Ensuring Open and Scalable Interoperability for Smart Information System

Boubou Thiam Niang, Giacomo Kahn, Nawel Amokrane, Yacine Ouzrout, Mustapha Derras and Jannik Laval

Journées nationales du GDR GPL 2022

Context

- Systems and applications are designed independently according to constantly evolving technical and domain-related standards.
- We need systems that are resistant to change, especially for communication purposes to ensure interoperability.
- It is essential to develop scalable interoperability mechanisms.

Scientific questions

- How can connectors be made more flexible and easily scalable by exploiting their commonalities?
- Is it possible to completely decouple the connector from the business code and make it independent?

Keywords

Delta-Oriented Programming, Information System, Interoperability, Model-Driven Engineering, Software configuration, Software Product Line

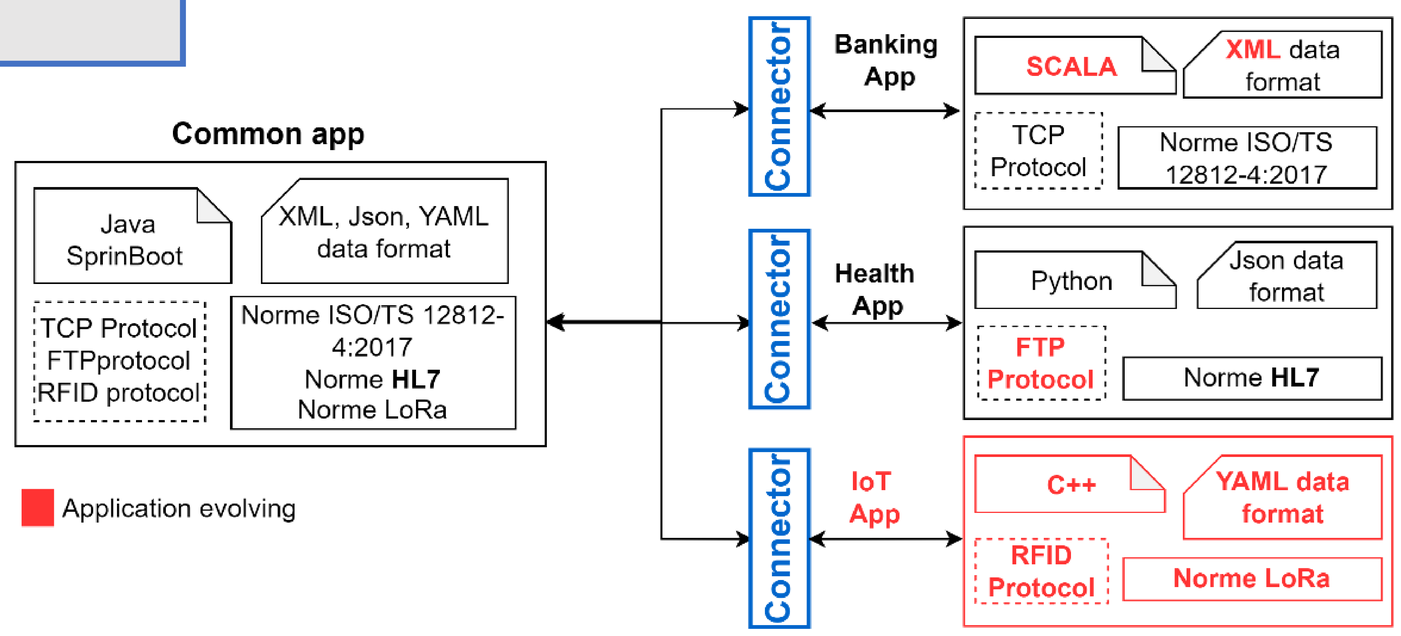
Expected results

Research

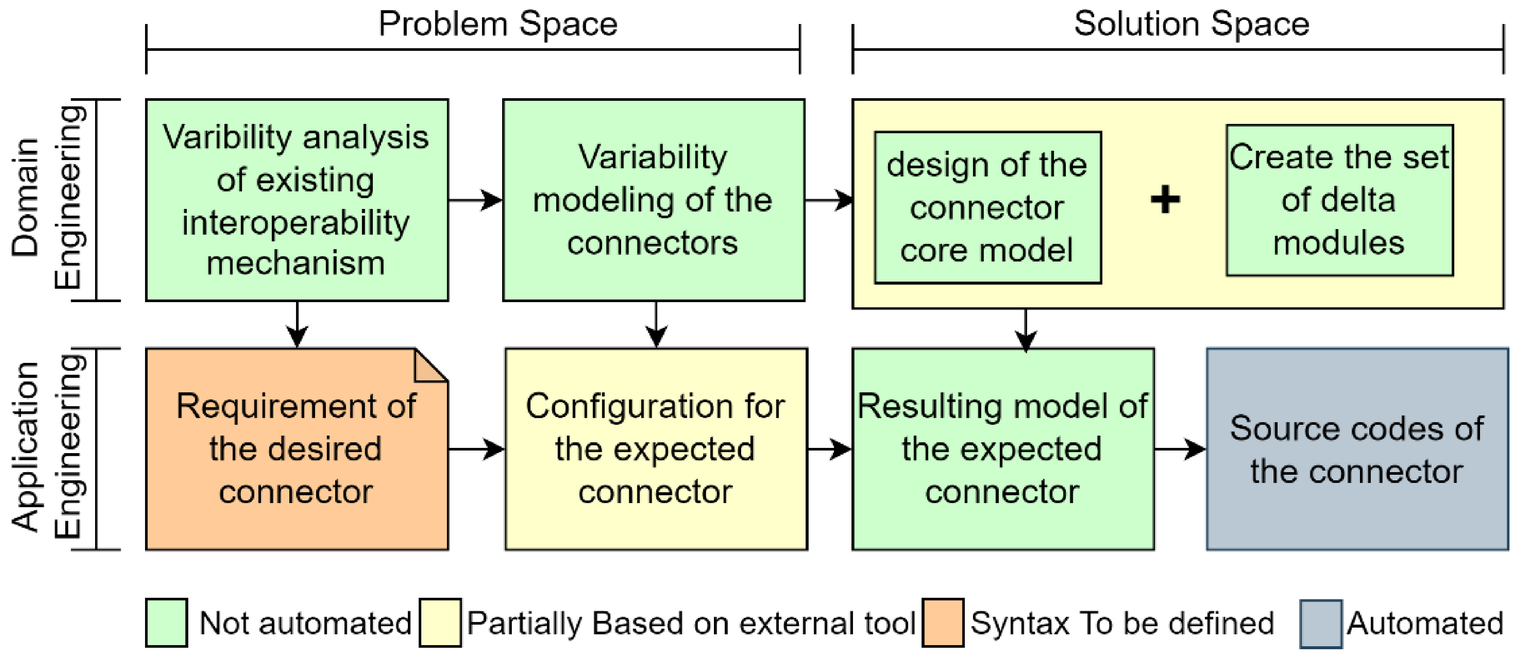
- Automatic generation of interoperability connectors
- Update of existing connectors
- Automatic generation of configuration for low code connectors
- Monitoring the behavior/state of the connectors

Development

- Reduced connector development time
- Increased responsiveness by making it easier to update the existing connectors



