July 8, 2019

Bridging PostDoc Digital Earth

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Robert Schima has been active for several years in environmental research, in particular in the field of mobile environmental monitoring and application-specific data acquisition. His interest lies in the mapping of a holistic process chain starting from measurement implementation to the information provision for decision making. He holds a PhD in Ocean Engineering from the University of Rostock.

Project Summary

The conservation and long-term protection of our environment require a better understanding of ecosystems through cross-domain integration of data and knowledge from different disciplines. Current methods used in applied environmental research and scientific surveys are not sufficient to address the heterogeneity and dynamics of ecosystems appropriately. To this end, an urgent need is seen in introducing new technology and methods for a service-oriented and holistic in-situ monitoring with increased spatio-temporal resolution and cutting edge functionalities. Recent developments in the field of digital information processing, the internet of things (IoT) or the the analysis of complex datasets are opening up new possibilities for data-based environmental research. This rapidly developing fields are calling for a disruptive paradigm shift towards a service-oriented earth observation (smart monitoring). To this end, future earth observation approaches will have a much stronger coupling between the modeling and the data acquisition. The development, implementation and evaluation of such an interface is one of the overall objectives of this project. To achieve this goal, a basic data model and a special hardware architecture must be defined. A realistic application scenario will be used to demonstrate the advantages of developing a monitoring strategy that is no longer based on static data collection but on the coupling of modeling and empiricism using integrated sensors for an advanced modeling.

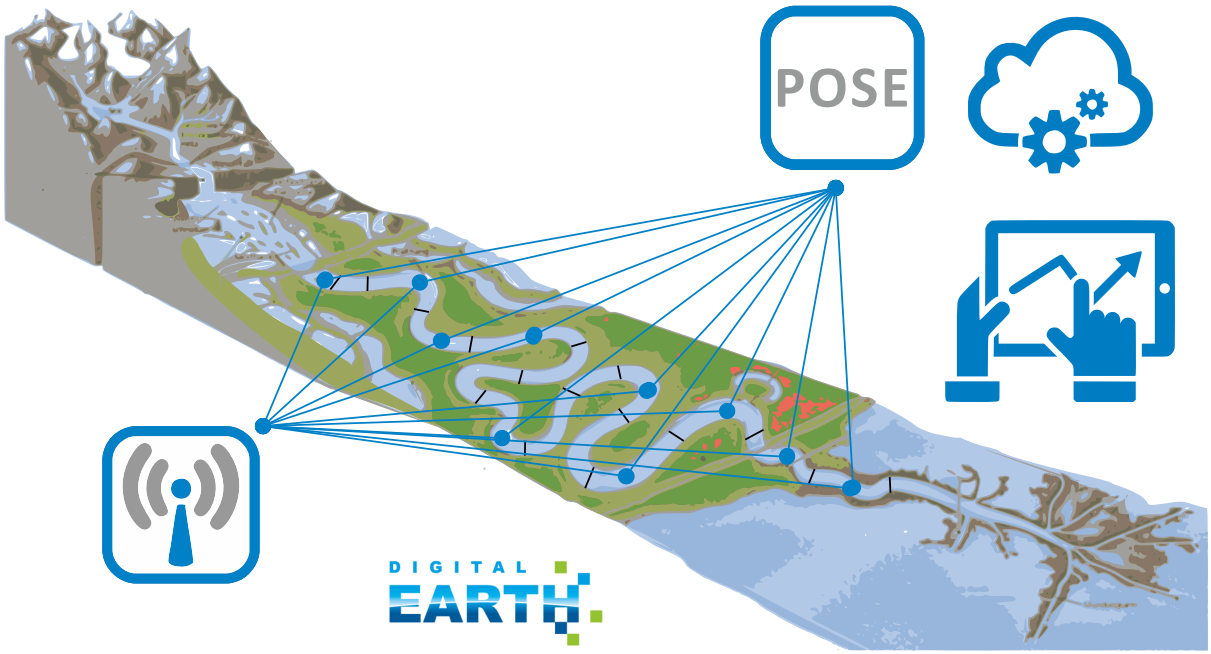

Figure 1: Simple model assumption using a reactive streamline model. Each river section represents a unique sub-system due to its length, aquatic conditions or the adjacent land use may pose special requirements towards the sampling or measurement procedure. POSE stands for predictive object specific exposure and serves as a underlaying sampling paradigm for a service-oriented data acquisition. The following expression can be formulated in order to provide a spatio-temporal sensitive exposure investigation of any object of interest:

$$\mathrm{POSE} = \int_{x_0}^{x_i} \int_{y_0}^{y_i} \int_{z_0}^{z_i} \int_{t_0}^{t_i} c(x, y, z, t)\ \mathrm{d}x\ \mathrm{d}y\ \mathrm{d}z\ \mathrm{d}t \tag{1}$$