DO MORE

www.rise.com.br

Towards Feature Traceability in Service-Oriented Product Lines

Tassio Vale

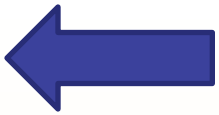
Ph.D. Student

Supervisor: Eduardo Santana de Almeida

Computer Science Department

Federal University of Bahia - Brazil

Agenda

- Research Problem 
- Questions
- Ongoing Work
- Future Work

Research Problem

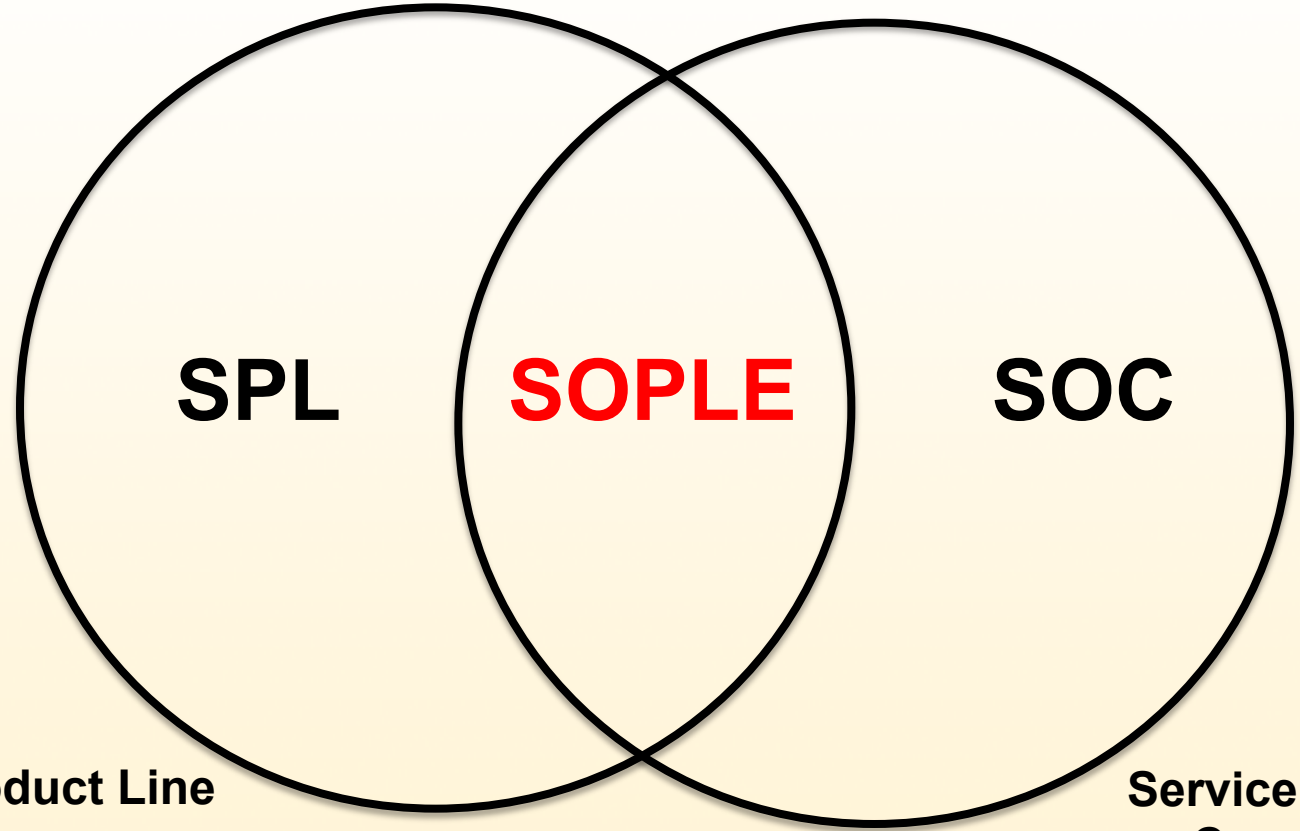
- Experience from Brazilian companies
  - Scenario:
    - Small and medium size companies
    - A trend for adopting agile software development practices
    - Information systems development
      - A set of similar systems
      - Considerable number of variation points
      - Few real configurations (products) compared to the possible ones
    - Few expertise on SPL and SOC in general
    - Single systems developed in different platforms

