

Fog Computing And Its Role In The Internet Of Things

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Fog and Edge Computing Rajkumar Buyya
2019-01-04 A comprehensive guide to Fog and Edge applications, architectures, and technologies Recent years have seen the

explosive growth of the Internet of Things (IoT): the internet-connected network of devices that includes everything from personal electronics and home appliances to automobiles and industrial machinery. Responding to the ever-

increasing bandwidth demands of the IoT, Fog and Edge computing concepts have developed to collect, analyze, and process data more efficiently than traditional cloud architecture. Fog and Edge Computing: Principles and Paradigms provides a comprehensive overview of the state-of-the-art applications and architectures driving this dynamic field of computing while highlighting potential research directions and emerging technologies. Exploring topics such as developing scalable architectures, moving from closed systems to open systems, and ethical issues rising from data sensing, this timely book addresses both the challenges and opportunities that Fog and Edge computing presents. Contributions from leading IoT experts discuss federating Edge resources, middleware design issues, data management and predictive analysis, smart transportation and surveillance applications, and more. A coordinated and integrated presentation of topics helps readers gain thorough knowledge of the foundations,

applications, and issues that are central to Fog and Edge computing. This valuable resource: Provides insights on transitioning from current Cloud-centric and 4G/5G wireless environments to Fog Computing Examines methods to optimize virtualized, pooled, and shared resources Identifies potential technical challenges and offers suggestions for possible solutions Discusses major components of Fog and Edge computing architectures such as middleware, interaction protocols, and autonomic management Includes access to a website portal for advanced online resources Fog and Edge Computing: Principles and Paradigms is an essential source of up-to-date information for systems architects, developers, researchers, and advanced undergraduate and graduate students in fields of computer science and engineering. **Handbook of Research on Cloud and Fog Computing Infrastructures for Data Science** Raj, Pethuru 2018-05-18 Fog computing is quickly increasing its applications and uses to

the next level. As it continues to grow, different types of virtualization technologies can thrust this branch of computing further into mainstream use. The Handbook of Research on Cloud and Fog Computing Infrastructures for Data Science is a key reference volume on the latest research on the role of next-generation systems and devices that are capable of self-learning and how those devices will impact society. Featuring wide-ranging coverage across a variety of relevant views and themes such as cognitive analytics, data mining algorithms, and the internet of things, this publication is ideally designed for programmers, IT professionals, students, researchers, and engineers looking for innovative research on software-defined cloud infrastructures and domain-specific analytics. *Communication Networks and Service Management in the Era of Artificial Intelligence and Machine Learning* Nur Zincir-Heywood
2021-09-03 COMMUNICATION NETWORKS AND SERVICE MANAGEMENT IN THE ERA OF

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING Discover the impact that new technologies are having on communication systems with this up-to-date and one-stop resource Communication Networks and Service Management in the Era of Artificial Intelligence and Machine Learning delivers a comprehensive overview of the impact of artificial intelligence (AI) and machine learning (ML) on service and network management. Beginning with a fulsome description of ML and AI, the book moves on to discuss management models, architectures, and frameworks. The authors also explore how AI and ML can be used in service management functions like the generation of workload profiles, service provisioning, and more. The book includes a handpicked selection of applications and case studies, as well as a treatment of emerging technologies the authors predict could have a significant impact on network and service management in the future. Statistical analysis and data mining are also

discussed, particularly with respect to how they allow for an improvement of the management and security of IT systems and networks. Readers will also enjoy topics like: A thorough introduction to network and service management, machine learning, and artificial intelligence An exploration of artificial intelligence and machine learning for management models, including autonomic management, policy-based management, intent based management, and network virtualization-based management Discussions of AI and ML for architectures and frameworks, including cloud systems, software defined networks, 5G and 6G networks, and Edge/Fog networks An examination of AI and ML for service management, including the automatic generation of workload profiles using unsupervised learning Perfect for information and communications technology educators, Communication Networks and Service Management in the Era of Artificial Intelligence

and Machine Learning will also earn a place in the libraries of engineers and professionals who seek a structured reference on how the emergence of artificial intelligence and machine learning techniques is affecting service and network management.

Fog Computing Based IoT Applications and Their Performance

Santosh Reddy Gundala
Palle 2018 Today's Internet of Things (IoT) is enabling innovations much faster to enhance the quality of life using various IoT applications such as Smart City, Smart Homes, Autonomous Driving Cars, Drone Monitoring Systems and many more applications. Cloud Computing in IoT has playing a significant role in providing its maximum services such as Data Storage, Computing or Processing, Analyzing and Securing Big Data etc for IoT applications. But, researchers estimated that the users are going to deploy 1 trillion IoT devices by the year 2025 which could have an economic impact of \$11 trillion dollars per year. The unprecedented

amount of data that is going to generate from those number of devices is pushing the cloud computing traditional systems to difficult situations to handle. Along with this situation there are certain applications (Self Driving, Health Monitoring, Gaming, Real-Time Big Data Analytics, Live Streaming and Controlling Applications etc.) in IoT which requires quick response to react and control the situations if necessary. The traditional Cloud Computing systems in this scenario cannot satisfy the service level agreement (SLA) made between the cloud service providers and cloud users. Balancing this scenario, cloud service providers must maintain a reasonable performance while reducing the energy consumption and cost of maintenance. In this thesis work a new computing paradigm called Fog Computing has been used for our newly proposed application models to overcome the problems or drawbacks of Cloud Computing and to enhance the performance for our application models by

satisfying the quality of service level agreements (QOSLA). By using Fog Computing distributed strategy our models achieved better performance and worked more efficient than in Cloud. It also reduced the network usage, energy consumption in cloud and cost of execution. To simulate our work, we used iFogSim simulation toolkit which is currently growing significantly for the past couple of years.

