Modeling of Cross-Organizational Business Processes - Current Methods and Standards

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Background – Cross-Organizational BP projects @ IWi

- Cross-Organizational Business Processes and Interoperability recently tackled by various research projects

- National, e.g.
  - P2E2 (Peer-to-Peer Enterprise Environment)
  - ArKoS (Architektur kollaborativer Szenarien)

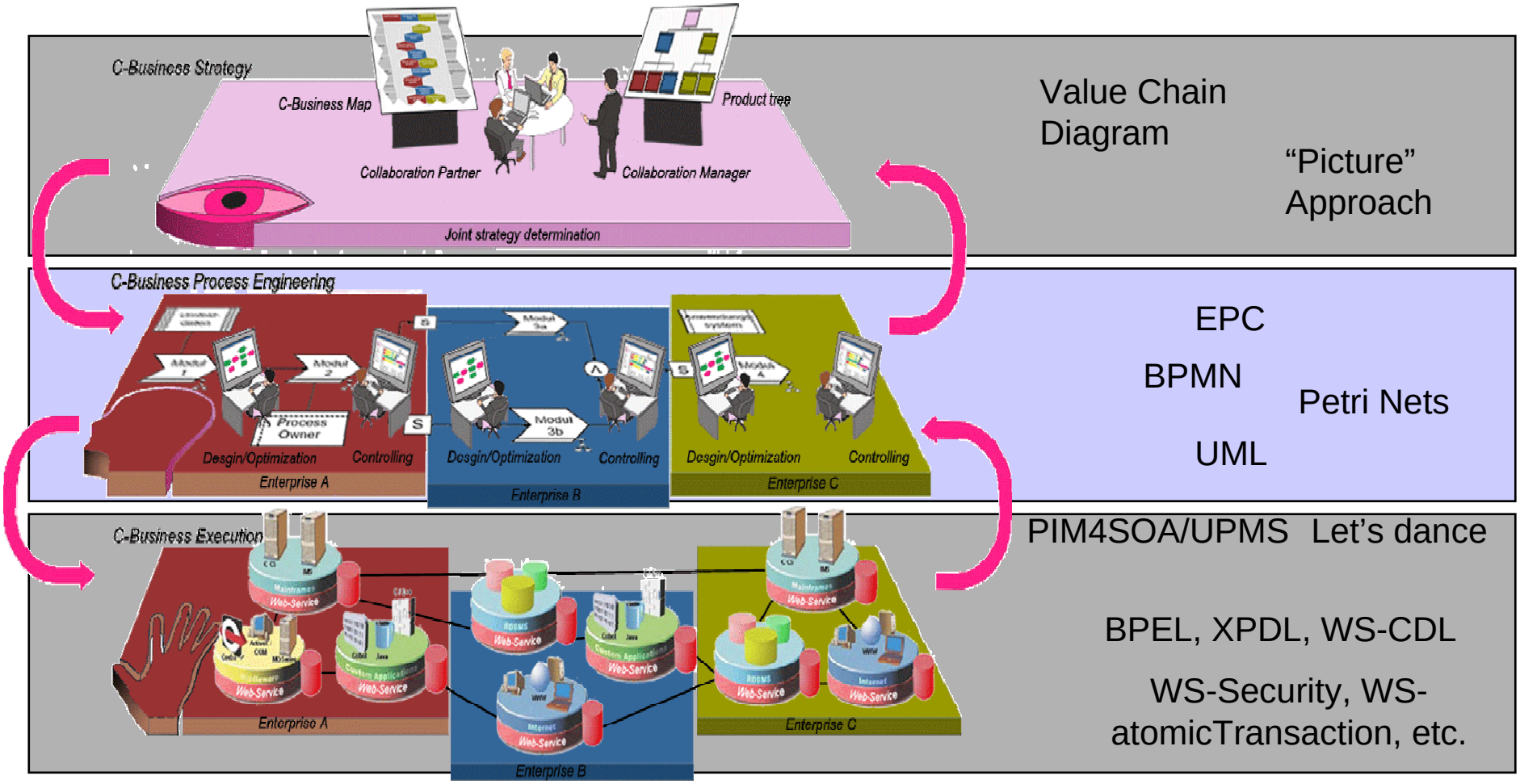
- EU, e.g.
  - ATHENA IP (www.athena-ip.org)
    - Focus on Enterprises, ended march 2007
  - Interop (www.interop-noe.org)
    - Network of Excellence, ended march 2007
  - R4eGov IP (www.r4egov.eu)
    - Focus on Public Administrations, start march 2006, duration 3 years
    - Goal: **secure** interoperations of **web service enabled** legacy public sector applications via **collaborative workflows**
    - Demonstrate on real cases, driven by demanding public administrations, capable of leading the way in Europe.
    - 5 Uses cases, including
      - Eurojust-Europol (Netherlands, Den Haag)

Research question and methodic

- Which modeling languages could we use or extend to describe our processes? Such that …
  - they describe the important characteristics on the conceptual level,
    - Interaction sequence, security perimeters, involved actors, etc.
  - support an automated analysis of the models,
    - Verification, monitoring, controlling
  - represent a basis for the model-driven generation of executable code?
    - Mapping to Services and SOA based workflows

- Methodic
  - Analysis of literature, expert interviews, analysis of related projects and case studies
  - Description of requirements on modeling languages
  - Description of concepts that fulfill these requirements
  - Evaluation of languages regarding both
    - Selected concepts,
    - but also directly to requirements
  - Evaluation regarding
    - Typical, “core” language attributes
    - Existence of concepts supplementing/extending the core

