

Preface

In the last decade Cloud computing gained significant attention from both industrial and scientific communities. Despite the worldwide efforts to make it a utility service for anyone, the concept implementation still require specific IT skills. In this context, the book aims to present the approach undertaken to simplify the Cloud service usage process by the team of the European project named MODAClouds. The targeted audience are the developers and operators of the Cloud aware applications. More precisely, the undertaken approach is supporting the simplification of the cycle development-operation in multi-Cloud environments with a special emphasis on ensuring the quality of services.

This book covers a large number of topics related to development and operation in multi-Clouds and was designed to offer to its readers ideas on how to address the Development and Operation—*DevOps*—problems encountered when working with Cloud services. It is structured as follows:

- Chapter 1 introduces the problems faced by MODAClouds and provides a general overview of its approach.
- Chapters 2–4 are dedicated to the development (*Dev*) of multi-Cloud applications. In particular, Chap. 2 focuses on the approach for selecting a set of Cloud service offers by taking risks and costs into account, Chap. 3 focuses on the metamodels and on the tool supporting our model-driven development approach, and Chap. 4 on the way we support Quality of Service assessment as well as the management of Service Level Agreements.
- Chapters 5–8 are dedicated to the operation (*Ops*) of applications in a multi-Cloud context. More specifically, Chaps. 5 and 6 shortly present our multi-Cloud monitoring and load balancing mechanisms, respectively. Chapter 7 focuses on the way we support data migration and synchronization between different NoSQL Databases as a Service (DaaS). Finally, Chap. 8 focuses on the *supporting services* that enable the proper management of the MODAClouds runtime platform.
- Chapters 9–11 describe those features that enable integration between development and operation into a single *DevOps* framework. These include the usage

of the models@runtime paradigm for continuous design, deployment, operation and self-adaptation (Chap. 9), the way monitoring data from the operational environment are used at design time to support optimization of multi-Clouds applications (Chap. 10), and the best practices and design patterns we have identified to enable application DevOps in a multi-Cloud context (Chap. 11).

- Chapters 12–15 are dedicated to the presentation of the industrial cases we have adopted to evaluate and put in practice the MODAClouds approach. These cases concern different application domains and business needs. The first case is concerned with the development of collaborative Cloud-based features for a pre-existing, desktop-based UML case tool (Chap. 12), the second with a business process supporting system to be cloudified and optimized (Chap. 13), the third with an application to support care of patients with mental problems (Chap. 14). Finally, the fourth case describes how, from a research idea developed in the project, our partner infrastructure software provider has developed a specific technology that extends the features it offers to its users (Chap. 15). Three out of the four presented cases are now commercialized by the respective companies.
- Finally, Chap. 16 draws some conclusions and identify future research trends in the context of support to multi-Cloud applications development.

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Milan, Italy
 Datchet, UK
 Timisoara, Romania
 Oslo, Norway
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Elisabetta Di Nitto
 Peter Matthews
 Dana Petcu
 Arnor Solberg

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The MODAClouds Approach

Di Nitto, E.; Matthews, P.; Petcu, D.; Solberg, A. (Eds.)

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