Frédérick BENABEN [1]
Nicolas BOISSEL-DALLIER [1&2]
Jean-Pierre LORRE [2]
Hervé PINGAUD [1]
[1] Mines d'Albi - Université de Toulouse – [2] Petals Link

SEMANTIC RECONCILIATION IN INTEROPERABILITY MANAGEMENT THROUGH MODEL-DRIVEN APPROACH

Pro-VE'10 – *Semantic Interoperability for Virtual Organisations*

13 October 2010 – Saint-Etienne

SUMMARY

- Introduction
- MISE Project
  - Big picture
  - Model transformation
  - Design approach in details
- Semantic issues
  - Semantic issues in MISE
  - Specific treatment in ISyCri project
  - Perspectives and current work

ECOLE DES MINES D'ALBI
C A R M A U X

Collaborative networks

- Interoperability functions
  - Information exchange
  - Activities coordination
  - Process orchestration

    ➔ Supported by the Information System

- MISE Project
  - Mediation Information System Engineering
  - In charge of Interoperability functions
  - Model-driven design approach of a MIS

  ➔ Semantic issues in abstract to concrete transformation

SUMMARY

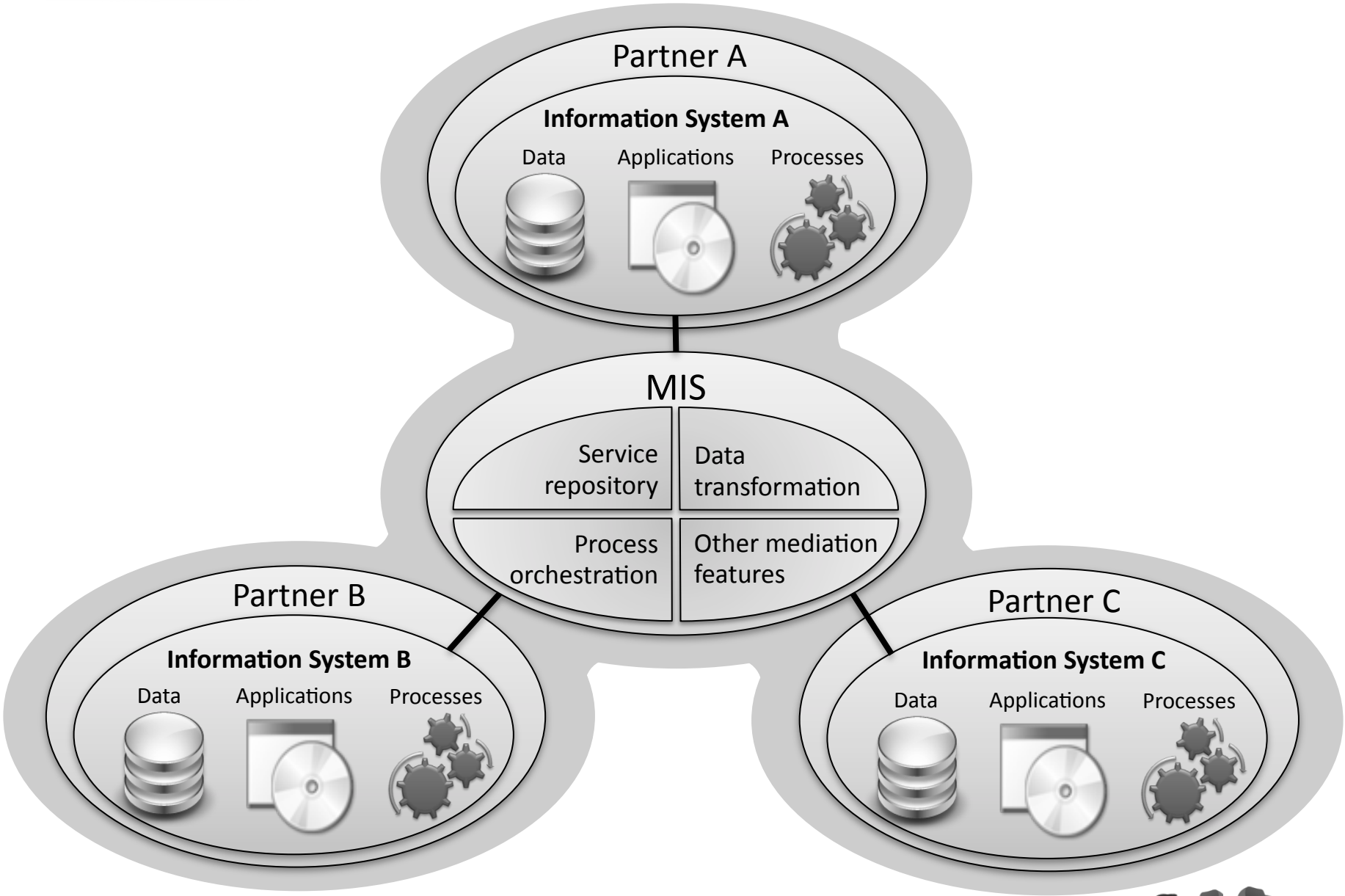
- Introduction
- MISE Project
  - Big picture
  - Model transformation
  - Design approach in details
- Semantic issues
  - Semantic issues in MISE
  - Specific treatment in ISyCri project
  - Perspectives and current work

