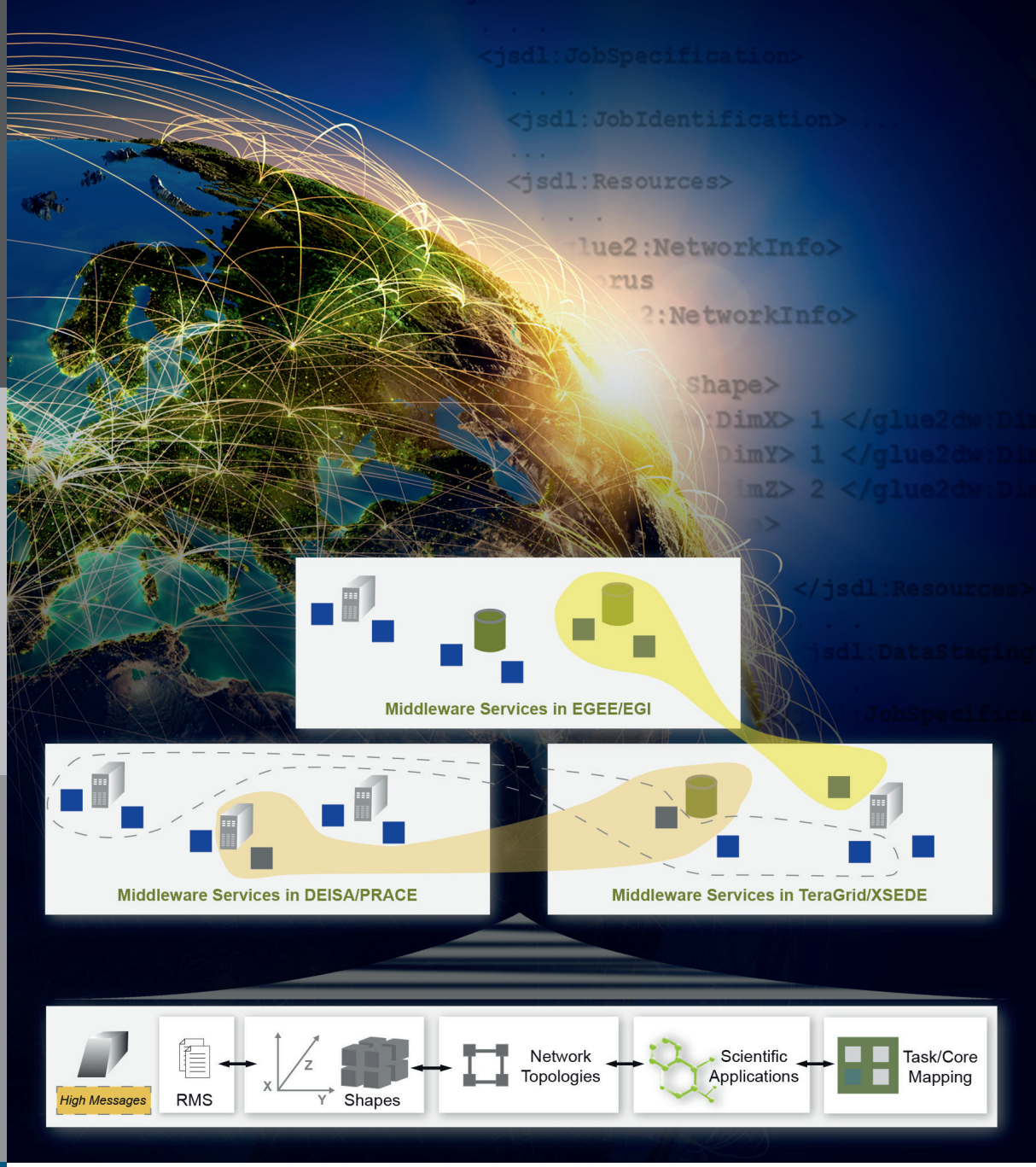

Design and Applications of an Interoperability Reference Model for Production e-Science Infrastructures

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Schriften des Forschungszentrums Jülich

IAS Series Volume 16

ISSN 1868-8489 ISBN 978-3-89336-861-7

Contents

Computational simulations and thus scientific computing is the third pillar alongside theory and experiment in todays science. The term e-Science evolved as a new research field that focuses on collaboration in key areas of science using next generation data and computing infrastructures (i.e. e-Science infrastructures) to extend the potential of scientific computing. During the past decade, significant international and broader interdisciplinary research is increasingly carried out by global collaborations that often share resources within a single production e-Science infrastructure. More recently, increasing complexity of e-Science applications that embrace multiple physical models (i.e. multi-physics) and consider a larger range of scales (i.e. multi-scale) is creating a steadily growing demand for world-wide interoperable infrastructures that allow for new innovative types of e-Science by jointly using different kinds of e-Science infrastructures. But interoperable e-Science infrastructures are still not seamlessly provided today and this thesis argues that this is due to the absence of a production-oriented e-Science infrastructure reference model. The goal of this thesis is thus to present an infrastructure interoperability reference model (IIRM) design tailored to production needs and that represents a trimmed down version of the Open Grid Service Architecture (OGSA) in terms of functionality and complexity, while on the other hand being more specifically useful for production and thus easier to implement. This reference model is underpinned with lessons learned and numerous experiences gained from production e-Science application needs through accompanying academic case studies of the bio-informatics, e-Health, and fusion domain that all seek to achieve research advances by using interoperable e-Science infrastructures on a daily basis. Complementary to this model, a seven segment-based process towards sustained infrastructure interoperability addresses important related issues like harmonized operations, cooperation, standardization as well as common policies and joint development roadmaps.

This publication was edited at the Jülich Supercomputing Centre (JSC) which is an integral part of the Institute for Advanced Simulation (IAS). The IAS combines the Jülich simulation sciences and the supercomputer facility in one organizational unit. It includes those parts of the scientific institutes at Forschungszentrum Jülich which use simulation on supercomputers as their main research methodology.

IAS Series
Volume 16
ISBN 978-3-89336-861-7

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