Building the 'Uncertainty Enabled Model Web'– lessons learned

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The creation of the Uncertainty Enabled Model Web was the aim of the UncertWeb project, which finished in January 2013. In this work we consider the outcomes of the UncertWeb project, critically assessing both the successes and identifying areas where further work is required. In particular we focus on three main areas:

1. How to expose models on the web. We review the Web Processing Service specification, and suggest how this might be improved using annotations, how to simplify the service interface using a SOAP/WSDL approach and identify the challenges of deploying models on the web in practice. We consider how to best facilitate the deployment of models in a web setting, and the implications of this for both model developers and web tool support needed.

2. Information models for the model web. We review the Observations and Measurements, GML and NetCDF extensions / profiles developed in the project, and provide guidance on when the different profiles are appropriate. We consider UncertML as an encoding for uncertainty and highlight possible improvements. We suggest where there are currently gaps in the existing information models and what is needed to improve the situation.

3. Tool support for web based model services. A key outcome of the UncertWeb project was the range of tools created, including tools for visualisation of uncertain geospatial data, expert elicitation of uncertainty and sensitivity analysis, emulation and probabilistic model validation. We review the tools, considering their strengths and limitations.

We also consider the architectural approach adopted in UncertWeb, which is based on a brokering approach using mediators that theoretically enable us to integrate a number of model exposures and encodings in a single unified system based on Open Geospatial Consortium standards at its core. We consider the "composition as a service" approach to be architecturally sound, and provide recommendations for future model web initiatives to consider. In particular we identify scalability, parallelisation, security and ease of use as key drivers for further developments. We also consider the particular challenges when managing uncertainty in such settings, including obtaining reliable uncertainty estimates, validation of probabilistic models and computational issues.

Finally we also consider the practical aspects of building the uncertainty enabled model web, with some guidance to funding such initiatives, and practical recommendations identifying where we believe the best return on investment would be.