Preface

About This Book

Cloud computing is a transformative paradigm that enables scalable, convenient, on-demand access to a shared pool of configurable computing and networking resources, for efficiently delivering applications and services over the Internet. This book is written as a textbook on cloud computing for educational programs at colleges and universities, and also for cloud service providers who may be interested in offering a broader perspective of cloud computing to accompany their own customer and developer training programs. The typical reader is expected to have completed a couple of courses in programming using traditional high-level languages at the college-level, and is either a senior or a beginning graduate student in one of the science, technology, engineering or mathematics (STEM) fields.

We have tried to write a comprehensive book that transfers knowledge through an immersive "hands on" approach, where the reader is provided the necessary guidance and knowledge to develop working code for real-world cloud applications. Concurrent development of practical applications that accompanies traditional instructional material within the book further enhances the learning process, in our opinion.

Organizationally, the book is organized into 3 main parts, comprising of a total of 13 chapters. Part I covers basic technologies that form the foundations of cloud computing. These include topics such as virtualization, load balancing, scalability & elasticity, deployment, replication. Real-world examples of cloud-based services and their characteristics are described.

Part II introduces the reader to the programming aspects of cloud computing with a view towards rapid prototyping complex applications. We chose Python as the primary programming language for this book, and an introduction to Python is also included within the text to bring readers to a common level of expertise. We also describe packages and frameworks for Python that allows rapid prototyping of practical cloud applications. Reference architectures for different classes of cloud applications, including e-Commerce, Business-to-Business,

Banking, Retail and Social Networking in the context of commonly used design methodologies are examined in detail. Other languages, besides Python, may also be easily used within the methodology outlined in this book.

Part III introduces the reader to specialized aspects of cloud computing including cloud application benchmarking, multimedia cloud applications, cloud security and big data analytics. Case studies on the applications of the cloud in industry, healthcare, transportation systems, smart grids, and education are provided.

Through generous use of hundreds of figures and tested code samples, we have attempted to provide a rigorous "no hype" guide to cloud computing. It is expected that diligent readers of this book can use these exercises to develop their own applications on cloud platforms, such as those from Amazon Web Services, Google Cloud, and Microsoft's Windows Azure. Review questions and exercises are provided at the end of each chapter so that the readers (students or instructors) can improve their understanding of the technologies conveyed. We adopted an informal approach to describing well-known concepts primarily because these topics are covered well in existing textbooks, and our focus instead is on getting the reader firmly on track to developing robust cloud applications as opposed to more theory.

While we frequently refer to offerings from commercial vendors, such as Amazon, Google or Microsoft, this book is not an endorsement of their products or services, nor is any portion of our work supported financially (or otherwise) by these vendors. All trademarks and products belong to their respective owners and the underlying principles and approaches, we believe, are applicable to other cloud vendors as well.

Chapter-1: Introduction to Cloud Computing

Provides an overview of cloud computing, including cloud deployment models, cloud service models, and development of cloud-based applications.

Chapter-2: Cloud Concepts & Technologies

Provides an introduction to underlying technologies, including virtualization, load balancing, scalability & elasticity, deployment, replication, monitoring, identity and access management, service level agreements (SLAs) and billing.

Chapter-3: Cloud Services & Platforms

Describes a classification of common cloud services including computing, storage, database, application, analytics, network and deployment services.

Chapter-4: Hadoop & MapReduce - Concepts

Provides an overview of Hadoop ecosystem, including MapReduce architecture, MapReduce job execution flow and MapReduce schedulers, with examples.

Chapter-5: Cloud Application Design

Provides the principles and methodologies of rapid cloud application design including common cloud application reference architectures.

Chapter-6: Python Basics

Provides an introduction to Python, installing Python, Python data types & data structures, control flow, functions, modules, packages, file input/output, data/time operations and classes.

Chapter-7: Python for Cloud

Provides an introduction to the use of Python for cloud development. Practical examples rely on Amazon Web Services, Python for Google Cloud Platform, Python for Windows Azure, Python for MapReduce, Python web application framework (i.e., Django) and development with Django.

Chapter-8: Cloud Application Development in Python

Provides instruction on the design of several case studies including Image Processing App, MapReduce App, Document Storage App and Social Media Analytics App.

Chapter-9: Big Data Analytics

Provides an introduction to big data analytics approaches, including clustering and classification of big data

Chapter-10: Multimedia Cloud

Provides a description of reference architectures for multimedia cloud for real-time applications and live streaming.

Chapter-11: Cloud Application Benchmarking & Tuning

Provides a description of cloud application workload characteristics, performance metrics for cloud applications, cloud application testing, and performance testing tools.

Chapter-12: Cloud Security

Provides an introduction to cloud security, including approaches for authorization authentication, identify & access management, data security, data integrity encryption & key management.

Chapter-13: Cloud for Industry, Healthcare & Education

Provides an introduction to applications of cloud computing in healthcare, energy, smart grids, manufacturing industry, transportation systems and education.

Book Website

For more information on the book, copyrighted source code of all examples in the book, lab exercises, and instructor material, visit the book website: www.cloudcomputingbook.info