A Survey on Workflow Annotation & Composition Approaches

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Outline

- Definition of workflow, annotation and composition
- Comparison criteria
- Workflow annotation approaches
  - Web Service annotation
  - Business Process annotation
  - Grid Service annotation
- Workflow composition approaches
  - Web Service composition
  - Business Process composition
  - Grid Service composition
- Comparison of existing approaches
- Conclusions, key questions and further work

Definition of workflow, annotation and composition

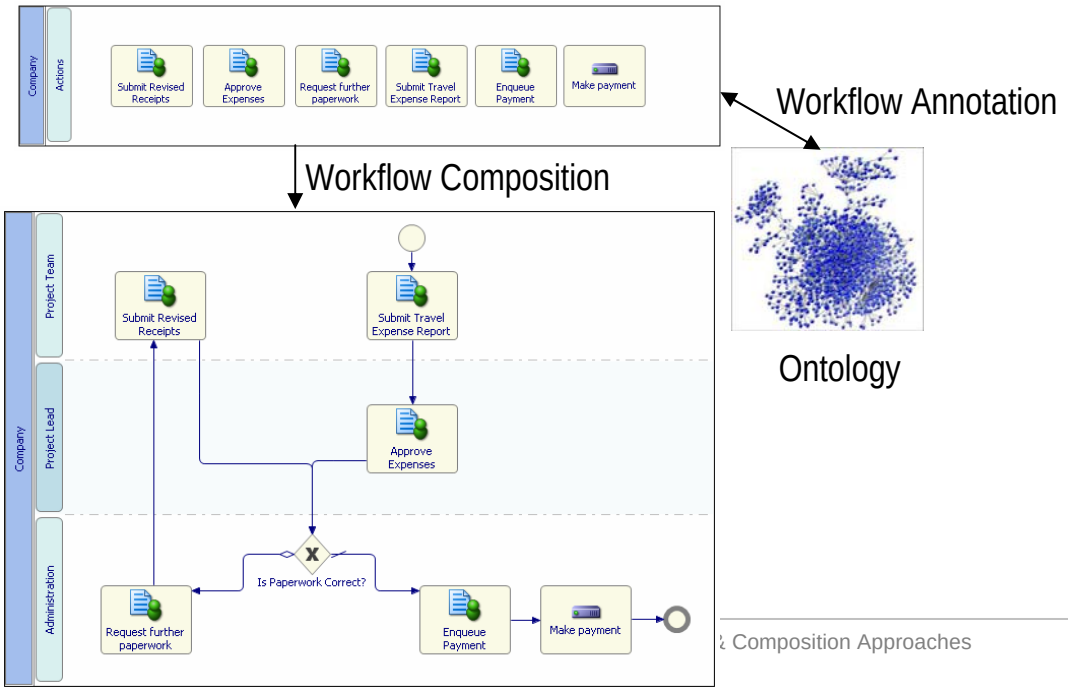
- Workflow:
  - the **automation** of a business process, in whole or part, during which **documents**, information or tasks are passed from one **participant** to another according to a set of procedural **rules**
  - Business Processes and workflows are essentially the same, albeit with some differences on emphasis.
  - The same for web services and Grid services.

  - Business processes are without any technical information
  - Web services and Grid services include plattform and technical information

  → ***Workflow*** as collective term for business processes, web services and Grid services

Definition of workflow, annotation and composition

- Annotation:
  - *a note added by way of comment or explanation* or *function from a document to formal representations*
  - *the act of annotating*
  - can take place in a descriptive way with plain text or in a formal way
  - can exist in the workflow itself or as an ontology outside the workflow
- Composition:



Comparison criteria

- Language (new or existing one)
- Application domain (business process, web service, Grid service)
- Semantics supported
- Annotation / composition
- Hierarchical (views, abstraction levels)
- Research vs. Industrial

5 key workflow aspects:

- Functional (Inputs, outputs, preconditions, effects)
- Behavioural (workflow patterns)
- Informational (data, parameters, variables)
- Organisational (roles and org. units)
- Operational (invocation methods)

Workflow annotation approaches

- Web Services annotation
  - WS-BPEL, WS-CDL
  - Semantic Web Services: OWL-S, WSMO, SAWSDL, WSDL-S, etc.
- Business Process annotation
  - Annotation of EPCs
  - Annotation of Petri Nets
  - m3po: multi-meta-model process ontology
  - Development of ontologies in the projects SUPER and FUSION
- Grid Service annotation
  - NextGRID: OWL-WS
  - K-Wf Grid: GWorkflowDL
  - myGrid: SCUFL
  - SIMDAT: XScufl / Freefluo
  - OntoGrid: ODESGS framework

Workflow composition approaches

- Web Service composition
  - several approaches: based on heuristic search, based on AI planner, interaction protocols, symbolic transition systems, temporal action logic, linear logic, etc.
  - most of them simply provide one way to a goal
- Business Process composition
  - Similarity measures for process composition based on Petri-nets
  - Mappings based on the SAP Enterprise Service Architecture
  - UML Actions annotated with IOPE are composed
- Grid Service composition
  - Akogrimo: currently based on BPEL4WS and keyword search
  - NextGRID, OntoGrid based on ontological descriptions
  - own frameworks and algorithms mostly

Comparison of existing approaches

- Detailed comparison concerning the mentioned criteria
- Result:
  - none of the approaches fulfils all requirements for annotation and composition completely
  - attempts in all application domains: Business process, web service and Grid
  - mostly research-driven
  - many already support semantics (based on Semantic Web Service languages)
  - most of the approaches were only designed for annotation, but can be used for composition, too.
  - organizational perspective is often neglected
  - other perspectives like functional (IOPEs) or behavioural (process flow) are considered in nearly all attempts

Conclusions and further work

- Business processes, Web services and Grid services all contain workflow aspects and might converge more and more into one research field, but still a long way
- Many different proprietary notations and languages for workflows
- Organizational aspect should be considered more for queries and reasoning on responsibilities and workflow of employees
- ODESGS ontology and the m3po approach are the attempts that fulfil most requirements
- Ontologies of the SUPER or FUSION project also promising

- Results of this survey are helpful for our current work on
  - how to annotate business process models
  - the composition of business processes in the context of the SEMPRO project

Key questions answered

- *What* am I proposing and *why*?
  - Consideration of existing proposals on workflow annotation and composition in order to get hopefully ONE standard language that is extendable in different directions and for different purposes (BPM, Grid, WS)
  - Don‘t reinvent the wheel again, but use existing standards, approaches and ontologies wherever possible! (at least that should be the goal)
  - The different communities and projects should more interact which each other.
- Which role play ontologies as formal, consensual representations of a domain of interest in my proposal?
  - They are of utmost importance for annotation and also necessary for an advanced composition (not only based on keywords)
- What technical contribution to business process management do I expect from my proposal?
  - None: As this was only a survey there is no technical contribution.

Questions?

- Thank you for your attention!
- Now it‘s time for the next presenter - I‘m looking forward to your questions.

Any questions???