Fog and Fogonomics Yang Yang 2020-01-14
THE ONE-STOP RESOURCE FOR ANY
INDIVIDUAL OR ORGANIZATION
CONSIDERING FOG COMPUTING Fog and
Fogonomics is a comprehensive and technology-
centric resource that highlights the system
model, architectures, building blocks, and IEEE
standards for fog computing platforms and
solutions. The "fog" is defined as the multiple
interconnected layers of computing along the
continuum from cloud to endpoints such as user
devices and things including racks or microcells

in server closets, residential gateways, factory control systems, and more. The authors—noted experts on the topic—review business models and metrics that allow for the economic assessment of fog-based information communication technology (ICT) resources, especially mobile resources. The book contains a wide range of templates and formulas for calculating quality-of-service values.

Comprehensive in scope, it covers topics including fog computing technologies and reference architecture, fog-related standards and markets, fog-enabled applications and services, fog economics (fogonomics), and strategy. This important resource: Offers a comprehensive text on fog computing Discusses pricing, service level agreements, service delivery, and consumption of fog computing Examines how fog has the potential to change the information and communication technology industry in the next decade Describes how fog enables new business models, strategies, and

competitive differentiation, as with ecosystems of connected and smart digital products and services Includes case studies featuring integration of fog computing, communication, and networking systems Written for product and systems engineers and designers, as well as for faculty and students, Fog and Fogonomics is an essential book that explores the technological and economic issues associated with fog computing.

Novel Practices and Trends in Grid and Cloud Computing Raj, Pethuru 2019-06-28

Business and IT organizations are currently embracing new strategically sound concepts in order to be more customer-centric, competitive, and cognitive in their daily operations. While useful, the various software tools, pioneering technologies, as well as their unique contributions largely go unused due to the lack of information provided on their special characteristics. Novel Practices and Trends in Grid and Cloud Computing is a collection of

innovative research on the key concerns of cloud computing and how they are being addressed, as well as the various technologies and tools empowering cloud theory to be participative, penetrative, pervasive, and persuasive. While highlighting topics including cyber security, smart technology, and artificial intelligence, this book is ideally designed for students, researchers, and business managers on the lookout for innovative IT solutions for all the business automation software and improvisations of computational technologies.

Integration of Cloud Computing with Internet of Things Monika Mangla 2021-03-08
The book aims to integrate the aspects of IoT, Cloud computing and data analytics from diversified perspectives. The book also plans to discuss the recent research trends and advanced topics in the field which will be of interest to academicians and researchers working in this area. Thus, the book intends to help its readers to understand and explore the spectrum of

applications of IoT, cloud computing and data analytics. Here, it is also worth mentioning that the book is believed to draw attention on the applications of said technology in various disciplines in order to obtain enhanced understanding of the readers. Also, this book focuses on the researches and challenges in the domain of IoT, Cloud computing and Data analytics from perspectives of various stakeholders.

The Smart Cyber Ecosystem for Sustainable Development Pardeep Kumar 2021-09-08
The Cyber Ecosystem can be a replica of our natural ecosystem where different living and non-living things interact with each other to perform specific tasks. Similarly, the different entities of the cyber ecosystem collaborate digitally with each other to revolutionize our lifestyle by creating smart, intelligent, and automated systems/processes. The main actors of the cyber ecosystem, among others, are the Internet of Things (IoT), Artificial Intelligence (AI), and the

mechanisms providing cybersecurity. This book documents how this blend of technologies is powering a digital sustainable socio-economic infrastructure which improves our life quality. It offers advanced automation methods fitted with amended business and audits models, universal authentication schemes, transparent governance, and inventive prediction analysis.

Fog, Edge, and Pervasive Computing in Intelligent IoT Driven Applications

Deepak Gupta 2021-01-07 A practical guide to the design, implementation, evaluation, and deployment of emerging technologies for intelligent IoT applications With the rapid development in artificially intelligent and hybrid technologies, IoT, edge, fog-driven, and pervasive computing techniques are becoming important parts of our daily lives. This book focuses on recent advances, roles, and benefits of these technologies, describing the latest intelligent systems from a practical point of view. Fog, Edge, and Pervasive Computing in

Intelligent IoT Driven Applications is also valuable for engineers and professionals trying to solve practical, economic, or technical problems. With a uniquely practical approach spanning multiple fields of interest, contributors cover theory, applications, and design methodologies for intelligent systems. These technologies are rapidly transforming engineering, industry, and agriculture by enabling real-time processing of data via computational, resource-oriented metaheuristics and machine learning algorithms. As edge/fog computing and associated technologies are implemented far and wide, we are now able to solve previously intractable problems. With chapters contributed by experts in the field, this book: Describes Machine Learning frameworks and algorithms for edge, fog, and pervasive computing Considers probabilistic storage systems and proven optimization techniques for intelligent IoT Covers 5G edge network slicing and virtual network systems that utilize new

networking capacity Explores resource provisioning and bandwidth allocation for edge, fog, and pervasive mobile applications Presents emerging applications of intelligent IoT, including smart farming, factory automation, marketing automation, medical diagnosis, and more Researchers, graduate students, and practitioners working in the intelligent systems domain will appreciate this book's practical orientation and comprehensive coverage. Intelligent IoT is revolutionizing every industry and field today, and Fog, Edge, and Pervasive Computing in Intelligent IoT Driven Applications provides the background, orientation, and inspiration needed to begin.

