

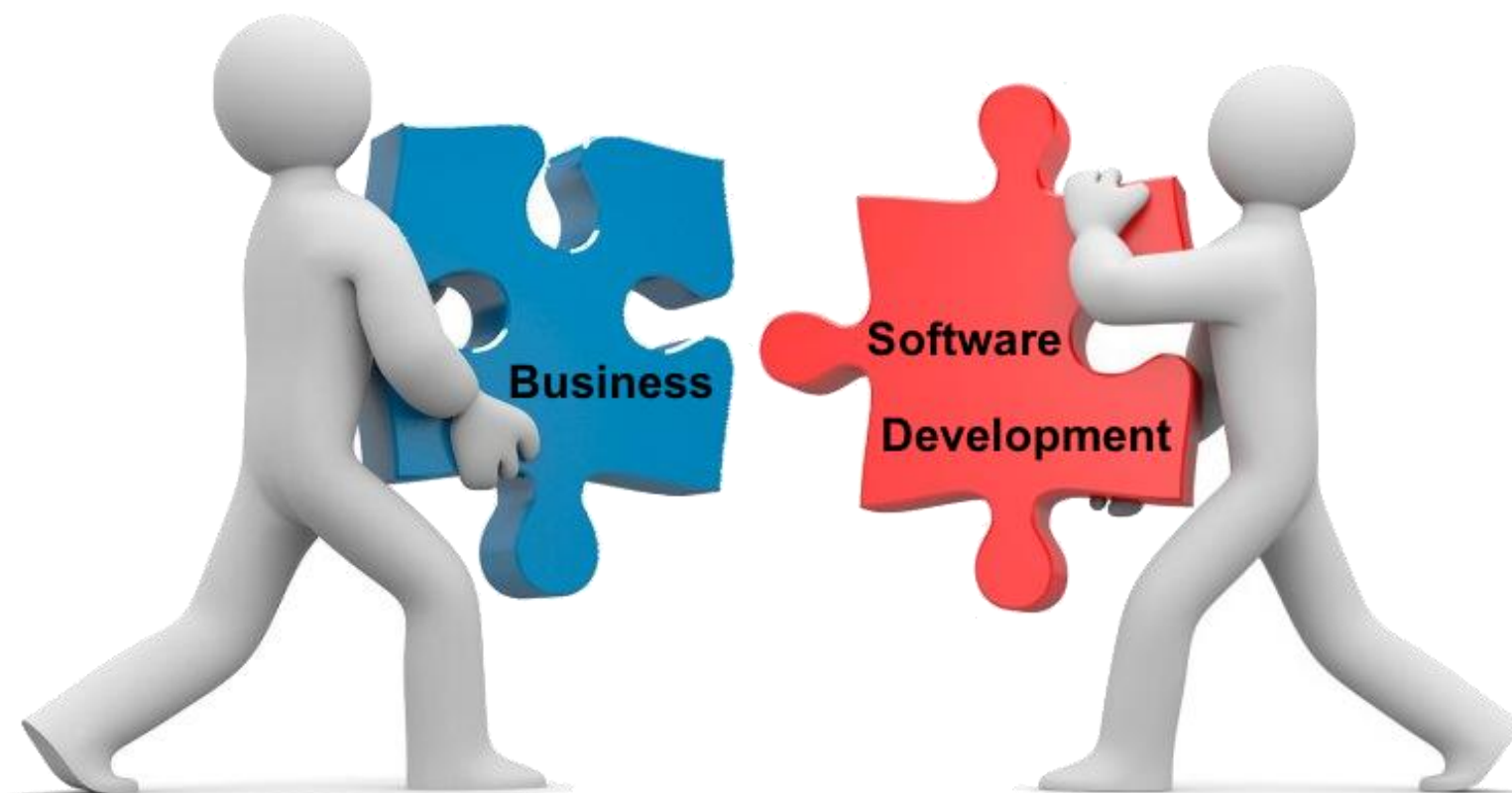
# Identifying Services in KAOS Models

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# Context

- Deploying Service-Oriented Architecture (SOA) in an organization requires that the services are aligned with the business concerns [1, 2]



[1] Azevedo L. et al.. A method for bridging the gap between business process models and services. *iSys-Revista Brasileira de Sistemas de Informação* 6(1), 62–8, (2014)

[2] Hans Weigand et al.. Value-based service modeling and design: Toward a unified view of services. In *International Conference on Advanced Information Systems Engineering*. Springer, Berlin, Heidelberg.

# Context

- Lack of consensus on how service development life cycle should be conducted [1]
- Existing service-oriented works do not offer detailed and systematic methods for business analysis and services identification [2]

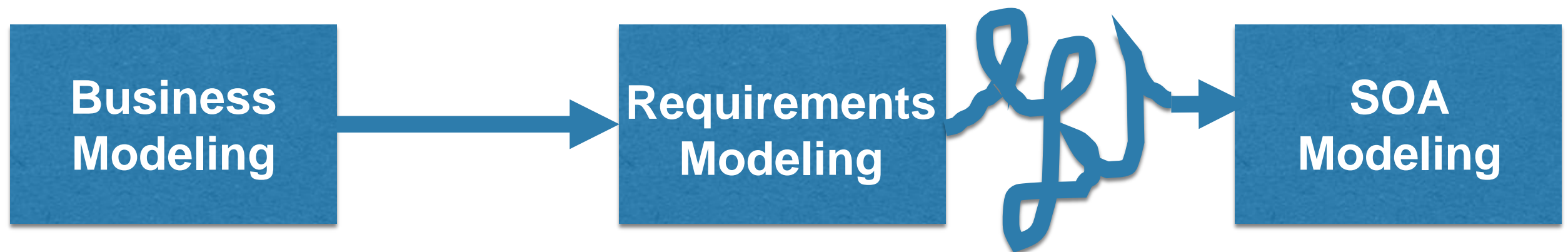


[1] Q. Gu and P. Lago. A stakeholder-driven service life cycle model for SOA. In 2nd international workshop on Service oriented software engineering @ 6th ESEC/FSE joint meeting. ACM, 1–7 (2007)

[2] T. Kohlborn et al.. Identification and analysis of business and software services at a consolidated approach. IEEE Transactions on Services Computing 2 (1), 50–64 (2009)

# Problem

- Previously, we demonstrate how to generate goal-models aligned with business models [1, 2]
- Existing service-oriented works propose principles or guidelines that are very difficult to follow in practice due to lack of a systematic process [3]



[1] Souza et al., Aligning Business Models with Requirements Models. In Information Systems. 14th EMCIS 2017, LNBIP Vol. 299. Springer, 545–558. (2017)

[2] Souza, E. et al., An approach to align business and IT perspectives during the SOA services identification. In Computational Science and Its Applications 2017, 3-6 (2017)

[3] Azevedo L. et al., A method for bridging the gap between business process models and services. iSys-Revista Brasileira de Sistemas de Informação 6 (1), 62–98 (2014)

# Research Question

How to take a systematic approach  
to model SOA applications  
using goal models?

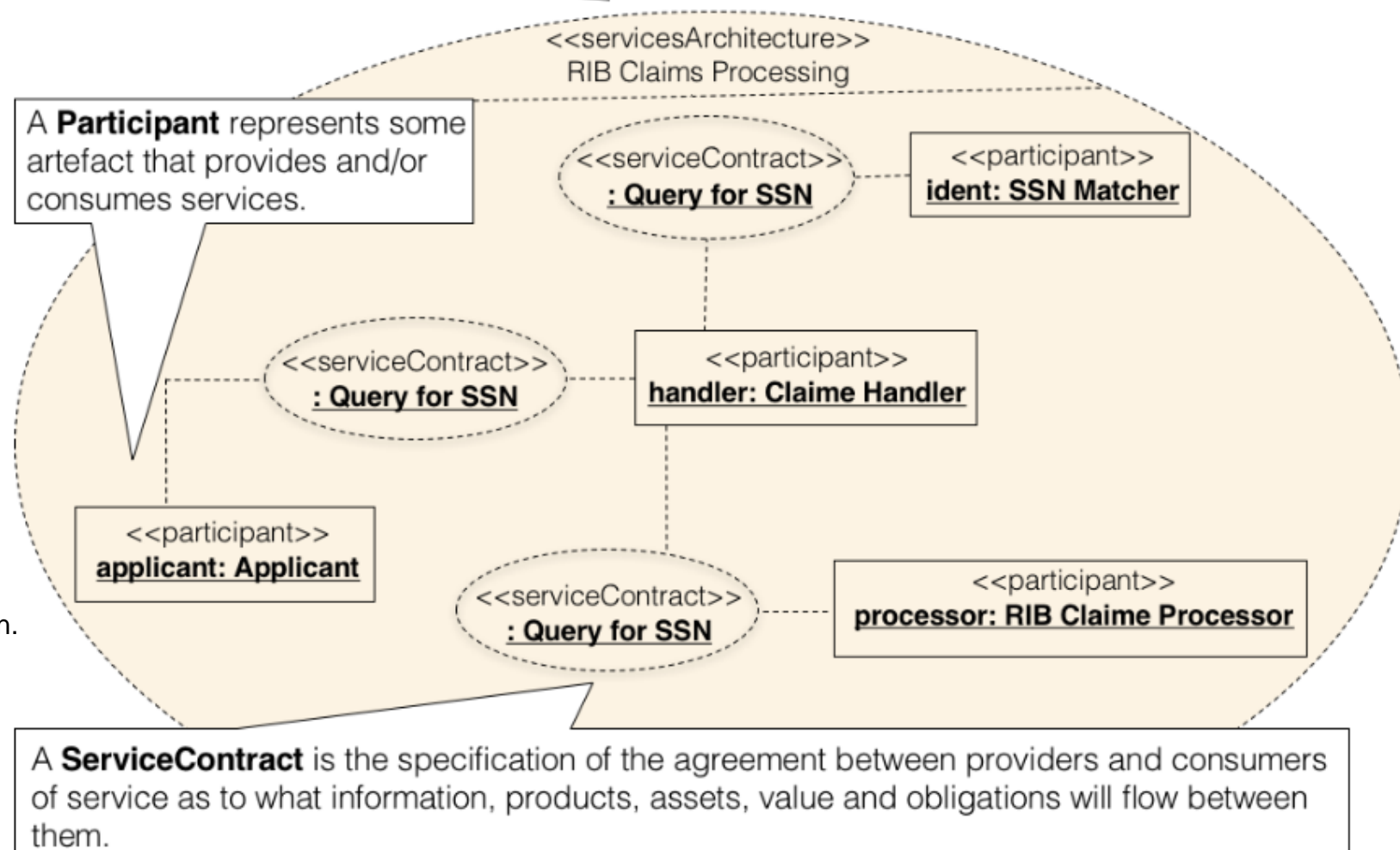




# Background

- **SOA** is an evolution of component-based development where services are the main building component [1, 2]
- Services are typically specified using **SOAML**

A **servicesArchitecture** describes how participants work together for a purpose by providing and using services expressed as ServiceContracts.