Languages tackled



Collaborative House of Business Engineering

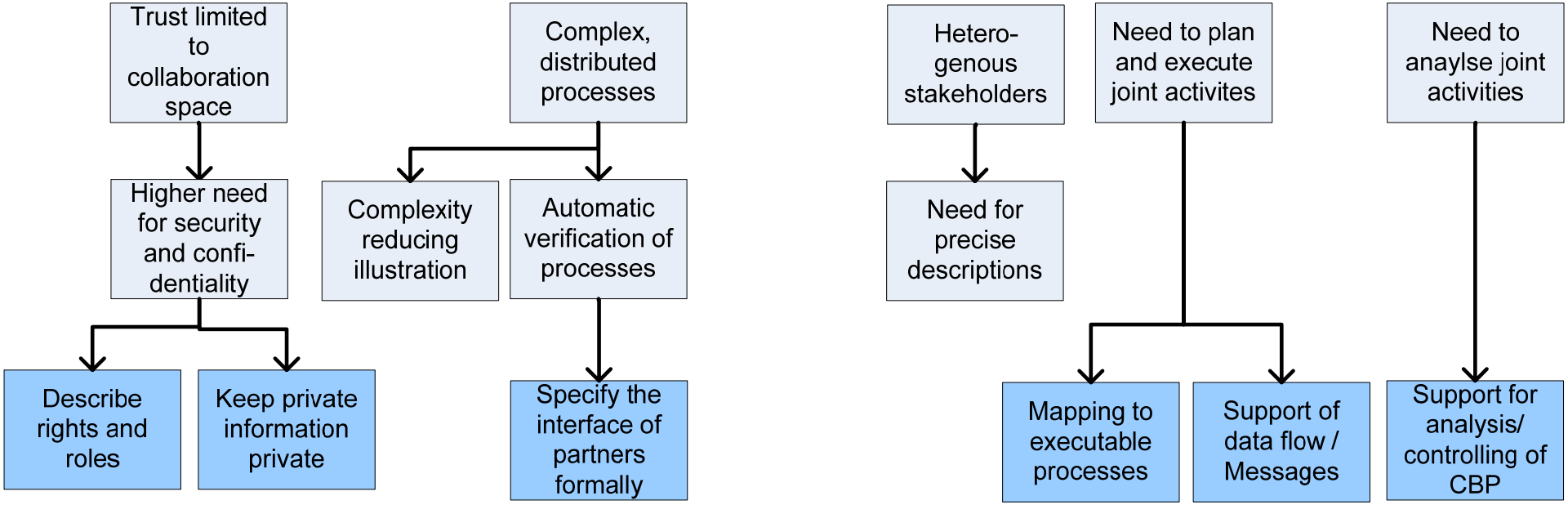
Standards on corresponding levels

Requirements

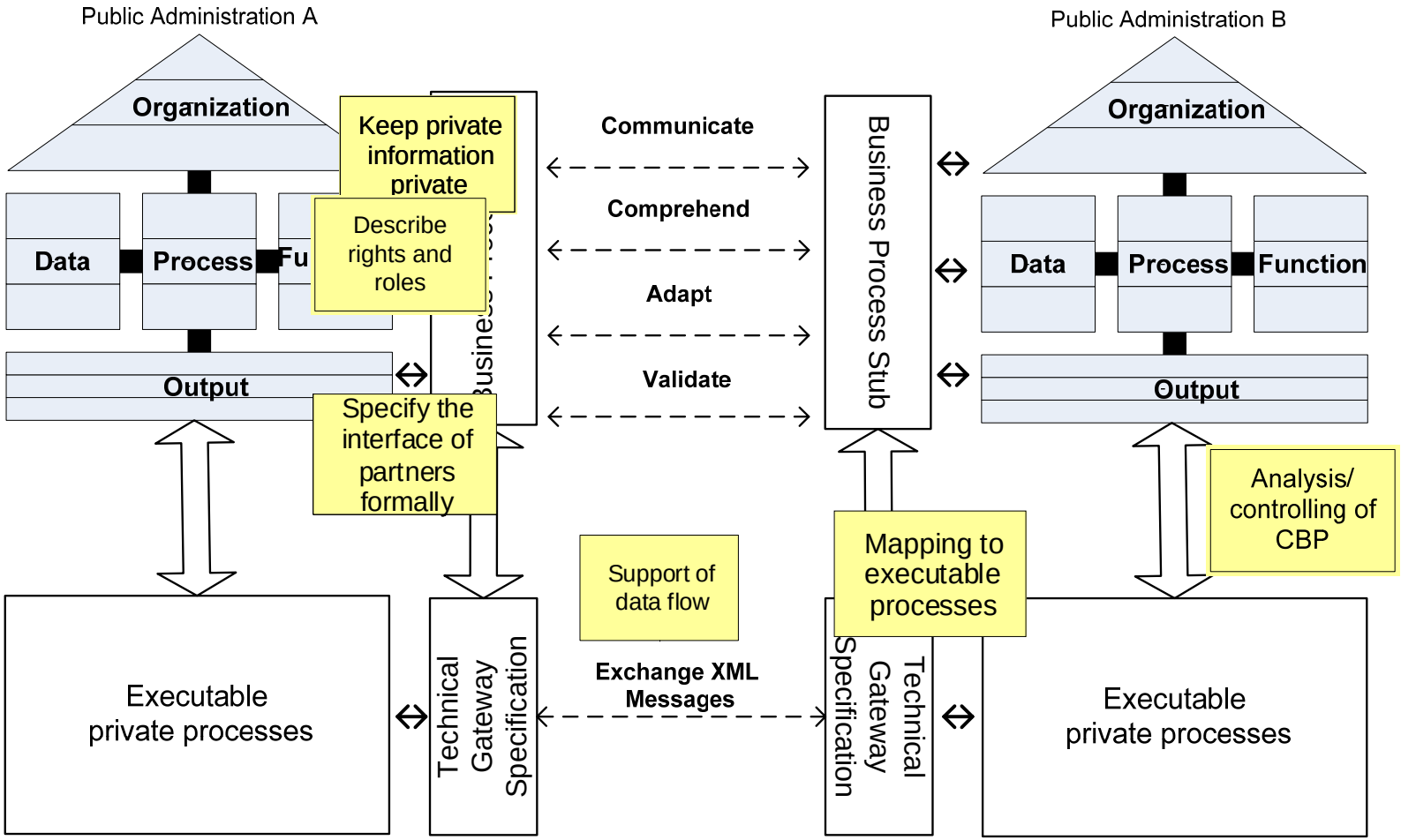
Generic vs. CBP specific requirements

- Business Process modeling in general
  - Business Process (BP): Sequence of organizational activities undertaken for the purpose of creating output
  - Requirements on BP models, e.g.
    - Correctness, easiness, operational, adaptability/flexibility, support of various enterprise dimensions (cp. Frank, van Laak 2005)
- CBP specific requirements, e.g.
  - Heterogeneity of actors involved in process
  - Different trust spheres
  - Distributed, complex processes
- Some solution for BP modeling requirements have to be transferred to CBP, e.g.
  - Controlling
  - Process automation