Cloud and Fog Computing in 5G Mobile Networks Evangelos Markakis 2017-06-30 Cloud computing, a key trend in networking, shows that availability and fault tolerance issues can directly impact on millions of end-users. Now diffused among end-users devices in mobile and wired networks, the cloud is becoming the "fog".

This book elaborates on a new paradigm by presenting frameworks and schemes that use end-user or near-user edge devices to carry out storage, communication, computation and control in the network. Topics covered include network storage, the Internet of Things and heterogeneous 5G mobile services.

Privacy-Enhancing Fog Computing and Its Applications Xiaodong Lin 2018-11-12 This SpringerBrief covers the security and privacy challenges in fog computing, and proposes a new secure and privacy-preserving mechanisms to resolve these challenges for securing fog-assisted IoT applications. Chapter 1 introduces the architecture of fog-assisted IoT applications and the security and privacy challenges in fog computing. Chapter 2 reviews several promising privacy-enhancing techniques and illustrates examples on how to leverage these techniques to enhance the privacy of users in fog computing. Specifically, the authors divide the existing privacy-enhancing techniques into three

categories: identity-hidden techniques, location privacy protection and data privacy enhancing techniques. The research is of great importance since security and privacy problems faced by fog computing impede the healthy development of its enabled IoT applications. With the advanced privacy-enhancing techniques, the authors propose three secure and privacy-preserving protocols for fog computing applications, including smart parking navigation, mobile crowdsensing and smart grid. Chapter 3 introduces identity privacy leakage in smart parking navigation systems, and proposes a privacy-preserving smart parking navigation system to prevent identity privacy exposure and support efficient parking guidance retrieval through road-side units (fogs) with high retrieving probability and security guarantees. Chapter 4 presents the location privacy leakage, during task allocation in mobile crowdsensing, and propose a strong privacy-preserving task allocation scheme that enables location-based

task allocation and reputation-based report selection without exposing knowledge about the location and reputation for participators in mobile crowdsensing. Chapter 5 introduces the data privacy leakage in smart grid, and proposes an efficient and privacy-preserving smart metering protocol to allow collectors (fogs) to achieve real-time measurement collection with privacy-enhanced data aggregation. Finally, conclusions and future research directions are given in Chapter 6. This brief validates the significant feature extension and efficiency improvement of IoT devices without sacrificing the security and privacy of users against dishonest fog nodes. It also provides valuable insights on the security and privacy protection for fog-enabled IoT applications. Researchers and professionals who carry out research on security and privacy in wireless communication will want to purchase this SpringerBrief. Also, advanced level students, whose main research area is mobile network security will also be

interested in this SpringerBrief.

Handbook of Large-Scale Distributed Computing in Smart Healthcare

Samee U. Khan 2017-08-07 This volume offers readers various perspectives and visions for cutting-edge research in ubiquitous healthcare. The topics emphasize large-scale architectures and high performance solutions for smart healthcare, healthcare monitoring using large-scale computing techniques, Internet of Things (IoT) and big data analytics for healthcare, Fog Computing, mobile health, large-scale medical data mining, advanced machine learning methods for mining multidimensional sensor data, smart homes, and resource allocation methods for the BANs. The book contains high quality chapters contributed by leading international researchers working in domains, such as e-Health, pervasive and context-aware computing, cloud, grid, cluster, and big-data computing. We are optimistic that the topics included in this book will provide a

multidisciplinary research platform to the researchers, practitioners, and students from biomedical engineering, health informatics, computer science, and computer engineering. *The Cloud-to-Thing Continuum* Theo Lynn 2020-01-01 The Internet of Things offers massive societal and economic opportunities while at the same time significant challenges, not least the delivery and management of the technical infrastructure underpinning it, the deluge of data generated from it, ensuring privacy and security, and capturing value from it. This Open Access Pivot explores these challenges, presenting the state of the art and future directions for research but also frameworks for making sense of this complex area. This book provides a variety of perspectives on how technology innovations such as fog, edge and dew computing, 5G networks, and distributed intelligence are making us rethink conventional cloud computing to support the Internet of Things. Much of this

book focuses on technical aspects of the Internet of Things, however, clear methodologies for mapping the business value of the Internet of Things are still missing. We provide a value mapping framework for the Internet of Things to address this gap. While there is much hype about the Internet of Things, we have yet to reach the tipping point. As such, this book provides a timely entrée for higher education educators, researchers and students, industry and policy makers on the technologies that promise to reshape how society interacts and operates. Theo Lynn is Full Professor of Digital Business at DCU Business School, Ireland and Director of the Irish Institute of Digital Business. John G. Mooney is Associate Professor of Information Systems and Technology Management at the Pepperdine Graziadio Business School, United States. Brian Lee is Director of the Software Research Institute at Athlone Institute of Technology. Patricia Takako Endo is a Postdoctoral Research Fellow at the