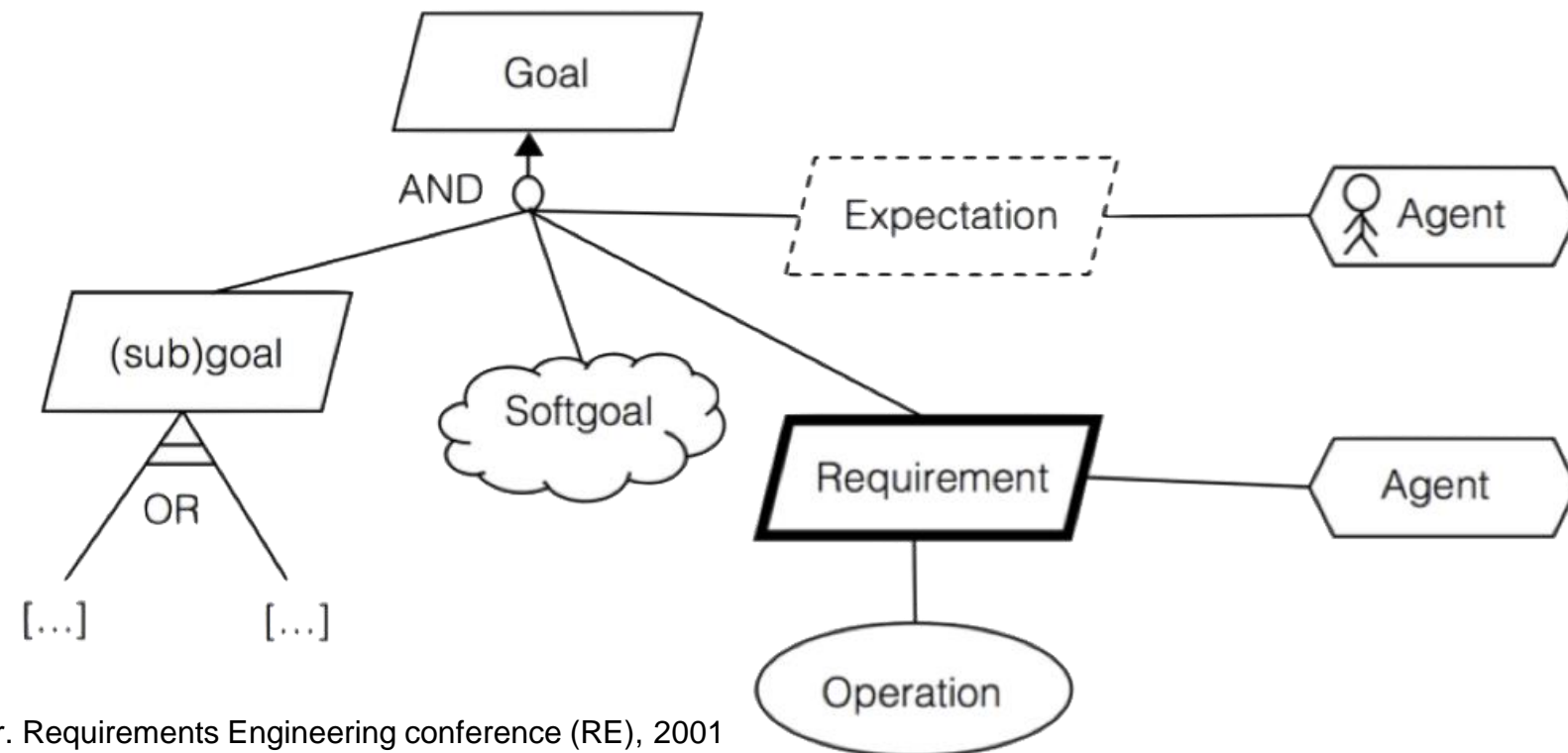


[1] T. Erl. Service-oriented architecture: concepts, technology, and design. Pearson Education, Inc, Indiana, USA. (2005)

[2] Valipour et al., A brief survey of software architecture concepts and service oriented architecture. *2nd IEEE International Conference on Computer Science and Information Technology*, 34-38 (2009)

# Background

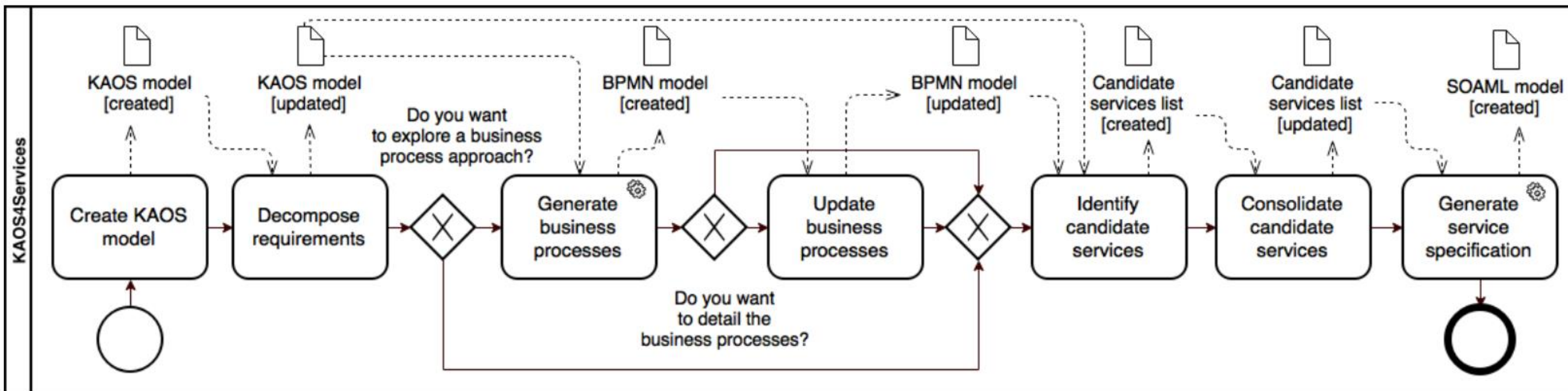
- **Goal-oriented requirements engineering** uses goals to elicit, elaborate, structure, specify, analyze, negotiate, document, and modify requirements [1]
- KAOS has been one of the most cited methods in the literature [2]



[1] A. van Lamsweerde. Goal-oriented requirements engineering: a guided tour. Requirements Engineering conference (RE), 2001

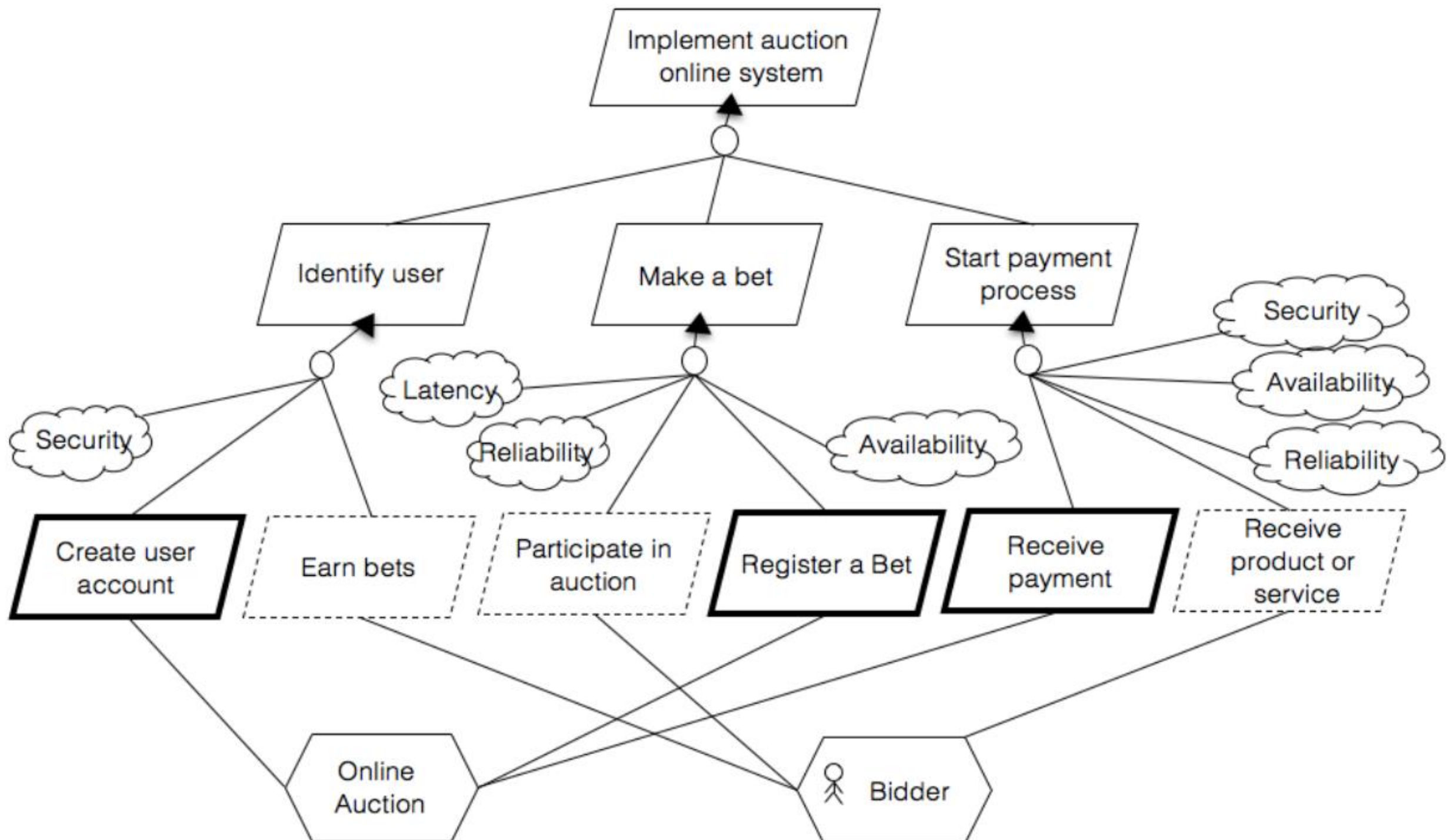
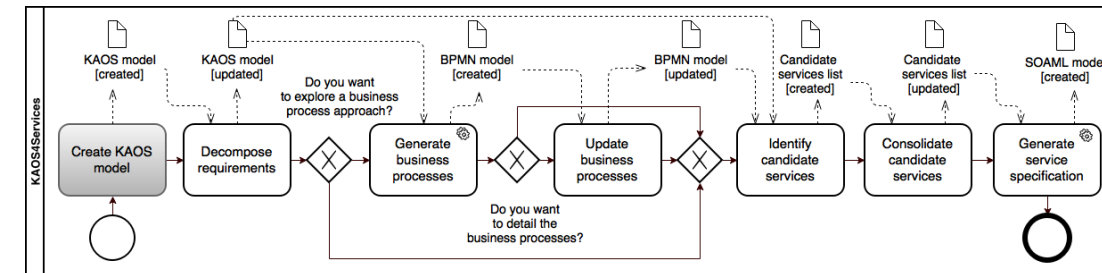
[2] F. Wanderley and J. Araújo. Generating goal-oriented models from creative requirements using model driven engineering. MoDRE'13 (2013)