Research Problem

- Experience from Brazilian companies
  - Companies' needs:
    - Turn single systems into a Service-Oriented Product Line (SOPL)
    - Achieve SPL and SOC benefits
      - Handle interoperability platform issues
      - Perform a systematic variability management
    - In a timely manner
    - Optimized effort

Research Problem

- Service-Oriented Product Line Engineering (SOPLE)



Research Problem

- Automated variability management problem
  - Variability is present in different layers
    adapted from Khan et al. (2011)
    - Service middleware layer (e.g. business processes, workflows)
    - Service consumer layer (e.g. service interface)
    - Service provider layer (e.g. service implementation)
  - Management is not a trivial task
    - Adding/removing/modifying new variation points, impact analysis, etc.

Research Problem

- Automated variability management problem
  - The specification of a feature changes: which services' elements (e.g. processes, interfaces, code) might be affected?
  - A bug is reported in a certain feature: how to find and understand the services' elements related to such feature?
  - Which service consumers might be affected by a feature change?

Questions adapted from Kästner et al. (2008)

Research Goal

Propose an **extractive** approach for

feature **traceability** in

service-oriented product lines

Research Goal

1. Why extractive?

- Extractive approach (Krueger 2001)
- Use existing software systems to extract common and varying source code to build SOPLs
- Only source code as starting point

2. Why feature-orientation?

- Widely adopted notation and the related tools (Berger et al. 2013)
- RiSE Labs industrial partners adopt feature-oriented approaches

Research Goal

3. What is feature traceability in this context?

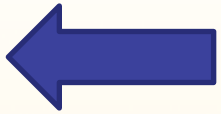
– Mechanism to provide a systematic variability management through feature-orientation in several layers

- Service middleware layer
  - Business process, workflow

- Service consumer layer
  - Service interface

- Service provider layer
  - Implementation

Agenda

- Research Problem
- Questions 
- Ongoing Work
- Future Work

Research Questions

RQ1. Which are the feature-based variability implementation approaches for service-oriented product lines?

- For the service consumer layer
- For the service provider layer

RQ2. How to implement a “feature-traceable” service-oriented product line?

- Which are the existing feature traceability approaches for traditional SPL development?
- How can the identified approaches be adapted to achieve SOPLE feature traceability?