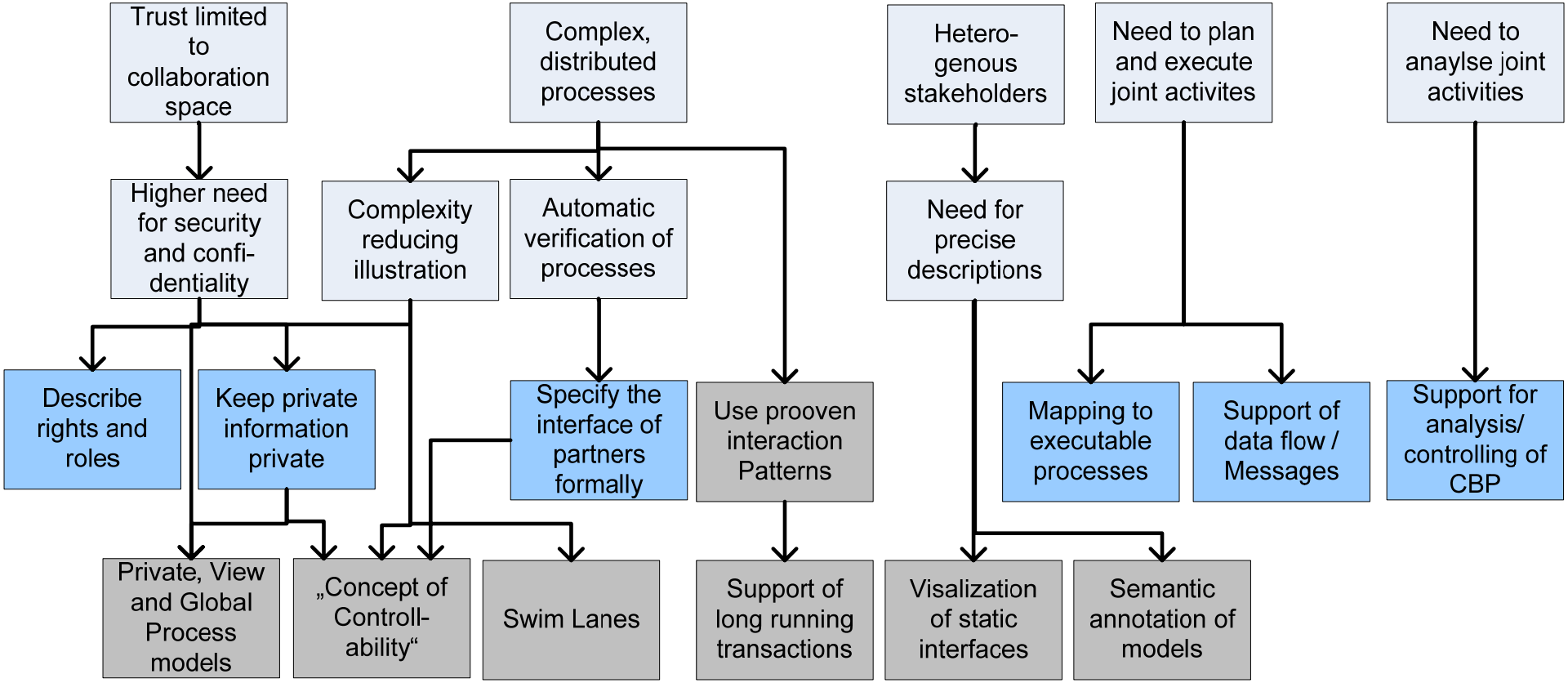
CBP modeling languages – Requirements …



Requirements in the light of CBP automation



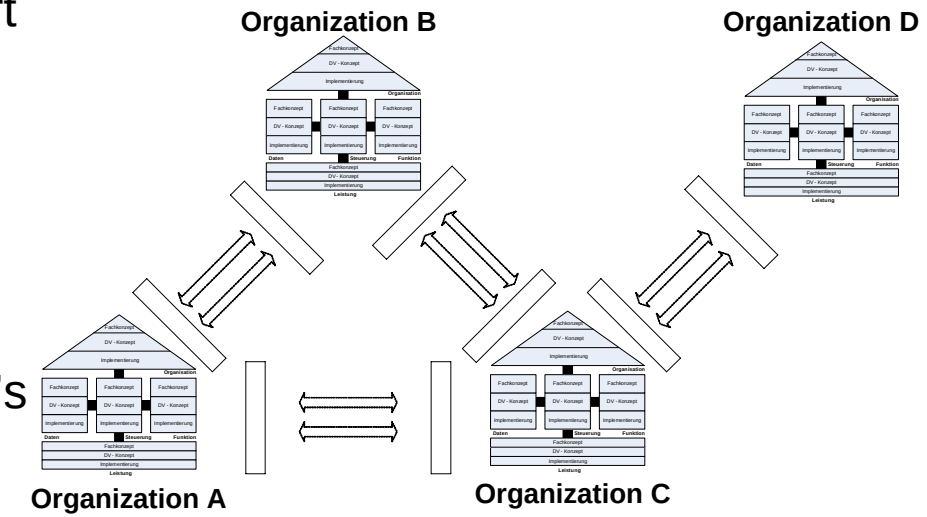
… and concepts for CBP modeling

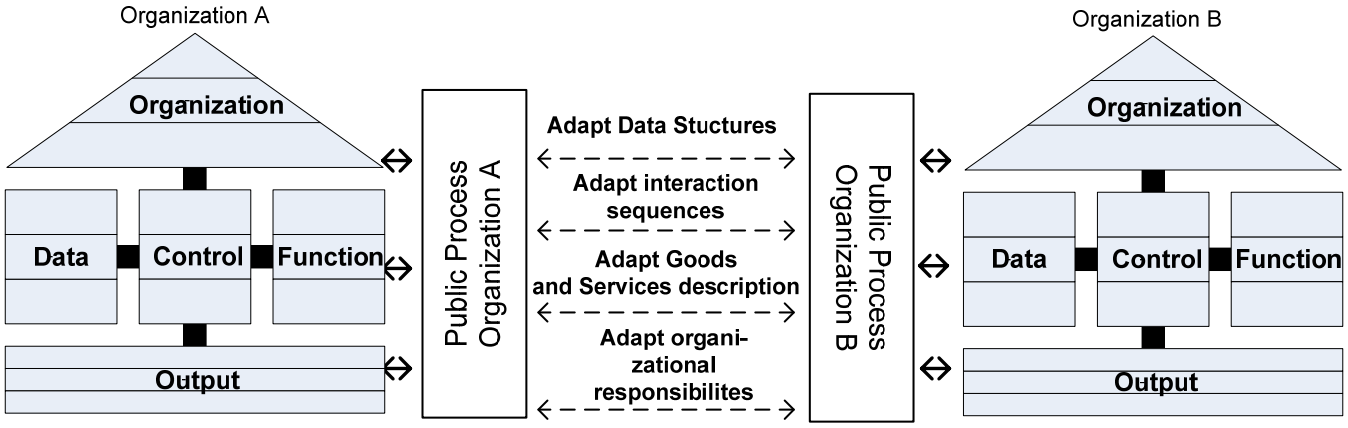


Concepts supporting CBP modeling

Concepts supporting CBP modeling – Displaying trust spheres with private, public and global processes