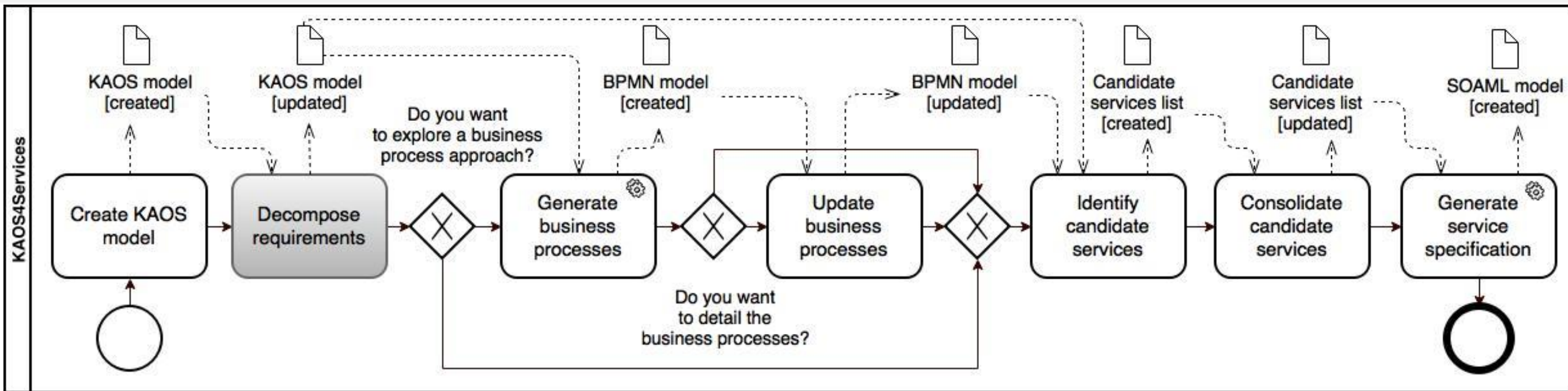
# KAOS4Services





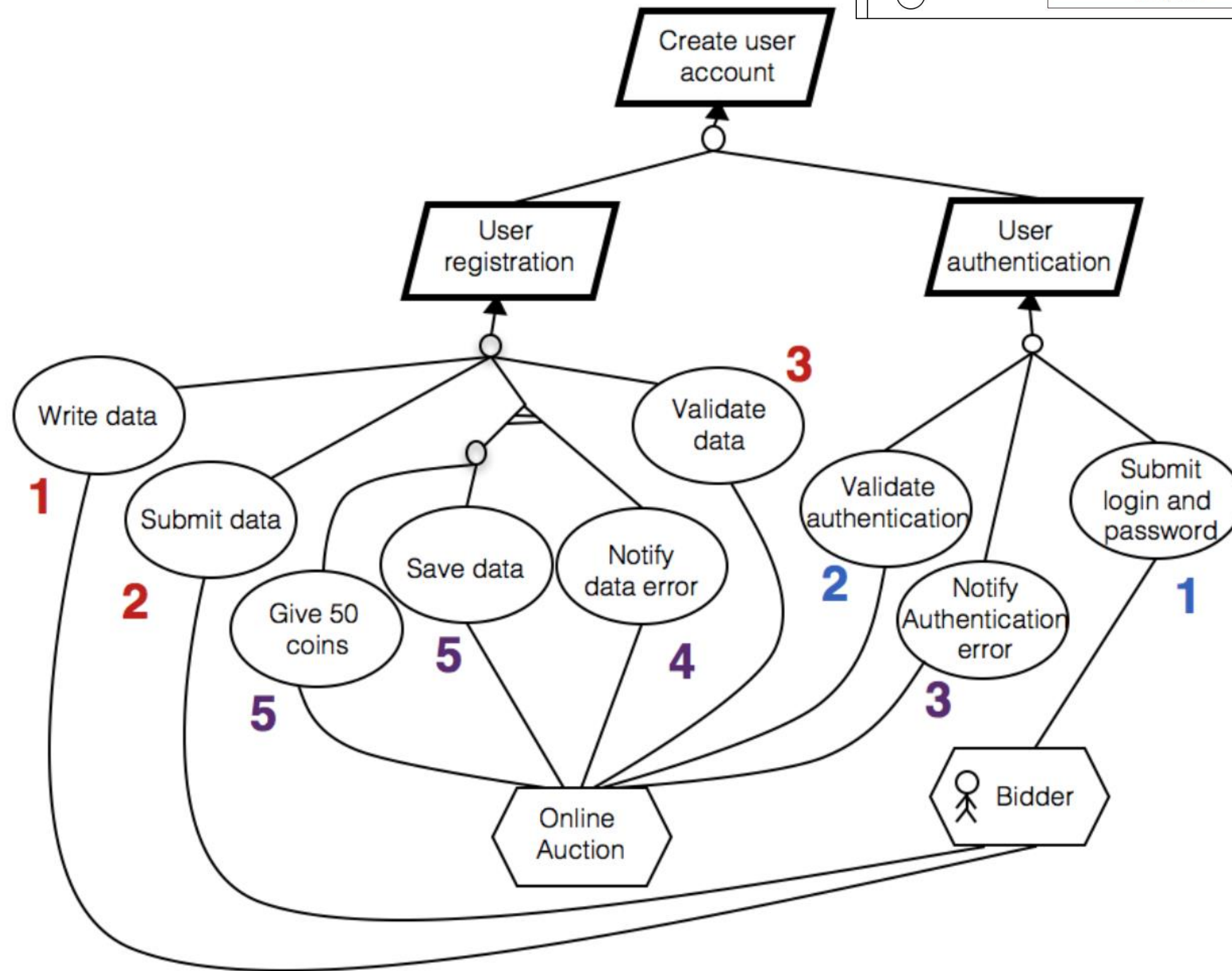
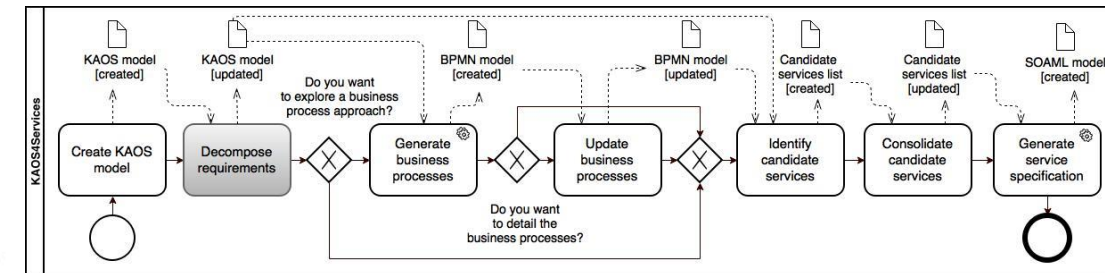
# Create KAOS model



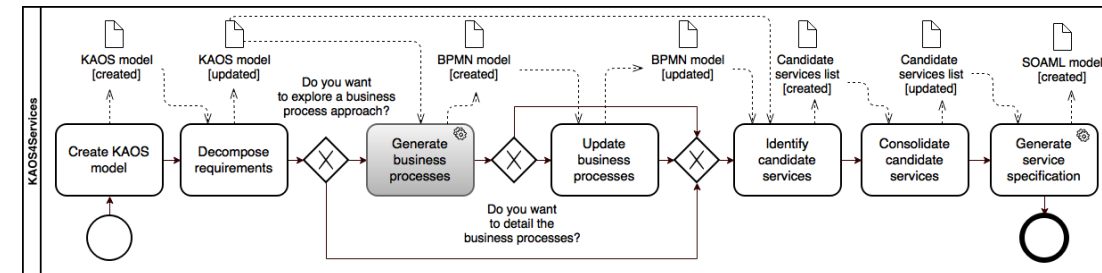


- System requirements are decomposed into **human-intensive operations** (executed by people), and **system-intensive operations** (requiring a number of computational transactions with minimal or no human intervention)
- Candidate services are identified from system-intensive operations, and are ordered according to the designers' order given to operations

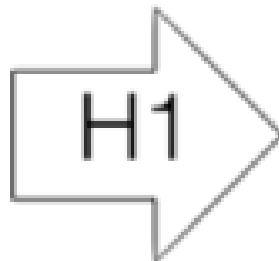
# Decompose requirements



# Generate business process

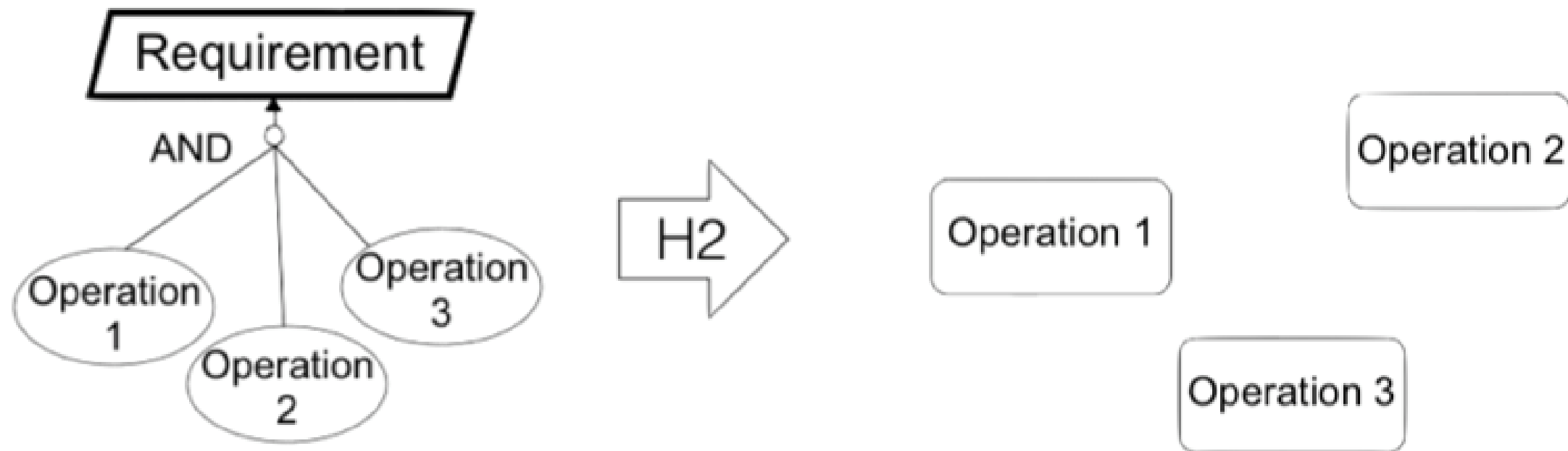
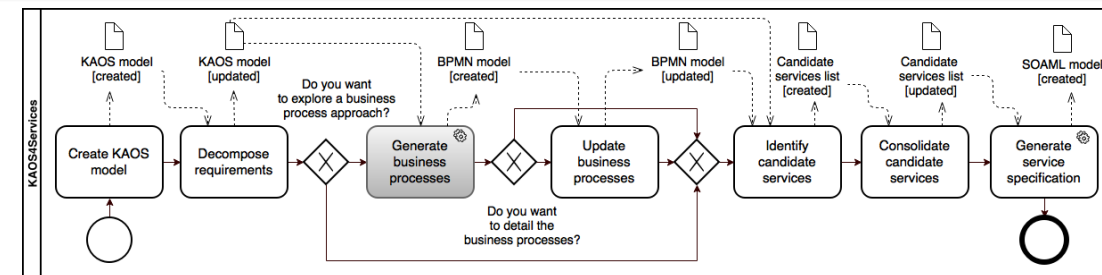


Agent



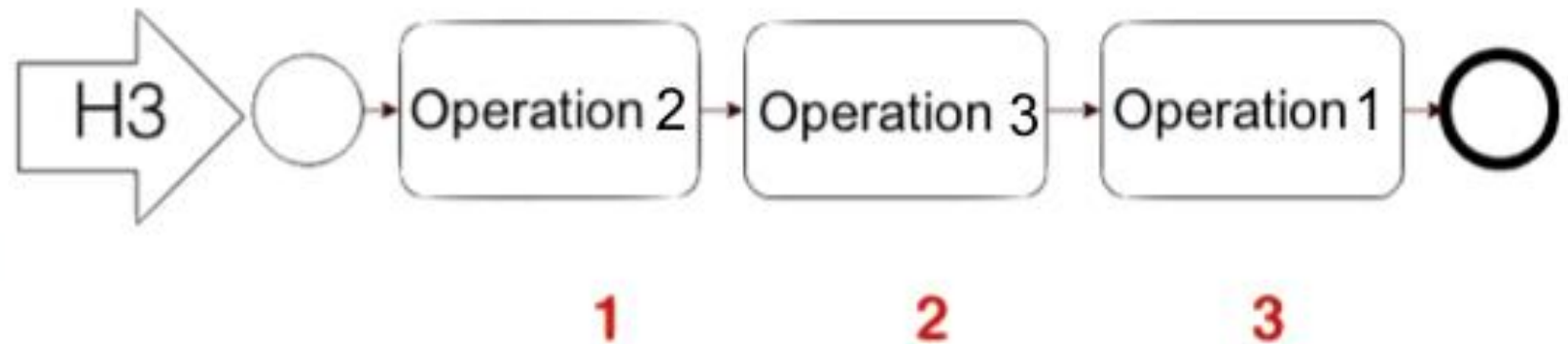
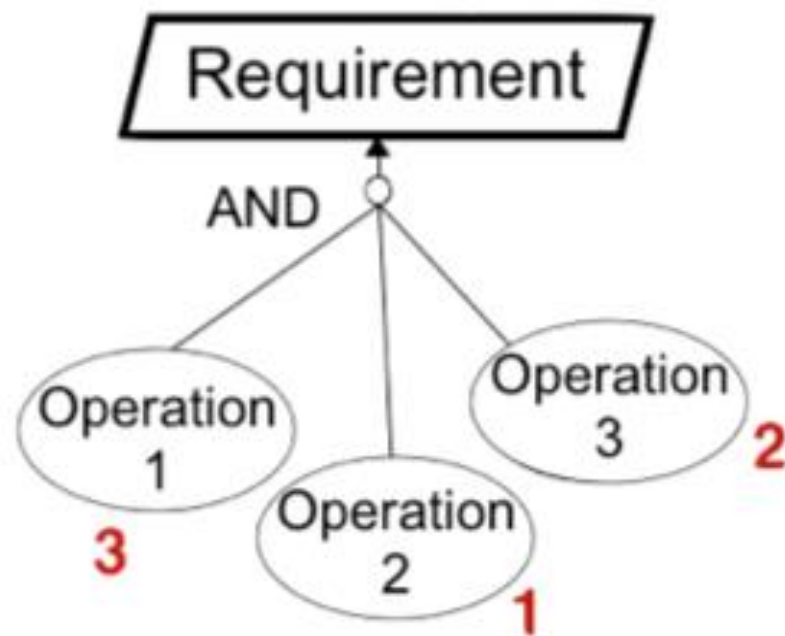
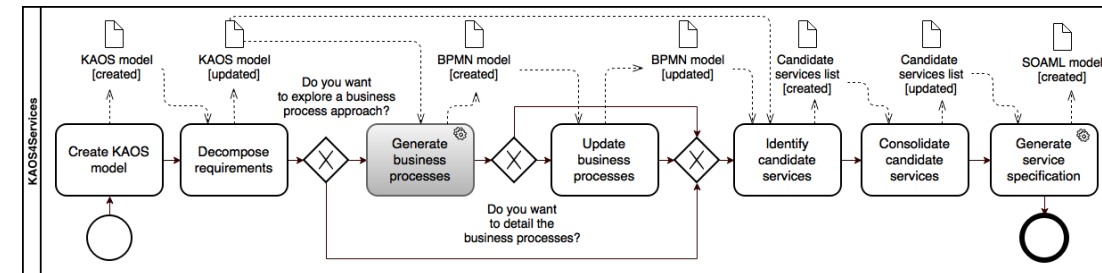


