Chapter 1
Introduction to Serverless Computing

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ABSTRACT

The chapter provides a comprehensive exploration of the dynamic and efficient realm of serverless computing. Beginning with a historical context, the chapter delves into the serverless fundamentals, limitations of traditional computing and the emergence of serverless solutions. The core components of serverless computing, including computer services, storage services, and event triggers, are explained. The chapter navigates through serverless architecture, drawing comparisons with microservices and monolithic structures, and highlights the role of serverless frameworks in facilitating development. Major serverless platforms, including Amazon web services, Microsoft Azure, and Google Cloud Platform, are explored in detail. The chapter addresses considerations such as cold starts, vendor lock-in, security concerns, and monitoring/debugging challenges. Real-world case studies provide practical insights into successful serverless implementations. In conclusion, the chapter discusses the future trajectory of serverless computing.

1. INTRODUCTION

In the ever-evolving landscape of information technology, the pursuit of more efficient, scalable, and cost-effective computing solutions has led to a paradigm shift known as serverless computing. This transformative approach challenges traditional server-based architectures, offering a dynamic alternative that allows developers to focus on writing code without the burden of managing underlying infrastructure. This chapter, "Introduction to Serverless Computing," is a comprehensive exploration of this revolutionary computing model, unravelling its core concepts, major platforms, and practical applications.

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As we embark on this journey, we will begin by defining serverless computing and examining its historical roots, setting the stage for a deeper understanding of why this paradigm has gained prominence. The limitations and challenges of traditional computing architectures will be scrutinized, providing context for the compelling need that fuelled the rise of serverless solutions.

With a solid foundation established, the chapter navigates through the fundamental principles of serverless computing. We will unravel the intricate web of components, including compute and storage services, event triggers, and the stateless nature of execution. Through this exploration, readers will gain insight into the inherent benefits of serverless, such as enhanced cost efficiency, unparalleled scalability, and accelerated development cycles.

Serverless architecture, a key aspect of this paradigm, will be dissected, drawing comparisons with established models like microservices and monolithic structures. The role of serverless frameworks in simplifying development processes will be highlighted, providing a bridge between conceptual understanding and practical implementation.

The journey continues with an in-depth examination of major serverless platforms, featuring Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP). Key services, including AWS Lambda, Azure Functions, and GCP Cloud Functions, will be explored to offer readers a comprehensive view of the diverse tools available for serverless development. Real-world applications form a significant portion of our exploration. Use cases spanning web and mobile applications, Internet of Things (IoT), real-time data processing, and more will illustrate the versatility and applicability of serverless computing in various domains. However, this paradigm shift is not without its challenges. We will delve into considerations such as cold starts, vendor lock-in, security concerns, and the nuances of monitoring and debugging in serverless environments. Moreover, the chapter will outline best practices, guiding readers on designing robust serverless solutions, implementing effective testing strategies, and establishing seamless deployment pipelines.

Looking ahead, the chapter explores the future trends and developments in the serverless landscape. The integration with edge computing, containers, and machine learning represents the next frontier, promising even greater innovation and efficiency. To ground our exploration in practicality, real-world case studies will be presented, offering tangible examples of successful serverless implementations. These case studies provide a bridge between theory and application, offering valuable insights for readers at various stages of their serverless journey. In conclusion, this chapter will summarize key takeaways, providing a cohesive understanding of serverless computing and its transformative impact on modern application development. Whether you are a newcomer seeking an introduction to serverless or an experienced practitioner looking to deepen your knowledge, this chapter aims to be your comprehensive guide through the exciting realm of serverless computing.

2. SERVERLESS COMPUTING AND ITS EVOLUTION

Serverless computing, often synonymous with Function as a Service (FaaS), is a revolutionary cloud computing paradigm that redefines how applications are developed, deployed, and scaled. At its essence, serverless computing empowers developers to focus solely on writing code without the encumbrance of managing servers or infrastructure. In this model, applications are constructed as a collection of independent functions, each designed to execute specific tasks in response to events or triggers. The term "serverless" can be misleading; servers are still a crucial part of the process, but the operational intrica-