Mediation Information System Engineering

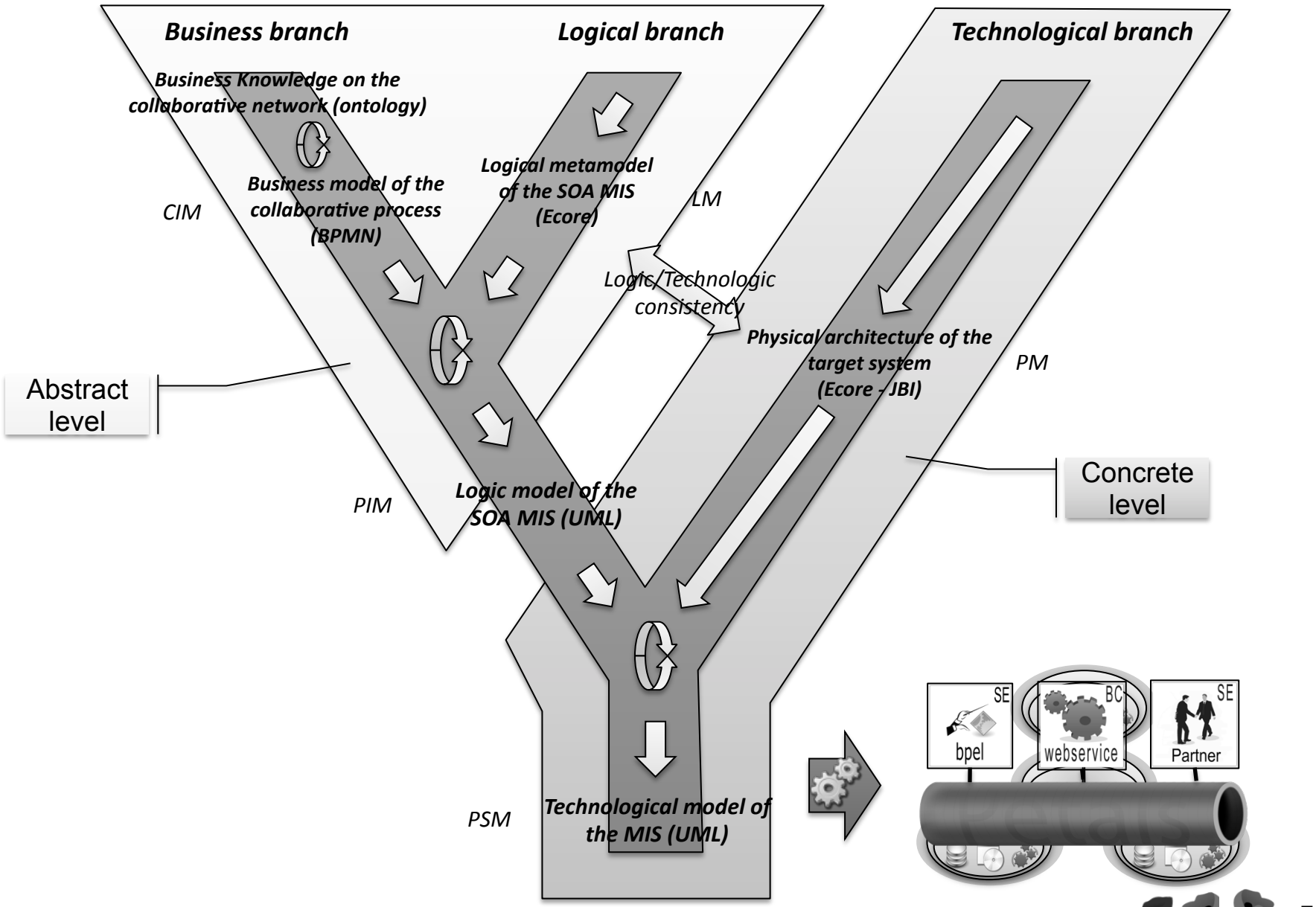
- "Université de Toulouse - Mines d'Albi" project
  - Supported by F. Benaben and H. Pingaud
  - 7 thesis since 2004
    - **Finished:** Jihed Touzi (2004-2007) & Vatcharaphun Rajsiri (2005-2009)
    - **In progress:** Sebastien Truptil (2007-2010), Wenxin "Olina" Mu (2009-2012) & Nicolas Boissel-Dallier (2009-2012)
    - **Just started:** Anne-Marie Barthe (2010-2013) & Sarah Zribi (2010-2013)

- Design a Mediation Information System (MIS)
  - Bring interoperability in collaboration context
  - Based on Model Driven Architecture: from collaboration design to running information system
  - Distributed, progressive, agile