# Generate business process

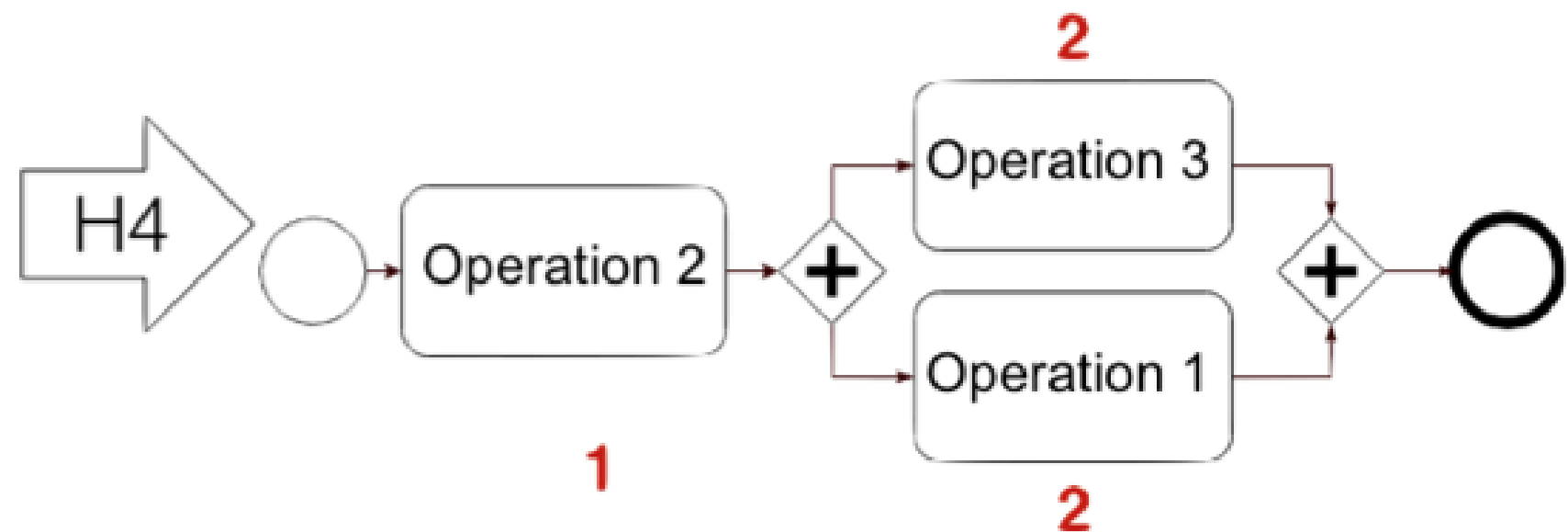
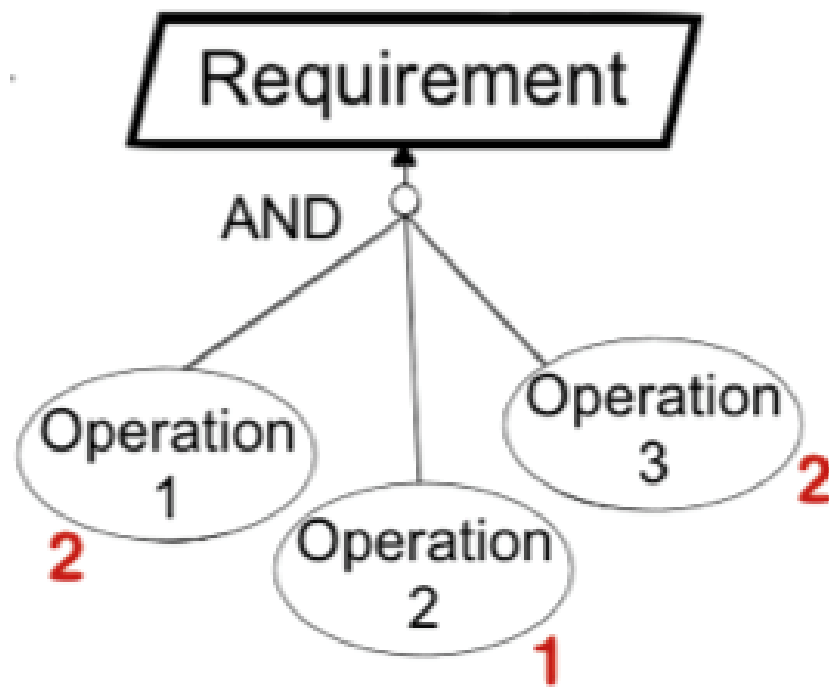
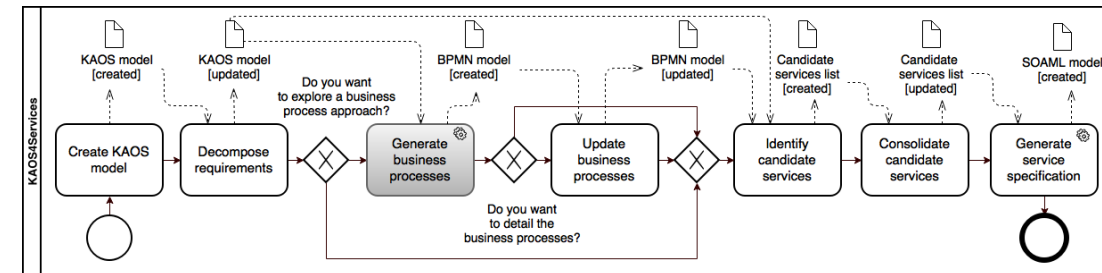




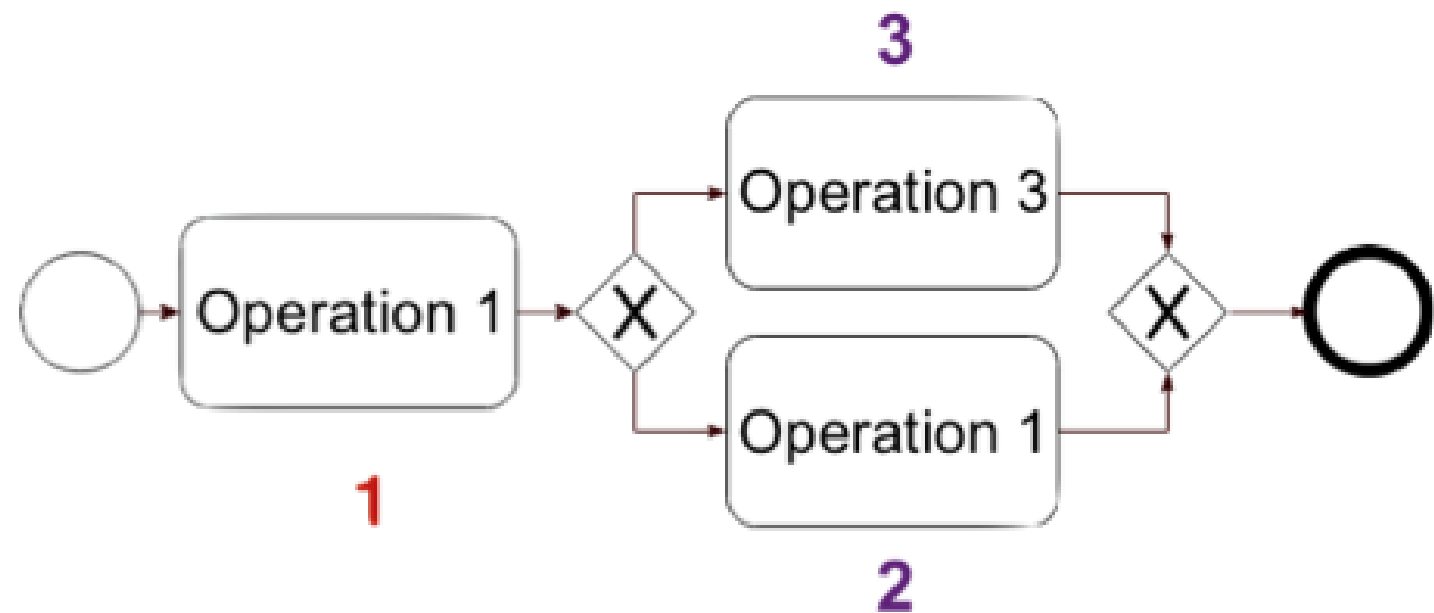
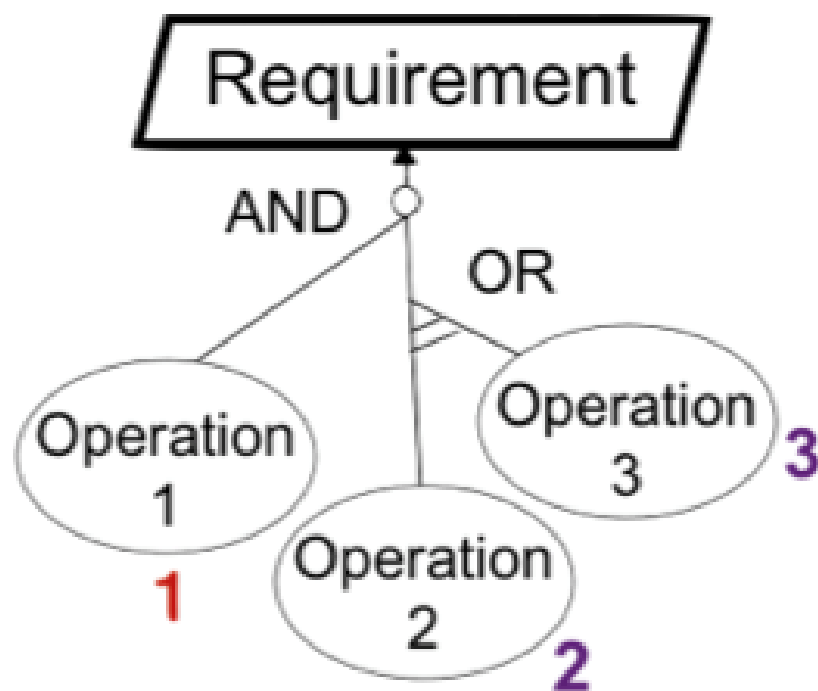
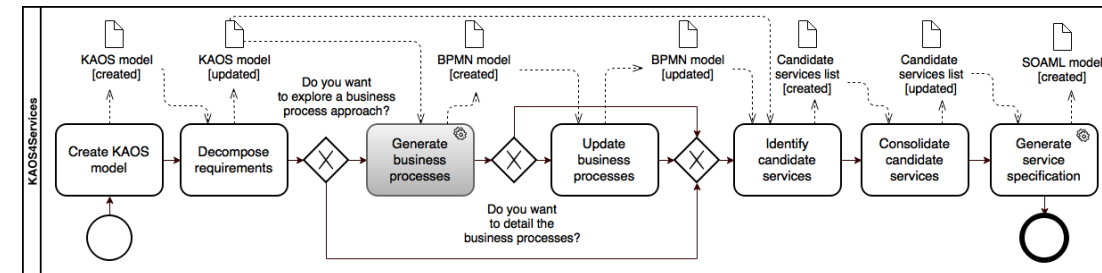
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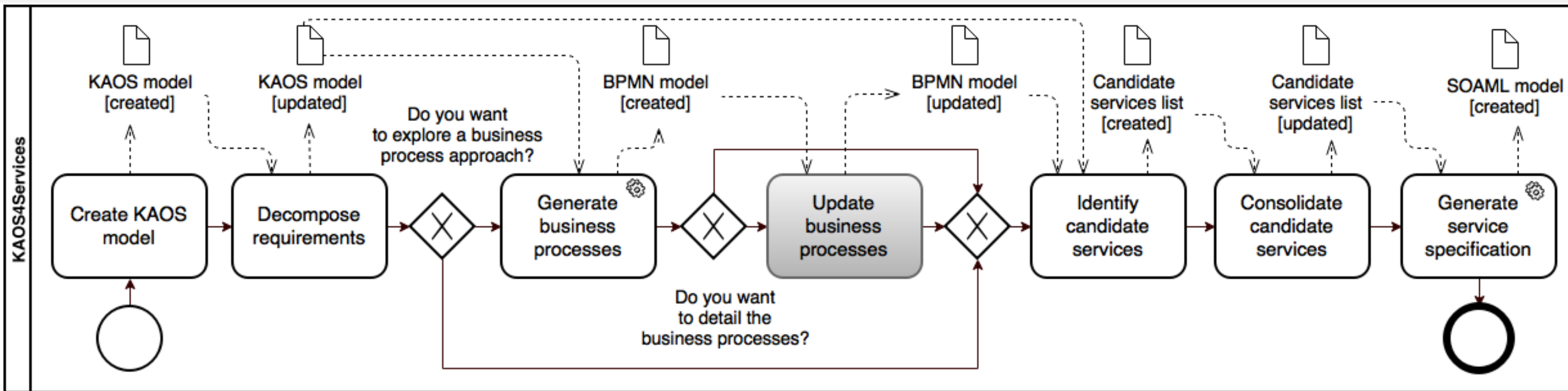