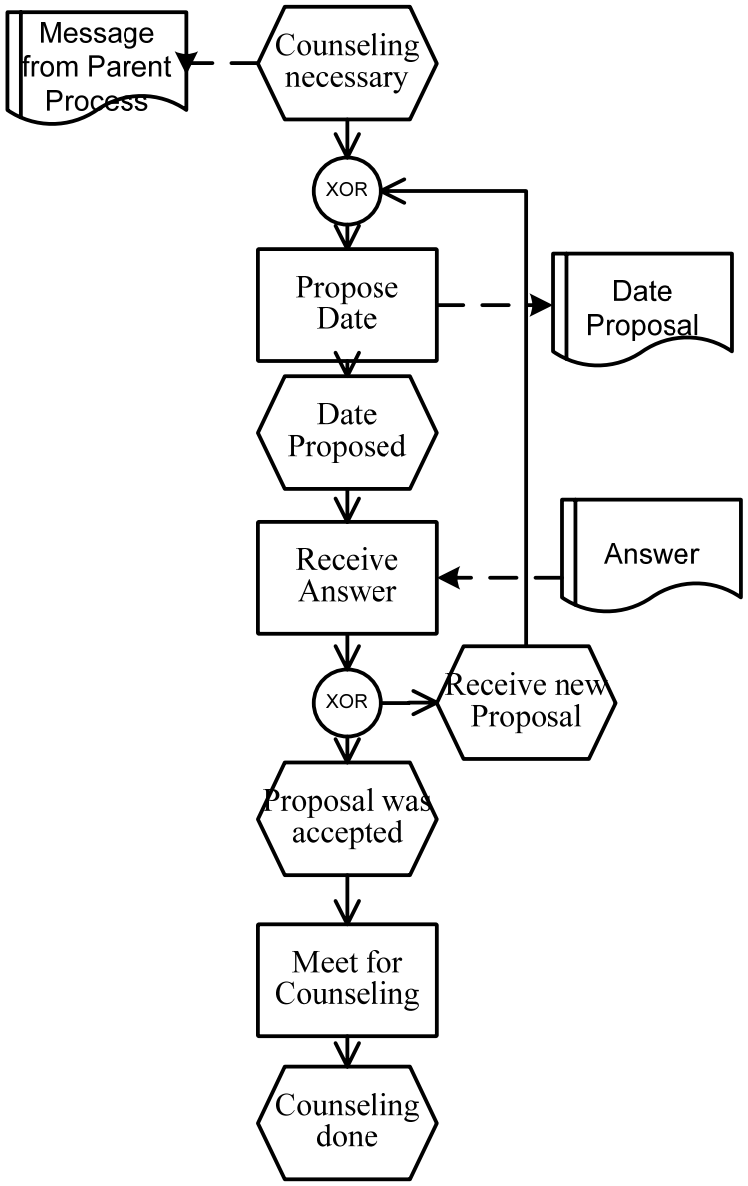
- Public process displays only those part of a private process from one partner relevant for interaction with others
- Global process displays all possible interactions between partners
- Orchestration vs. Choreography
- Apart from technical approaches ("Let's dance", BPEL) EPC based concepts exist
  - Horizontal transformation
  - Vertical transformation





