

Premier Reference Source

Cloud Technology

Concepts, Methodologies, Tools, and Applications



Information Resources Management Association



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Preface

The constantly changing landscape of Cloud Technology challenges experts and practitioners to stay apprized of the field's most up-to-date research. That is why Information Science Reference is pleased to offer this four-volume reference collection that will empower students, researchers, and academicians with a strong understanding of critical issues within Cloud Technology by providing both broad and detailed perspectives on cutting-edge theories and developments in the field. This collection is designed to act as a single reference source on conceptual, methodological, technical, organizational, and managerial issues, as well as provide insight into emerging trends and future opportunities within the discipline.

Cloud Technology: Concepts, Methodologies, Tools, and Applications is organized into eight distinct sections that provide comprehensive coverage of important topics. The sections are (1) Fundamental Concepts and Theories, (2) Development and Design Methodologies, (3) Tools and Technologies, (4) Utilization and Application, (5) Organizational and Social Implications, (6) Managerial Impact, (7) Critical Issues, and (8) Emerging Trends. The following paragraphs provide a summary of what readers may expect from this invaluable reference tool.

Section I, *Fundamental Concepts and Theories*, includes an overview of Cloud Technology, providing readers with a foundation of knowledge for the entirety of this multivolume reference. The first chapter, "Cloud Computing Overview" by Yushi Shen, Yale Li, Ling Wu, Shaofeng Liu, and Qian Wen introduces this section and the volume as a whole with a brief history and present state of cloud computing technologies. Later chapters introduce the state of the art for a variety of applications, including library science ("Libraries and Cloud Computing Models" by Satish C. Sharma and Harshila Bagoria), health-care ("A Survey on Research Initiatives for Healthcare Clouds" by Rahul Ghos, Ioannis Papapanagiotou, and Keerthana Bolor), and big data ("Accessing Big Data in the Cloud Using Mobile Devices" by Haoliang Wang, Wei Liu, and Tolga Soyata), among others. The section concludes with chapters such as "Cloud Computing Forensics" by Mario A. Garcia and "Legal Process and Requirements for Cloud Forensic Investigations" by Ivan Orton, Aaron Alva, and Barbara Endicott-Popovsky, two chapters that look deeply into the legal aspects of Cloud Technology.

Section 2, *Development and Design Methodologies*, investigates some of the many policies and procedures in place to make effective use of Cloud Technology. The first chapter in this section, "Data Recovery Strategies for Cloud Environments" by Theodoros Spyridopoulos and Vasilios Katos, explores one of the most common uses of Cloud Technology: the backup and restoration of critical files. A second use for cloud computing technologies is the sharing of information and files over long distances, a topic explored in the chapters "A Cloud-Oriented Reference Architecture to Digital Library Systems" by K. Palanivel and S. Kuppuswami, "Cloud Computing Networks" by Yale Li and Yudong Liu, and "A Framework for Compliance and Security Coverage Estimation for Cloud Services" by Dipankar Dasgupta and Durdana Naseem. This section concludes with discussions of Software as a Service and software testing in the cloud in the chapters "SaaS Requirements Engineering for Agile Development"

by Asif Qumer Gill and Deborah Bunker and “Experiences with Cloud Technology to Realize Software Testing Factories” by Alan W. Brown.

Section 3, *Tools and Technologies*, focuses on the software aspect of Cloud Technology and how networks, databases, and platforms can be utilized to securely store and process information. The section begins with a focus on software testing, including chapters such as “Cloud-Enabled Software Testing Based on Program Understanding” by Chia-Chu Chiang and Shucheng Yu and “Testbed Platform” by Deepak Mane. Additional technologies explored in this section include cloud networks (“Design and Implementation of Optical Cloud Networks” by Walid Abdallah and Nouredine Boudriga), network security (“Efficient Healthcare Integrity Assurance in the Cloud with Incremental Cryptography and Trusted Computing” by Wassim Itani, Ayman Kayssi, and Ali Chehab), and database management (“Cloud Database Systems” by Swati V. Chande). Finally, the section concludes with a focus on networking and communication in cloud environments, with “Communication Infrastructures in Access Networks” by Syed Ali Haider, M. Yasin Akhtar Raja, and Khurram Kazi being a notable example.