# Generate business process



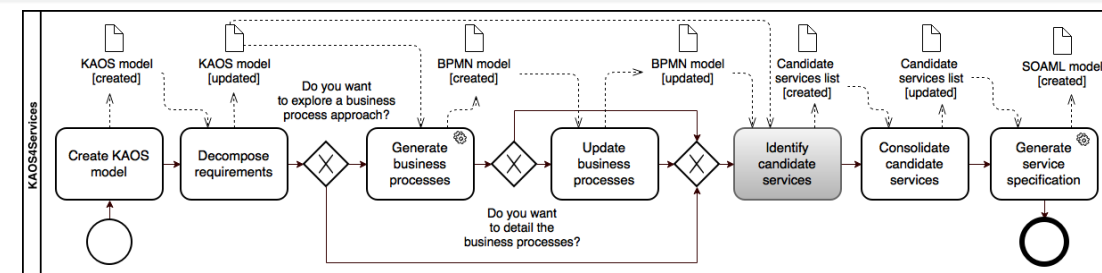
# Generate business process



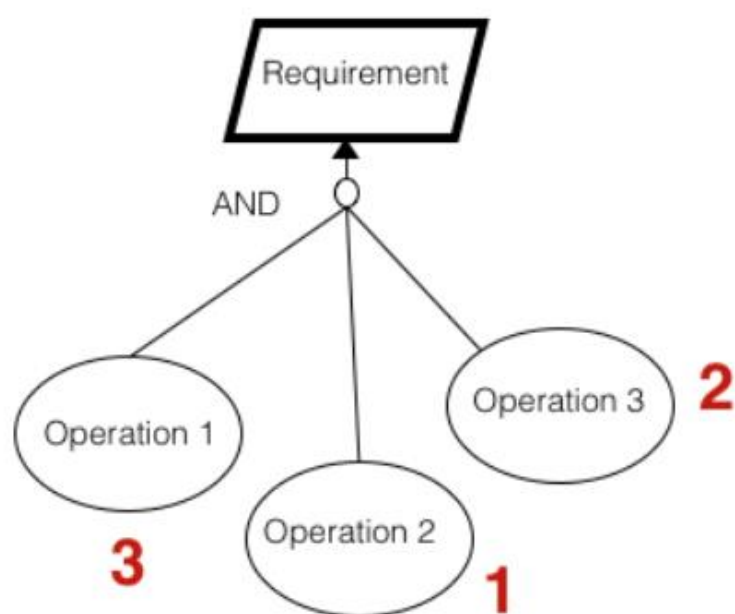


- The execution of this non-mandatory activity depends on the level of detail the service designer wants
- The more detailed the business process is, the more detailed the service specification will be