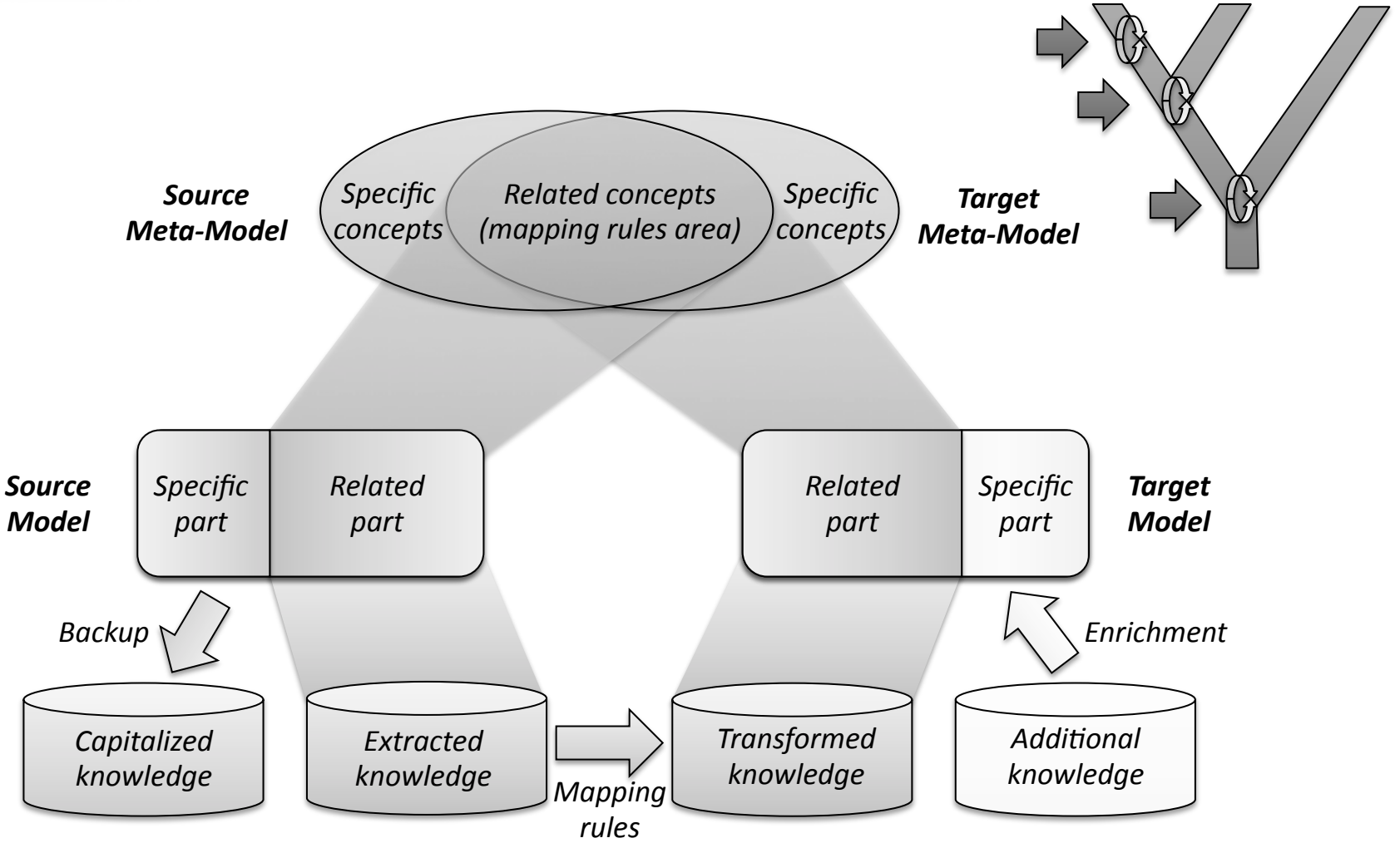
MISE PROJECT: OVERVIEW OF MIS