Context: Interaction between a common application and three third-party applications. Changes to the third-party applications do not require adaptation of the common application. Only the connectors are updated to establish interoperability.



Approach: automatic generation of interoperability connectors using software product line engineering and model-based delta-oriented programming

Achievement

Domain engineering

- Variability analysis: performed manually from source codes and specifications of industrial connectors and literature.
- Variability modeling: we have proven that the connector is a first-class element of the system, and we propose a functionality model for connectors
- Connector product line: We propose a core model of the connector and prepare a set of delta modules for the implementation of a use case.

Achievement

Application engineering

- From specification to the source code generation: we have proved the feasibility of the approach by generating connectors domain engineering.
- Use case implementation: https://cvs.disp-lab.fr/demo-approach-spl-dop-connector

-B. Niang, G. Kahn, N. Amokrane, Y. Ouzrout, M. Derras and J. Laval - Towards the generation of interoperability Connector using Software Product Line Engineering. Conference en IngénieriE du Logiciel CIEL 2021 - No proceeding.

-B. Niang, G. Kahn, N. Amokrane, Y. Ouzrout, H. Sahli, M. Derras and J. Laval - Automatic Generation of Interoperability Connectors using Software Product Lines Engineering - International Conference on Software Technologies ICSOFT 2022 –Accepted.