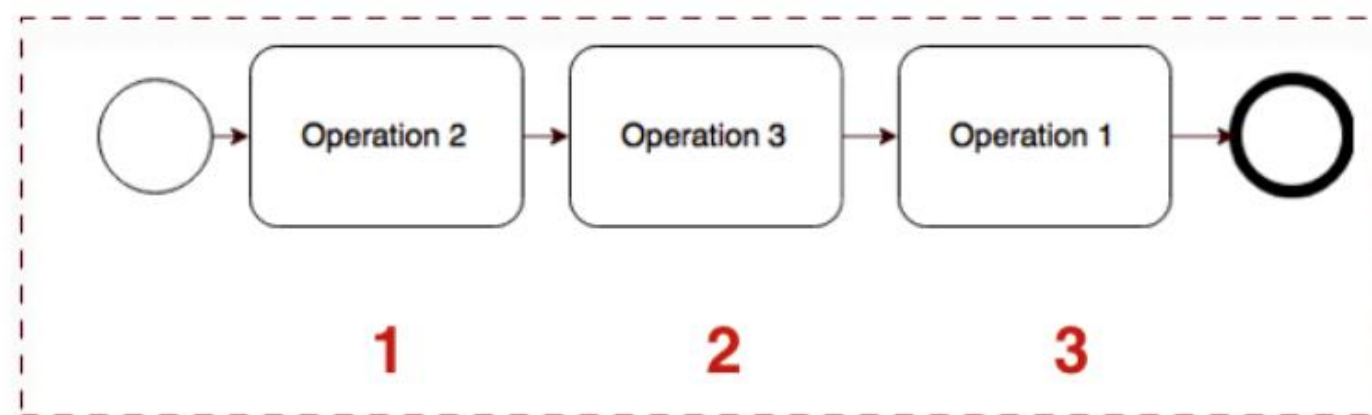
# Identify candidate services



H6

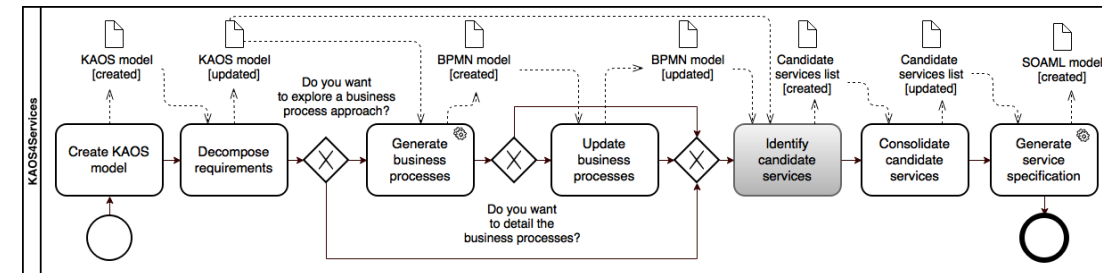


Candidate service

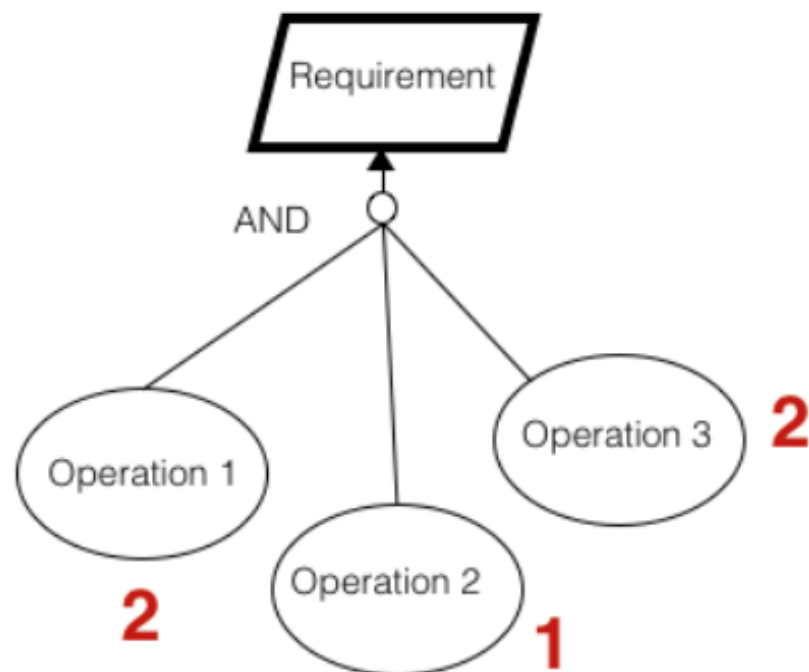




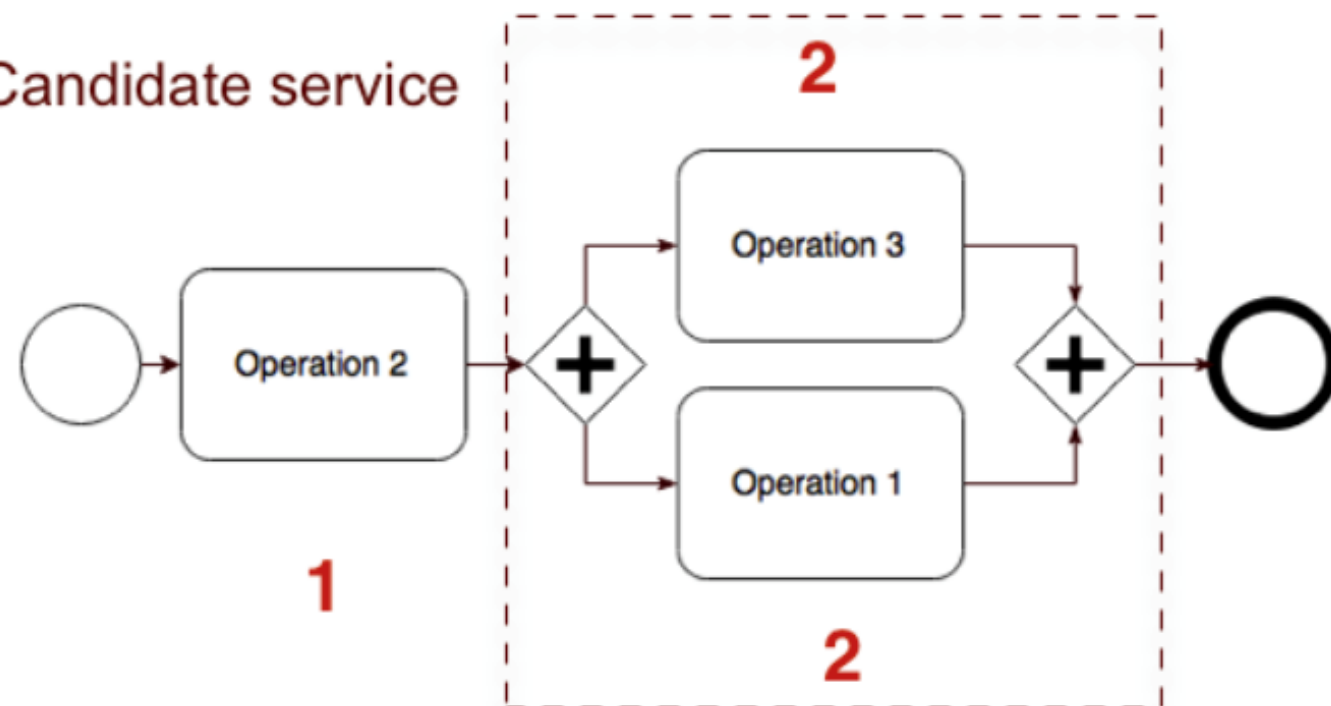
# Identify candidate services



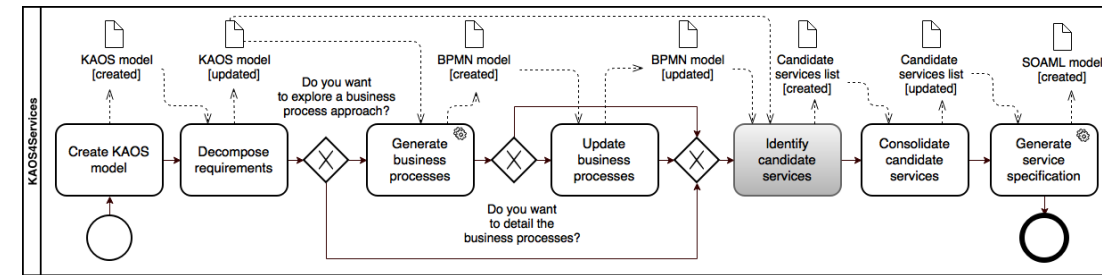
H7



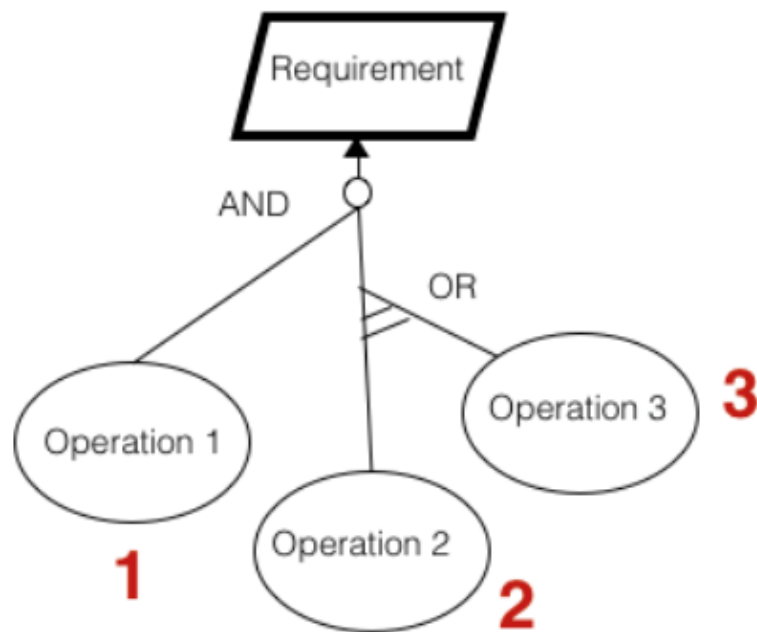
Candidate service



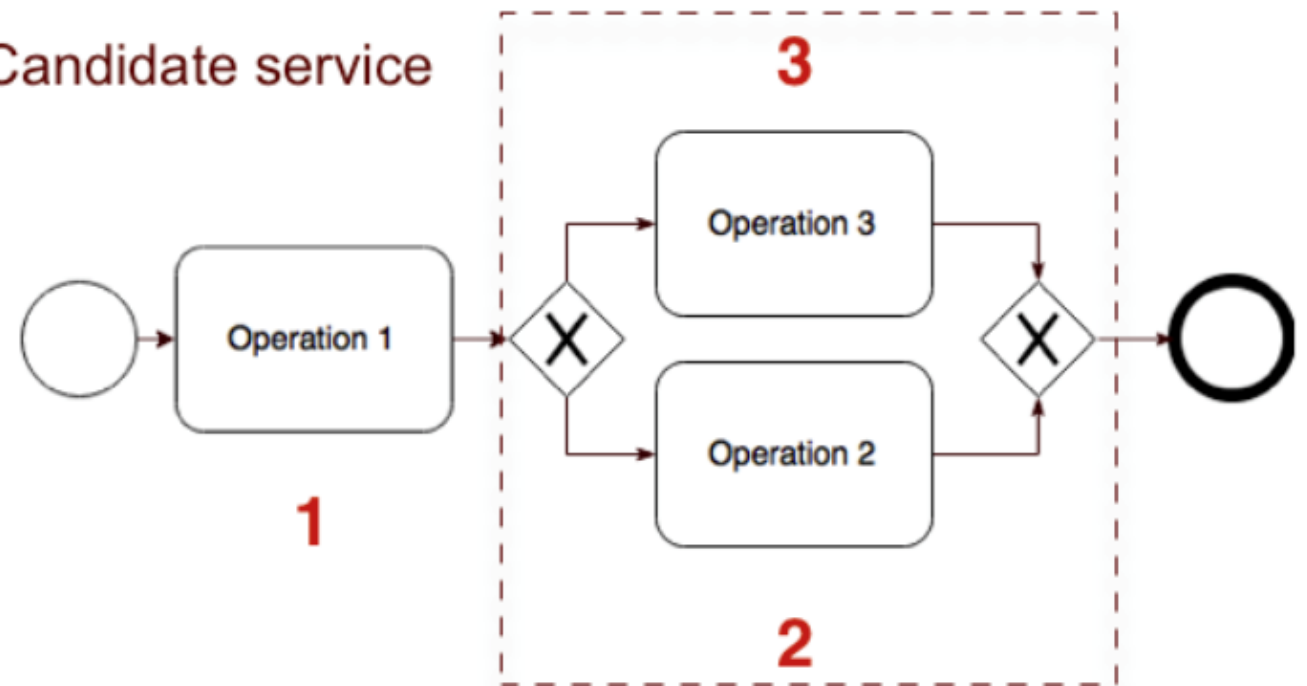
# Identify candidate services



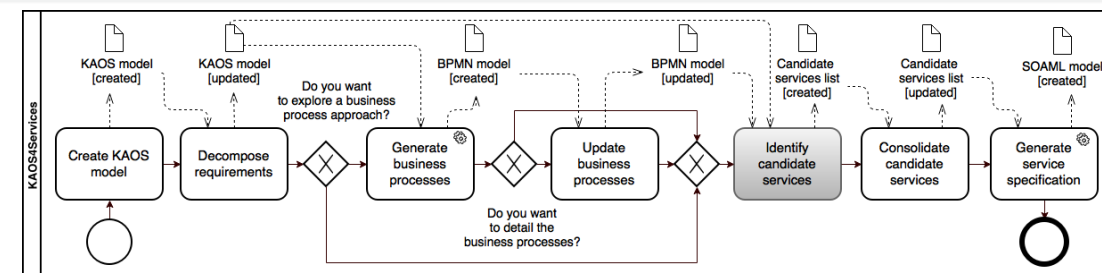
H8



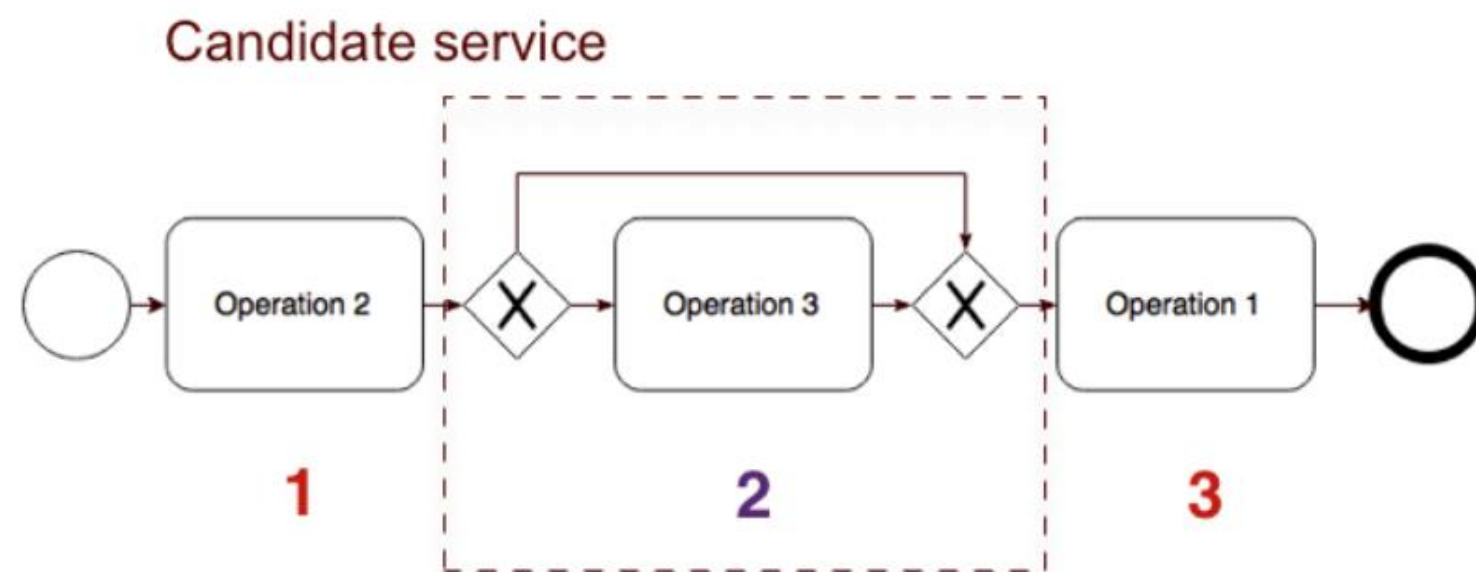
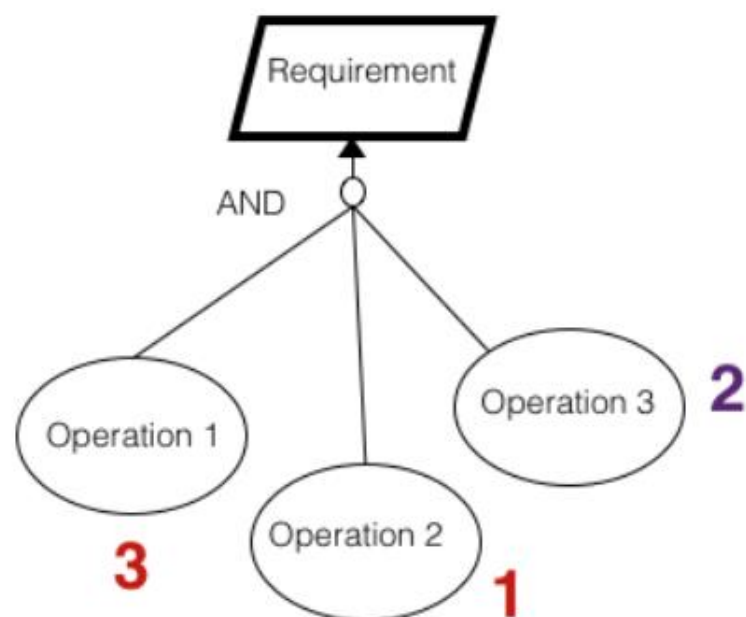
Candidate service