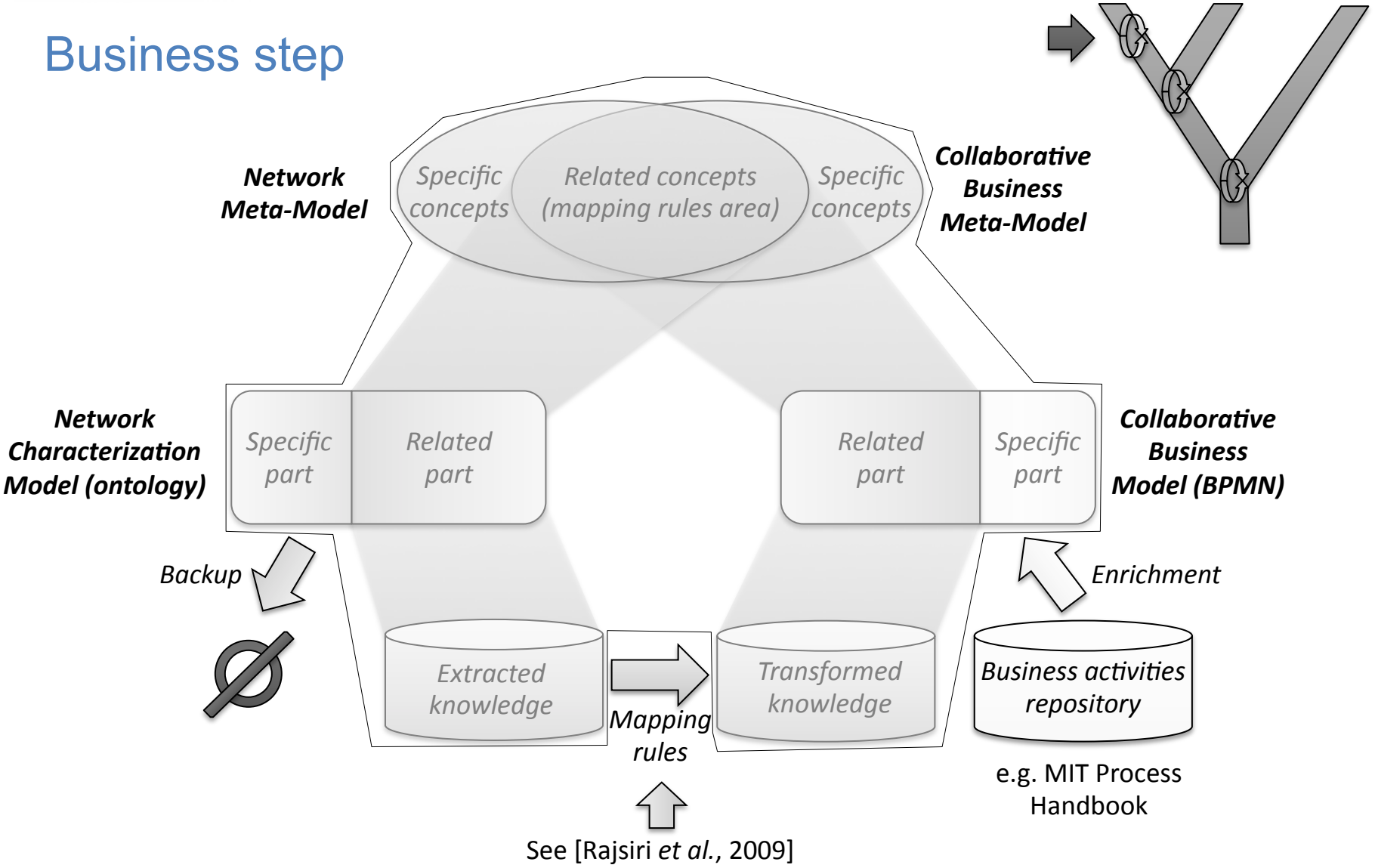
MISE PROJECT: BIG PICTURE OF DESIGN APPROACH