Section 4, *Utilization and Application*, explores some of the vast array of useful applications of Cloud Technology. Researchers are constantly developing innovative new uses for the cloud, adding to the already exceptional number of fields that rely heavily on this technology. Chapters of note in this section include “The Network Infrastructures for Big Data Analytics” by Pethuru Raj; “Integration of Cognitive Radio Sensor Networks and Cloud Computing” by Yasir Saleem, Farrukh Salim, and Mubashir Husain Rehmani; “Cloud Computing and Gov 2.0” by Jeffrey Roy; “Digital Library and Its Requirements in the Global World” by Surbhi Saini; “Digital Forensic Investigation and Cloud Computing” by Joshua I. James, Ahmed F. Shosha, and Pavel Gladyshev; and “Bioinformatics Clouds for High-Throughput Technologies” by Claudia Cava, Francesca Gallivanone, Christian Salvatore, Pasquale Anthony Della Rosa, and Isabella Castiglioni, among many others, chapters that demonstrate the diverse range of uses for and the fundamentally ubiquitous nature of Cloud Technology.

Section 5, *Organizational and Social Implications*, takes a look at how Cloud Technology impacts the lives and livelihoods of those who use it. The first chapter, “Demystifying Quality of Healthcare in the Cloud” by Anastasios Mourtoglou, explores cloud computing’s impact on the medical field, and the next chapter, “Using Obstacles for Systematically Modeling, Analysing, and Mitigating Risks in Cloud Adoption” by Shehnila Zardari, Funmilade Faniyi, and Rami Bahsoon, examines the element of risk inherent in all online environments. Next, the section explores topics of regulation and security with chapters such as “Regulatory Aspects of Cloud Computing in Business Environments” by Michael Losavio, Pavel Pastukhov, and Svetlana Polyakova and “Different Perspectives of Cloud Security” by M. Sundaresan and D. Boopathy, among others, and privacy in chapters such as “Security and Privacy Issues in Cloud Computing” by Jaydip Sen and “Addressing Privacy in Traditional and Cloud-Based Systems” by Christos Kalloniatis, Evangelia Kavakli, and Stefanos Gritzalis. The final chapter in this section, “Digital Identity Management in Cloud” by Vladimir Vujin, Konstantin Simić, and Borko Kovačević, considers cloud computing on a personal level and how Cloud Technology impacts the lives of its users.

Section 6, *Managerial Impact*, delves more deeply into both the management and utilization of Cloud Technology, as well as the use of Cloud Technology in managing others. Early chapters in this section, such as “Cloud Computing Security and Risk Management” by Yoshito Kanamori and Minnie Yi-Miin Yen and “Risk Management in the Cloud and Cloud Outages” by S. Srinivasan, consider the security of the cloud and how managers and professionals mitigate security risks. The next few chapters discuss cloud computing for business leaders and how these tools can benefit a variety of organizations and businesses. Notable chapters include, among others, “Holistic Investment Framework for Cloud

Computing” by Marc Rabaey, “Organizational Control Related to Cloud” by Sathish A. Kumar, and “Organizational and Management Aspects of Cloud Computing Application in Scientific Research” by Mladen Čudanov and Jovan Krivokapić. The final chapter in this section, “Managing the Cloud for Information Systems Agility” by Haibo Yang, Sid L. Huff, and Mary Tate, considers the potential for improving cloud systems, analyzing both current practices and possible future outcomes in the industry.

Section 7, *Critical Concerns*, considers Cloud Technology from an analytic perspective, challenging accepted notions and looking toward future best practices. The beginning of this section evaluates the performance of cloud computing paradigms with chapters such as “Towards Improving the Testability of Cloud Application Services” by Tariq M. King, Annaji S. Ganti, and David Froslic and “Performance Evaluation of Data Intensive Computing in the Cloud” by Sanjay P. Ahuja and Bhagavathi Kaza, both being indicative of this section’s primary focus. Additional chapters, such as “Solving Security and Availability Challenges in Public Clouds” by Maxim Schnjakin and Christoph Meinel, “Key Legal Issues with Cloud Computing” by Sam De Silva, and “Securing Business IT on the Cloud” by Bina Ramamurthy, investigate security and legal implications of the cloud, while “A Case Study of the Health Cloud” by Roma Chauhan and “Do Open Educational Resources and Cloud Classroom Really Improve Students’ Learning?” by Chia-Wen Tsai and Pei-Di Shen consider cloud computing from a health and education standpoint. The final chapter, “Is the Cloud the Future of Computing?” by Joseph M. Kizza and Li Yang, transitions nicely into the final section on future trends and predicted developments in the industry.

