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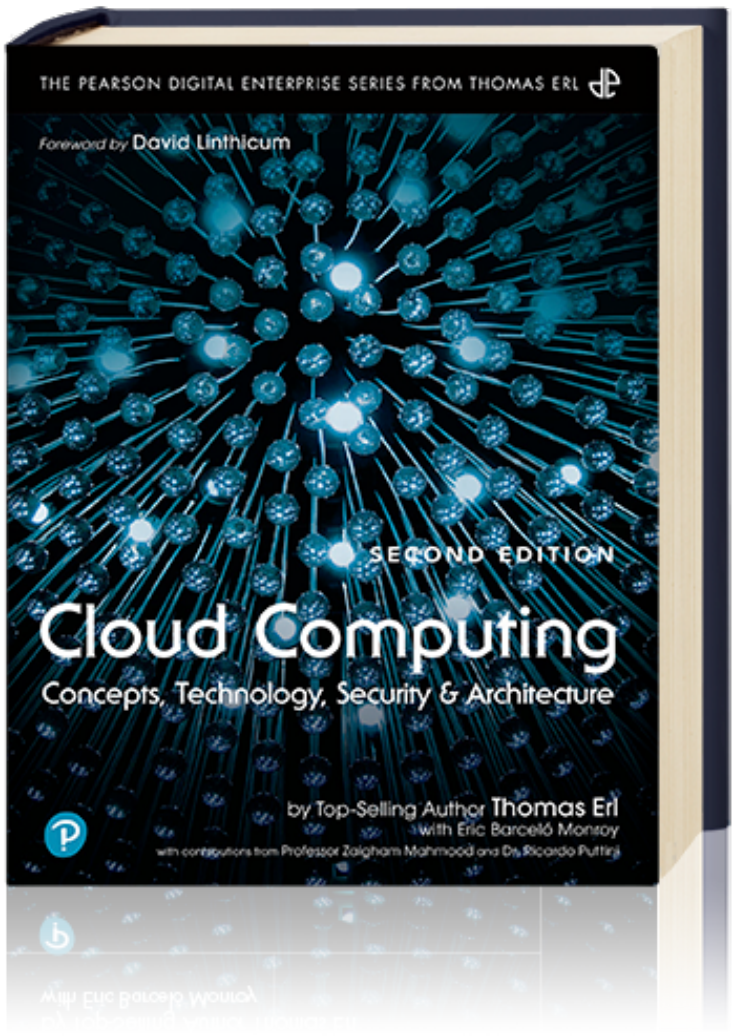
Official Instructor Guide for

Cloud Computing:
Concepts, Technology, Security & Architecture
Second Edition
9780138052256



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Free Online Resources for Academic Institutions

Arcitura Education developed this Instructor's Guide and has developed numerous additional educational supplements that correspond to and expand upon the contents in this book, as part of its education and accreditation curriculum.

Arcitura further makes a range of complimentary online resources available to eligible academic institutions, including:

- structured online courses and lessons
- online video lessons
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- interactive and automatically graded self-tests and quizzes
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- online supplements

Access can often be granted to a school's entire student body in support of realizing the school's learning and development goals.

If you are with an academic institution that has interest in gaining access to these online resources, please contact info@arcitura.com and include information about your school and programs.

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The *Cloud Computing: Concepts, Technology, Security & Architecture (Second Edition)* book is an official supplement for several Arcitura certification programs, as shown in the *Arcitura Education Professional Accreditation Programs* section at the end of this guide.

Color Figures Download

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Symbol Legend PDFs

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Book Series Website, LinkedIn Group, YouTube Channel

This book is part of the Pearson Digital Enterprise Book Series from Thomas Erl. To access chapter descriptions, a detailed TOC, symbol legend downloads and more resources for other series titles, visit: www.thomaserl.com/books

The LinkedIn group for this book series is at: www.linkedin.com/groups/2954416 and Thomas Erl's YouTube channel is at: www.youtube.com/@terl

How to Use Case Study Examples

Although this Instructor's Guide does not reference the case study examples in this book, it is important that these be considered for teaching purposes. Instructors may wish to even extend or expand upon case study content by creating new examples or new adding new problem scenarios to the existing case study backgrounds in Chapter 2.

Cloud Computing Design Patterns Book

Many of the architecture models covered in Part III of this book are available in a standardized design pattern format in the book *Cloud Computing Design Patterns* (Pearson Education, ISBN: 9780133858563), which is also a title in the Pearson Digital Enterprise Book Series from Thomas Erl (thomaserl.com/books).



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Introduction

The book begins with Chapters 1 and 2 providing introductory content and case studies background information. Introductory content from Chapter 1 is repurposed in this Instructor's Guide to provide context for parts and chapters.

Chapters subsequent to 1 and 2 are organized into the following parts:

Part I: Fundamental Cloud Computing

The five chapters in this part cover introductory topics in preparation for all subsequent chapters.

- Chapter 3: Understanding Cloud Computing
- Chapter 4: Fundamental Concepts and Models
- Chapter 5: Cloud-Enabling Technology
- Chapter 6: Understanding Containerization
- Chapter 7: Understanding Cloud Security and Cybersecurity

Part II: Cloud Computing Mechanisms

Technology mechanisms represent well-defined IT artifacts that are established within an IT industry and commonly distinct to a certain computing model or platform. The technology-centric nature of cloud computing requires the establishment of a formal level of mechanisms to be able to explore how solutions can be assembled via different combinations of mechanism implementations. This part formally documents 48 technology mechanisms that are used within cloud environments to enable generic and specialized forms of functionality. Each mechanism description is accompanied by a case study example that demonstrates its usage. The utilization of select mechanisms is further explored throughout the technology architectures covered in Part III.