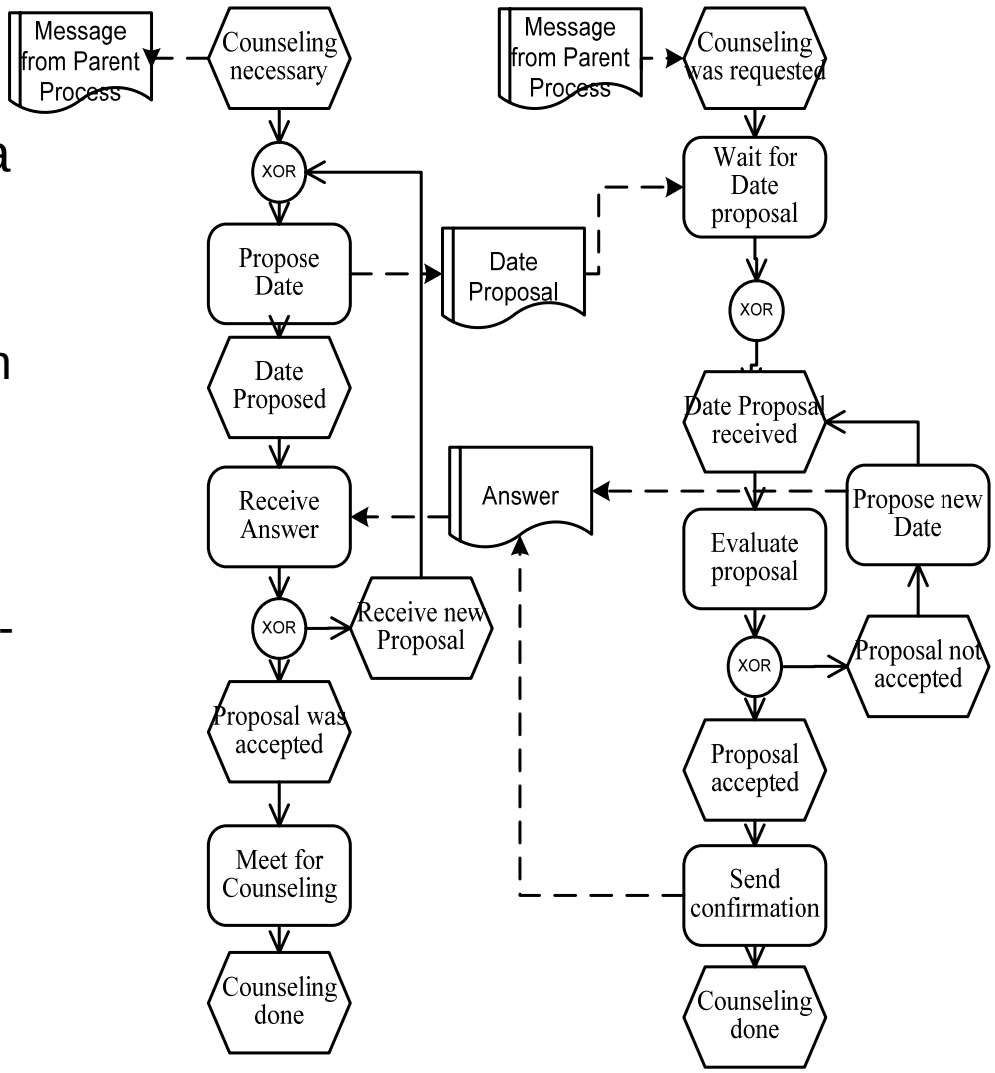
Concepts supporting CBP modeling – Public Processes

- Public process displays only those part of a private process from one partner relevant for interaction with others
- Can be derived from private processes, e.g.
  - “Show just those activities where messages are send or received from organizational unit ‘Buyer’ “
- Concept exist to transform EPC view processes to BPEL protocols



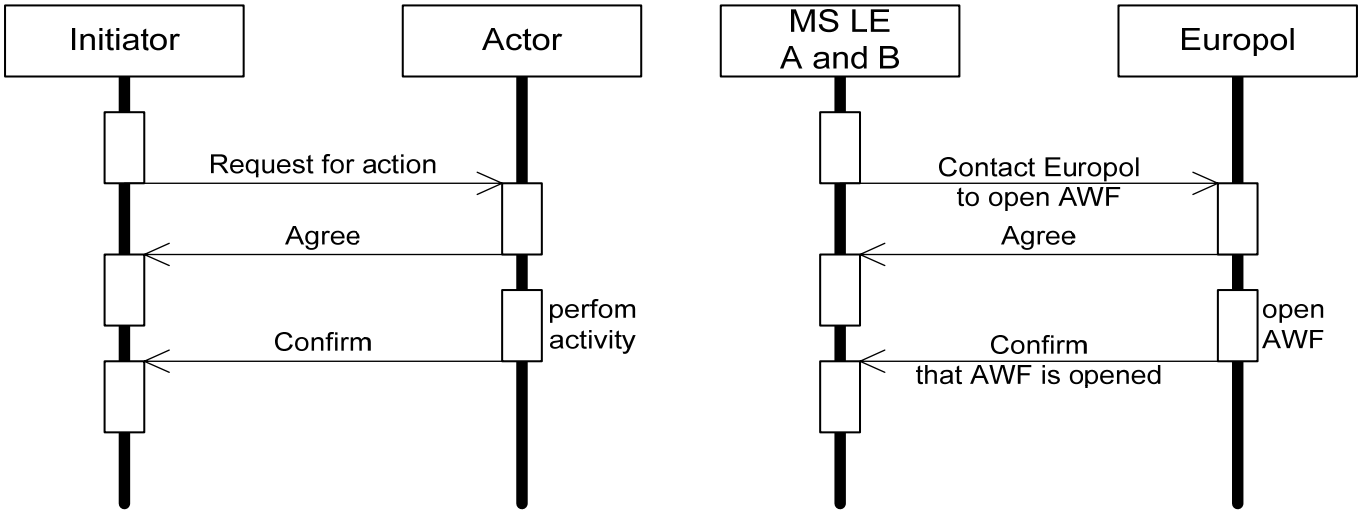
Concepts supporting CBP modeling – “Controllability”

- Can be seen as complementary to public processes
- In order to detect controllability, a strategy for the own workflow is generated (cp. Lohmann et al. 2006)
  - A strategy describes a set of workflows that could interact with the own workflow
- Developed for open workflow nets (oWFN)
  - Extension of Workflow Nets (low-level petri nets)