Section 8, *Emerging Trends*, examines recent developments and improvements in Cloud Technology to predict where the field might head next. The section begins with a discussion of the overall outlook of the field, including chapters such as “Rationale for Use of Cloud Computing” by Amir Zeid, Ahmed Shawish, and Maria Salama and “The Cloud Inside the Network” by João Soares, Romeu Monteiro, Márcio Melo, Susana Sargento, and Jorge Carapinha. The next chapters, notably “Novel Resource Allocation Algorithm for Energy-Efficient Cloud Computing in Heterogeneous Environment” by Wei-Wei Lin, Liang Tan, and James Z. Wang; “High-Throughput Encryption for Cloud Computing Storage System” by Yaser Jararweh, Ola Al-Sharqawi, Nawaf Abdulla, Lo’ ai Tawalbeh, and Mohammad Alhammouri; and “Mobile and Cloud Technologies for Smarter Governance” by Pethuru Raj, investigate recent and forthcoming improvements to cloud systems, as well as novel applications of the technology. This four-volume reference concludes with the chapter “Cloud Bioinformatics in a Private Cloud Deployment” by Victor Chang, a chapter that focuses on a future where private, personal cloud environments are common.

As a comprehensive collection of research on current findings related to the development of interdisciplinary technologies, *Cloud Technology: Concepts, Methodologies, Tools, and Applications* provides researchers, administrators, and all audiences with a complete understanding of the latest advances, applications, and concepts in Cloud Technology. Although the primary organization of the contents in this multi-volume work is based on its eight sections, offering a progression of coverage on the important concepts, methodologies, technologies, applications, social issues, managerial considerations, critical concerns, and emerging trends, the reader can also identify specific content by utilizing the extensive indexing system found at the end of each volume. Given the vast number of issues concerning usage, successes and failures, policies, strategies, and applications of Cloud Technology in countries around the world, *Cloud Technology: Concepts, Methodologies, Tools, and Applications* addresses the demand for a resource that encompasses the most pertinent research on the technologies being employed to globally bolster the knowledge and implementation of Cloud Technology.

Table of Contents

Preface	xxviii
---------------	--------

Volume I

Section 1 Fundamental Concepts and Theories

This section includes an overview of Cloud Technology, providing readers with a foundation of knowledge for the entirety of this multivolume reference. Cloud computing and other network-based technologies have grown exponentially in recent years, necessitating a thorough understanding of both where the industry has been as well as where it is going. This section explores technologies such as big data, mobile applications, and library information systems, among others. In the opening 16 chapters of this extensive reference source, readers will obtain a clear understanding of the fundamental concepts and theories integral to the field of Cloud Technology.

Chapter 1

Cloud Computing Overview	1
<i>Yushi Shen, Microsoft Corporation, USA</i>	
<i>Yale Li, Microsoft Corporation, USA</i>	
<i>Ling Wu, EMC2 Corporation, USA</i>	
<i>Shaofeng Liu, Microsoft Corporation, USA</i>	
<i>Qian Wen, Endronic Corp, USA</i>	

Chapter 2

Cloud Computing Terms, Definitions, and Taxonomy	25
<i>Shamim Hossain, IBM Corporation, Australia</i>	

Chapter 3

Cloud Libraries: Issues and Challenges	50
<i>Mayank Yuvaraj, Banaras Hindu University, India</i>	

Chapter 4

Libraries and Cloud Computing Models: A Changing Paradigm	72
<i>Satish C. Sharma, Maharaja College of Management, India</i>	
<i>Harshila Bagoria, Maharaja College of Management, India</i>	

Chapter 5

Value Co-Creation in Cloud Services	98
---	----

Ammar Rashid, Auckland University of Technology, New Zealand

William Yu Chung Wang, Auckland University of Technology, New Zealand

Felix B Tan, Auckland University of Technology, New Zealand

Chapter 6

From Mainframe to Cloud	116
-------------------------------	-----

Božidar Radenković, University of Belgrade, Serbia

Petar Kočović, Calisto Adriatic/Gartner, Serbia

Chapter 7

Infrastructure as a Service.....	146
----------------------------------	-----

Shamim Hossain, IBM Corporation, Australia

Chapter 8

A Survey on Research Initiatives for Healthcare Clouds.....	170
---	-----

Rahul Ghosh, IBM, USA

Ioannis Papapanagiotou, Purdue University, USA

Keerthana Bolor, IBM TJ Watson Research Center, USA

Chapter 9

The Compute Infrastructures for Big Data Analytics	187
--	-----

Pethuru Raj, IBM India Pvt Ltd, India

Chapter 10

Accessing Big Data in the Cloud Using Mobile Devices	222
--	-----

Haoliang Wang, George Mason University, USA

Wei Liu, University of Rochester, USA

Tolga Soyata, University of Rochester, USA

Chapter 11

Mobile Cloud Computing: Technologies, Services, and Applications.....	249
---	-----

