Chapter 11
Efficient Energy Management Using Fog-Based Framework in the Healthcare Industry

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ABSTRACT

Fog computing brings computation closer to the data source by utilizing resources at the network edge, such as routers, gateways, or even devices themselves. By providing data processing closer to where it is needed, Fog Computing in healthcare speeds up data processing for better patient care by saving time and energy. But Fog nodes often have limited resources, making it tough to optimize energy use without compromising service quality. To improve energy efficiency in fog computing environments, this chapter leverages technological advancements. In healthcare, Fog-based frameworks can monitor and analyze patient data in real-time, helping medical professionals for better decision making. This study is a collection of frameworks created for fog computing applications in healthcare. The frameworks comprise three layers: objects, fog nodes, and a cloud data center. The results emphasize how crucial energy-saving frameworks are to expanding the potential of fog computing in healthcare infrastructure

INTRODUCTION

IoT has the potential to automate processes across many different industries. It is the resultant global network that uses extended Internet technologies to link smart objects. Many predict that the Internet of Things will grow into a massive industry, and it will greatly influence our life (Abdellatif Et. al.,2022) Currently, this network is utilized in various industries, like banking, manufacturing, government, transportation, agriculture, and the healthcare system in particular. IoT-based smart healthcare refers to a technological revolution that uses cloud based computing, sensor technologies, big data analytics and artificial learning to provide healthcare facilities which are more effective, convenient, affordable, and quick(Behmanesh et al., 2020). As smart nodes have limited energy resources, achieving energy-efficient

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services is the biggest challenge in the field of smart healthcare. Fog computing is the best option for IoT-based healthcare applications that bridges gap between cloud computing and the end-user devices (Elhadad et al., 2022).

Fog Computing

With the advancement of technology and the huge demand for the consumption of internet and content, the methods by which we store and manage data have also transformed drastically in the last few years. This has led to the adoption of two different ways of computing: one is cloud computing, and the other is fog computing. Fog computing stores the data to the device which is nearby the end user in place of centralized cloud so that we can bring the cloud facility close to IoT devices. Fog devices are globally distributed on different types of platforms to improve the security and response time (Navakauskas & Kazlauskas, 2023). It is basically introduced by Cisco to resolve the issues faced by cloud computing which are volume, latency and bandwidth.

FOG COMPUTING BENEFITS IN HEALTHCARE

Fog computing provides the given advantages over cloud computing.

Low Latency

As we know healthcare services need real time reactions and its applications are latency sensitive, so fog computing is helpful to get proper response on time. Because of the distance between users and data is less, the response time in fog computing so the crucial information can be provided in reduced time as compared to the cloud computing fog computing can provide the crucial information in reduced time.

Bandwidth Efficiency

A lot of data is being generated and has to be transferred among various end users, gadgets and cloud (Elhadad et al., 2022). With the help of fog computing the cost of transfer of information has been reduced because a huge amount of information is handled by the Fog nodes which are nearby the IoT healthcare devices in spite of sending it to far away cloud which need more cloud bandwidth

Security and Privacy

Sensitive and private information is frequently included in healthcare data Fog computing stores the data on local fog nodes. So the data which is not required is not transferred on cloud which in result will improve the safety and confidentiality of data (Aazam et al., 2020).

Scalability

Fog computing can manage extra work with the help of distributed processing by distributing the load among various edge devices.