Irish Institute of Digital Business, Dublin City University, Ireland, and a Professor at Universidade de Pernambuco, Brazil. 2018 IEEE Intl Conf on Parallel and Distributed Processing with Applications, Ubiquitous Computing and Communications, Big Data and Cloud Computing, Social Computing and Networking, Sustainable Computing and Communications (ISPA IUCC BDCloud SocialCom SustainCom) IEEE Staff 2018-12-11 The five conferences offer important international platforms and bring together the scientists, engineers, researchers, and students from academy and industry all over the world to share their latest work, exchange experiences and discuss the state of the art challenges of Parallel and Distributed Processing with Applications Ubiquitous computing and communications big data and cloud computing social computing and communications and sustainable computing and communications Blockchain-enabled Fog and Edge Computing:

Concepts, Architectures and Applications

Muhammad Maaz Rehan 2020-07-27 This comprehensive book unveils the working relationship of blockchain and the fog/edge computing. The contents of the book have been designed in such a way that the reader will not only understand blockchain and fog/edge computing but will also understand their co-existence and their collaborative power to solve a range of versatile problems. The first part of the book covers fundamental concepts and the applications of blockchain-enabled fog and edge computing. These include: Internet of Things, Tactile Internet, Smart City; and E-challan in the Internet of Vehicles. The second part of the book covers security and privacy related issues of blockchain-enabled fog and edge computing. These include, hardware primitive based Physical Unclonable Functions; Secure Management Systems; security of Edge and Cloud in the presence of blockchain; secure storage in fog using blockchain; and using

differential privacy for edge-based Smart Grid over blockchain. This book is written for students, computer scientists, researchers and developers, who wish to work in the domain of blockchain and fog/edge computing. One of the unique features of this book is highlighting the issues, challenges, and future research directions associated with Blockchain-enabled fog and edge computing paradigm. We hope the readers will consider this book a valuable addition in the domain of Blockchain and fog/edge computing.

Fog and Edge Computing Rajkumar Buyya
2019-02-06 A comprehensive guide to Fog and Edge applications, architectures, and technologies Recent years have seen the explosive growth of the Internet of Things (IoT): the internet-connected network of devices that includes everything from personal electronics and home appliances to automobiles and industrial machinery. Responding to the ever-increasing bandwidth demands of the IoT, Fog

and Edge computing concepts have developed to collect, analyze, and process data more efficiently than traditional cloud architecture. Fog and Edge Computing: Principles and Paradigms provides a comprehensive overview of the state-of-the-art applications and architectures driving this dynamic field of computing while highlighting potential research directions and emerging technologies. Exploring topics such as developing scalable architectures, moving from closed systems to open systems, and ethical issues rising from data sensing, this timely book addresses both the challenges and opportunities that Fog and Edge computing presents. Contributions from leading IoT experts discuss federating Edge resources, middleware design issues, data management and predictive analysis, smart transportation and surveillance applications, and more. A coordinated and integrated presentation of topics helps readers gain thorough knowledge of the foundations, applications, and issues that are central to Fog

and Edge computing. This valuable resource: Provides insights on transitioning from current Cloud-centric and 4G/5G wireless environments to Fog Computing Examines methods to optimize virtualized, pooled, and shared resources Identifies potential technical challenges and offers suggestions for possible solutions Discusses major components of Fog and Edge computing architectures such as middleware, interaction protocols, and autonomic management Includes access to a website portal for advanced online resources Fog and Edge Computing: Principles and Paradigms is an essential source of up-to-date information for systems architects, developers, researchers, and advanced undergraduate and graduate students in fields of computer science and engineering. **Innovations in the Industrial Internet of Things (IIoT) and Smart Factory** Goundar, Sam 2021-01-22 Industrial internet of things (IIoT) is changing the face of industry by completely redefining the way stakeholders,

enterprises, and machines connect and interact with each other in the industrial digital ecosystem. Smart and connected factories, in which all the machinery transmits real-time data, enable industrial data analytics for improving operational efficiency, productivity, and industrial processes, thus creating new business opportunities, asset utilization, and connected services. IIoT leads factories to step out of legacy environments and arcane processes towards open digital industrial ecosystems. Innovations in the Industrial Internet of Things (IIoT) and Smart Factory is a pivotal reference source that discusses the development of models and algorithms for predictive control of industrial operations and focuses on optimization of industrial operational efficiency, rationalization, automation, and maintenance. While highlighting topics such as artificial intelligence, cyber security, and data collection, this book is ideally designed for engineers, manufacturers, industrialists,

managers, IT consultants, practitioners, students, researchers, and industrial industry professionals.

Fog Computing Zaigham Mahmood 2018-07-12

This authoritative text/reference describes the state of the art of fog computing, presenting insights from an international selection of renowned experts. A particular focus is provided on development approaches, architectural mechanisms, and measurement metrics for building smart adaptable environments. The coverage also includes important related topics such as device connectivity, security and interoperability, and communication methods. Topics and features: introduces the core concepts and principles of fog computing, and reviews the latest research and best practice relating to fog/edge environments; discusses the vision for an Internet of Things (IoT) in terms of fog computing and other related distributed computing paradigms, such as cloud computing; presents a survey of the key issues and broader

aspects of the fog paradigm, as well as the factors that affect adoption of fog computing; examines frameworks and methodologies for fog-based architecture design, improving performance, and measuring quality of experience; proposes tools and methodologies for analyzing large amounts of sensor data from smart city initiatives; describes approaches for designing robust services, management of data-intensive applications, context-aware data analysis, and vehicular networking; identifies potential future research directions and technological innovations in relation to distributed computing environments such as the IoT. This enlightening volume offers essential perspectives for researchers of distributed computing and computer networking, as well as for advanced undergraduate and graduate students pursuing interests in this area. Professional engineers seeking to enhance security and connectivity in their IoT systems will also find this work to be a valuable

reference.