Jorge E. F. Costa, Institute of Telecommunications, University of Beira Interior, Portugal

*Joel J. P. C. Rodrigues, Institute of Telecommunications, University of Beira Interior,
Portugal*

Chapter 12

Energy-Efficiency in a Cloud Computing Backbone	266
---	-----

Burak Kantarci, University of Ottawa, Canada

Hussein T. Mouftah, University of Ottawa, Canada

Chapter 13	
Testing in the Cloud: Balancing the Value and Risks of Cloud Computing.....	289
<i>Randall W. Rice, Rice Consulting Services, USA</i>	
Chapter 14	
Concolic Test Generation and the Cloud: Deployment and Verification Perspectives.....	302
<i>Nikolai Kosmatov, CEA LIST, France</i>	
Chapter 15	
Cloud Computing Forensics	323
<i>Mario A. Garcia, Texas A&M University – Corpus Christi, USA</i>	
Chapter 16	
Legal Process and Requirements for Cloud Forensic Investigations	332
<i>Ivan Orton, King County Prosecuting Attorney's Office, USA</i>	
<i>Aaron Alva, University of Washington, USA</i>	
<i>Barbara Endicott-Popovsky, University of Washington, USA</i>	

Section 2

Development and Design Methodologies

This section investigates some of the many policies and procedures in place to make effective use of Cloud Technology. Understanding how to best implement new technologies is a first step in ensuring the efficacy of those technologies. Particular considerations include topics such as data recovery, library/database management, and data privacy, among others. The 16 chapters that make up this section explore the development and design methodologies that bridge the gap between fundamental concepts and real-world applications of Cloud Technology.

Chapter 17	
Data Recovery Strategies for Cloud Environments	377
<i>Theodoros Spyridopoulos, University of Bristol, UK</i>	
<i>Vasilios Katos, Democritus University of Thrace, Greece</i>	
Chapter 18	
A Theoretical Foundation of Demand Driven Web Services	392
<i>Zhaohao Sun, University of Ballarat, Australia & Hebei Normal University, China</i>	
<i>John Yearwood, Federation University, Australia</i>	
Chapter 19	
Towards Federation and Interoperability of Cloud Storage Systems.....	423
<i>Sebastian Dippl, Siemens AG Corporate Technology, Germany</i>	
<i>Michael C. Jaeger, Siemens AG Corporate Technology, Germany</i>	
<i>Achim Luhn, Siemens AG Corporate Technology, Germany</i>	
<i>Alexandra Shulman-Peleg, IBM Haifa Research Lab, Israel</i>	
<i>Gil Vernik, IBM Haifa Research Lab, Israel</i>	

Chapter 20

Dashboard Services for Pragmatics-Based Interoperability in Cloud and Ubiquitous Manufacturing	435
--	-----

Luís Ferreira, School of Technology, Polytechnic Institute of Cávado e Ave, Portugal & CGIT Research Centre, University of Minho, Portugal

Goran Putnik, CGIT Research Centre, School of Engineering, University of Minho, Portugal

Maria Manuela Cruz-Cunha, School of Technology, Polytechnic Institute of Cávado e Ave, Portugal & CGIT Research Centre, University of Minho, Portugal

Zlata Putnik, CGIT Research Centre, School of Engineering, University of Minho, Portugal

Hélio Castro, CGIT Research Centre, School of Engineering, University of Minho, Portugal

Cátia Alves, CGIT Research Centre, School of Engineering, University of Minho, Portugal

Vaibhav Shah, CGIT Research Centre, School of Engineering, University of Minho, Portugal

Chapter 21

A New Framework for Building Academic Library through Cloud Computing	450
---	-----