- Chapter 8: Cloud Infrastructure Mechanisms
- Chapter 9: Specialized Cloud Mechanisms
- Chapter 10: Cloud Security and Cybersecurity Access-Oriented Mechanisms
- Chapter 11: Cloud Security and Cybersecurity Data-Oriented Mechanisms
- Chapter 12: Cloud Management Mechanisms

Part III: Cloud Computing Architecture

Technology architecture within the realm of cloud computing introduces requirements and considerations that manifest themselves in broadly scoped architectural layers and numerous distinct architectural models. This set of chapters builds upon the coverage of cloud computing mechanisms from Part II by formally documenting 38 cloud-based technology architectures and scenarios in which different combinations of the mechanisms are documented in relation to fundamental, advanced, and specialized cloud architectures.

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- Chapter 13: Fundamental Cloud Architectures
- Chapter 14: Advanced Cloud Architectures
- Chapter 15: Specialized Cloud Architectures

Part IV: Working with Clouds

Cloud computing technologies and environments can be adopted to varying extents. An organization can migrate select IT resources to a cloud, while keeping all other IT resources on premises—or it can form significant dependencies on a cloud platform by migrating larger amounts of IT resources or even using the cloud environment to create them. For any organization, it is important to assess a potential adoption from a practical and business-centric perspective to pinpoint the most common factors that pertain to financial investments, business impact, and various legal considerations. This set of chapters explores these and other topics related to the real-world considerations of working with cloud-based environments.

- Chapter 16: Cloud Delivery Model Considerations
- Chapter 17: Cost Metrics and Pricing Models
- Chapter 18: Service Quality Metrics and SLAs

Learning Objectives & Sample Exercises

Each of the next 10 sections in this Instructor's Guide provides a set of learning objectives associated with a chapter and a sample exercise that demonstrates how students can be tested for knowledge of chapter content.

The sections are organized as follows:

- Chapter 3: Understanding Cloud Computing
- Chapter 4: Fundamental Concepts and Models
- Chapter 5: Cloud-Enabling Technology
- Chapter 6: Understanding Containerization
- Chapter 7: Understanding Cloud Security and Cybersecurity
- Chapter 8-12: Cloud Mechanisms
- Chapter 13-15: Cloud Architectures
- Chapter 16: Cloud Delivery Model Considerations
- Chapter 17: Cost Metrics and Pricing Models
- Chapter 18: Service Quality Metrics and SLAs

The subsequent sections in this Instructor's Guide that provide sample exam questions combine topics from these book chapters.

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Chapter 3: Understanding Cloud Computing

Following a brief history of cloud computing and a discussion of business drivers and technology innovations, basic terminology and concepts are introduced, along with descriptions of common benefits and challenges of cloud computing adoption.

Learning Objectives

- Describe the emergence of cloud computing from a combination of business drivers and technology innovations and describe the evolution of definitions associated with cloud computing.
- Describe the responsibility and challenges of capacity planning for IT enterprises and explain the issue of operating overhead for organizations with fluctuating or unpredictable usage requirements.
- Explain the need for business agility for an IT enterprise to respond to business change.
- Describe the concept of grid computing and the notion of “pay-as-you-go” computing.
- Describe the term “service” within the context of cloud computing and explain what constitutes an IT resource.
- Describe horizontal scaling and the two types of horizontal scaling – and – describe vertical scaling and the two types of vertical scaling.
- Explain virtualization as a key technology in cloud computing environments, as well as the purpose of a virtualization environment.
- Explain the concept of containerization and how containers are similar in concept to virtual servers.
- Describe serverless environments and their benefits.
- Explain what constitutes a cloud and the difference between an on-premises and cloud-based IT resource.
- Describe what containers are, including how they are commonly used in clouds.
- Describe the benefit of Increased Responsiveness and explain how this benefit relates to the platform administration carried out by organizations and the complexity of their infrastructure environments.
- Describe the benefit of Reduced Investment and Proportional Costs and explain the relationship of this benefit to the pay-per-use billing model and how the cost benefits of leasing cloud-based IT resources differ from on-premises IT resources.
- Describe the benefit of Increased Scalability and explain how this benefit can relate to an organization’s responsiveness.
- Describe the benefit of Increased Availability and Reliability and explain how this benefit relates to failover support and how it is provided transparently to cloud consumers.

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- Describe the challenge of Increased Vulnerability Due to Overlapping Trust Boundaries and explain how this challenge relates to security technology and cloud consumer data.
- Describe the challenge of Increased Vulnerability Due to Shared Security Responsibility and explain how this challenge relates to the cloud shared responsibility model.
- Describe the challenge of Increased Exposure to Cyber Threats and explain why this challenge arises with the increased adoption of contemporary digital technologies and digital transformation.
- Describe the challenge of Reduced Operational Governance Control and explain why this challenge arises with cloud environments and how it relates to the cloud consumer's usage of cloud provider SLAs. Further explain also how this challenge can lead to problems with irresponsible cloud providers.
- Describe the challenge of Limited Portability between Cloud Providers and explain why cloud providers impose proprietary characteristics within their clouds and explain the role of industry standardization in relation to this challenge.
- Describe the challenge of Multiregional Compliance and Legal Issues and explain how legal issues pertaining to the geographic location of cloud consumer data and IT resources can cause problems.
- Describe the challenge of Cost Overruns and explain its root causes and consequences.

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