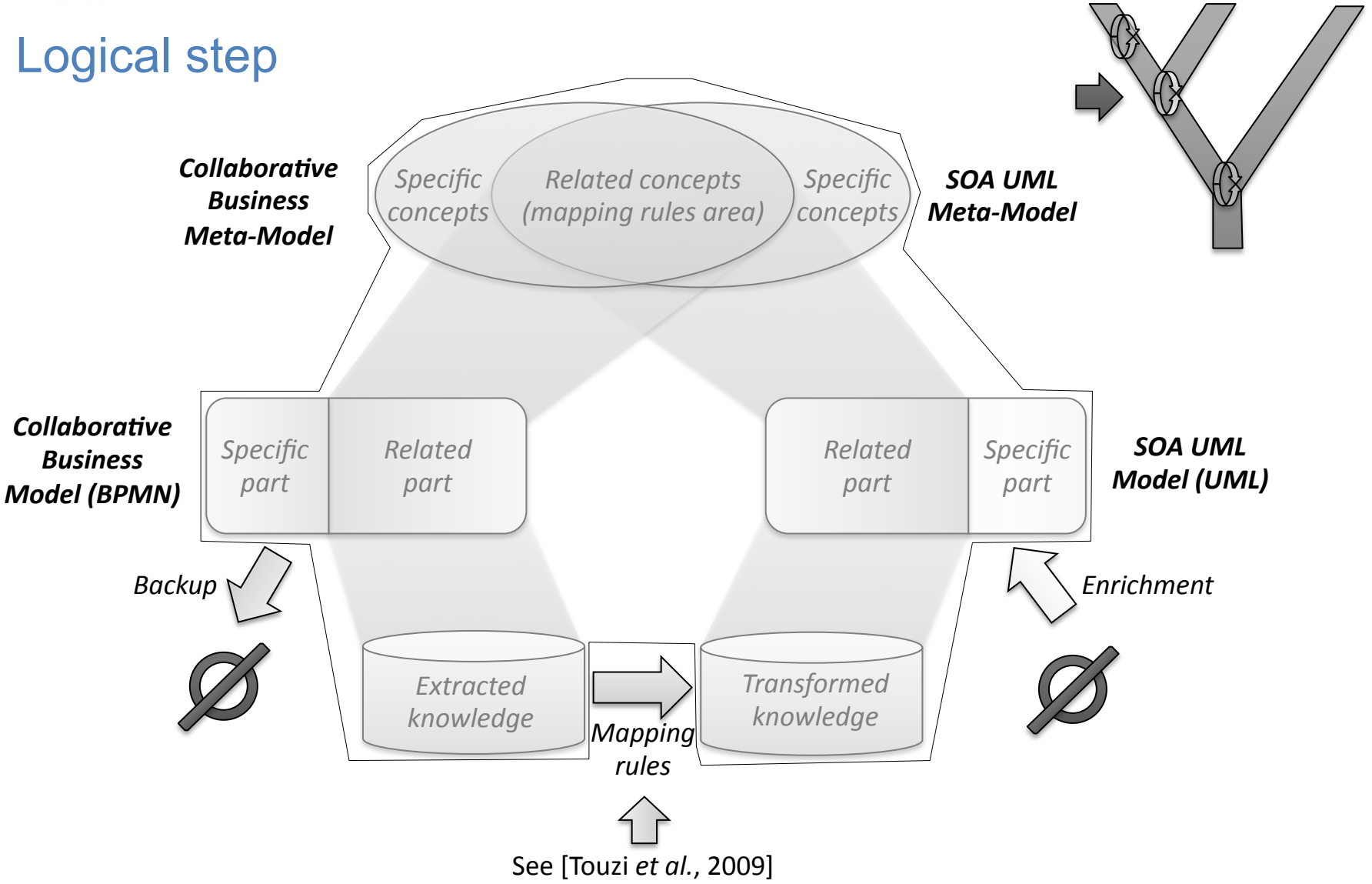
MISE PROJECT: MODEL TRANSFORMATION PRINCIPLES



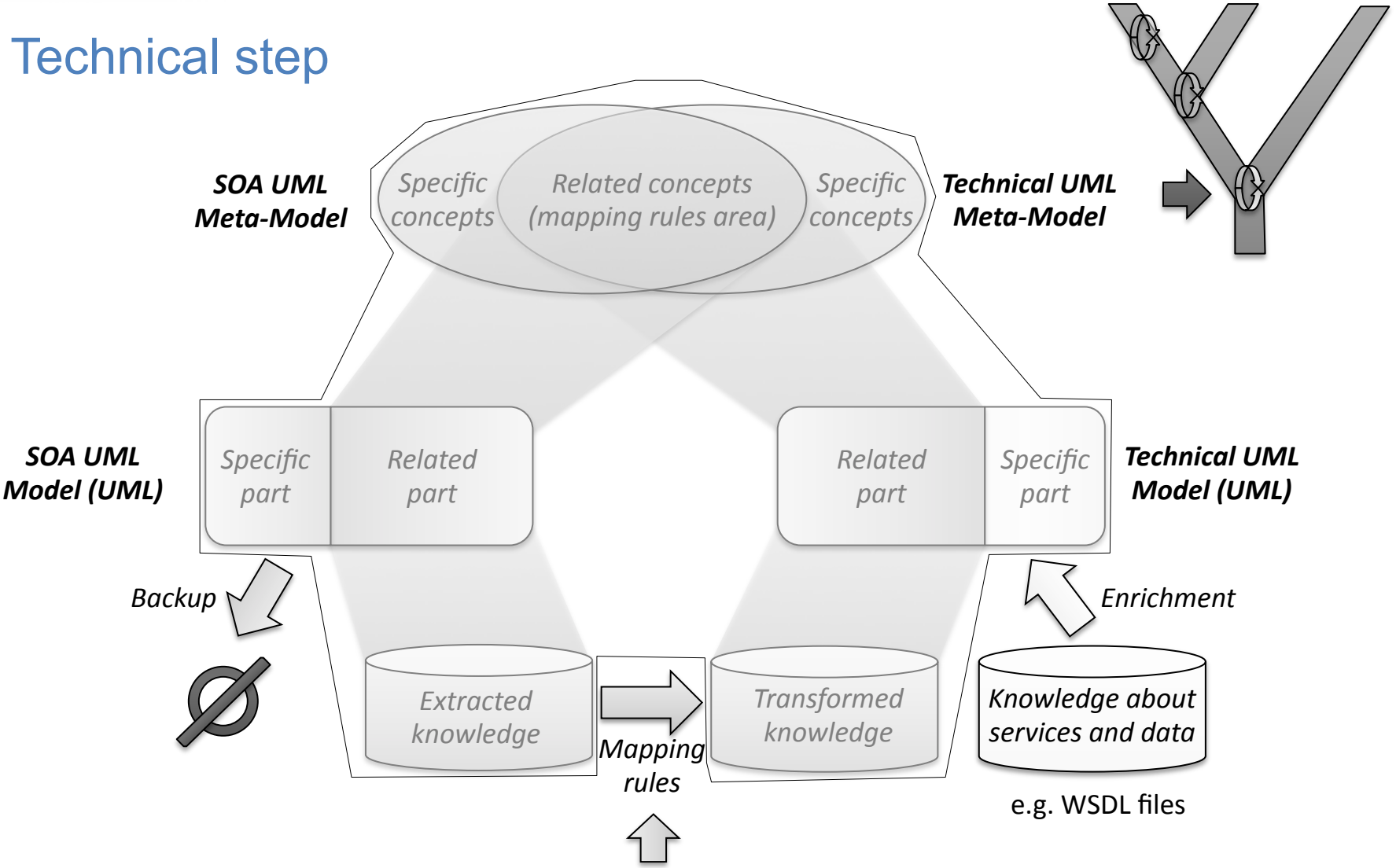
Business step



Logical step



Technical step

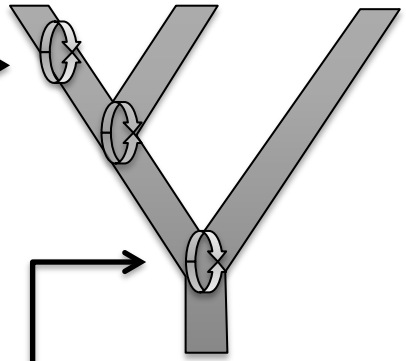


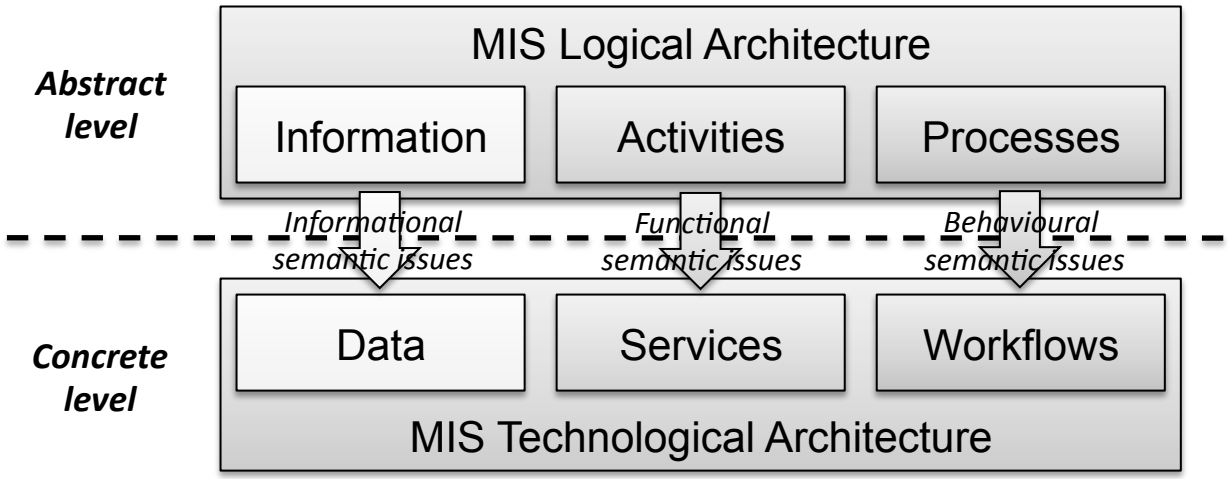
SUMMARY

- Introduction
- MISE Project
  - Big picture
  - Model transformation
  - Design approach in details
- Semantic issues
  - Semantic issues in MISE
  - Specific treatment in ISyCri project
  - Perspectives and current work

Semantic gaps

- Linked to additional knowledge
  - Business model design
    - From problem to potential solution
    - Not considered in this article
  - Transition from abstract to concrete level
    - Find technical elements to implement logical components





Semantic gaps

- How to deal with information reconciliation?
  - From business information to technical data
  - Many-to-many issue
- How to ensure the matching between business activities and technical services?