Vijay Parashar, Mody Institute of Technology & Science, India

Mohan Lal Vishwakarma, Mody Institute of Technology & Science, India

Reema Parashar, Mody Institute of Technology & Science, India

Chapter 22

A Cloud-Oriented Reference Architecture to Digital Library Systems	466
--	-----

K. Palanivel, Pondicherry University, India

S. Kuppuswami, Kongu College of Engineering, India

Chapter 23

Application of Cloud-Based Simulation in Scientific Research	490
--	-----

Mihailo Marinković, Telenor, Serbia

Sava Čavoški, MDS Information Engineering, Serbia

Aleksandar Marković, University of Belgrade, Serbia

Chapter 24

A Cognitive Access Framework for Security and Privacy Protection in Mobile Cloud Computing	517
--	-----

Gianmarco Baldini, Joint Research Centre – European Commission, Italy

Pasquale Stirparo, Joint Research Centre – European Commission, Italy

Chapter 25

A Framework for Compliance and Security Coverage Estimation for Cloud Services: A Cloud Insurance Model	543
---	-----

Dipankar Dasgupta, University of Memphis, USA

Durdana Naseem, University of Memphis, USA

Chapter 26

Designing a Forensic-Enabling Cloud Ecosystem	566
---	-----

Keyun Ruan, University College Dublin, Ireland

Chapter 27	
Cloud Environment Controls Assessment Framework	580
<i>Bharat Shah, Lockheed Martin Corporation, USA</i>	

Volume II

Chapter 28	
A Stable Matching Algorithm for VM Migration to Improve Energy Consumption and QOS in Cloud Infrastructures	606
<i>Abdelaziz Kella, University of Oran, Algeria</i>	
<i>Ghalem Belalem, University of Oran, Algeria</i>	

Chapter 29	
Addressing Device-Based Adaptation of Services: A Model Driven Web Service Oriented Development Approach	624
<i>Achilleas P. Achilleos, University of Cyprus, Cyprus</i>	
<i>Kun Yang, University of Essex, UK</i>	
<i>George A. Papadopoulos, University of Cyprus, Cyprus</i>	

Chapter 30	
Cloud Computing Networks: Utilizing the Content Delivery Network.....	648
<i>Yale Li, Microsoft Corporation, USA</i>	
<i>Yushi Shen, Microsoft Corporation, USA</i>	
<i>Yudong Liu, Western Washington University, USA</i>	

Chapter 31	
SaaS Requirements Engineering for Agile Development	660
<i>Asif Qumer Gill, University of Sydney, Australia</i>	
<i>Deborah Bunker, University of Sydney, Australia</i>	

Chapter 32	
Experiences with Cloud Technology to Realize Software Testing Factories	689
<i>Alan W. Brown, IBM Rational and University of Surrey, UK</i>	

Section 3 Tools and Technologies

This section focuses on the software aspect of Cloud Technology and how networks, databases, and platforms can be utilized to securely store and process information. While the cloud may seem simple from a user's perspective, many advanced technologies go into making cloud systems possible. In particular, software, networks, and databases must be effectively maintained, in addition to security and privacy concerns that are constantly at the forefront of this technology. With 12 chapters, this section offers a broad treatment of some of the many tools and technologies within Cloud Technology.

Chapter 33	
Cloud-Enabled Software Testing Based on Program Understanding	717
<i>Chia-Chu Chiang, University of Arkansas at Little Rock, USA</i>	
<i>Shucheng Yu, University of Arkansas at Little Rock, USA</i>	

Chapter 34

- Testbed Platform: Amazon Web Services for Library730
Deepak Mane, Tata Research Design and Development Center, India

Chapter 35

- Cloud-TM: An Elastic, Self-Tuning Transactional Store for the Cloud.....749
João Barreto, Technical University Lisbon, Portugal
Pierangelo Di Sanzo, Sapienza Università di Roma, Italy
Roberto Palmieri, Sapienza Università di Roma, Italy
Paolo Romano, Technical University Lisbon, Portugal

Chapter 36

- Main Components of Cloud Computing.....782
Yushi Shen, Microsoft Corporation, USA
Yale Li, Microsoft Corporation, USA
Ling Wu, EMC2 Corporation, USA
Shaofeng Liu, Microsoft Corporation, USA
Qian Wen, Endronic Corp, USA

Chapter 37

- Design and Implementation of Optical Cloud Networks: Promises and Challenges.....808
Walid Abdallah, University of Carthage, Tunisia
Noureddine Boudriga, University of Carthage, Tunisia

