Cloud Robotics Security Framework and Performance Assessment: An End Point Balancing Technique

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Abstract— End Point Balancing Technology, It is a remote local cloud that addresses cloud robotics security issues with End Point Balancing Technology (CRT). There is extremely little literature with theoretical and statistical backing, even though numerous related hypotheses have been put out. The research on model construction and performance evaluation is the main topic of this work. First, an End Point Technique-based cloud robotics security model is created. With this model, the system's concurrency and distributed large-capacity storage performance are greatly in- creased, and numerous security vulnerabilities associated with typical cloud robotics systems may be avoided. Second, average latency and throughput are used to assess the performance of the suggested model; these metrics are significant for further study and optimization in this area. The analysis and test results show that the security model based on End Point Balancing is successful.

Index Terms—Cloud Robotics, End Point Balancing, Security.

I. Introduction

Cloud robotics systems have been developed and used extensively in the past few years. The number of these devices is growing steadily and quickly each year, according to market data on cloud robotics. According to analysts, there are presently 21 billion active robotics devices worldwide, and in a few years, that figure is expected to rise to 50 billion. Information security professionals are worried about the degree of protection offered by cloud robotics technologies because of their development and widespread implementation. They claim that the vast quantity of unsecured cloud devices presents new potential for online thieves. Indeed, there are already documented instances of multiple cloud robotics systems breaking down. This work is particularly crucial when utilizing these instruments at vital infrastructure.

Cyber risks are evolving due to new tools and technologies. These days, a lot of businesses have launched their protection models and are working hard to standardize, correlate, and apply them. Information security is changing as a result of the rise of cloud computing. Therefore, several cybersecurity issues can be resolved thanks to the advancement and cutting edge of computing technologies. The primary use of the End Point Balancing Technique is on cloud robotics devices for remote monitoring and direct data processing. The primary benefit of this strategy is that it eliminates the need to move all data to a data center or cloud, which reduces processing time and decision-making.

Therefore, a number of cybersecurity issues can be resolved thanks to the advancement and cutting edge of computing technologies. The primary use of the End Point Balancing Technique is on cloud robotics devices for remote monitoring and direct data processing. The primary benefit of this strategy is that it eliminates the need to move all data to a data centre or cloud, which reduces processing time and decision-making. Cloud robotics and the End Pont Balancing Technique (EBT) together represent a promising field with applications in industry, hospitals, temperature control systems, ”smart” buildings, trade and logistics networks, and city or region infrastructure management. The application of edge computing to access control and network security monitoring is particularly intriguing. When it comes to stopping specific kinds of cyberattacks and the distribution of dangerous software, this technology is very effective. Additionally, by calculating as soon as a signal is received, you may choose whether to sound an alarm or place the ”object” into quarantine or isolate several cloud robotics devices, if necessary, to avoid system failure or network compromise. When cloud robotics devices are widely used, a lot of data is generated that is getting harder to move to a data centre or cloud, process, or storm. For this reason, edge computing is becoming essential in many sectors of the digital society. For the advancement of digital society and the entrance of mankind into the fourth industrial revolution, it is imperative that we research traffic minimization technologies, data storage, resources, and security in cloud robotics employing edge computing.

II. End Point Balancing -based Cloud Security Model

The difficulties of overseeing robotic operations in far-off, frequently unreachable places are addressed by the ”End Point Balancing Technique for Cloud Robotics on Remote Loca- tions”. This method ensures smooth and effective task execu- tion by optimizing robotic endpoint coordination and control through the use of cloud computing. To improve efficiency and dependability, it focuses on striking a balance between processing demands and communication delays. Applications where real-time data processing and adaptive decision-making are critical, like environmental monitoring, disaster response, agriculture, and the armed forces, require this technique. In the end, it seeks to transform the deployment and management of robots in remote environments, increasing their usefulness and efficiency.

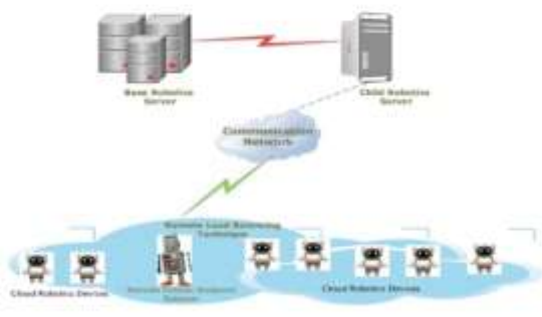

Fig. 1. End Point Balancing Architecture

III. Performance Evaluations

Ensuring that the computational load and communication responsibilities are effectively spread among robotic devices, particularly at remote locations, is known as endpoint bal- ancing in cloud robotics. The purpose of this experiment is to assess how well device-to-device communication and security are improved in a cloud robotics environment using the endpoint-balancing technique.