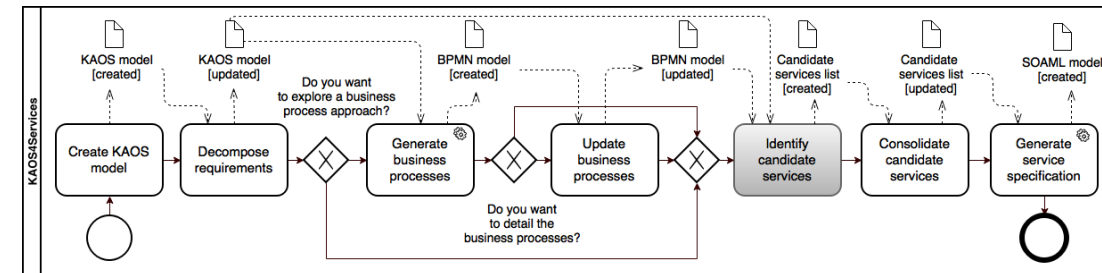
# Identify candidate services



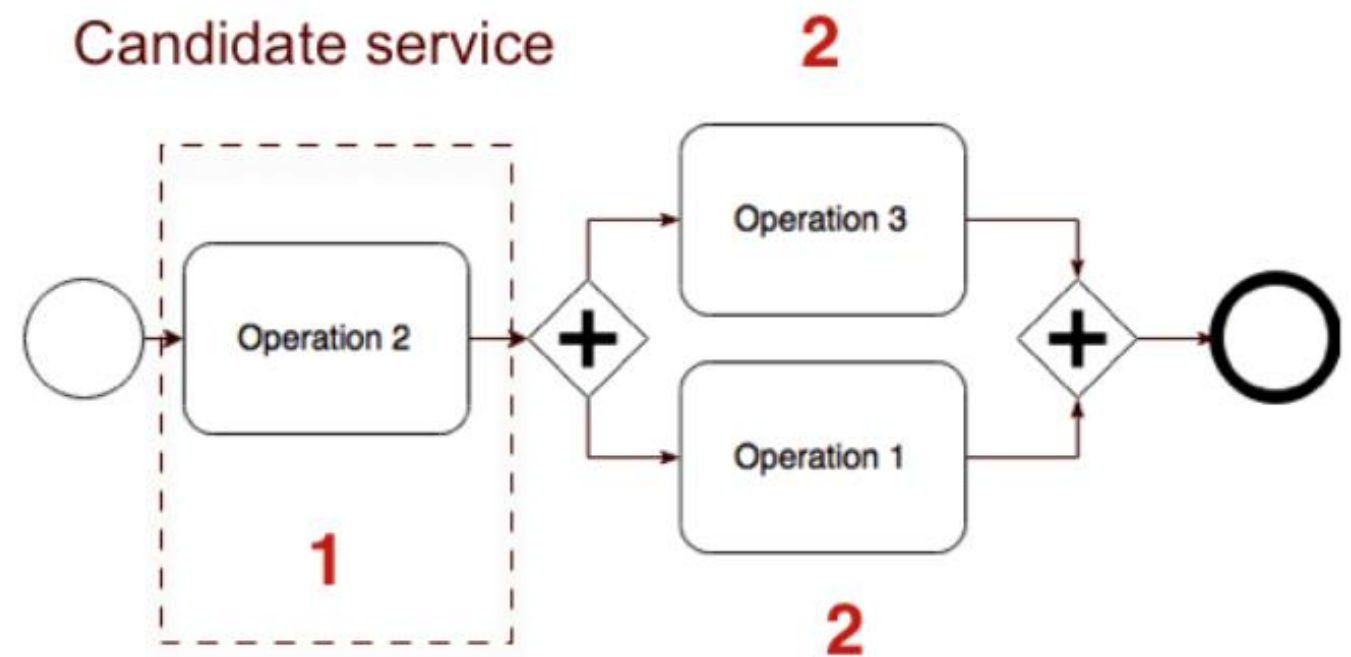
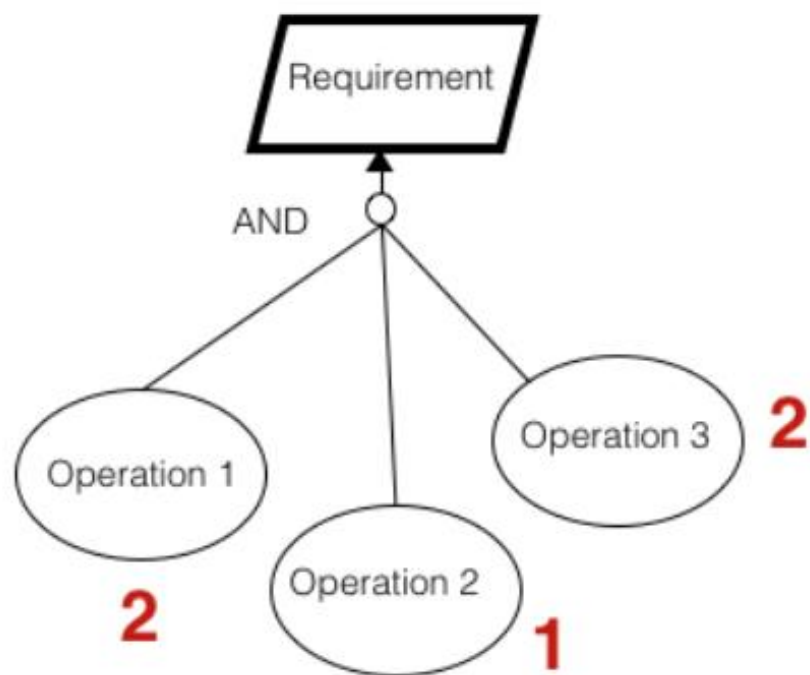
H9

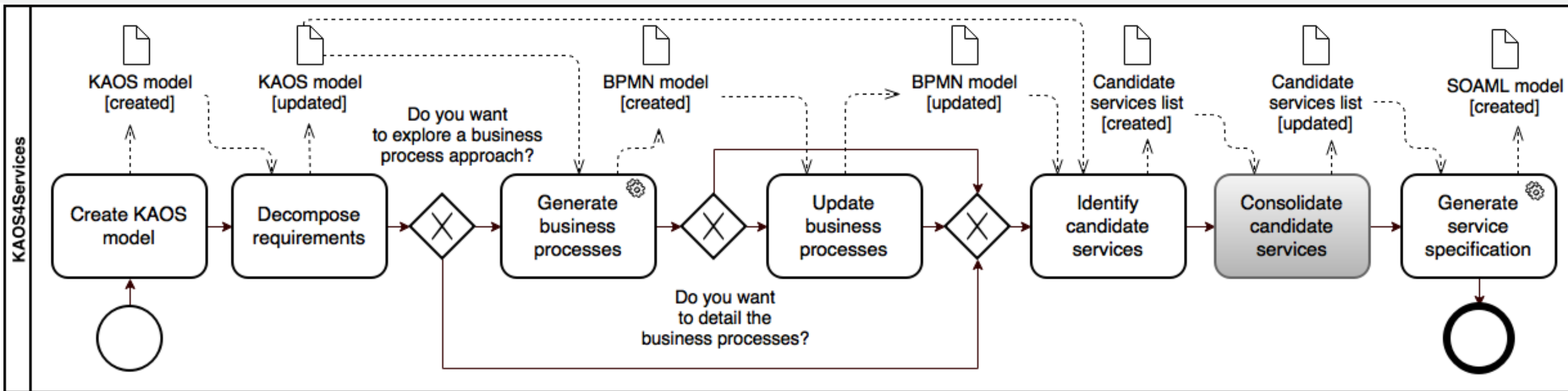


# Identify candidate services



H10

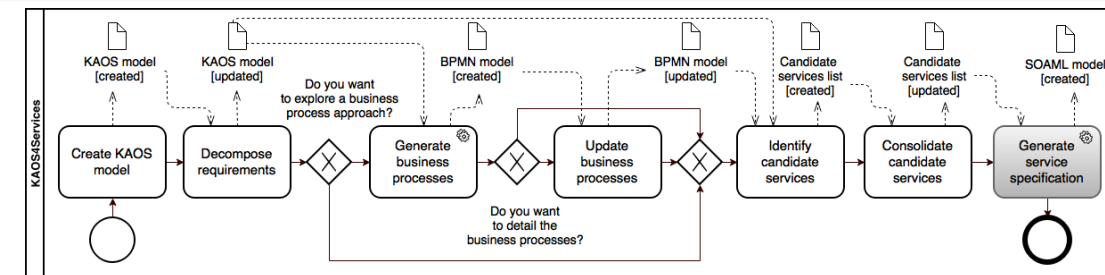




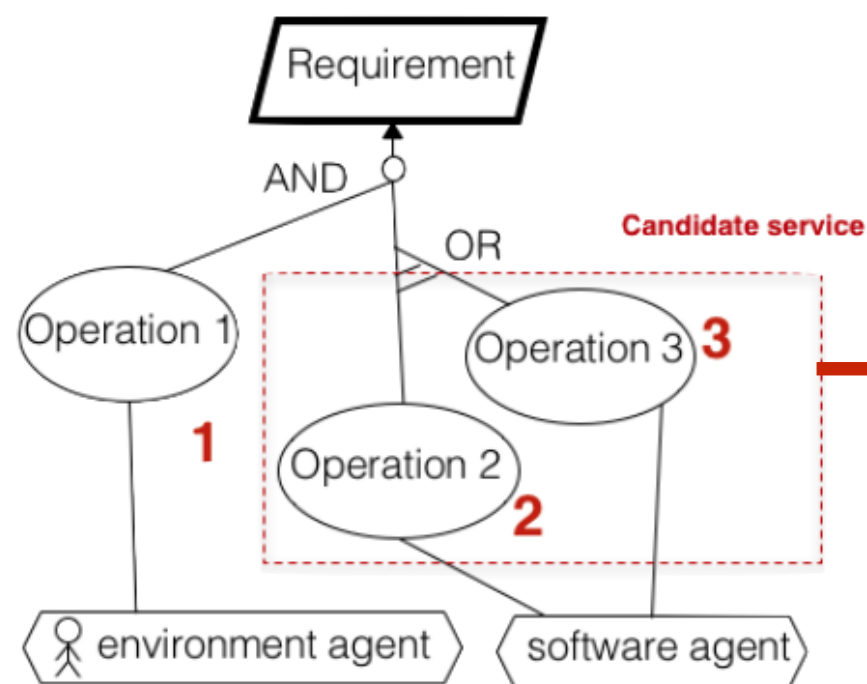
- H11: The sum of goals the candidate service needs to achieve indicates its likelihood of being reused
- H12: The higher the number of dependencies to a candidate service, the higher the probability of being implemented
- H13: Candidate services with a single operation (orphan operation) can be aggregated into another candidate service