Concepts supporting CBP modeling – Existence of proven interaction patterns

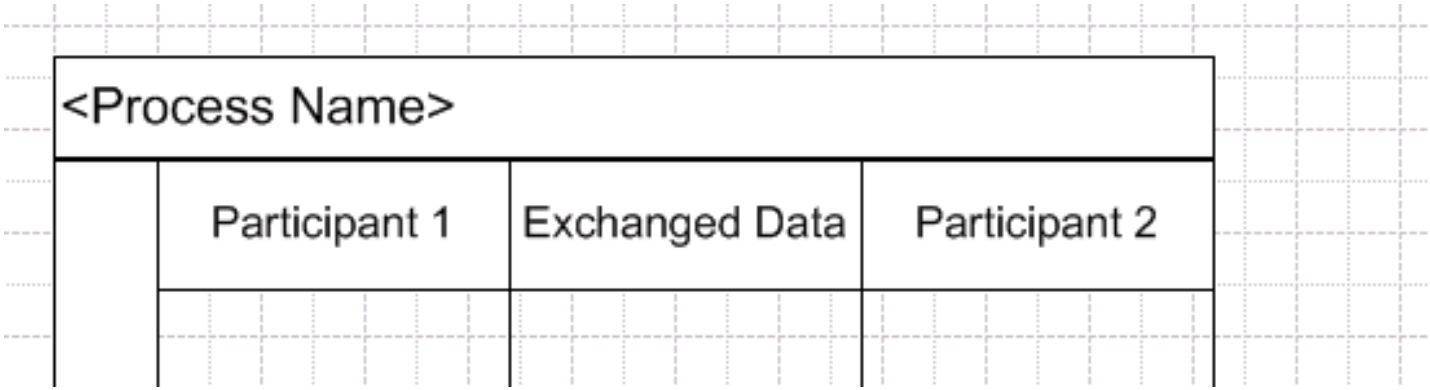
- Interaction sequences which can be used in different contexts
- Exist on different vertical levels, mainly on the technical ones
  - EPC/IEM patterns (cp. Interop)
  - RosettaNet Partner Interface Processes (PIPs)
  - Service Interaction patterns (cp. Barros et al.)



Concepts supporting CBP modeling – Swim lanes

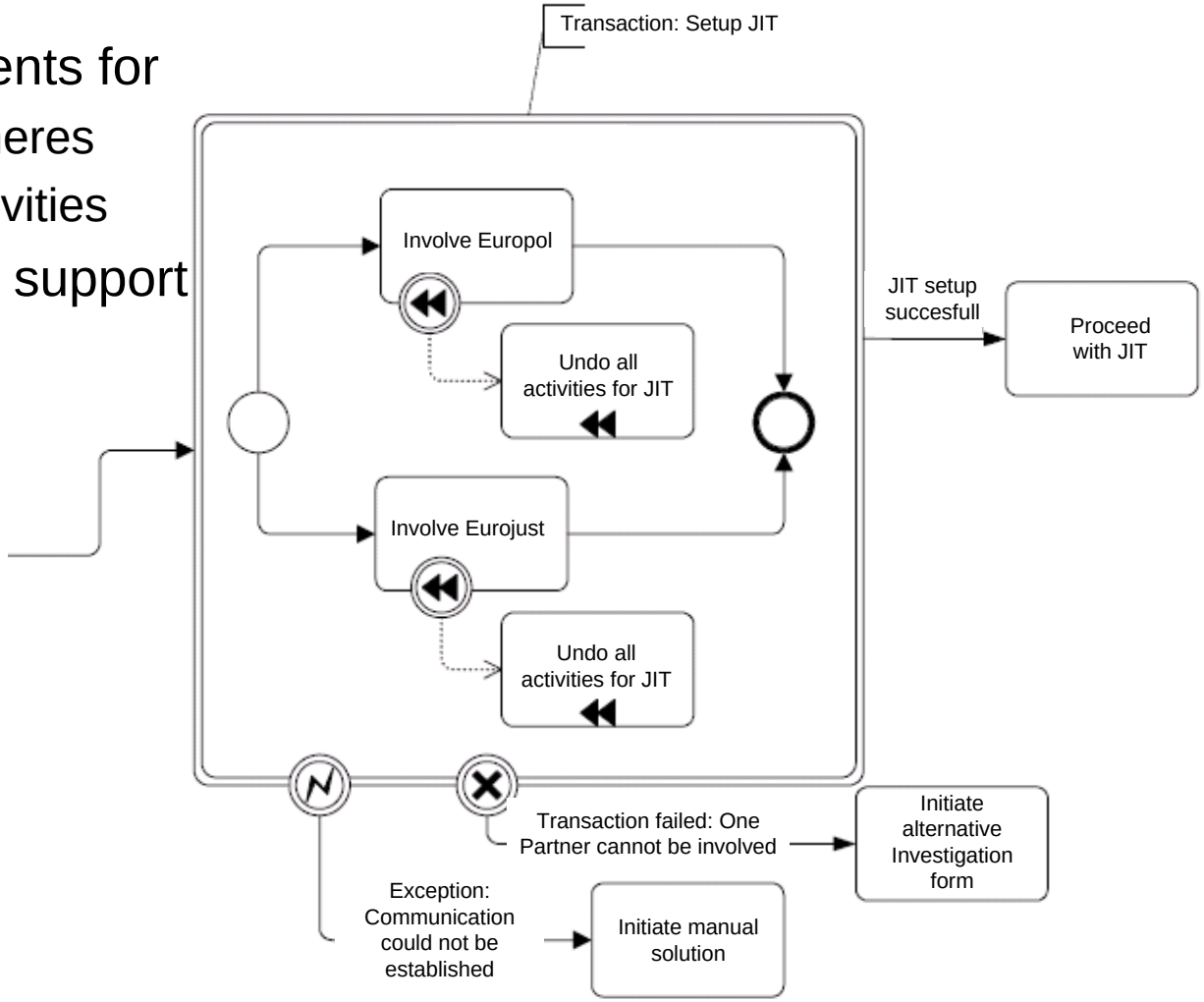
- Global models are divided into subsets according to different actors
- Subsets can also be seen as “view processes”

- Applied in EPC and Petri Nets …
- … but more common in BPMN and UML Activity diagrams
  - UML Sequence diagrams are implicitly separated into Swim lanes