The Rise of Fog Computing in the Digital Era Srinivasa, K.G. 2018-08-31 With the immense growth of information, the prevalence of ubiquitously connected smart devices is rapidly increasing. Providing platforms that support computation, storage, and networking services between end devices is an essential aspect of an expanding digital society. The Rise of Fog Computing in the Digital Era provides innovative insights into the present generation of computing devices, as well as new approaches to computational platforms through fog computing. The content within this publication presents concepts and theories on data analytics, management systems, networking architectures, and many more. It is a vital reference source for IT professionals, computer programmers, software developers, computer engineers, researchers, and upper-level students seeking topics centered on the challenges and benefits of fog computing in mobile

environments.

Enterprise Internet of Things Handbook

Arvind Ravulavaru 2018-04-30 Get familiar with the building blocks of IoT solutions using off-the-shelf IoT platforms. Key Features Work with various trending IoT platforms such as AWS IoT, Azure IoT, Google IoT, IBM Watson IoT, and Kaa IoT Gain hands-on knowledge working with Cloud-based IoT platforms, IoT Analytics, and so on. A practical guide that will help you build IoT strategies for your organization Book Description There is a lot of work that is being done in the IoT domain and according to Forbes the global IoT market will grow from \$157B in 2016 to \$457B by 2020. This is an amazing market both in terms technology advancement as well as money. In this book, we will be covering five popular IoT platforms, namely, AWS IoT, Microsoft Azure IoT, Google IoT Core, IBM Watson IoT, and Kaa IoT middleware. You are going to build solutions that will use a Raspberry Pi 3, a DHT11 Temperature and

humidity sensor, and a dashboard to visualize the sensor data in real-time. Furthermore, you will also explore various components of each of the platforms that are needed to achieve the desired solution. Besides building solutions, you will look at how Machine Learning and IoT go hand in hand and later design a simple predictive web service based on this concept. By the end of this book, you will be in a position to implement an IoT strategy best-fit for your organization What you will learn Connect a Temperature and Humidity sensor and see how these two can be managed from various platforms Explore the core components of AWS IoT such as AWS Kinesis and AWS IoT Rules Engine Build a simple analysis dashboard using Azure IoT and Power BI Understand the fundamentals of Google IoT and use Google core APIs to build your own dashboard Get started and work with the IBM Watson IoT platform Integrate Cassandra and Zeppelin with Kaa IoT dashboard Review some Machine Learning and

AI and get to know more about their implementation in the IoT domain. Who this book is for This book is targeted at IoT architects and engineers, or any stakeholders working with IoT solutions in an organization. This book will also help decision makers and professionals from small- and medium-sized enterprises build an IoT strategy for their venture.

Research Anthology on Privatizing and Securing Data Management Association, Information Resources 2021-04-23 With the immense amount of data that is now available online, security concerns have been an issue from the start, and have grown as new technologies are increasingly integrated in data collection, storage, and transmission. Online cyber threats, cyber terrorism, hacking, and other cybercrimes have begun to take advantage of this information that can be easily accessed if not properly handled. New privacy and security measures have been developed to address this cause for concern and

have become an essential area of research within the past few years and into the foreseeable future. The ways in which data is secured and privatized should be discussed in terms of the technologies being used, the methods and models for security that have been developed, and the ways in which risks can be detected, analyzed, and mitigated. The *Research Anthology on Privatizing and Securing Data* reveals the latest tools and technologies for privatizing and securing data across different technologies and industries. It takes a deeper dive into both risk detection and mitigation, including an analysis of cybercrimes and cyber threats, along with a sharper focus on the technologies and methods being actively implemented and utilized to secure data online. Highlighted topics include information governance and privacy, cybersecurity, data protection, challenges in big data, security threats, and more. This book is essential for data analysts, cybersecurity professionals, data

scientists, security analysts, IT specialists, practitioners, researchers, academicians, and students interested in the latest trends and technologies for privatizing and securing data.

5G Mobile Communications Wei Xiang
2016-10-13 This book provides a comprehensive overview of the emerging technologies for next-generation 5G mobile communications, with insights into the long-term future of 5G. Written by international leading experts on the subject, this contributed volume covers a wide range of technologies, research results, and networking methods. Key enabling technologies for 5G systems include, but are not limited to, millimeter-wave communications, massive MIMO technology and non-orthogonal multiple access. 5G will herald an even greater rise in the prominence of mobile access based upon both human-centric and machine-centric networks. Compared with existing 4G communications systems, unprecedented numbers of smart and heterogeneous wireless devices will be

accessing future 5G mobile systems. As a result, a new paradigm shift is required to deal with challenges on explosively growing requirements in mobile data traffic volume (1000x), number of connected devices (10-100x), typical end-user data rate (10-100x), and device/network lifetime (10x). Achieving these ambitious goals calls for revolutionary candidate technologies in future 5G mobile systems. Designed for researchers and professionals involved with networks and communication systems, *5G Mobile Communications* is a straightforward, easy-to-read analysis of the possibilities of 5G systems.