Research Questions

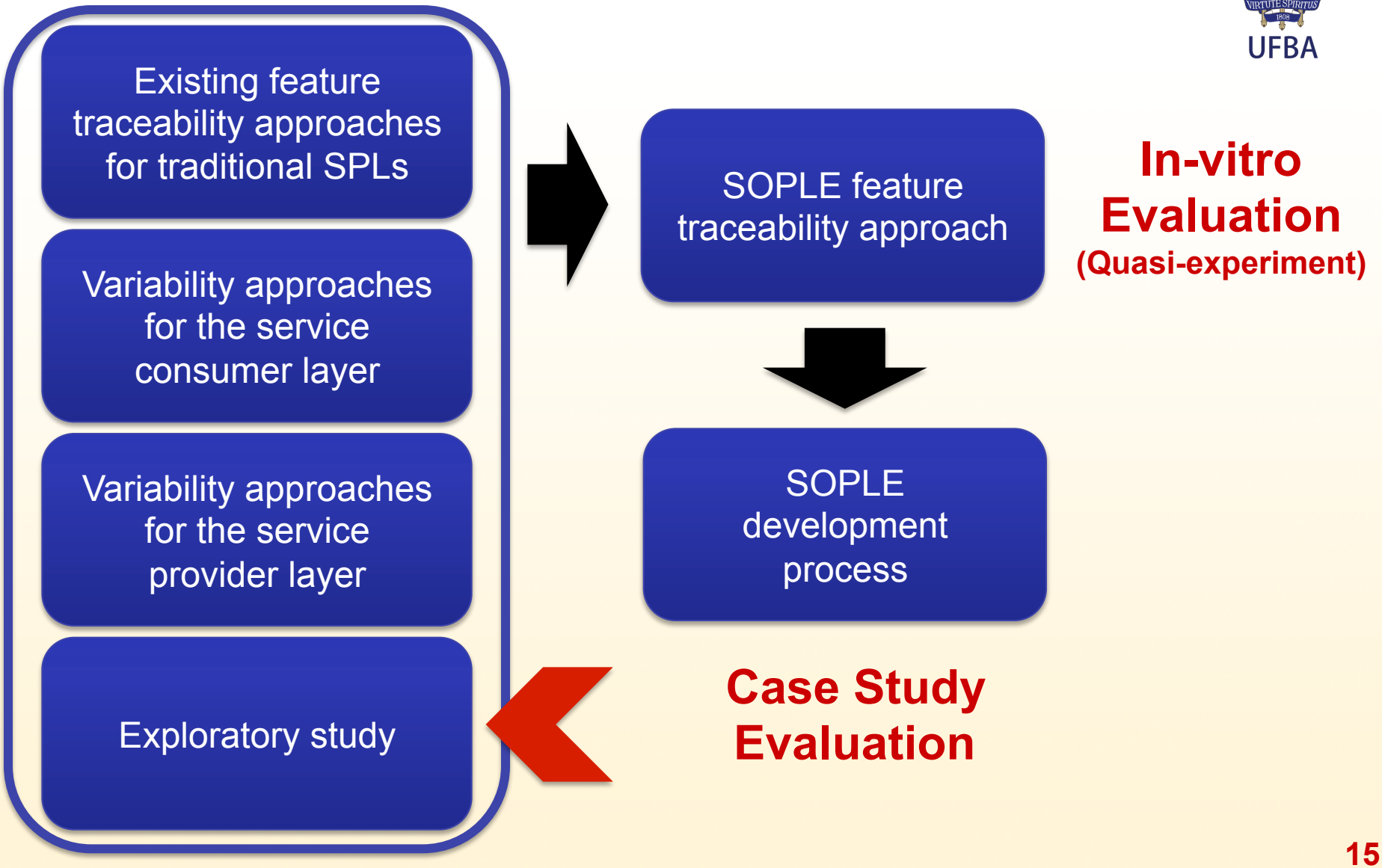
RQ3. How can the companies achieve SOPLE feature traceability?

- Which criteria should be used in the evaluation?

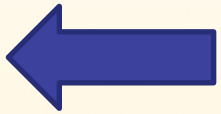
RQ4. How can this proposal be evaluated?

- Which are the suitable criteria to evaluate the proposal?
- Does it should take a qualitative, quantitative or hybrid fashion?

Research Design (Draft)



Agenda

- Research Problem
- Questions
- Ongoing Work 
- Future Work

Ongoing Work

- SOPLE Testbed (warehouse system example)

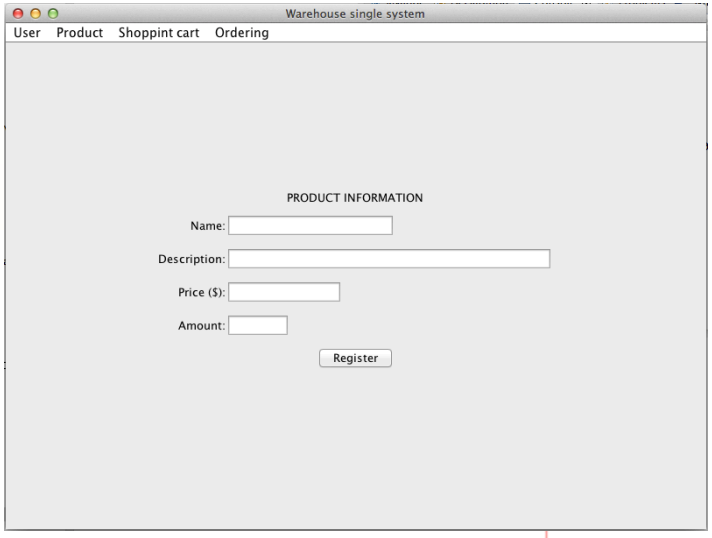
  Adapted from Apel et al. (2008)