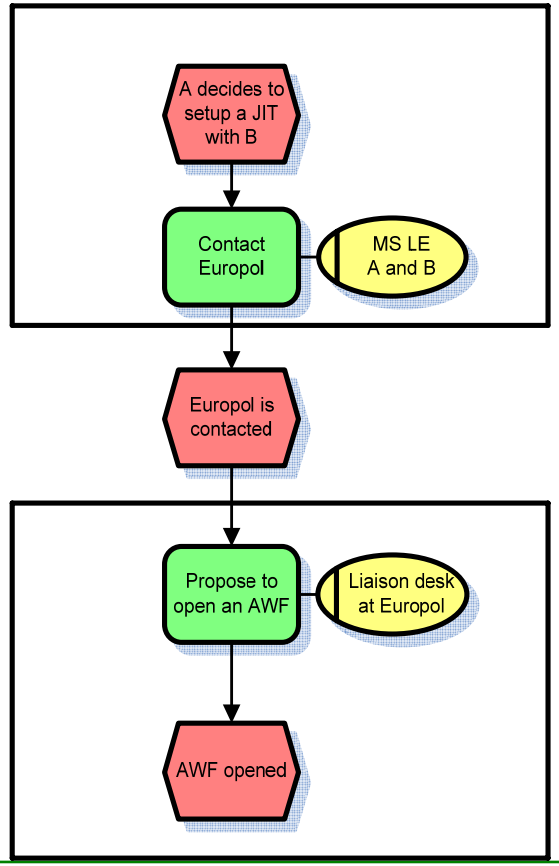
Concepts supporting CBP modeling – Distributed transactions

- Can be seen as interaction pattern
- Special model elements for
  - Compensation spheres
  - Compensation activities
- BPMN offers explicit support



Concepts supporting CBP modeling – Visualization of static interfaces

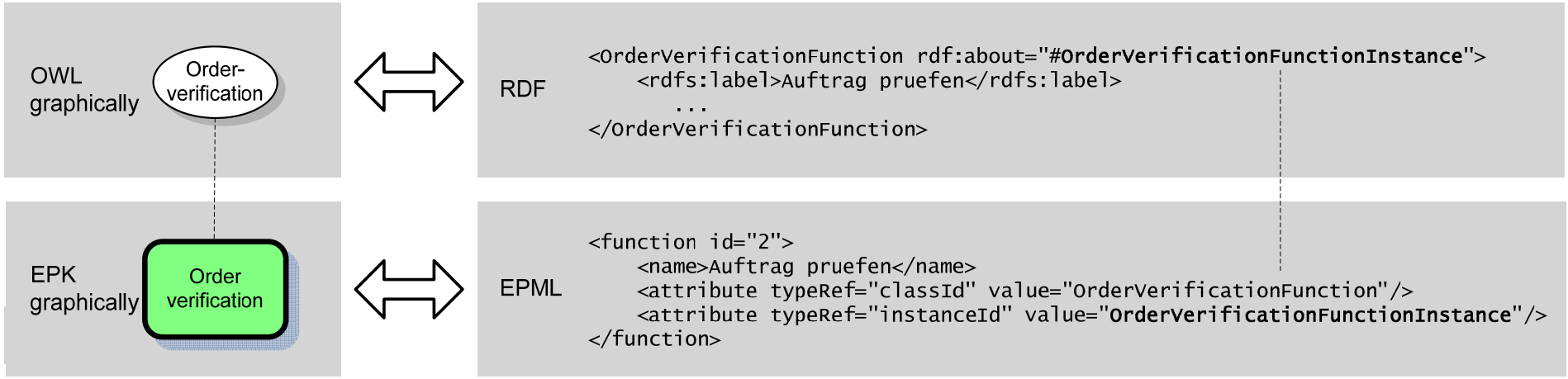
- Detailed description of individual interactions
- Enterprise dimensions useful
- Explicit support for EPC
  - Kupsch, Klein 2004



	MS LE A and B	Europol
Process-name		
Function	Contact Europol	Propose to opne an AWF
Dimension 1 (Time)	directly	directly
Dimension 2 (Flexibility)	MS LE A fax, email	Liason desk call
Dimension 3 (Location)	London	The Hague

Concepts supporting CBP modeling – Semantic Annotation

- Use of ontologies to unambiguously describe objects comprised in process
  - Structured glossary shared by a community
- Two aims:
  - Horizontal understanding / matchmaking
  - Vertical model Transformation / Synchronization
- Concept for EPC exist (cp. Thomas/Fellmann)



Connections: Relation ---------- Semantic Aquivalence of different representation forms ⟺

Summary

Summary - Concepts supported by selected business process modelling languages

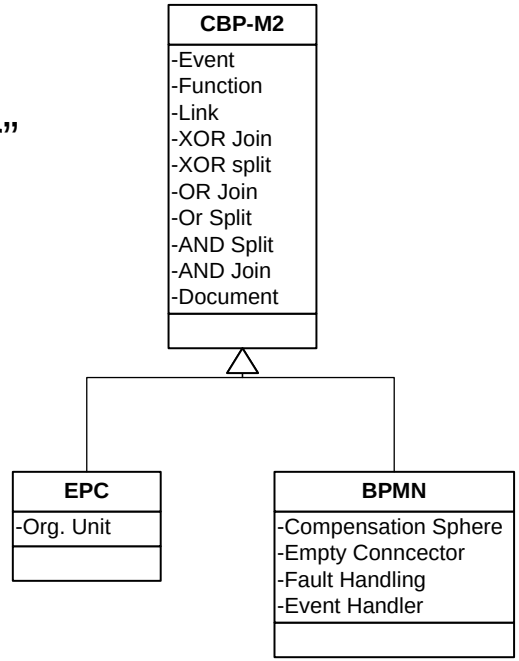
	UML	Petri nets	BPMN	EPC
Swim-lanes	+	o	+	o
Private, public and global processes	o	+	o	+
Visualization of static interfaces	o	-	o	+
Semantic annotation of modelling languages	-	-	-	+
Representing long running transactions	-	-	+	-
Controllability	o	+	o	o
Interaction patterns	o	+	o	o

Summary - Requirements fulfilled by selected business process modelling languages