Chapter 38

- Performance Evaluation of Secure Data Transmission Mechanism (SDTM) for Cloud Outsourced Data and Transmission Layer Security (TLS)839
Abdullah A. Alhaj, The University of Jordan-Aqaba Branch, Jordan

Chapter 39

- Efficient Healthcare Integrity Assurance in the Cloud with Incremental Cryptography and Trusted Computing.....845
Wassim Itani, Beirut Arab University, Lebanon
Ayman Kayssi, American University of Beirut, Lebanon
Ali Chehab, American University of Beirut, Lebanon

Chapter 40

- The University Library Electronic Identities Authentication System (UL-EIDA): Enhanced by Segmented Virtual Machines and VLANs for Deployment in the Sub-Saharan Region858
Jameson Mbale, University of Namibia, Namibia

Chapter 41

- Cloud Database Systems: NoSQL, NewSQL, and Hybrid874
Swati V. Chande, International School of Informatics and Management, India

Chapter 42

- Sharing Medical Information by Means of Using Intelligent Agents and Cloud Computing889
Mauricio Paletta, Universidad Nacional Experimental de Guayana, Venezuela

Chapter 43

- Elastic Application Container System: Elastic Web Applications Provisioning920
Sijin He, Imperial College London, UK
Li Guo, University of Central Lancashire, UK
Yike Guo, Imperial College London, UK

Chapter 44

- Communication Infrastructures in Access Networks.....943
Syed Ali Haider, University of North Carolina at Charlotte, USA & National University of Science and Technology, Pakistan
M. Yasin Akhtar Raja, University of North Carolina at Charlotte, USA
Khurram Kazi, New York Institute of Technology, USA

Section 4 **Utilization and Application**

This section explores some of the vast array of useful applications of Cloud Technology. Cloud and network computing are both pervasive in the digital world, and diverse industries are making use of these technologies to improve their daily operations. Some of the applications described in this section include vehicular networks, e-government, biology and medicine, and education, among others. The 16 chapters in this section provide an in-depth examination of the utilization and application of the fundamental principles of Cloud Technology.

Chapter 45

- The Network Infrastructures for Big Data Analytics.....971
Pethuru Raj, IBM India Pvt Ltd, India

Chapter 46

- Mobile Video Cloud Networks1000
Qi Wang, University of the West of Scotland, UK
James Nightingale, University of the West of Scotland, UK
Runpeng Wang, Beijing Foreign Studies University, China
Naeem Ramzan, University of the West of Scotland, UK
Christos Grecos, University of the West of Scotland, UK
Xinheng Wang, University of the West of Scotland, UK
Abbes Amira, University of the West of Scotland, UK
Chunbo Luo, University of the West of Scotland, UK

Chapter 47

- Integration of Cognitive Radio Sensor Networks and Cloud Computing: A Recent Trend1025
Yasir Saleem, Sunway University, Malaysia
Farrukh Salim, NED University of Engineering and Technology, Pakistan
Mubashir Husain Rehmani, COMSATS Institute of Information Technology, Pakistan

Chapter 48

Vehicular Cloud Computing: Trends and Challenges.....1049

Kayhan Zrar Ghafoor, Koya University, Iraq

Marwan Aziz Mohammed, Koya University, Iraq

Kamalrulnizam Abu Bakar, Universiti Teknologi Malaysia, Malaysia

Ali Safa Sadiq, Universiti Teknologi Malaysia, Malaysia

Jaime Lloret, Universidad Politecnica de Valencia, Spain

Chapter 49

Computing Traffic Information in the Cloud1062

Po-Ting Wei, National Tsing Hua University, Taiwan

Tai-Chi Wang, National Tsing Hua University, Taiwan

Shih-Yu Chang, National Tsing Hua University, Taiwan

Yeh-Ching Chung, National Tsing Hua University, Taiwan

Chapter 50

The Use of Cloud Computing in Shipping Logistics.....1080

Kamalendu Pal, City University London, UK

Bill Karakostas, City University London, UK

Chapter 51

Cloud Computing and Gov 2.0: Traditionalism or Transformation across the Canadian Public Sector?.....1101

Jeffrey Roy, School of Public Administration, Dalhousie University, Canada

Chapter 52

Digital Library and Its Requirements in the Global World.....1119

Surbhi Saini, Indira Gandhi National Open University, India

Chapter 53

A University of Greenwich Case Study of Cloud Computing: Education as a Service.....1140