  - From business activities to technical services
  - Many-to-many issue

Linked

- How to obtain workflow from business process?
  - Translation issue according to selected services/data

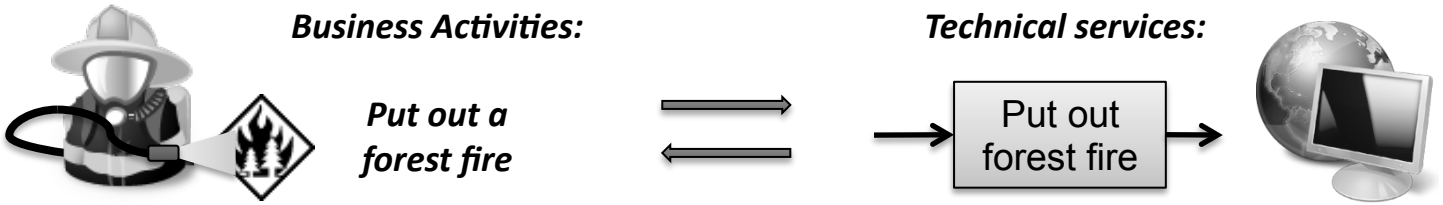
ISyCri project

- Interoperability of **I**nformation **Sy**stems in **Cri**sis situations
  - French funded project (ANR)
  - Objective: provide a crisis management cell based on a MIS and ensure the collaboration between partners
  - Previous semantic issues solved for this specific case

Functional semantic issues

- Semantic problem avoided
  - Business activities repository populated with technical services
  - Same vocabulary (from business ontology) and granularity

- Reasonable assumption in our specific case
  - Technical services seen as business activities interfaces: used to synchronize partners' actions
  - For each possible activity, there is one linked tech. service
  - e.g.

