# Rosemary: A Flexible Programming Framework to Build Science Gateways 

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Abstract

The lessons learned during six years of experience in design, development, and operation of four Science Gateway (SG) generations motivated us to develop yet another generation of platforms coined "Rosemary". At the core of Rosemary the three fundamental SG functions, namely related to data, computing, and collaboration management, are integrated together. Our earlier studies showed that complete integration between these functions is a feature that is usually overlooked in the existing SG platforms. Rosemary provides a generic data model, RESTful API, and responsive UI that can be customized through programming to build customized SGs. Moreover, Rosemary is designed and implemented to be flexible to changes in e-Infrastructures and user community requirements. The software frameworks, tools and libraries employed in the realization of Rosemary streamline the development, deployment and operation of customized SGs for the users needs. The code of Rosemary is available at https://github.com/AMCeScience/Rosemary-Vanilla. So far the platform has been used to implement prototypes of three SGs for high-throughput analysis and management of neuroimaging data, sharing of data in in-vitro fertilization research, and provenance tracking of DNA sequencing data. This paper presents the design considerations, data model, and system architecture of Rosemary and highlights some of the features that are intrinsic to its design and implementation with examples from the three prototypes.

