Sven Helmer, Alexandra Poulouvassilis, and Fatos Xhafa

Reasoning in Event-Based Distributed Systems
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Reasoning in Event-Based Distributed Systems
Fatos Xhafa dedicates this book to the memory of his father.
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 founda-
tional 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 be 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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