A. End Point Implementation

I am implementing the chosen endpoint balancing technique on the cloud platform. In this technique, I ensure that this technique can securely and dynamically allocate tasks based on real-time network and device conditions. Task Distribution:

1. I am designing a series of tasks that require device-to-device communication, such as collaborative mapping, object transportation, and synchronized movements.

2. Distribute these tasks among the robotic devices using the implemented end-point balancing technique.

Data Collection:

1. I monitor and log performance data (e.g., latency, throughput, energy consumption) during task execution.

2. I am using network analysis tools to measure the quality of service (QoS) parameters such as jitter, packet loss, and bandwidth utilization.

B. Average Latency S1

Based on EBT’s data acquisition. Table 1 displays the average delay of each transaction activity with 6, 8, and 12 nodes when the workloads are S1.

Based on the information that End Point Balancing col- lected. Table 1 displays the average latency of each transaction process with 6, 8, and 12 nodes when the workload is S1.

	EBT		
	6 nodes	8 nodes	12 nodes
Number of transactions	0.90	0.85	23.99
	1.66	1.45	1.10
	2.60	2.67	1.50
	5.70	5.20	3.19
	27.79	29.98	16.29

Table 1. The average latency of each transaction with nodes 6, 8, and 12 when the workload is S1.

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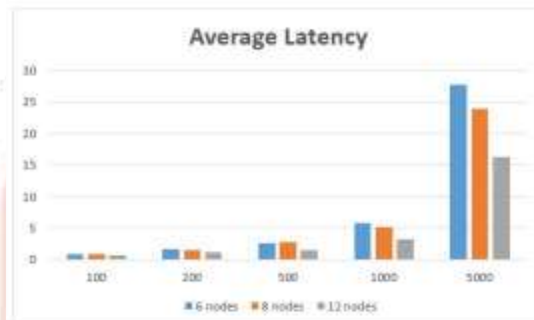

Fig. 2. When S1, comparison of average latency for each transaction with nodes 6,8,12

Figure 2 When S1, comparison of average latency for each transaction with nodes 6,8,12

When S1, the average delay under the same number of nodes grows as the number of transactions increases. The average latency, which is 0.90s, 0.85s, and 23.99s, respectively, is rather low and approximate when the number of transactions is modest, like 100. There was a noticeable rise in average latency after 1000 transactions. According to Figure 2, the average delay increases with the amount of transactions. Examine lateral relationships between the same numbers of transactions: the average latency of each transaction process decreases with the number of nodes.

C. Throughput: S1

Table 2. When the workload is S1, the throughput with nodes 6, 8, and 12

Figure 2 When S1, comparison of throughput with nodes

6,8,12

Table 2 displays the throughput of 6, 8, and 12 nodes under S1. At the same nodes, the model’s throughput hits a big value inside the fluctuation range when the number of transactions rises to about 500. The throughput stops increasing with the

	EBT		
	6 nodes	8 nodes	12 nodes
Number of transactions	105.07	114.50	149.20
	118.30	130.15	179.20
	170.48	190.15	325.40
	17906	192.20	312.90
	184.90	210.05	308.10

Table 2. When the workload is S1, the throughput with nodes 6, 8, and 12

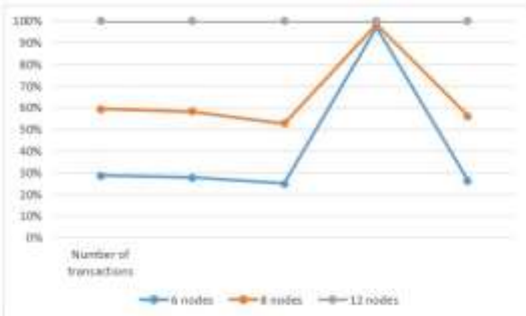

Fig. 3. When S1, comparison of throughput with nodes 6,8,12

number of transactions at 500. Different nodes in the same transaction have a considerable performance disparity.

IV. CONCLUSIONS

In this research, we proposed an End Point Balancing Technique (EPBT) to improve cloud-based robotic systems' performance and security. This paper explores the construction of a secure cloud robotics architecture through the use of an endpoint balancing technique. In addition to optimizing the allocation of computing work, the EPBT guarantees data integrity, authentication, and access control. The efficacy of the framework is demonstrated by the experimental findings, which indicate decreased latency and increased efficiency. This two-pronged strategy tackles important security issues and enhances resource efficiency, providing a solid answer for safe and effective cloud robotics. Cloud robotics will advance as a result of future research that improves EPBT algorithms and expands the framework's application area.

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