  - Traditional single system
  - SOC single system
  - Traditional SPL
  - SOPL
    - Service variability patterns (Khan et al., 2011b)
      - Parameter Pattern
      - Routing Pattern
      - Service Wrapping Pattern
      - Etc…

Considering variability

Ongoing Work

- SOPLE Testbed



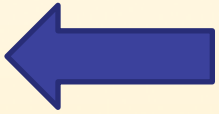

```
 */
@WebService(serviceName = "ShippingService")
public class ShippingService {

    /**
     * Web service operation
     * @param order
     * @return
     */
    @WebMethod(operationName = "calculateShippingValue")
    public double calculateShippingValue(@WebParam(name = "order") Order order) {
        double shippingValue = 0, totalValue = 0;
        Object[] orderDetailsArray = order.getOrderDetailsArray();

        for (Object orderDetailsArray1 : orderDetailsArray) {
            OrderDetail detail = (OrderDetail) orderDetailsArray1;
            //Shipping value per product delivered: $3.65
            shippingValue += detail.getAmount() * 3.65;
            totalValue += shippingValue + detail.getProduct().getPrice() * detail.getAmount();
        }

        order.setTotal(totalValue);
        return shippingValue;
    }
}
```

Agenda

- Research Problem
- Questions
- Ongoing Work
- Future Work 

Future Work

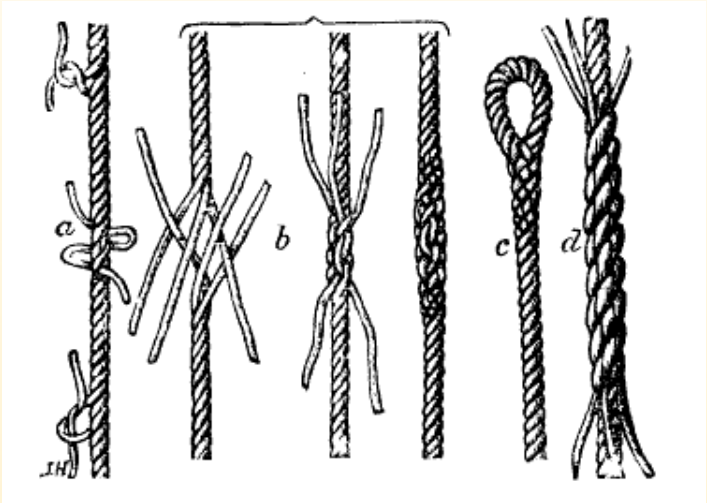
- Catalog the feature-centric variability approaches for the service consumer and provider layers
  - Applying it in the SOPLE Testbed
- Investigate feature traceability approaches in traditional SPL development
- Plan and execute the experiment to validate the feature traceability approach
- Plan and execute the case study with the industrial partner

Wait! Our tool!