Fog Computing for Healthcare 4.0 Environments
Sudeep Tanwar 2020-08-02 This book provides an analysis of the role of fog computing, cloud computing, and Internet of Things in providing uninterrupted context-aware services as they relate to Healthcare 4.0. The book considers a three-layer patient-driven healthcare architecture for real-time data collection, processing, and transmission. It gives insight to

the readers for the applicability of fog devices and gateways in Healthcare 4.0 environments for current and future applications. It also considers aspects required to manage the complexity of fog computing for Healthcare 4.0 and also develops a comprehensive taxonomy.

Handbook of Research on Information and Records Management in the Fourth

Industrial Revolution Chigwada, Josiline Phiri

2021-06-25 Information and records

management has been an important part of society for establishing procedures to effectively manage information. As technology has increased in society, this essential function has been impacted as well. With the onset of technological tools brought upon by the fourth industrial revolution, technologies such as artificial intelligence, the internet of things, big data, and more have changed the face of information and records management. These technologies and tools have paved new ways for security, efficiency in timely processes, new

ways to create and process records, and other beneficial traits. Along with these advancements come new contemporary issues, leading to the need for research on how exactly information records management is functioning in modern times, the technologies brought on by the fourth industrial revolution, and both the benefits and challenges to this transition. The Handbook of Research on Information and Records Management in the Fourth Industrial Revolution showcases contemporary issues and demonstrates the value of information and records management in the fourth industrial revolution. The book provides a summary of the key activities undertaken by information and records managers as they seek to make records and information management more visible in the modern knowledge-driven society. The chapters highlight innovation, the use of information and communication technology in information and records management, best practices, challenges encountered, and how they are overcome. The

target audience of this book will be composed of professionals, librarians, archivists, lecturers, and researchers working in the field of library and information science, along with practitioners, academicians, and students interested in information and records management in the 21st century.

Applying Integration Techniques and Methods in Distributed Systems and Technologies Kecskemeti, Gabor 2019-04-12

Distributed systems intertwine with our everyday lives. The benefits and current shortcomings of the underpinning technologies are experienced by a wide range of people and their smart devices. With the rise of large-scale IoT and similar distributed systems, cloud bursting technologies, and partial outsourcing solutions, private entities are encouraged to increase their efficiency and offer unparalleled availability and reliability to their users. Applying Integration Techniques and Methods in Distributed Systems is a critical scholarly

publication that defines the current state of distributed systems, determines further goals, and presents architectures and service frameworks to achieve highly integrated distributed systems and presents solutions to integration and efficient management challenges faced by current and future distributed systems. Highlighting topics such as multimedia, programming languages, and smart environments, this book is ideal for system administrators, integrators, designers, developers, researchers, and academicians. [Big Data and Internet of Things: A Roadmap for Smart Environments](#) Nik Bessis 2014-03-11 This book presents current progress on challenges related to Big Data management by focusing on the particular challenges associated with context-aware data-intensive applications and services. The book is a state-of-the-art reference discussing progress made, as well as prompting future directions on the theories, practices, standards and strategies that are related to the

emerging computational technologies and their association with supporting the Internet of Things advanced functioning for organizational settings including both business and e-science. Apart from inter-operable and inter-cooperative aspects, the book deals with a notable opportunity namely, the current trend in which a collectively shared and generated content is emerged from Internet end-users. Specifically, the book presents advances on managing and exploiting the vast size of data generated from within the smart environment (i.e. smart cities) towards an integrated, collective intelligence approach. The book also presents methods and practices to improve large storage infrastructures in response to increasing demands of the data intensive applications. The book contains 19 self-contained chapters that were very carefully selected based on peer review by at least two expert and independent reviewers and is organized into the three sections reflecting the general themes of

interest to the IoT and Big Data communities:
Section I: Foundations and Principles
Section II: Advanced Models and Architectures
Section III: Advanced Applications and Future Trends
The book is intended for researchers interested in joining interdisciplinary and transdisciplinary works in the areas of Smart Environments, Internet of Things and various computational technologies for the purpose of an integrated collective computational intelligence approach into the Big Data era.

Fog Computing Assad Abbas 2020-04-21
Summarizes the current state and upcoming trends within the area of fog computing
Written by some of the leading experts in the field, *Fog Computing: Theory and Practice* focuses on the technological aspects of employing fog computing in various application domains, such as smart healthcare, industrial process control and improvement, smart cities, and virtual learning environments. In addition, the Machine-to-Machine (M2M) communication methods for

fog computing environments are covered in depth. Presented in two parts—Fog Computing Systems and Architectures, and Fog Computing Techniques and Application—this book covers such important topics as energy efficiency and Quality of Service (QoS) issues, reliability and fault tolerance, load balancing, and scheduling in fog computing systems. It also devotes special attention to emerging trends and the industry needs associated with utilizing the mobile edge computing, Internet of Things (IoT), resource and pricing estimation, and virtualization in the fog environments. Includes chapters on deep learning, mobile edge computing, smart grid, and intelligent transportation systems beyond the theoretical and foundational concepts Explores real-time traffic surveillance from video streams and interoperability of fog computing architectures Presents the latest research on data quality in the IoT, privacy, security, and trust issues in fog computing Fog Computing: Theory and Practice provides a platform for

researchers, practitioners, and graduate students from computer science, computer engineering, and various other disciplines to gain a deep understanding of fog computing. Internet of Everything Beniamino Di Martino 2017-10-15 This book focuses on the Internet of Everything and related fields. The Internet of Everything adds connectivity and intelligence to just about every device, giving it special functions. The book provides a common platform for integrating information from heterogeneous sources. However, this can be quite reductive, as the Internet of Everything provides links not only among things, but also data, people, and business processes. The evolution of current sensor and device networks, with strong interactions between people and social environments, will have a dramatic impact on everything from city planning, first responders, the military and health. Such a shared ecosystem will allow for the interaction between data, sensor inputs and heterogeneous systems.

