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Editor

Smart Cities

Development and Governance Frameworks

 Springer

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To
Eyaad Imran Rashid Khan and
Zayb-un-Nisa Khan, the youngest in the
family and the most delightful

Preface

Overview

A smart city is a new vision for urban development that brings together the various sectors of the society through the deployment of Internet of Things (IoT) and distributed computing technologies. The aim is to integrate and manage a city's resources and processes relating to transportation, health care, commerce, education, water and power, law enforcement, etc. as well as city's various departmental information systems. The suggestion is that the world cities are growing larger; new generations have entirely new priorities; hyper-globalization is revolutionizing how we build and deliver products and services; and technological innovation is accelerating at an exponential rate. Therefore, the ultimate objective is to develop smart living environments, improve living conditions of citizens, automate city services and processes, develop open and transparent systems, and, in general, build *smarter* and *connected* communities. Goal is to ensure that citizens' needs are met and they are technologically empowered to affect the city's functioning following a technologically led and citizen-centered-government approach.

Apart from the desire to use the technology for the sake of speed, openness, transparency, and effectiveness, there are currently a range of challenges that our cities face that drive the cities to urgently move to next levels of urbanization. These challenges include factors such as the following: rise in unemployment due to global economic downturn; pressures on housing sector due to growing demand, transportation, and health care due to increase in population; concerns about climate change; paradigm shift toward online entertainment and services; pressures on public finances and city resources due to increased awareness on the part of the general public; and the requirement to empower citizens to affect the working of local and federal governments. Fortunately, relevant computing technologies, social media offerings, distributed computing paradigms, mobile crowdsourcing, cyber-physical cloud computing, IoT frameworks, communication protocols, and device connectivity approaches are already well established to achieve citizens'

empowerment to consume e-services provided by smart cities; and to allow city officials to interact directly with the community and monitor digital environments.

With this background, there is an urgent need for properly integrated solutions taking into account a number of related aspects including big data analytics and devices security; signaling and device detection; devices and data management; communication protocols and connectivity platforms; network bandwidth and topology; seamless connectivity and interoperability; and worldwide regulations and legal compliance.

In this context, this book aims to investigate development, management, governance, and monitoring approaches to building smart cities; and distributed computing environments therein. Majority of contributions in this volume focus on various aspects of related methodologies and approaches; device connectivity and communication; and security and interoperability. Thirty-two researchers and practitioners of international repute have presented latest research on frameworks, current trends, case studies, and suggestions for further enhancement of the IoT-based smart cities vision.

Hopefully, the current text, *Smart Cities—Development and Governance Frameworks*, will fill a gap with respect to smart living in smart environments and extend the existing body of knowledge in this field.

Objectives

The aim of this volume is to present and discuss the state of the art in terms of frameworks, methodologies, challenges, and solutions for IOT-based smarter living environments. The core objectives include the following:

- Capturing the state-of-the-art *research and practice* with respect to the issues and limitation of smart city environments;
- Presenting case studies illustrating approaches, best practices, examples, and practical solutions;
- Discussing corporate analysis and a balanced view of benefits and inherent barriers to smart city developments and management;
- Developing a complete reference for students, researchers, and practitioners of distributed computing systems and environments;
- Identifying further research directions and technological innovations in the context of distributed computing environments and IoT.

Organization

There are 13 chapters in this volume: *Smart Cities—Development and Governance Frameworks*. These are organized in three parts, as follows:

Part I: Frameworks and Models

This section has a focus on approaches and methodologies, relating to the next more advanced levels of urbanization. There are four chapters. In the first contribution, the authors present a recursive and layered approach to model large-scale resource management systems for self-sustainable cities. The second chapter discusses the security and privacy issues in relation to social, management, economy, and legal aspects of a smart city. The third contribution presents a novel architecture for hybrid vehicular wireless sensor networks, VANET-WSN, as a core component of smarter cities. The next chapter proposes a pricing mechanism for the management of natural resources, with particular emphasis on the energy sector, in the context of smarter living environments; case studies are also presented.

Part II: Challenges and Opportunities

This part of the book comprises five chapters that focus on issues and solutions. The first chapter discusses generic challenges of building intelligent distribute systems for smart cities. The next contribution focuses on building blocks for data and citizen-centric knowledge-based governance of smart cities and looks into the related IoT challenges. The third chapter in the section provides a holistic vision of smart city surveillance and fog computing paradigms including challenges and opportunities; a case study of urban traffic surveillance is also presented. The fourth contribution discusses issues and challenges relating to big data management and analytics relevant to smart grids. The final chapter considers risks and opportunities of electric vehicles adoption in smart city environments.