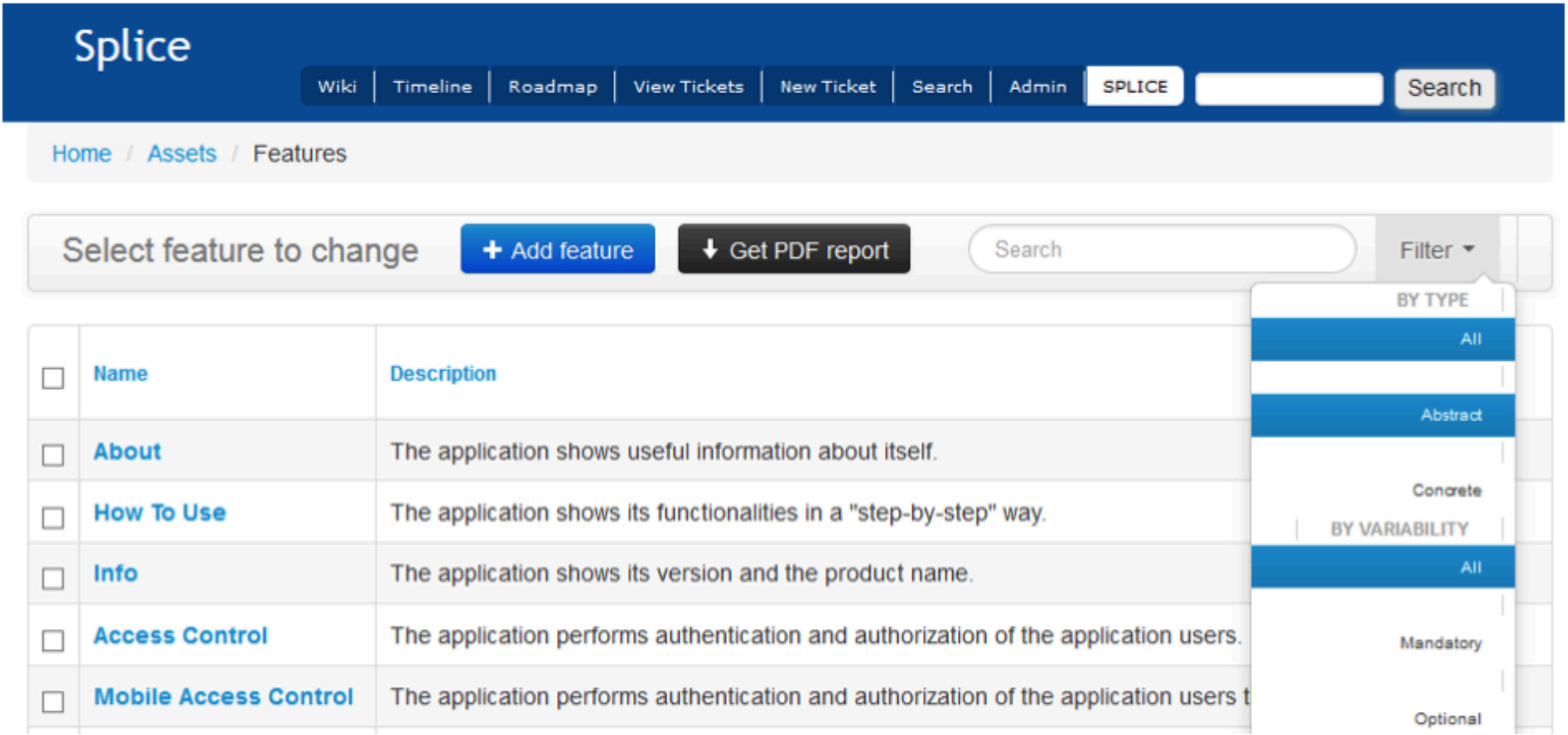
SPLICE

Software Product Line Integrated Construction Environment

"splice" means joining or connecting ropes



Wait! Our tool!



References

[Mohabbati et al. 2013] Bardia Mohabbati, Mohsen Asadi, Dragan Gašević, Marek Hatala, Hausi A. Müller, Combining service-orientation and software product line engineering: A systematic mapping study, Information and Software Technology, Available online 13 June 2013, ISSN 0950-5849.

[Berger et al. 2013] Thorsten Berger, Ralf Rublack, Divya Nair, Joanne M. Atlee, Martin Becker, Krzysztof Czarnecki, and Andrzej Wąsowski. 2013. A survey of variability modeling in industrial practice. In Proceedings of the Seventh International Workshop on Variability Modelling of Software-intensive Systems (VaMoS '13). ACM, New York, NY, USA, , Article 7 , 8 pages.

[Krueger 2001] Charles W. Krueger. 2001. Easing the Transition to Software Mass Customization. In Revised Papers from the 4th International Workshop on Software Product-Family Engineering (PFE '01), Frank van der Linden (Ed.). Springer-Verlag, London, UK, UK, 282-293.

References

[Apel et al. 2008] Sven Apel, Christian Kaestner, and Christian Lengauer. 2008. Research challenges in the tension between features and services. In Proceedings of the 2nd international workshop on Systems development in SOA environments (SDSOA '08). ACM, New York, NY, USA, 53-58.