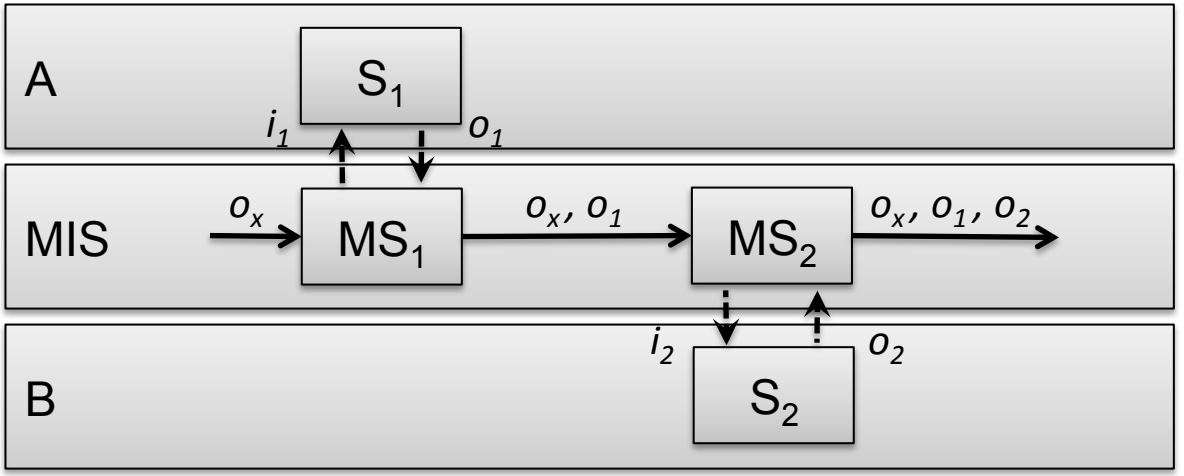


➔ Simplified matching. Not adapted to other context

Informational semantic issues

- Partial matching already done
  - Technical services were selected in the previous step
  - Data is embedded by services as input/output

- Translation and matching between data
  - Outputs must be used as input for other services



SPECIFIC SEMANTIC TREATMENT IN ISYCRI PROJECT

- Mediation services
  - Could use any previous output
  - Based on static transformation tables
  - Limited to syntactic matching
  - Specific to the considered field
- Semantic reconciliation
  - Used for unsolved data
  - Knowledge should be managed by mediation service
  - Currently, this is a manual work
  - Very limited in this specific case (all required data are pre-defined)

Behavioural semantic issues

- From logic workflow to executable file
  - No semantic issues here
  - BPEL generation based on chosen services/data
  - Mapping rules defined (syntactic mapping)
  - BPEL transformation tools already available

Spread of ISyCri method to general cases

- Extended to classical services
  - Different granularity between business activities/information and technical services/data
  - Semantic concepts different between information systems

    → **Many-to-many service matching**

    → **Semantic service matchmaking**

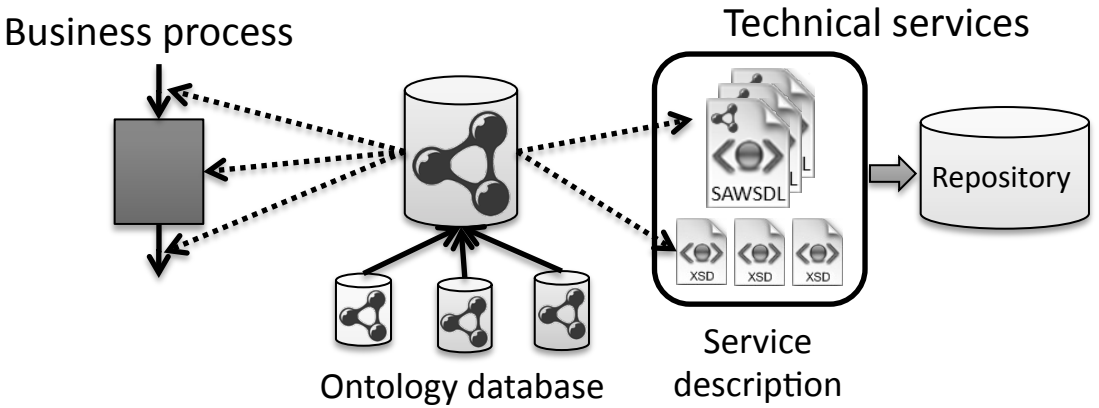
- Industrial collaboration
  - Large number of services
  - Frequent system evolutions

