

# ENERGY-EFFICIENT DISTRIBUTED COMPUTING SYSTEMS

Edited by

Albert Y. Zomaya • Young Choon Lee



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Albert Y. Zomaya  
Young Choon Lee



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# ENERGY-EFFICIENT DISTRIBUTED COMPUTING SYSTEMS

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*To our families for their help, support, and patience.*

# PREFACE

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The scope of energy-efficient computing is not limited to main computing components (e.g., processors, storage devices, and visualization facilities), but it can expand to a much larger range of resources associated with computing facilities, including auxiliary equipment, water used for cooling, and even physical and floor space that these resources occupy. Energy consumption in computing facilities raises various monetary, environmental, and system performance concerns.

Recent advances in hardware technologies have improved the energy consumption issue to a certain degree. However, it still remains a serious concern for energy-efficient computing because the amount of energy consumed by computing and auxiliary hardware resources is affected substantially by their usage patterns. In other words, resource underutilization or overloading incurs a higher volume of energy consumption when compared with efficiently utilized resources. This calls for the development of various software energy-saving techniques and new algorithms that are more energy efficient.

This book, *Energy-Efficient Distributed Computing Systems*, seeks to provide an opportunity for researchers to explore different energy consumption issues and their impact on the design of new computing systems. The book is quite timely since the field of distributed computing as a whole is undergoing many changes. Vast literature exists today on such energy consumption paradigms and frameworks and their implications for a wide range of distributed platforms.

The book is intended to be a virtual roundtable of several outstanding researchers, which one might invite to attend a conference on energy-efficient computing systems. Of course, the list of topics that is explored here is by no means exhaustive, but most of the conclusions provided here should be extended to other computing platforms that are not covered here. There was a decision to limit the number of chapters while providing more pages for contributing

authors to express their ideas, so that the book remains manageable within a single volume.

We also hope that the topics covered in this book will get the readers to think of the implications of such new ideas on the developments in their own fields. The book endeavors to strike a balance between theoretical and practical coverage of innovative problem-solving techniques for a range of distributed platforms. The book is intended to be a repository of paradigms, technologies, and applications that target the different facets of energy consumption in computing systems.

The 26 chapters were carefully selected to provide a wide scope with minimal overlap between the chapters to reduce duplications. Each contributor was asked that his/her chapter should cover review material as well as current developments. In addition, the choice of authors was made so as to select authors who are leaders in their respective disciplines.

ALBERT Y. ZOMAYA  
YOUNG CHOON LEE



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