Optimizing E-Commerce Systems with Self-Healing Mechanisms and LLMs

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Abstract

This document examines the integration of self-healing mechanisms and Large Language Models (LLMs) into Azure Stack, aiming to enhance the reliability and efficiency of e-commerce systems. In the face of increasing traffic and the demands of modern e-commerce, traditional incident handling proves insufficient. By implementing a self-healing architecture that utilizes Azure Monitor, Azure Machine Learning, and Azure Kubernetes Service, this study proposes a model that not only mitigates downtime but also improves system responsiveness automatically. The approach is tested under simulated traffic spikes, with results indicating significant improvements in system handling and downtime reduction. This document offers a clear depiction of the implementation, benefits, and practical applications of self-healing systems in cloud-based infrastructures.

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1. Introduction
The modern e-commerce landscape demands robust and adaptive systems capable of managing unexpected traffic loads without compromising user experience. Traditional methods often fall short, necessitating an innovative approach to system resilience. This document introduces a self-healing mechanism integrated with Large Language Models (LLMs), specifically tailored for Azure Stack, enhancing its capability to support dynamic e-commerce environments.

2. Proposed Method/Algorithm
We propose a self-healing system architecture that incorporates real-time data analytics via Azure Monitor and predictive interventions using Azure Machine Learning. The system automatically adjusts resources within Azure Kubernetes Service (AKS) to respond to varying load conditions, thereby maintaining optimal performance without manual intervention.
Table 1. The summary of the occurance of formal and informal linguistic features

3. Research Method
The research involved setting up a simulated e-commerce environment on Azure Stack where traffic spikes were artificially generated. The performance of the Azure Stack, both with and without the proposed self-

healing mechanisms, was compared. Data was collected on response times, system availability, and resource utilization.
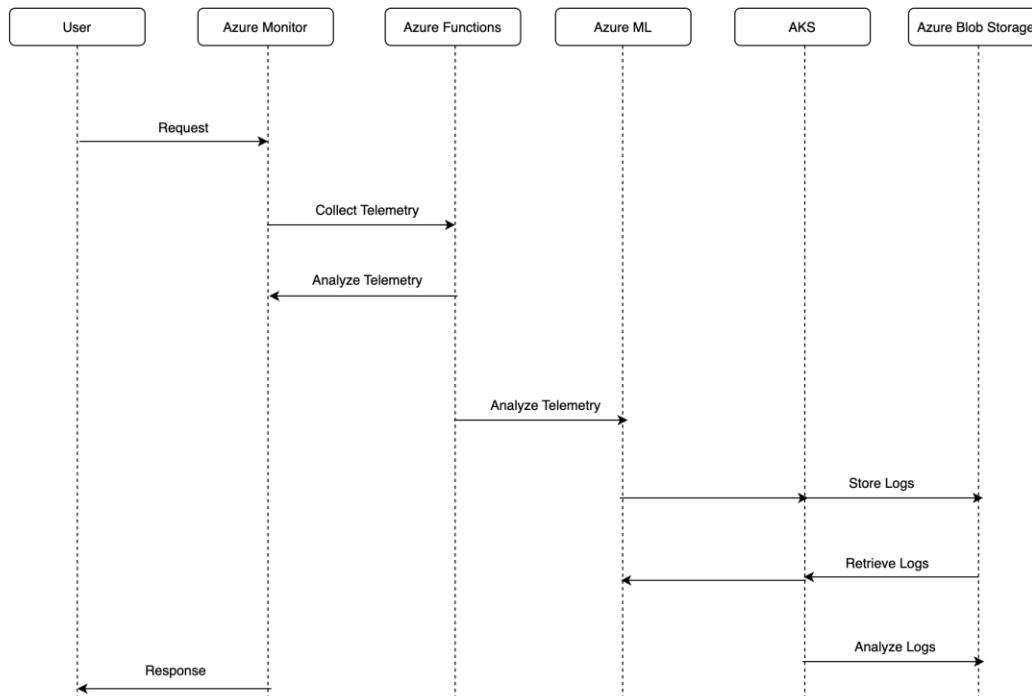

Figure 1. *Sequence Diagram*

3. ResultsandAnalysis

The results demonstrate that the self-healing system significantly reduces downtime and improves resource allocation efficiency. The integration of LLMs allowed for predictive scaling and resource management, which effectively countered the simulated traffic surges. This section discusses the implications of these findings and how they can be applied to real-world scenarios.

4. Conclusion

The study confirms that incorporating self-healing mechanisms and LLMs into Azure Stack offers substantial benefits in managing e-commerce platforms. These systems ensure higher uptime and better performance, thus potentially increasing customer satisfaction and revenue. Future research will focus on refining these models and exploring their applicability to other types of cloud infrastructures.

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