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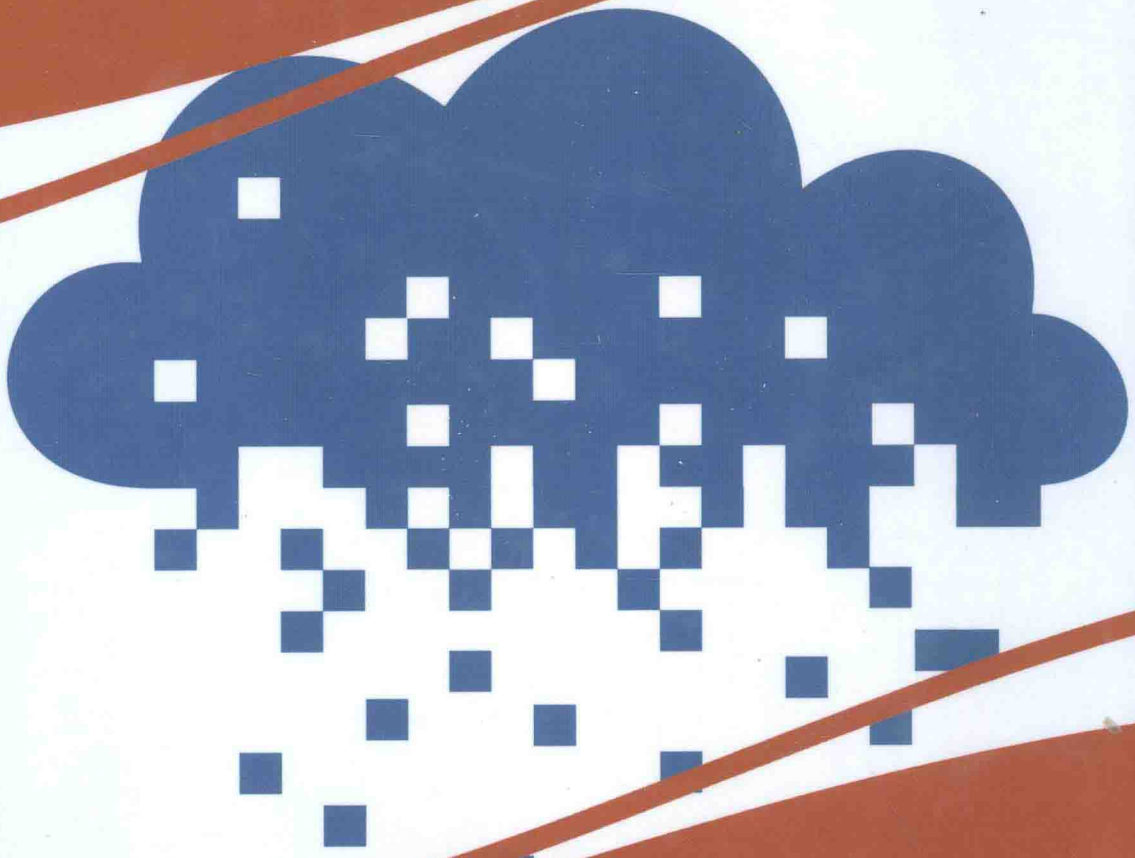
Cloud Technology

Concepts, Methodologies, Tools, and Applications



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Concepts, Methodologies, Tools, and Applications

Information Resources Management Association
USA

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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 1, *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), healthcare ("A Survey on Research Initiatives for Healthcare Clouds" by Rahul Ghos, Ioannis Papapanagiotou, and Keerthana Boloor), 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"

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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 Noureddine 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 Anastasius Moumtzoglou, 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 Froslie 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.

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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.

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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.

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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.

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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.

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