Victor Chang, University of Greenwich, UK, University of Southampton, UK & School of Computing and Creative Technologies, UK

Gary Wills, University of Southampton, UK

Chapter 54

Telecommunication Industry: Storage and Mobility1162

Fredrik Solsvik, Telenor ASA, Norway

Michel Dao, Orange Labs, France

Chapter 55

Leveraging the Cloud for Large-Scale Software Testing: A Case Study - Google Chrome on Amazon1175

Anjan Pakhira, University of Newcastle upon Tyne, UK

Peter Andras, University of Newcastle upon Tyne, UK

Volume III

Chapter 56

Cloud Computing for Earth Observation	1204
---	------

Roberto Cossu, European Space Agency, Italy

Claudio Di Giulio, European Space Agency, Italy

Fabrice Brito, Terradue, Italy

Dana Petcu, Institute e-Austria, Austria & West University of Timisoara, Romania

Chapter 57

Digital Forensic Investigation and Cloud Computing	1231
--	------

Joshua I. James, University College Dublin, Ireland

Ahmed F. Shosha, University College Dublin, Ireland

Pavel Gladyshev, University College Dublin, Ireland

Chapter 58

Cloud Computing for BioLabs	1272
-----------------------------------	------

Abraham Pouliakis, University of Athens, Greece

Aris Spathis, University of Athens, Greece

Christine Kottaridi, University of Athens, Greece

Antonia Mourtzikou, University of Athens, Greece

Marilena Stamouli, Naval and Veterans Hospital, Greece

Stavros Archondakis, 401 General Army Hospital, Greece

Efrossyni Karakitsou, National Technical University of Athens, Greece

Petros Karakitsos, University of Athens, Greece

Chapter 59

Bioinformatics Clouds for High-Throughput Technologies	1294
--	------

Claudia Cava, National Research Council, Italy

Francesca Gallivanone, National Research Council, Italy

Christian Salvatore, National Research Council, Italy

Pasquale Anthony Della Rosa, National Research Council, Italy

Isabella Castiglioni, National Research Council, Italy

Chapter 60

Cloud Computing for Cytopathologists	1312
--	------

Abraham Pouliakis, University of Athens, Greece

Stavros Archondakis, 401 Military Hospital, Greece

Efrossyni Karakitsou, National Technical University of Athens, Greece

Petros Karakitsos, University of Athens, Greece

Section 5

Organizational and Social Implications

This section takes a look at how Cloud Technology impacts the lives and livelihoods of those who use it. In addition to data security concerns, professional and private users alike have a vested interest in cloud computing systems and in ensuring the reliability and usefulness of these systems. Critical concerns include risk assessment and regulation, security, and privacy. In these 16 chapters, readers will find an in-depth discussion of some of the most pressing organizational and social implications of Cloud Technology.

Chapter 61

- Demystifying Quality of Healthcare in the Cloud1334
*Anastasios Moumtzoglou, Hellenic Society for Quality and Safety in Healthcare, Greece & P.
 & A. Kyriakou Children's Hospital, Greece*

Chapter 62

- Using Obstacles for Systematically Modeling, Analysing, and Mitigating Risks in Cloud
 Adoption1351
*Shehnaila Zardari, University of Birmingham, UK
 Funmilade Faniyi, University of Birmingham, UK
 Rami Bahsoon, University of Birmingham, UK*

Chapter 63

- Regulatory Aspects of Cloud Computing in Business Environments1373
*Michael Losavio, University of Louisville, USA
 Pavel Pastukhov, Perm State University, Russia
 Svetlana Polyakova, Perm State University, Russia*

Chapter 64

- Cloud Standards: Security and Interoperability Issues1387
*Fabio Bracci, University of Bologna, Italy
 Antonio Corradi, University of Bologna, Italy
 Luca Foschini, University of Bologna, Italy*

Chapter 65

- Impact of Cultural Differences on the Cloud Computing Ecosystems in the USA and China.....1417
*Yushi Shen, Microsoft Corporation, USA
 Jie Yang, Microsoft Corporation, USA
 Tayfun Keskin, University of Washington, USA*

Chapter 66

- Different Perspectives of Cloud Security1432
*M. Sundaresan, Bharathiar University, India
 D. Boopathy, Bharathiar University, India*