Part III: Examples and Case Studies

There are four chapters in this section that focus on ongoing research in relation to sustainability, illustrating several case studies. The first chapter looks at the design and sustainability approaches for building smart cities; the contribution explores smart city projects in four of the Japanese cities. The next chapter proposes a sustainable business model to implement smart city digital services in relation to smart city initiatives in Indian cities. The third contribution explores the challenges and opportunities in relation to smart city projects in Brazil; the authors discuss related factors such as collaboration, communication, sustainability, and automation. The final contribution of the book discusses the sustainability requirements for the provision of healthcare services, presenting several smart city scenarios.

Target Audiences

The current volume is a reference text aimed at supporting a number of potential audiences, including the following:

- *Communication Engineers, Software Developers, and Network Security Specialists* who wish to adopt the newer approaches to ensure the security of data and devices for seamless connectivity in the smarter cities environments.

- *Students* and *Lecturers* who have an interest in further enhancing the knowledge of technologies, mechanisms, and frameworks relevant to the smarter living environments from a distributed computing perspective.
- *Researchers* and *Practitioners* in this field who require up to date knowledge of the current practices, mechanisms, frameworks, and limitations relevant to the smart cities and Internet of Things vision.

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Other Springer Books by Zaigham Mahmood

Data Science and Big Data Computing: Frameworks and Methodologies

This reference text has a focus on data science and provides practical guidance on big data analytics. Expert perspectives are provided by an authoritative collection of 36 researchers and practitioners, discussing the latest developments and emerging trends; presenting frameworks and innovative methodologies; and suggesting best practices for efficient and effective data analytics. ISBN: 978-3-319-31859-2.

Connected Environments for the IoT: Challenges and Solutions

This comprehensive reference presents a broad-ranging overview of device connectivity in distributed computing environments, supporting the vision of IoT. Expert perspectives are provided, covering issues of communication, security, privacy, interoperability, networking, access control, and authentication. Corporate analysis is also offered via several case studies. ISBN 978-3-319-70102-8.

Connectivity Frameworks for Smart Devices: The Internet of Things from a Distributed Computing Perspective

This is an authoritative reference that provides a focus on the latest developments on the Internet of Things. It presents state of the art on the current advances in the connectivity of diverse devices and provides in-depth discussion on the communication, security, privacy, access control, and authentication aspects of the device connectivity in distributed environments. ISBN: 978-3-319-33122-5.

Software Project Management for Distributed Computing: Life Cycle Methods for Developing Scalable and Reliable Tools

This unique volume explores cutting-edge management approaches to developing complex software that is efficient, scalable, sustainable, and suitable for distributed environments. Emphasis is on the use of the latest software technologies and frameworks for life cycle methods, including design, implementation, and testing stages of software development. ISBN: 978-3-319-54324-6.

Requirements Engineering for Service and Cloud Computing

This text aims to present and discuss the state of the art in terms of methodologies, trends, and future directions for requirements engineering for the service and cloud computing paradigm. Majority of the contributions in the book focus on requirements elicitation; requirements specifications; requirements classification; and requirements validation and evaluation. ISBN: 978-3-319-51309-6.

Software Engineering Frameworks for the Cloud Computing Paradigm

This is an authoritative reference that presents the latest research on software development approaches suitable for distributed computing environments. Contributed by researchers and practitioners of international repute, the book offers practical guidance on enterprise-wide software deployment relevant to the cloud environment. Case studies are also presented. ISBN: 978-1-447-15030-5.

Cloud Computing: Methods and Practical Approaches

The benefits associated with cloud computing are many; yet the dynamic, virtualized, and multi-tenant nature of the cloud environment presents numerous challenges. To help tackle these, this volume provides illuminating viewpoints and case studies to present current research and best practices on approaches and technologies for the emerging cloud paradigm. ISBN: 978-1-447-15106-7.

Cloud Computing: Challenges, Limitations, and R&D Solutions

This reference text reviews the challenging issues that present barriers to greater implementation of the cloud computing paradigm, together with the latest research into developing potential solutions. The book presents case studies and analysis of the implications of the cloud paradigm, from a diverse selection of researchers and practitioners of international repute. ISBN: 978-3-319-10529-1.

Continued Rise of the Cloud: Advances and Trends in Cloud Computing

This reference volume presents latest research and trends in cloud-related technologies, infrastructure, and architecture. Contributed by expert researchers and practitioners in the field, the book presents discussions on current advances and practical approaches including guidance and case studies on the provision of cloud-based services and frameworks. ISBN: 978-1-447-16451-7.

Cloud Computing for Enterprise Architectures

This reference text, aimed at system architects and business managers, examines the cloud paradigm from the perspective of enterprise architectures. It introduces fundamental concepts, discusses principles, and explores frameworks for the adoption of cloud computing. The book explores the inherent challenges and presents future directions for further research. ISBN: 978-1-447-12235-7.

User-Centric E-Government: Challenges & Opportunities

This text presents a citizen-focused approach to the development and implementation of electronic government. The focus is twofold: discussion on challenges of service availability and e-service operability on diverse smart devices; as well as on opportunities for the provision of open, responsive, and transparent functioning of world governments. ISBN: 978-3-319-59441-5.

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