
TinyOS
Windows CE
Windows
Series 60
...
Physical Layer
Zigbee
Bluetooth
WLAN
...

Application Ontology Manager

- Provides a unified interface for using the Device Ontology and all the related models
- AOM maintains the run-time instances of the Hydra devices
- On top of the AOM runs HYDRA Ontology Manager IDE providing an environment for ontology browsing, device instances and properties listing
- Semantic model based on *Sesame* framework
- Ontology administration tools included in the IDE (Integrated Development Environment), that enables
  - Ontology browsing
  - Ontology and annotation editing
  - Querying with expectations and requirements
  - Application awareness support



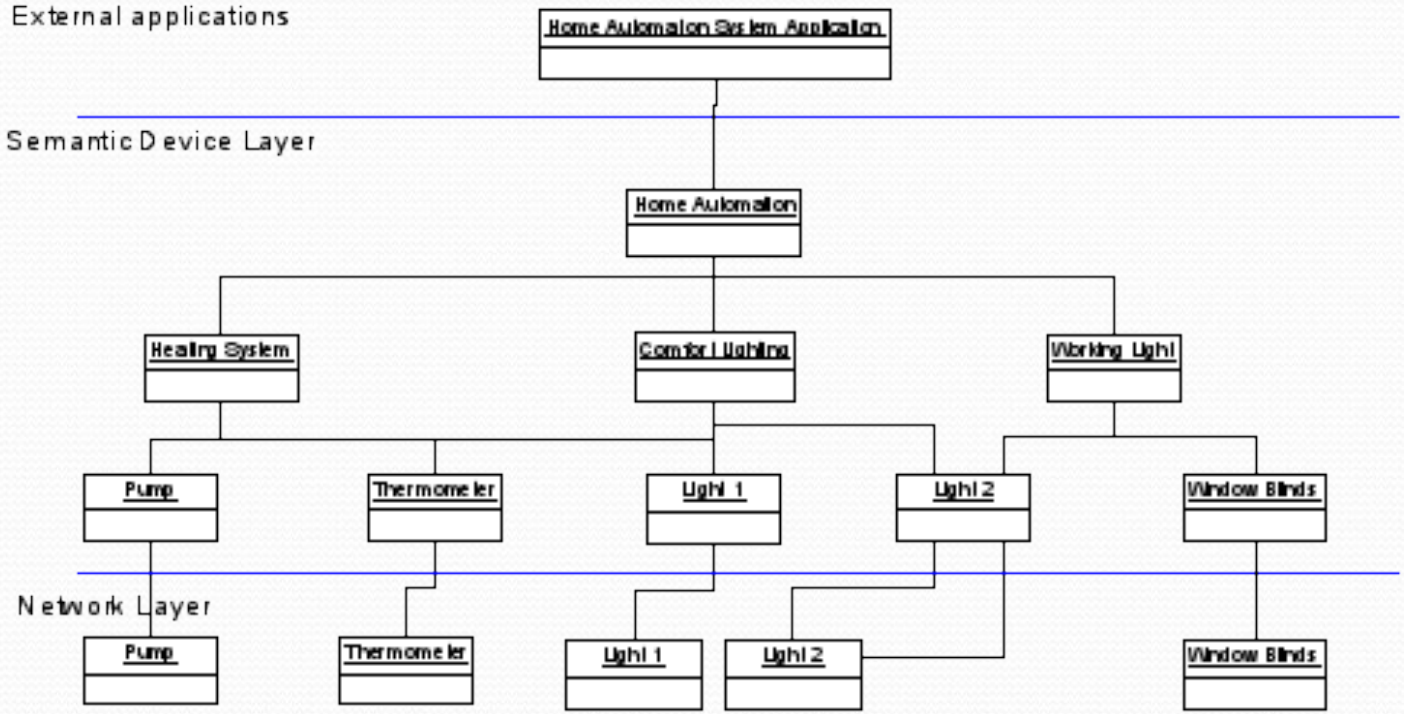
Device/Application Browser

Query/Service Query Builder, Query Results

Semantic Devices

- Programming concept representing a logical aggregate of devices and services to support the application development by providing the application specific services
- Example of usage:
  - If there are more thermometer devices in an application, “get average room temperature” or “hold the temp. on spec. level” can be provided
- Each semantic device defined by semantic services
- Semantic services composed by the set of requirements in terms of preconditions, which has to be satisfied
  - *Static preconditions* (list of identifiers of concrete devices)
  - *Dynamic preconditions* (SPARQL query to generate the candidates)
- Creation of semantic devices in DDK (Ontology-driven design)
  - Ontology support for selection of proper services
- Developer can focus on selection of devices – proxies and code generated automatically in DDK according to the configuration information attached

Semantic Devices (2)



GridMiner

- Host:

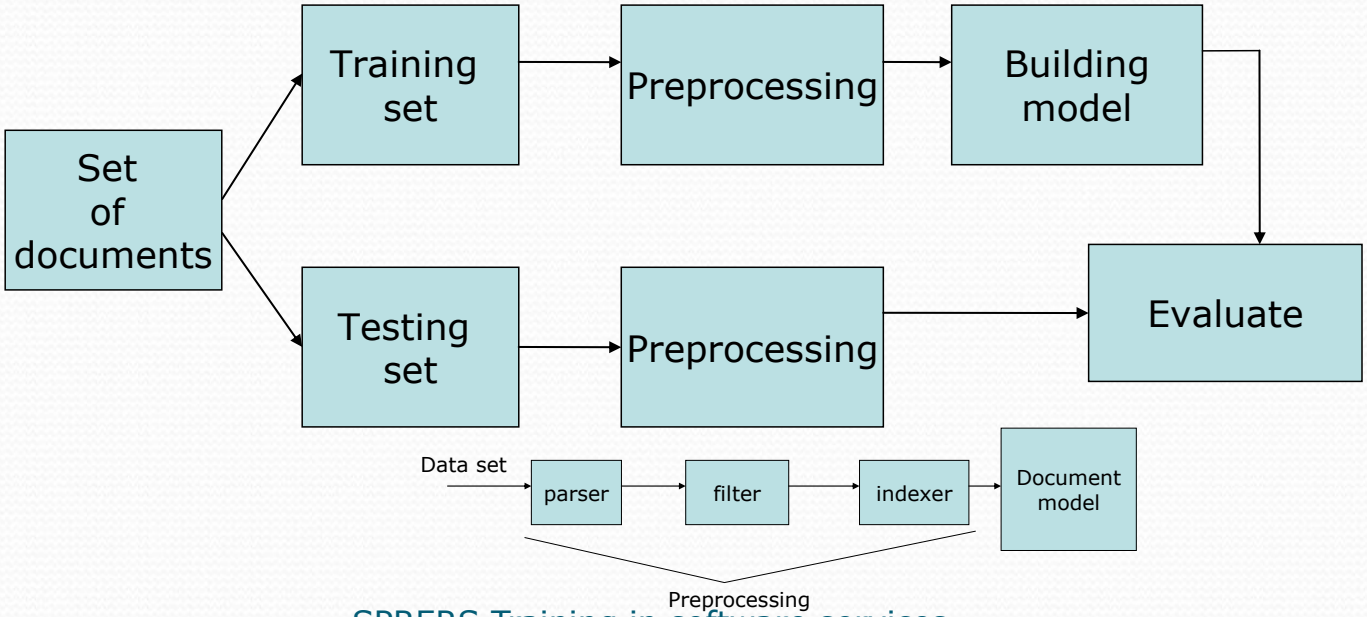
University of Vienna

Vienna University of Technology

- Test application area: medical
  - traumatic brain injury treatment
  - Predicting the outcome of seriously ill patients
  - analytical part focuses on data mining and On-Line Analytical Processing (OLAP)
- Target:
  - provide tools to discover and access relevant knowledge and information from different distributed and heterogeneous data sources

GridMiner

- JBowl (Java Bag Of Words Library)
  - Text Mining Framework
- Task – Knowledge Discovery in Textual Documents (Categorization, Clustering tasks)
  - Preprocessing – Model Creation - Evaluation
- SOA – Knowledge Discovery Tasks represented as services



Distributed Text Mining

- Distributed algorithm for decision tree inducition for text classification models
- Distributed algorithm for Growing Hierarchical Self-organizing Maps for text clustering
- Distributed approach to Formal Concept Analysis based on GHSOM

SEMCO WS

- SEMCO – WS project (Semantic composition of Web and Grid Services)
- Text Mining Domain
- Establishing the Semantic Annotation
  - Goal - to leverage the advances in the Semantic Web to establish an automated framework for mining the textual data
- Web Services Composition

WSDL to OWL-S

- WSRF2OWL-S - tool used to create semantic descriptions of the text-mining services
- Generating the OWL-S description for stateful and stateless services from the corresponding web service descriptions (wsdl)
- Translation
  - translator parses the WSDL document extracting the operations, port-types, inputs, outputs as well as resource properties
  - generates for each WSDL operation a skeleton of the OWL-S document,
  - outcome of the process is OWL-S document describing the web service operations
- Inevitable in the text-mining area hosting a vast number of services
- Tool to create semantic descriptions of the text mining services

Workflow Execution

- BPEL
  - Models of the semantics are expressed in OWL-S/Execution is conducted in BPEL standard
  - From OWL-S – we can obtain building blocks of BPEL process model
  - Linking between building blocks of the workflow is represented by the plan produced during the workflow construction
- Petri Nets
  - GWorkflowDL (K-WF-grid project)
  - GWES – Workflows execution

Thank you for your attention

- Questions?