Semantics is a fundamental component of this since semantic technologies are able to provide the necessary bridge between different data representations, and to solve terminology incongruence. Integrating data from distributed devices, sensor networks, social networks and biomedical instruments requires, first of all, the systematization of the current state of the art in such fields. Then, it is necessary to identify a common action thread to actually merge and homogenize standards and techniques applied in such a heterogeneous field. The exact requirements of an Internet of Everything environment need to be precisely identified and formally expressed, and finally, the role of modern computing paradigms, such as Cloud and Fog Computing, needs to be assessed with respect to the requirements expressed by an Internet of Everything ecosystem.

Modeling and Simulation Design Phillip Tavel
2007-01-01

Architecture and Security Issues in Fog

Computing Applications Goundar, Sam
2019-09-20 As the progression of the internet continues, society is finding easier, quicker ways of simplifying their needs with the use of technology. With the growth of lightweight devices, such as smart phones and wearable devices, highly configured hardware is in heightened demand in order to process the large amounts of raw data that are acquired. Connecting these devices to fog computing can reduce bandwidth and latency for data transmission when associated with centralized cloud solutions and uses machine learning algorithms to handle large amounts of raw data. The risks that accompany this advancing technology, however, have yet to be explored. Architecture and Security Issues in Fog Computing Applications is a pivotal reference source that provides vital research on the architectural complications of fog processing and focuses on security and privacy issues in intelligent fog applications. While highlighting

topics such as machine learning, cyber-physical systems, and security applications, this publication explores the architecture of intelligent fog applications enabled with machine learning. This book is ideally designed for IT specialists, software developers, security analysts, software engineers, academicians, students, and researchers seeking current research on network security and wireless systems.

Research Anthology on Architectures, Frameworks, and Integration Strategies for Distributed and Cloud Computing

Management Association, Information Resources
2021-01-25 Distributed systems intertwine with our everyday lives. The benefits and current shortcomings of the underpinning technologies are experienced by a wide range of people and their smart devices. With the rise of large-scale IoT and similar distributed systems, cloud bursting technologies, and partial outsourcing solutions, private entities are encouraged to

increase their efficiency and offer unparalleled availability and reliability to their users. The Research Anthology on Architectures, Frameworks, and Integration Strategies for Distributed and Cloud Computing is a vital reference source that provides valuable insight into current and emergent research occurring within the field of distributed computing. It also presents architectures and service frameworks to achieve highly integrated distributed systems and solutions to integration and efficient management challenges faced by current and future distributed systems. Highlighting a range of topics such as data sharing, wireless sensor networks, and scalability, this multi-volume book is ideally designed for system administrators, integrators, designers, developers, researchers, academicians, and students.

Data Lakes Anne Laurent 2020-04-09 The concept of a data lake is less than 10 years old, but they are already hugely implemented within large companies. Their goal is to efficiently deal

with ever-growing volumes of heterogeneous data, while also facing various sophisticated user needs. However, defining and building a data lake is still a challenge, as no consensus has been reached so far. Data Lakes presents recent outcomes and trends in the field of data repositories. The main topics discussed are the data-driven architecture of a data lake; the management of metadata – supplying key information about the stored data, master data and reference data; the roles of linked data and fog computing in a data lake ecosystem; and how gravity principles apply in the context of data lakes. A variety of case studies are also presented, thus providing the reader with practical examples of data lake management.

Fog/Edge Computing For Security, Privacy, and Applications Wei Chang 2021-01-04 This book provides the state-of-the-art development on security and privacy for fog/edge computing, together with their system architectural support and applications. This book is organized into five

parts with a total of 15 chapters. Each area corresponds to an important snapshot. The first part of this book presents an overview of fog/edge computing, focusing on its relationship with cloud technology and the future with the use of 5G communication. Several applications of edge computing are discussed. The second part of this book considers several security issues in fog/edge computing, including the secure storage and search services, collaborative intrusion detection method on IoT-fog computing, and the feasibility of deploying Byzantine agreement protocols in untrusted environments. The third part of this book studies the privacy issues in fog/edge computing. It first investigates the unique privacy challenges in fog/edge computing, and then discusses a privacy-preserving framework for the edge-based video analysis, a popular machine learning application on fog/edge. This book also covers the security architectural design of fog/edge computing, including a comprehensive overview

of vulnerabilities in fog/edge computing within multiple architectural levels, the security and intelligent management, the implementation of network-function-virtualization-enabled multicasting in part four. It explains how to use the blockchain to realize security services. The last part of this book surveys applications of fog/edge computing, including the fog/edge computing in Industrial IoT, edge-based augmented reality, data streaming in fog/edge computing, and the blockchain-based application for edge-IoT. This book is designed for academics, researchers and government officials, working in the field of fog/edge computing and cloud computing. Practitioners, and business organizations (e.g., executives, system designers, and marketing professionals), who conduct teaching, research, decision making, and designing fog/edge technology will also benefit from this book The content of this book will be particularly useful for advanced-level students studying computer science,

computer technology, and information systems, but also applies to students in business, education, and economics, who would benefit from the information, models, and case studies therein.

