

A Goal-Based Method to Support the Process of Making Data FAIR: From Planning to Conceptual Modelling

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Abstract

The FAIR principles [1] provide guidance for improving the Findability, Accessibility, Interoperability and Reusability of data and metadata. Workflows for the process of making data FAIR ('FAIRification') [2] describe how the principles can be realized through a set of steps, such as identification of objectives, (meta)data conceptual modelling and validation.

As a multidisciplinary activity, FAIRification relies on clear understanding among the different expertise involved. However, FAIRification workflows currently do not specify approaches to meet this need. With this in mind, we are designing a method that uses 'goal-oriented modelling' to support FAIRification, based on the assumption that goals facilitate planning and communication [3]. Goal-oriented models focus on the use of goals as descriptions of desired situations, which are realized by tasks (which can use resources), qualified by qualities, and assigned to stakeholders.

Our method adapts existing goal-based modelling approaches (e.g., iStar, KAOS) to support two FAIRification steps. First, in the 'identify FAIRification objective' step, the motivation(s) for the need for FAIR data are identified. Here, goal languages will be used to create a set of FAIRification goal models. Secondly, in the 'semantic modelling of (meta)data' step, (meta)concepts about data are defined with existing terms from widely used ontologies and standards. Here, we propose that three sub-activities are performed: (i) identification of scope; (ii) goal modelling; and (iii) conceptual modelling. In (i), domain concepts are extracted from the FAIRification goal models. In (ii), the concepts serve as a basis for domain goal modelling, producing a second set of goal models. In (iii), the new goal models are used to guide the (meta)data conceptual modelling. The difference between the two sets of goal models is the context: while the first set focuses on FAIRification objectives and aid the process planning, the second explains why the concepts are needed in the data domain.

For the 'conceptual modelling' activity, the method describes best practices and procedures for conceptual modelling, which are adapted from "Goal-Based Ontology Engineering" methods [4,


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5]. Guidelines are based on the use of goal models to support the grounding of domain elements into foundational ontologies concepts.

In essence, it is expected that the goal-based approach will improve the quality of FAIRification, based on the clearer and easier communication of constraints and intentions among everyone involved in the project. We expect a positive effect on the products of FAIRification and the efficiency and reproducibility of the process. The approach can enhance the interoperability of FAIRified data, based on the conceptual modelling good practices that will follow it. We are currently studying what solutions can compose the approach, considering also the feasibility of similar paradigms (e.g., value modelling [6]), as we need to find balance between added functionality and complexity. As a next step, we will finalize the design of the method and run a set of proofs-of-concept to validate and adjust it.

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