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A blueprint for Environmental Computing Applications

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Environmental Computing can be defined as the collaborative and multi-disciplinary approach to using computational sciences and technologies to support integration of environmental models capturing different aspects of the phenomena being studied. The analysis of the modelling results is often revealing previously unknown dependencies between the models, which is one of the ways it can provide a solid basis for further research and decision making. As such, environmental computing is the bleeding edge research area that bridges the gap between computer sciences and a multitude of application domains. The key technical challenge is to integrate heterogeneous models into flexible, cooperating wholes and providing application scientists with an easy access to (and use of) infrastructure components.

This paper focuses on the development of an e-Science infrastructure to provide end-to-end services (models, data, and both an easy to use workflow manager and graphical user interface) for environmental computing by exploiting HPC, Grid and Cloud resources. Best practices in adopting environmental computing applications to the newly formed e-Science infrastructure will be presented, as well as a blueprint of a flexible, extensible, and interoperable ICT infrastructure that supports composition of heterogeneous environmental computing workflows, while hiding low level complexity at the same time. This particular work will focus on the underlying ICT architecture and its core components, for example a central data store and (binary) repository, that will be described in more detail. Additionally, the generic approaches that allow running legacy codes on resources of different types (i.e. varying CPU architectures or different types of services, such as Clouds, Grids, HPC clusters, etc.) presented and illustrated by concrete case studies based on the experiences and lessons learned related to the DRIHM project.

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