The Rise of Fog Computing in the Digital Era

K. G. Srinivasa 2018 "This book contains a compendium of the latest academic material on the evolving theory and practice related to fog computing. Including innovative studies on distributed fog computing environments, programming models, and access control mechanisms"--

Fog Computing: Breakthroughs in Research and Practice Management Association, Information Resources 2018-06-04 Fog computing is rapidly expanding in its applications and capabilities through various parts of society. Utilizing different types of virtualization technologies can push this branch of computing to even greater heights. Fog Computing: Breakthroughs in Research and Practice contains a compendium

of the latest academic material on the evolving theory and practice related to fog computing. Including innovative studies on distributed fog computing environments, programming models, and access control mechanisms, this publication is an ideal source for programmers, IT professionals, students, researchers, and engineers.

Fog Computing in the Internet of Things Amir M. Rahmani 2017-05-29 This book describes state-of-the-art approaches to Fog Computing, including the background of innovations achieved in recent years. Coverage includes various aspects of fog computing architectures for Internet of Things, driving reasons, variations and case studies. The authors discuss in detail key topics, such as meeting low latency and real-time requirements of applications, interoperability, federation and heterogeneous computing, energy efficiency and mobility, fog and cloud interplay, geo-distribution and location awareness, and case studies in

healthcare and smart space applications. *Advancing Consumer-Centric Fog Computing Architectures* Munir, Kashif 2018-12-07 Due to a rapidly growing number of devices and communications, cloud computing has begun to fall behind on its ability to adequately process today's technology. Additionally, companies have begun to look for solutions that would help reduce their infrastructure costs and improve profitability. Fog computing, a paradigm that extends cloud computing and services to the edge of the network, has presented itself as a viable solution and cost-saving method. However, before businesses can implement this new method, concerns regarding its security, privacy, availability, and data protection must be addressed. *Advancing Consumer-Centric Fog Computing Architectures* is a collection of innovative research on the methods and applications of fog computing in technological, business, and organizational dimensions. Thoroughly examining fog computing with

respect to issues of management, trust and privacy, governance, and interoperability, this publication highlights a range of topics including access control mechanism, data confidentiality, and service-oriented architecture. This book is ideally designed for academicians, researchers, software developers, IT professionals, policymakers, technology designers, graduate-level students, managers, and business owners. Encyclopedia of Big Data Technologies Sherif Sakr 2019-03-01 The Encyclopedia of Big Data Technologies provides researchers, educators, students and industry professionals with a comprehensive authority over the most relevant Big Data Technology concepts. With over 300 articles written by worldwide subject matter experts from both industry and academia, the encyclopedia covers topics such as big data storage systems, NoSQL database, cloud computing, distributed systems, data processing, data management, machine learning and social technologies, data science. Each peer-reviewed,

highly structured entry provides the reader with basic terminology, subject overviews, key research results, application examples, future directions, cross references and a bibliography. The entries are expository and tutorial, making this reference a practical resource for students, academics, or professionals. In addition, the distinguished, international editorial board of the encyclopedia consists of well-respected scholars, each developing topics based upon their expertise.

Fog and Edge Computing Ajit Singh 2021-03-21 In recent times, the number of Internet of Things (IoT) devices/sensors increased tremendously. To support the computational demand of real-time latency-sensitive applications of largely geo-distributed IoT devices/sensors, a new computing paradigm named 'Fog computing' has been introduced as the demerits of cloud computing lie in the velocity, bandwidth, and privacy of data. Fog computing is an extension of cloud computing, and it is one of the most

important archetype in the current world. Fog computing is like cloud computing as it provides data storage, computation, processing capabilities. IoT edge computing is significantly different from non-IoT edge computing, with distinct demands and considerations. IoT devices typically have limited data processing and storage capabilities, so substantial data processing needs to occur off the device, with the edge offering an environment to undertake this processing and manage large volumes of IoT devices and data. This, in turn, can reduce device cost, as many functions can be off-loaded to the edge. The location of the edge itself has various possibilities and will differ according to the use case. For example, the edge for IoT could reside at an operator's local or regional data centre, at a base station or at a dedicated server on the customer's premises. This book features Fog and Edge Computing with respect to Cloud, Mobile, IoT and IIoT technologies from evolution, architecture, implementation and

design. All aspects have been covered with in-depth real-life and practical use cases from industry. This book covers the curriculum of the Fog/Edge Computing course at prominent global Universities / Institutions. Simply In Depth.....

Intelligent Internet of Things Farshad Firouzi

2020-01-21 This holistic book is an invaluable reference for addressing various practical challenges in architecting and engineering Intelligent IoT and eHealth solutions for industry practitioners, academic and researchers, as well as for engineers involved in product development. The first part provides a comprehensive guide to fundamentals, applications, challenges, technical and economic benefits, and promises of the Internet of Things using examples of real-world applications. It also addresses all important aspects of designing and engineering cutting-edge IoT solutions using a cross-layer approach from device to fog, and cloud covering standards, protocols, design principles, reference architectures, as well as all

the underlying technologies, pillars, and components such as embedded systems, network, cloud computing, data storage, data processing, big data analytics, machine learning, distributed ledger technologies, and security. In addition, it discusses the effects of Intelligent IoT, which are reflected in new business models and digital transformation. The second part provides an insightful guide to the design and

deployment of IoT solutions for smart healthcare as one of the most important applications of IoT. Therefore, the second part targets smart healthcare-wearable sensors, body area sensors, advanced pervasive healthcare systems, and big data analytics that are aimed at providing connected health interventions to individuals for healthier lifestyles.