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## Foreword

This collection of articles on ‘Workflows for e-Science’ is very timely and important. Increasingly, to attack the next generation of scientific problems, multidisciplinary and distributed teams of scientists need to collaborate to make progress on these new ‘Grand Challenges’. Scientists now need to access and exploit computational resources and databases that are geographically distributed through the use of high speed networks. ‘Virtual Organizations’ or ‘VOs’ must be established that span multiple administrative domains and/or institutions and which can provide appropriate authentication and authorization services and access controls to collaborating members. Some of these VOs may only have a fleeting existence but the lifetime of others may run into many years. The Grid community is attempting to develop both standards and middleware to enable both scientists and industry to build such VOs routinely and robustly.

This, of course, has been the goal of research in distributed computing for many years; but now these technologies come with a new twist – service orientation. By specifying resources in terms of a service description, rather than allowing direct access to the resources, the IT industry believes that such an approach results in the construction of more robust distributed systems. The industry has therefore united around web services as the standard technology to implement such service oriented architectures and to ensure interoperability between different vendor systems.

The Grid community is also now uniting in developing ‘Web Service Grids’ based on an underlying web service infrastructure. In addition to the security services of VOs, scientists require services that allow them to run jobs on remote computers and to access and query databases remotely. As these data analysis operations become more and more complex and repetitive, there is a need to capture and coordinate the orchestrated operations that access the resources of a VO or Grid.

Scientific workflows have therefore emerged and been adapted from the business world as a means to formalize and structure the data analysis and computations on the distributed resources. Such scientific workflows in fact

now encapsulate scientific intellectual property and enable the sharing of knowledge between researchers.

This is the first book to provide a comprehensive survey of the present state of the art and include descriptions of all the major scientific workflow systems. From these accounts it is clear that there is much overlap in the functionality of the different systems and it is to be hoped that this collection will be a first step on the road to the consolidation of key workflow services. As such this book may well be a landmark collection heralding a step change in the level of abstraction for scientific workflows.

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Workflows for e-Science

Scientific Workflows for Grids

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