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Essentials of Cloud Computing

A Holistic Perspective

Springer

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Foreword

Business organizations across the globe are keenly focused on various digital transformation initiatives and implementations such that they are right and relevant for their customers, consumers, partners, employees, etc. The primary business objective today is to wisely leverage proven and potential digital technologies (IoT, AI, data analytics, blockchain, enterprise mobility, containerization, microservices architecture, software-defined cloud environments, etc.) to be extremely competitive and competent in their core activities. With cloudification processes becoming integrated and insightful, IT infrastructures are bound to be highly optimized and organized to efficiently host and run a dazzling array of business workloads; that is, applications are becoming cloud infrastructure aware and cloud resources, on the other hand, are all set to become application aware. The praiseworthy innovations and changes made in the cloud space will without an iota of doubt bring forth a bevy of delectable business transformations; that is, advances in the IT landscape will result in delivering pioneering and premium business solutions and services.

The book relates the story of the humble beginning and the continued journey of enigmatic cloud philosophy. The book makes a heady start by describing the fundamental and foundational aspects of cloud computing, and then proceeds with the various cloud service and deployment models. Popular cloud realization technologies are well expressed and exposed in this book. Cloud networking, storage, and security details are etched beautifully. Other important traits and tenets, such as cloud migration, monitoring, measurement, management, orchestration, and brokerage, are explained in detail and should empower readers. The final chapter describes how the cloud concept is invaluable in fulfilling business continuity as a result of its disaster recovery (DR) capability.

The book is a must for every cloud architect and software developer. Research scholars and academic professors will benefit greatly from this carefully crafted book on the cloud paradigm.

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Preface

The cloud paradigm has generated a tectonic shift in IT space. The extreme agility, adaptability, and affordability of cloud-enabled IT systems have substantially and strategically impacted business operations, offerings, and outputs. The goals of business automation and acceleration are being easily and quickly met through various noteworthy advances in the cloud space. This book relates the story of the cloud computing journey and much more.

Chapter 1 is dedicated to introducing the concept of cloud computing. It presents a quick refresher on traditional computing models—namely, monolithic computing, client–server computing, distributed computing, cluster computing, and grid computing, etc. Furthermore, it compares and contrasts cloud computing with other computing models. By the end of the chapter readers should understand the primary purpose for which cloud computing has been developed.

Chapter 2 introduces the fundamentals of cloud computing. It covers many features of cloud computing such as cloud computing architecture, different service classes, and deployment models. In addition, it gives a brief overview of different public cloud service providers.

Chapter 3 illustrates the enabling technologies and tools of cloud computing including service-oriented architecture (SOA), microservices architecture (MSA), compartmentalization (virtualization and containerization), and computing models such as cluster, grid, on-demand, utility, and DevOps. The greater maturity and stability of a number of technological paradigms has led to the rapid proliferation of cloud environments. The way in which this has happened raises a number of questions: How does cloud computing permit elastic resource sharing using the same physical hardware infrastructure for different users engaged in different kinds of computing tasks? What is it that enables an infrastructure, platform, or software system to be available to many users in a multi-tenancy environment? What technologies are key to the cloud taking its solid shape? This chapter aims to present answers to these question. By the end of this chapter readers should have an understanding of the key technological foundations of cloud computing.

Chapter 4 explains the nuances and nitty-gritty of cloud networking. The cloud computing environment is a huge computing environment that consists of many computational resources dispersed over different geographical locations. It goes without saying that resources are tied together with the help of networks. However,

this chapter aims to describe how these networks evolved from the simple design of the flat network model to the software-defined networking model for the cloud. By the end of this chapter readers should have gained an overall idea of enterprise networking, cloud networking, and how they work together to achieve business goals.

Chapter 5 digs deeper and describes what is involved in cloud storage. Data are a major if not core asset of every organization. Every organization of course has a need for its data to be stored. There are different types of storage devices with different characteristics such as capacity, scalability, reliability, performance, and cost. Navigating and selecting the appropriate storage device for a specific purpose requires an understanding of these different types of storage. The objective of this chapter is to progressively describe various types of storage, from conventional storage to cloud storage, and at the same time describe the evolution of data and the need for digitization.

Chapter 6 is all about security, the challenges it poses, and approaches taken to solve them. Cloud solutions are third-party solutions for any enterprise or user. Since cloud users avail themselves of the many different services that are deployed on the cloud provider's infrastructure, security naturally becomes a major concern. The objective of this chapter is to detail security-related concepts in the cloud. Readers will be shown how security is provided in different service models such as IaaS, PaaS, and SaaS. By the end of this chapter readers should understand that implementing security is a shared responsibility and the cloud user is responsible for data security, compliance, and regulatory and privacy requirements.

Chapter 7 details the intricacies of cloud migration. As a result of the cloud being deemed a game-changer, individuals, innovators, and institutions are migrating and modernizing their personal, social, and business workflows to cloud environments (private, public, and hybrid). Hence there are a number of cloud migration techniques, tools, and tips. The objective of this chapter is to introduce readers to the fundamentals of cloud migration. By the end of this chapter readers should understand the migration processes, migration strategies, and taxonomies of cloud-enabled, cloud-optimized, and cloud-native applications.

Chapter 8 explains the relevance of cloud monitoring. Cloud environments comprise physical and virtual infrastructures, IT platforms, and business applications. The number of participative, interactive, and collaborative cloud components is constantly growing. Therefore, meticulous and minute monitoring of each participant and constituent is essential to bringing about the originally envisaged benefits of cloud computing. The objective of this chapter is to highlight the basic concepts behind cloud monitoring. By the end of the chapter readers should understand how monitoring plays a crucial role in achieving the fundamental characteristics of cloud computing and optimizing the cloud.

Chapter 9 addresses the hot topic of cloud management. Monitoring and measuring the various cloud systems in a systematic manner requires cloud management. Having learned the technological, migration, and monitoring aspects readers will be interested in knowing about how the cloud computing environment is managed. The objective of this chapter is to introduce the basics of cloud

management. By the end of the chapter readers should understand the different cloud management functionalities and how they are managed by cloud management platforms and tools.

Chapter 10 explains the importance of cloud brokerage. As a result of the surge in popularity of the cloud the number of cloud and communication service providers (CSPs) is growing steadily. There are state-of-the-art cloud infrastructures and integrated platforms for design, development, debugging, deployment, delivery, decommissioning, etc. Hence the solutions and services provided by cloud brokerage could not have come at a better time. This chapter introduces the basics of cloud service brokerage (CSB). By the end of this chapter readers should understand what CSB is, why enterprises need CSB, and what its typical capabilities and architecture are.

Chapter 11 throws light on the growing importance of cloud orchestration. The objective of this chapter is to introduce the basics of cloud orchestration in multi-cloud environments. By the end of the chapter readers should understand why we need multi-cloud environments and hybrid IT, the challenges involved in bringing them about, and how cloud orchestration helps to resolve some of these challenges. Readers will also learn about the currently available tools for cloud orchestration.

Chapter 12 is all about cloud-based application and data recovery. Like security, disaster recovery (DR) is a major concern in the IT industry. Enterprises want to maintain business continuity (BC) in the event of disasters. The objective of this chapter is to present the basics of DR and highlight how DR plans can be prepared and implemented using the cloud.

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