

Sven Helmer
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Reasoning in Event-Based Distributed Systems

Sven Helmer, Alexandra Poulouvasilis, and Fatos Xhafa

Reasoning in Event-Based Distributed Systems

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Fatos Xhafa dedicates this book to the memory of his father.

Preface

Event-based distributed systems are playing an ever increasing role in areas such as enterprise management, information dissemination, finance, environmental monitoring and geo-spatial systems. Event-based processing originated with the introduction of Event-Condition-Action (ECA) rules to database systems in the 1980s. Since then, the use of ECA rules and the reactive computing paradigm has spread widely into middleware, stream processing, wireless sensor networks and radio frequency identification (RFID).

The wide propagation of event-based processing spanning numerous application domains explains why many different distributed architectures are being used for event-based systems, including publish-subscribe, Peer-to-Peer, Grid, event-stream processing and message queues. As such systems become more complex and more pervasive, intelligent techniques are needed for detecting and processing events that are of interest to users from the possibly huge volumes of low-level event occurrences. Complex Event Processing aims to correlate simple event occurrences into more meaningful derived events and is the topic of several chapters of this book. Other research issues include detection of new or unusual events, optimisation of event processing, event consumption policies, privacy and security, system dynamicity and responsiveness, and quality of service guarantees.

Intelligent and logic-based approaches provide sound foundations for addressing many of the research challenges, and this book covers a broad range of recent advances contributed by leading experts in the field. Reasoning about the properties and behaviour of event-based distributed systems presents significant challenges beyond those of centralised systems due to their greater complexity and dynamicity, and their temporal, spatial and context-aware characteristics. Nevertheless, this also opens up opportunities for building highly scalable and adaptable systems. The fundamental concepts presented in this book are illustrated with examples drawn from applications in areas such as supply chain management, environmental and traffic monitoring, patient monitoring, data centre and network monitoring, fraud detection, smart homes, role-based access control, spacecraft and satellite data

monitoring, online collaboration in virtual organisations, monitoring market data, and monitoring business processes.

The target audience of the book are senior year undergraduate and graduate students, as well as instructors, researchers and industry professionals. The book covers theoretical approaches, architectural frameworks, system implementations and applications. The first three chapters provide foundational material which gives the necessary background for reading the other chapters for those who are unfamiliar with the subject. The chapters have been contributed by many leading experts in the field and we hope that the book will become a useful reference and resource for those who are already working in this exciting and rapidly evolving field or are moving into it.

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Fatos Xhafa's work was undertaken during his stay at Birkbeck, University of London, UK (on leave from Technical University of Catalonia, Spain) and was supported by the General Secretariat of Universities of the Ministry of Education, Spain.

December 2010

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Contents

| | |
|---|-----|
| Introduction to Reasoning in Event-Based Distributed Systems | 1 |
| <i>Sven Helmer, Alex Poulouvassilis, Fatos Xhafa</i> | |
| Distributed Architectures for Event-Based Systems | 11 |
| <i>Valentin Cristea, Florin Pop, Ciprian Dobre, Alexandru Costan</i> | |
| A CEP Babelfish: Languages for Complex Event Processing and Querying Surveyed | 47 |
| <i>Michael Eckert, François Bry, Simon Brodt, Olga Poppe, Steffen Hausmann</i> | |
| Two Semantics for CEP, no Double Talk: Complex Event Relational Algebra (CERA) and Its Application to XChange^{EQ} | 71 |
| <i>Michael Eckert, François Bry, Simon Brodt, Olga Poppe, Steffen Hausmann</i> | |
| ETALIS: Rule-Based Reasoning in Event Processing | 99 |
| <i>Darko Anicic, Paul Fodor, Sebastian Rudolph, Roland Stühmer, Nenad Stojanovic, Rudi Studer</i> | |
| GINSENG Data Processing Framework | 125 |
| <i>Zbigniew Jerzak, Anja Klein, Gregor Hackenbroich</i> | |
| Security Policy and Information Sharing in Distributed Event-Based Systems | 151 |
| <i>Brian Shand, Peter Pietzuch, Ioannis Papagiannis, Ken Moody, Matteo Migliavacca, David M. Eysers, Jean Bacon</i> | |
| Generalization of Events and Rules to Support Advanced Applications | 173 |
| <i>Raman Adaikkalavan, Sharma Chakravarthy</i> | |