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Semantic data integration from Multi Linked Model Framework

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Abstract: Model integration is becoming increasingly important due to the requirements for multi-scale and multi-objective assessment and decision making. Moreover, instead of incorporating all complex related information system models that are relevant for different related aspects into one super-model, a multi linked model framework has been proposed to extract data and output from multiple linked models into the coherent data warehouse, which respects the interdependency of data from different model as well as additional knowledge already contained in its existing data cubes.

In this paper, first the multi linked model framework is defined in a very formal manner. The mathematical abstract specification provides the basis for handling data exchange among various linked models as well as data from those models integrated into a data warehouse. In this context, an ETL (extract-transform-load) process has been specified to integrate data from linked models. A new feature of our approach in comparison with other ETL processes is that our transformations also require input from the data warehouse, i.e. exchanging data from linked models with the data warehouse. Hereafter, the data warehouse is developed in term of multidimensional database. While each model may keep very detailed and intermediate ('raw') data and results, the data warehouse only contains integrated data that are appropriate for the task at hand.

As a proof of concept, the multi linked model framework is used to develop a common knowledge pool in term of data warehouse on the representation of socio-economic heterogeneity, and strengthen the information flows among multi linked models, e.g. population projections, energy-economic, and air pollution integrated assessment models etc., which have been developed at International Institute for Applied Systems Analysis (IIASA).

Keywords: Linked Models; IIASA; ETL; Data warehouse; Data Integration