    → **Static data matching impossible**

    → **“On the fly” data transformation**

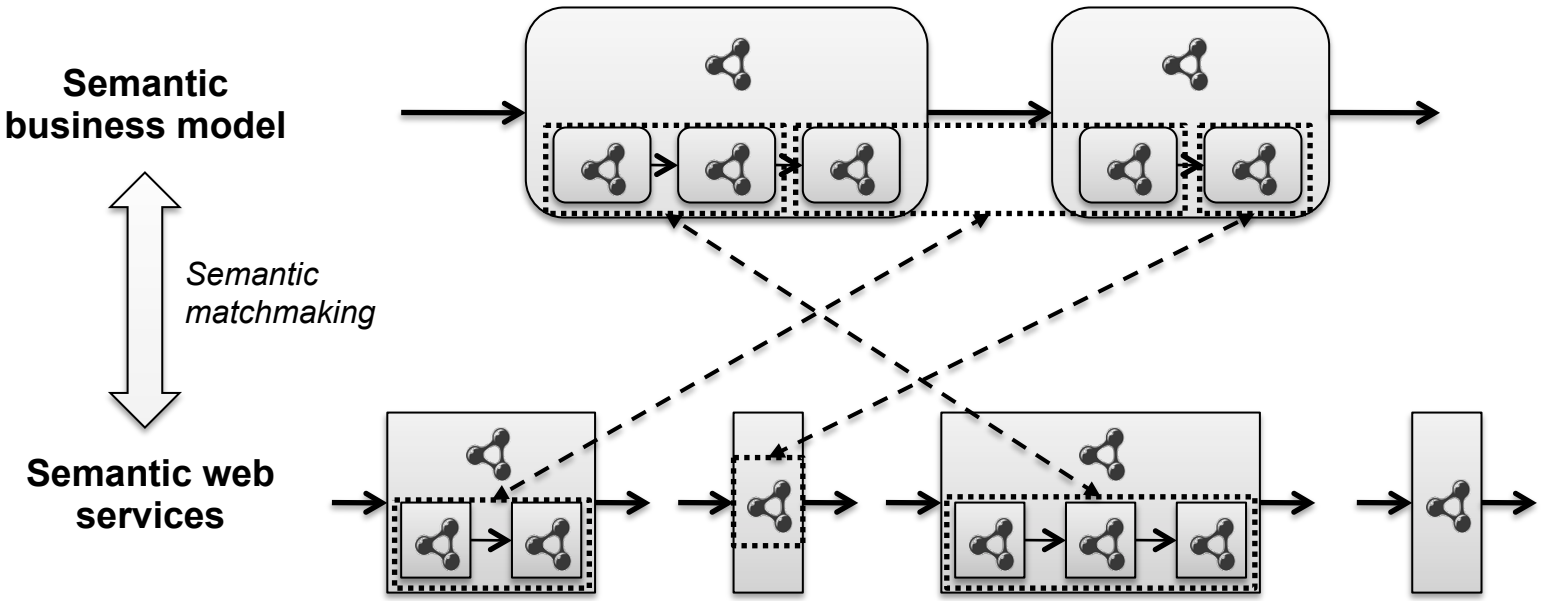
System semantization

- Knowledge modelling
  - Technical and business concepts
  - From scratch or using existing partner ontologies
  - Knowledge expansion using inference engines
- Semantic annotations
  - Incorporating semantics into business and technical models
  - Based on existing standards



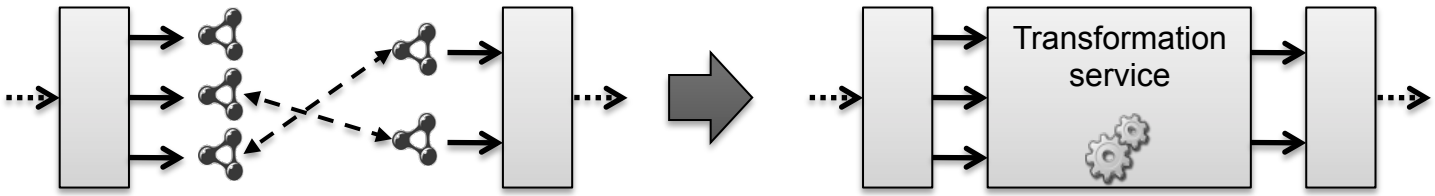
Semantic service matchmaking

- Many-to-many matching
  - Internal behaviour semantic description using standards such as WSMO, WSMO-Lite, OWL-S…
  - Semantic matchmaking in design time or runtime (delayed choice or unavailable service)



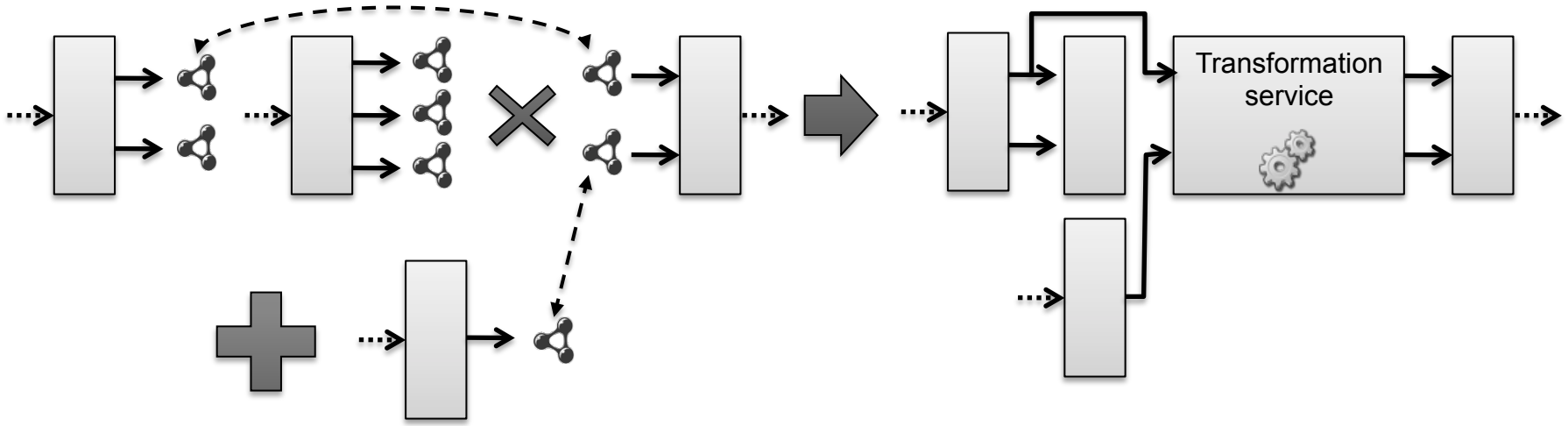
Semantic data matchmaking

- On the fly transformation
  - Transformation services based on semantic matchmaking engine
  - Configured at design time
  - Highlight lack of data (need of new services)



Semantic data matchmaking

- On the fly transformation
  - Transformation services based on semantic matchmaking engine
  - Configured at design time
  - Highlight lack of data (need of new services)



THANKS FOR YOUR ATTENTION

Questions?