

## Case study: corresponding analysis

**Purpose.** We examined if its method fragments in our MLSAC metamodel are consistent and corresponded with real-world scenarios. This would ascertain if the theories, assumptions, and casual relations underlying the metamodel are valid and conform real-world reengineering process scenarios

**Evaluation procedure.** We used the tracing technique [1],[2] to identify the origin of activities that were performed in real-world scenarios to the corresponding ones in MLSAC metamodel method fragments. This indicates the extent to which the semantic of these scenarios are preserved by MLSAC. That is, method fragments in MLSAC, as the source model positioned at M2-level, are instantiated to express the activities that were defined in real-world reengineering processes, as the target model positioned at M1-level, which is a vertical model transformation according to the MOF framework. As each scenario has its own scope and focus, not all of MLSAC method fragments were required to use to represent the target reengineering process model. We thoroughly reviewed the available documents of real-world migration scenarios and attested how their activities can be derived from appropriate MLSAC's method fragments. In this thematic analysis, we used some leading questions to identify activities in each scenario to compare with related ones MLSAC, for example, deliverables were generated in the scenarios.

### NovaTec case: migrating a legacy application data layer to cloud

At NovaTec Holding GmbH[3], [4] in Germany, Nova Enterprise Resource Management (NovaERM) had been developed in Java to automate and support company-internal business processes such as the hiring process. The application includes several components representing a partner, e.g., employees, job candidates, and contracts. All these components had been realized using Web services. NovaTec was getting large in scale and hence the company decided to move some data components to both its internal private cloud and public Amazon services, i.e. migration type III [5]. At NovaTec, the reengineering process started with formulating an overall migration strategy that considers properties such as live/non-live, complete/partial, and permanent/temporary migration. Developers performed an activity named *Select migration scenario*. This is equally represented by the method fragment *Define plan* in the *Plan* phase of MLSAC. Furthermore, the developers performed an activity named *Describe desired cloud data hosting solution* to identify functional and non-functional requirements regarding a target cloud data storage. MLSAC represents this activity via *Choose cloud service platform* defined in the *Design* phase. Within NovaTec, *Select cloud data store or data service* ensures a cloud database solution is chosen with a focus on the mapping properties of cloud database solution as identified in the previous activity. The choice of a cloud service may raise some incompatibilities with the legacy application database. In *Identify patterns to solve potential migration conflicts*, NovaTec's developers utilized a catalogue of data migration patterns to resolve these incompatibilities. Since the data layer migration to the cloud may influence business logic layers, the developers performed code refactoring for data access and business logic layers. Both activities *Select cloud data store or data service* and *Identify patterns to solve potential migration conflicts* are, respectively, expressed by *choose cloud service platform* and *Identify incompatibilities* in *Design* phase of MLSAC. Figure 1 shows the MLSAC conformance to NovaTec's reengineering process activities.

**Revision to MLSAC.** At NovaTec, *Migrate data* deals with configuring network connections to the source and target data stores and credentials. This activity was not explicitly included as a method fragment in MLSAC. To enable MLSAC to directly describe application configuration update, we added *Configure network* task method fragment as a part of *Configure environment* under *Maintain* phase. This allows a method engineer to express the same information expressed by activities of network configuration in NovaTec by *Configure network* in MLSAC.

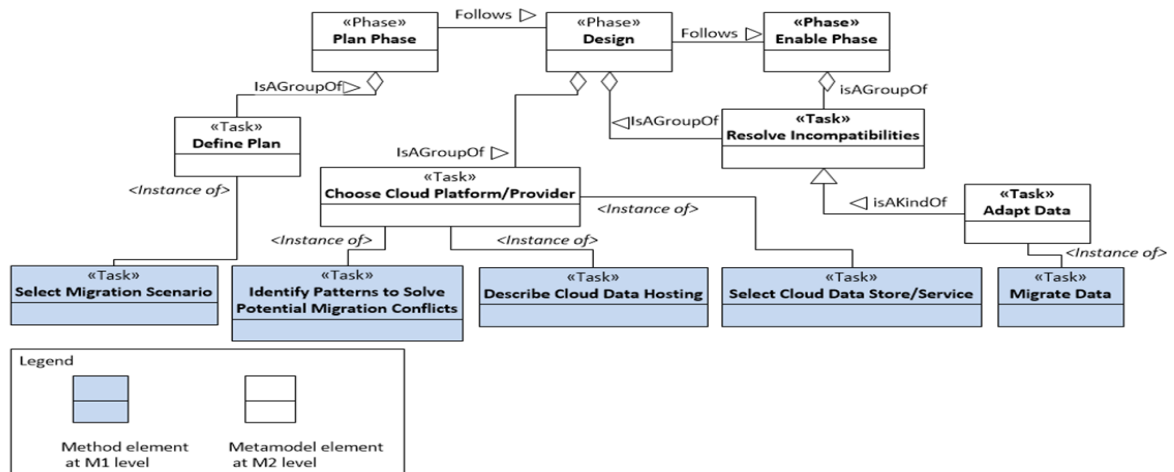


Fig 1. Conformance of NovaTec reengineering process method fragments at M1-level to the MLSAC metamodel at M2-level

## References

- [1] M. Fahmideh, F. Daneshgar, F. Rabhi, and G. Beydon, "A generic cloud migration process model," *European Journal of Information Systems*, 2019.
- [2] M. Antkiewicz, K. Czarnecki, and M. Stephan, "Engineering of framework-specific modeling languages," *Software Engineering, IEEE Transactions on*, vol. 35, no. 6, pp. 795-824, 2009.
- [3] Novatec, "https://www.novatec-gmbh.de/en/consulting/ (last access 2020)," p. 28.
- [4] V. A. S. Strauch, D. Karastoyanova, F. Leymann, "Migrating Enterprise Applications to the Cloud: Methodology and Evaluation," *International Journal of Big Data Intelligence*, 2014. [Online]. Available: [www.inderscience.com/ijbdi](http://www.inderscience.com/ijbdi). Perpetual Innovation Media Pvt. Ltd.
- [5] M. Fahmideh, F. Daneshgar, G. Low, and G. Beydoun, "Cloud migration process—A survey, evaluation framework, and open challenges," *Journal of Systems and Software*, vol. 120, pp. 31-69, 2016.