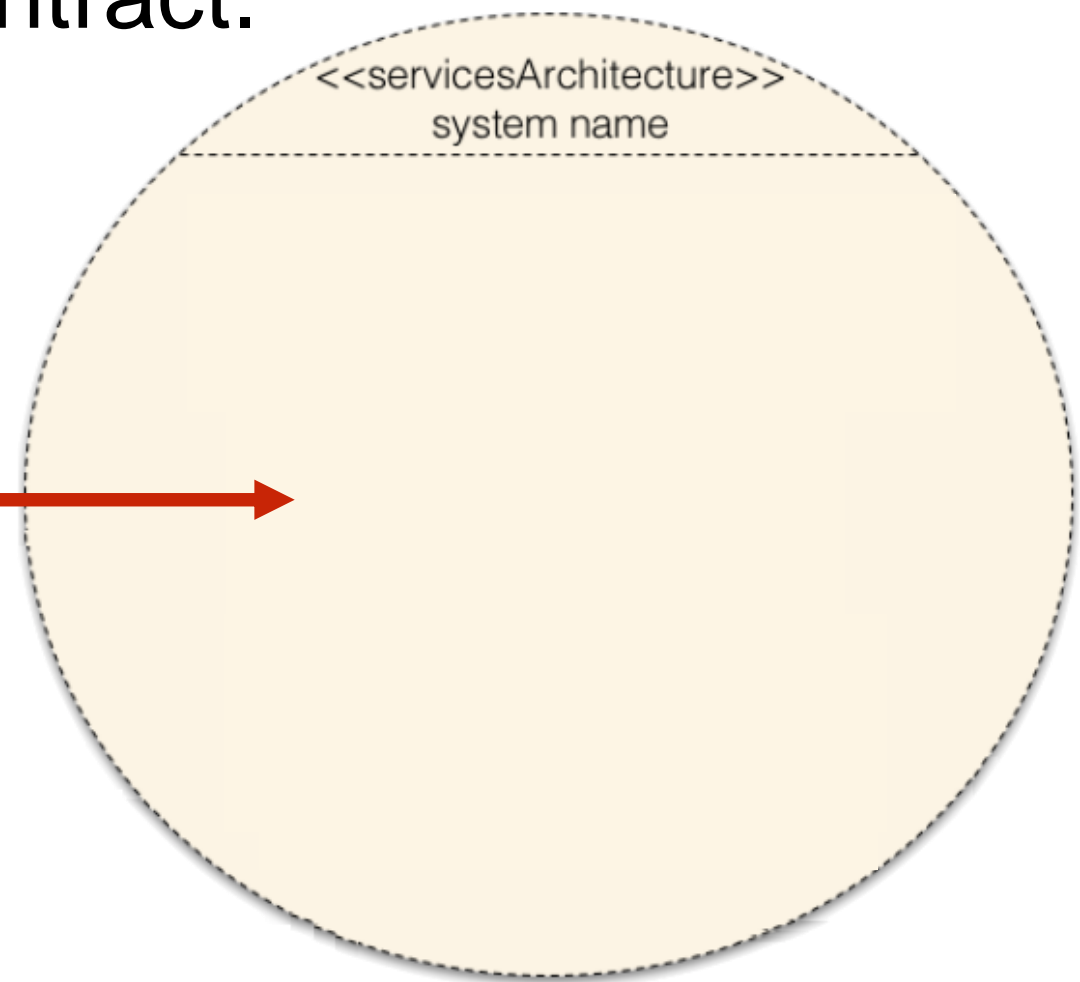
# Generate service specification



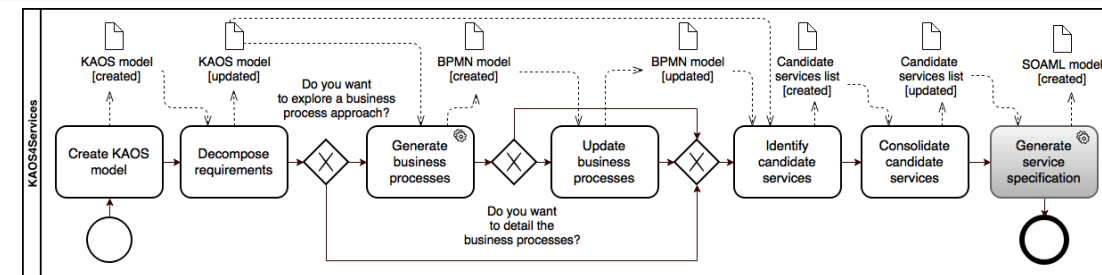
H14: A candidate service is mapped into a SOAML service contract.



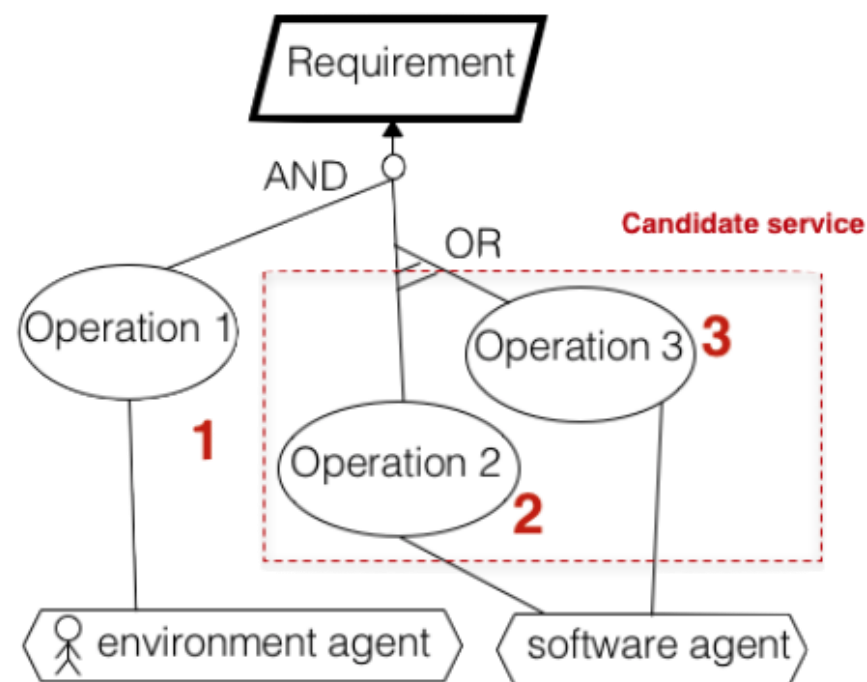
**H14**



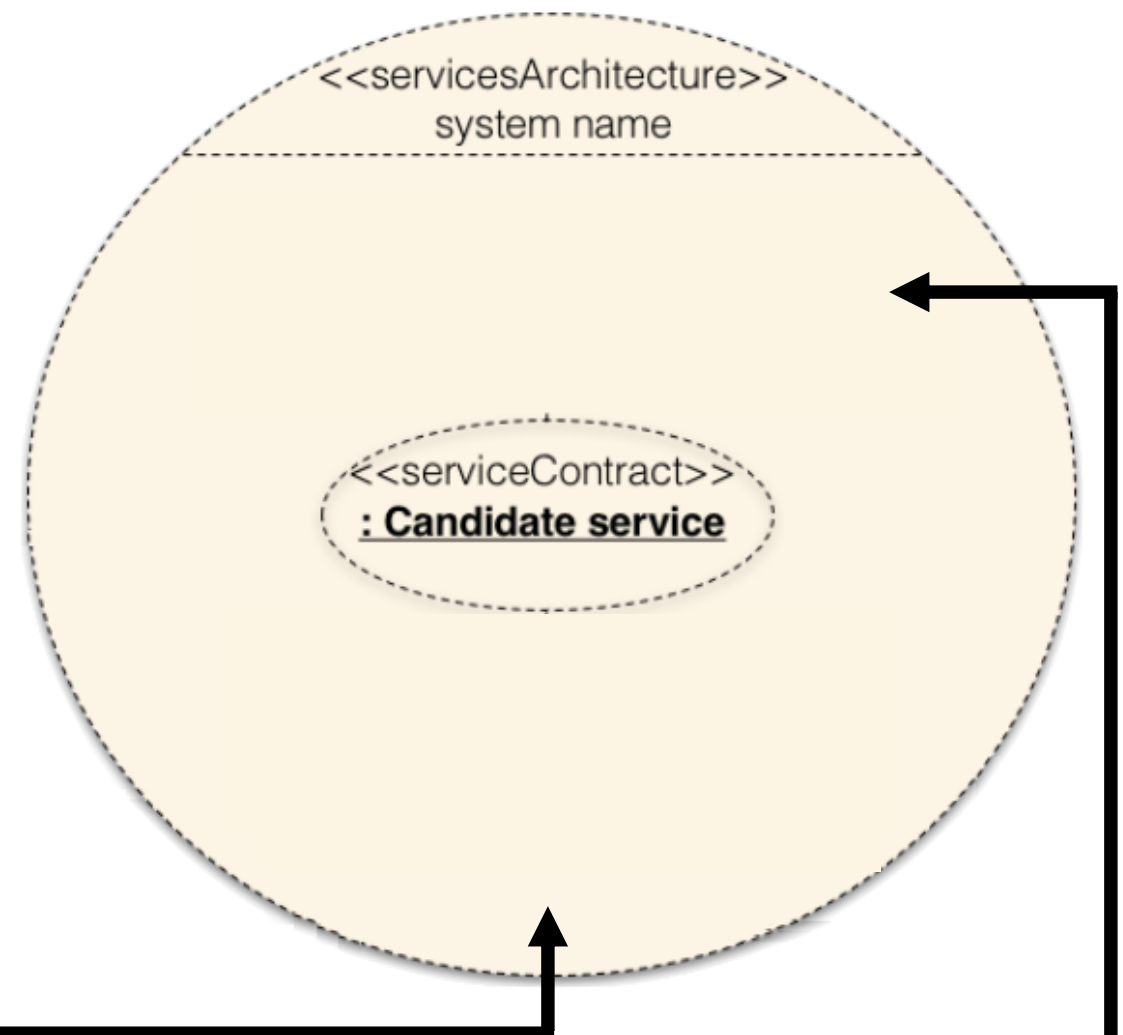
# Generate service specification



H15: KAOS agents are mapped into SOAML participants.

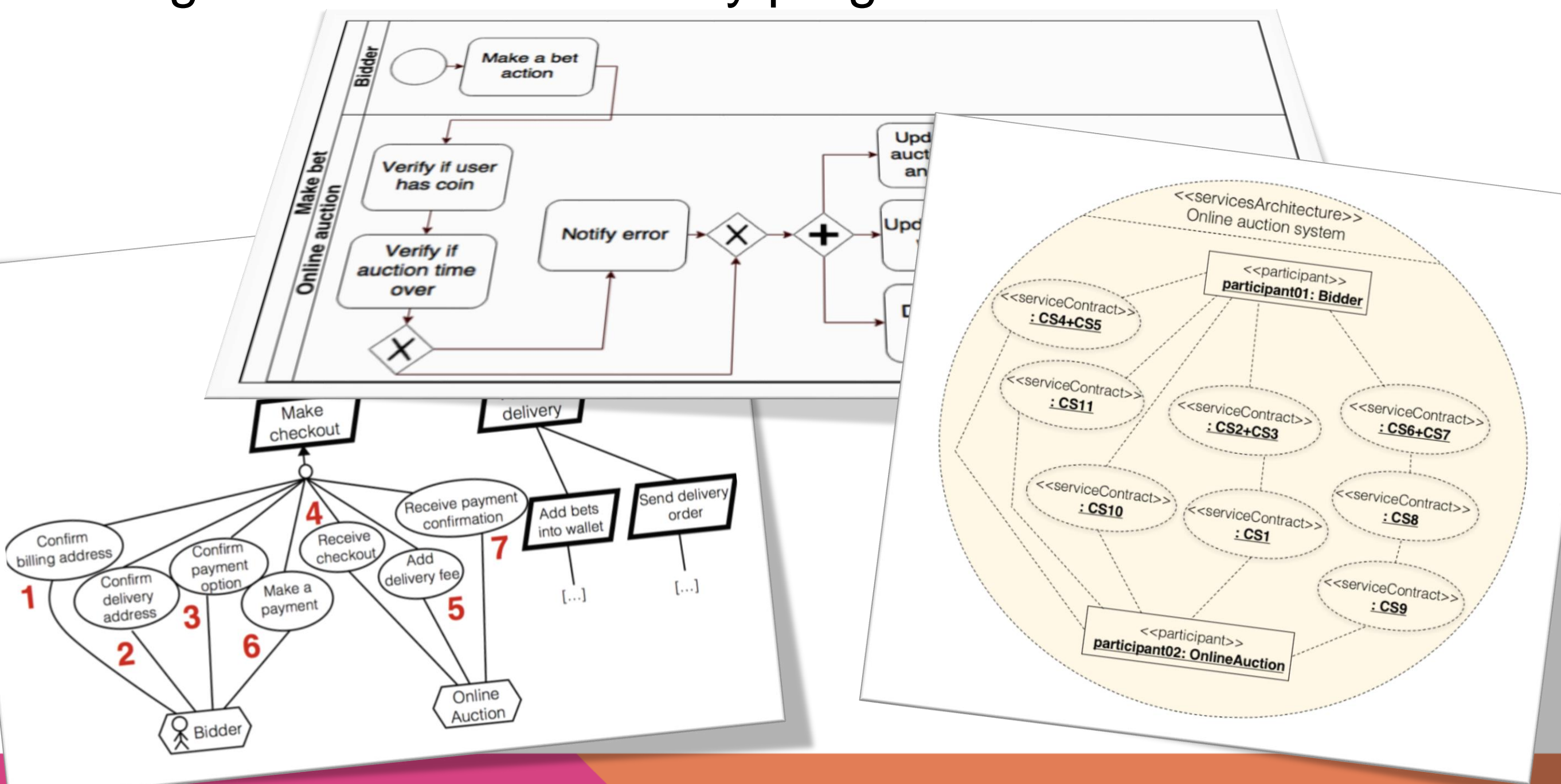


**H15**



# Evaluation

- Industrial online auction system, from a Brazilian gas station chain fidelity program



# Results

- 11 candidate services identified
- After analysis, 8 services to be designed
- Heuristics to consolidate candidate services have been valuable, but further research is needed to decrease the subjectivity of the analysis
- A SOAML specification was generated based on the 8 identified services

# Conclusion

- KAOS4Services is a systematic approach to modeling SOA applications using goal-models
- KAOS4Services offers a set of heuristics to identify candidate services from KAOS
- KAOS4Services applied to a case study based on a real-project of an on-line auction system, guiding the identification of a set of SOA services
- Current and future work includes tool support using DSL techniques and exploring the satisfaction of NFRs at the architectural level



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