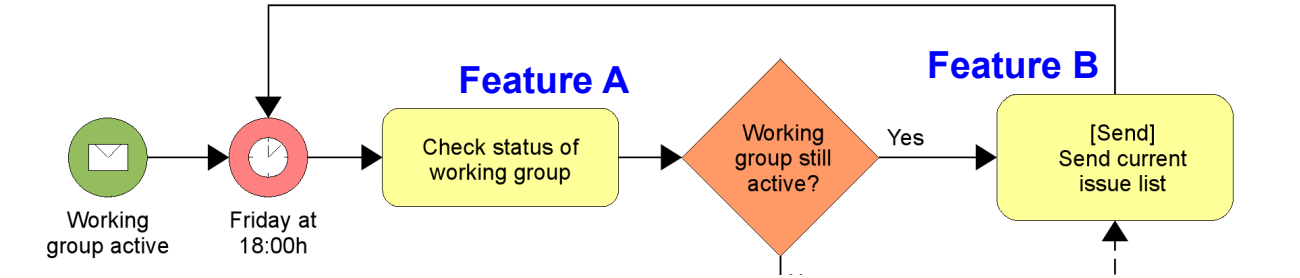
[Kästner et al. 2008] Christian Kästner, Salvador Trujillo , Sven Apel. 2008. Visualizing Software Product Line Variabilities in Source Code. In Proceedingsof the SPLC Workshop on Visualization in Software Product Line Engineering (ViSPLE).

[Khan et al. 2011] Ateeq Khan, Christian Kastner, Veit Koppen, Gunter Saake. 2011. "The Pervasive Nature of Variability in SOC". In Frontiers of Information Technology (FIT), pp.69,74, 19-21. December 2011.

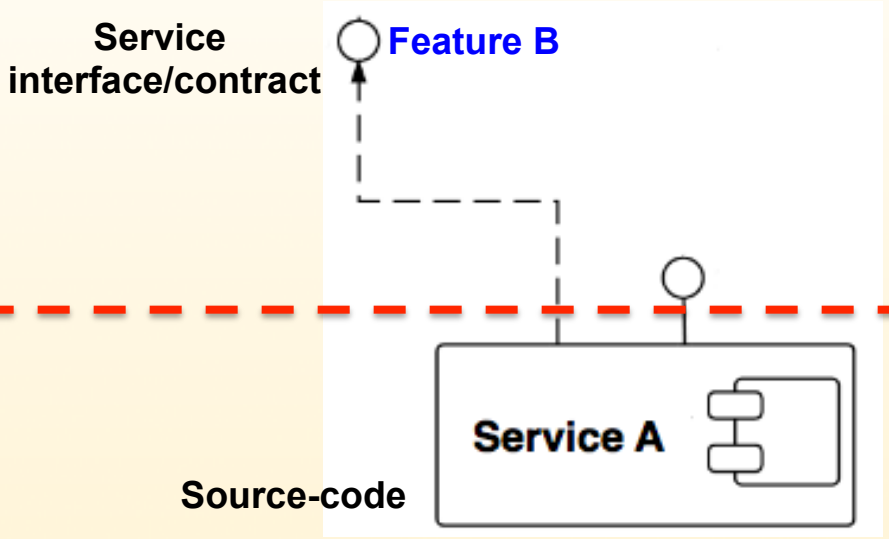
References

[Khan et al. 2011b] Ateeq Khan, Christian Kästner, Veit Köppen, and Gunter Saake. 2011. Service variability patterns. In *Proceedings of the 30th international conference on Advances in conceptual modeling: recent developments and new directions* (ER'11), Olga De Troyer, Claudia Bauzer Medeiros, Roland Billen, Pierre Hallot, and Alkis Simitsis (Eds.). Springer-Verlag, Berlin, Heidelberg, 130-140.

SOPLE feature traceability



Service middleware layer



Service consumer layer

Service provider layer

Evaluating Variability Implementation Mechanisms

Claudia Fritsch, Andreas Lehn, Dr. Thomas Strohm