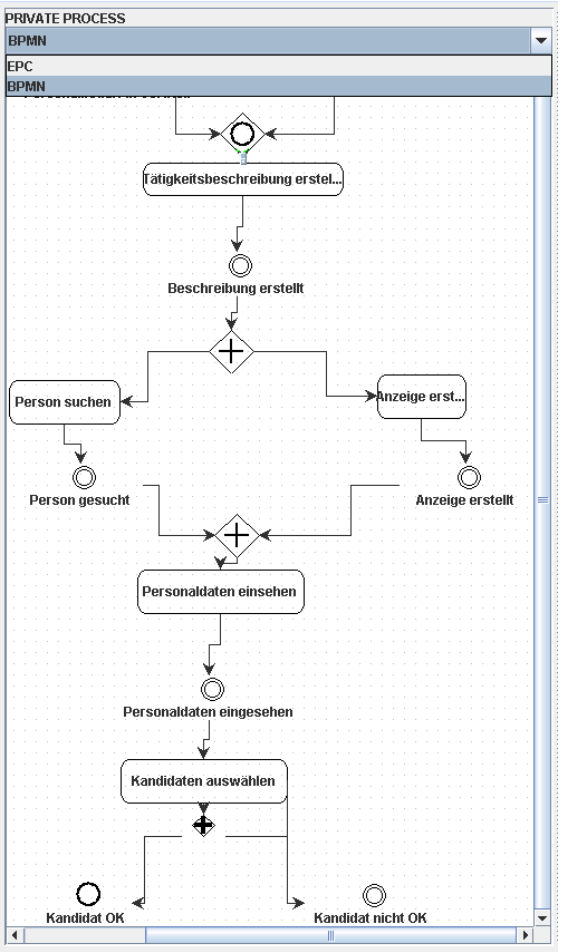
	UML	Petri nets	BPMN	EPC
Keep private information private	o	o	o	+
Specify the interfaces formally	o	+	-	o
Mapping the CBP to executable processes	+	+	+	o
Support of data flow	o	+	o	o
Support of involved roles	-	o	-	+
Support of analysis/controlling of the CBP	-	+	-	+

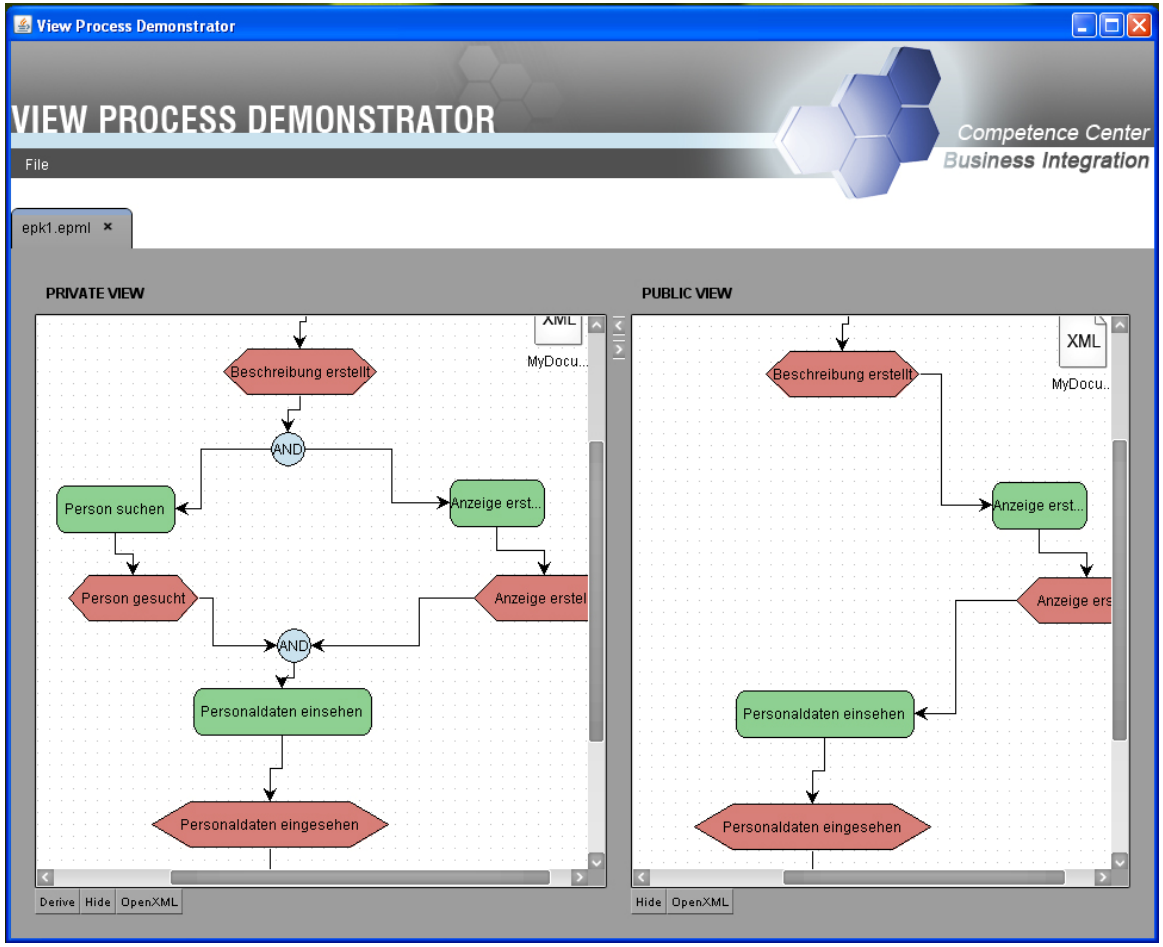
Future work

- Definition of Collaborative Business Metamodel
  - Common metamodel for EPC / BPMN
    - Automatic transformation/switch between BPMN and EPC models
  - Basis for BPEL transformation
    - Annotation of XML documents
    - Annotation of Web Services representing business functions
  - Deriving View Processes from Private Processes
    - Abstraction of process elements
    - Aggregation of process elements
- Further development of corresponding tool
  - “Business Interoperability Interface Modeler”
  - EPML based
  - Realizing above mentioned functions



Business Interoperability Interface Modeler





Thank you!

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