Chapter 3
Edge Architecture Integration of Technologies

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EXECUTIVE SUMMARY

The enormous growth of the internet of things (IoT) and cloud-based services have paved the way for edge computing, the new computing paradigm which processes the data at the edge of the network. Edge computing resolves issues related to response time, latency, battery life limitation, cost savings for bandwidth, as well as data privacy and protection. The architecture brings devices and data back to the consumer. This model of computing as a distributed IT system aims at satisfying end-user demands with faster response times by storing data closer to it. The enormous increase in individuals and locations, connected devices such as appliances, laptops, smartphones, and transport networks that communicate with each other has raised exponentially. Considering these factors in this chapter, edge computing architecture along with the various components that constitute the computing platform are discussed. The chapter also discusses resource management strategies deliberate for edge computing devices and integration of various computing technologies to support efficient IoT architecture.

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INTRODUCTION

The IoT is a fusion of the technologies of infrastructure, applications, and networking. Data is an important aspect of an IoT device, which must be analyzed immediately. Based on the specific IoT devices that are installed under the network, an IoT framework will produce unlimited data within a second as per business needs. The data generated from IoT devices or sources are limitless and will easily absorb network bandwidth, resulting in excess data storage requirements. Aggregating and digitizing the data at the edge of the network is important, and can then be transmitted to back-end applications (Gubbi et al., 2013). Edge computing takes control of this burden and aims to reduce or automate the IT infrastructure. Such edge computing systems are positioned next to the IoT devices/data sources and therefore implement the necessary security. Edge computing has a significant benefit in reducing the response and maximizing the usage of network resources. This also aims to reduce bottlenecks in the bandwidth and the network.

Thus, IoT systems and infrastructure must be capable of serving heterogeneous devices producing vast quantities of data and events. Taking such ideas into consideration, Edge Computing improves IoT efficiency through its clustered structure where network traffic may therefore be substantially reduced and latency between the cloud's edge node and end-users may be improved. Thus, this makes IoT applications' real-time responsiveness relative to cloud and fog computing (Premsankar et al., 2018). Edge computing provides cloud services such as processing, storage, and networking closer to software, computers, and consumers. It achieves this by utilizing tiny power cell stations to facilitate high-speed transport of data without needing to drive large distances to a server or data center. The innovation of edge computing is to introduce artificial intelligence, machine learning, data analytics through the Internet of Things (IoT), the ability to operate containers, and also the ability to run entire virtual machines directly through a wide variety of computers and devices. Such devices may be as compact as a smartphone, or as large for sophisticated processing as complete computing racks. Regardless of the device's size and capacities, the information on certain computers is still connected to the cloud.

IoT-enabled systems have made cutting edge computing technologies a market requirement. Data density, speed, and new capabilities have rendered cloud computing increasingly unrealistic for devices requiring millisecond data processing. Latency is just too high (Ganz et al., 2015). Complex event processing occurs in the device or a network near to the device with edge computing architecture, which removes round-trip issues and allows activities to occur faster. For instance, vehicles with autonomous driving capability need the brakes immediately applied or will lead to the risk of crashing. With cloud computing services, the round-trip time to the cloud is too slow for this task to accommodate. If the Edge computing capabilities are equipped in a vehicle, the critical decision to stop the car will exist solely on the device of the vehicle avoiding an accident. Following this incident, the data will then be transferred to the cloud for further vehicle tracking and maintenance. Thus, edge computing is a new platform that aims to have a decrease in delays owing to its "proximity" to end-users or applications with the necessary processing and storage facilities.

The main objective of this paper is to discuss Edge computing architecture and its components. It also focusses on efficient resource management in edge computing and the Integration of various technologies to provide a flexible IoT paradigm.

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