An Efficient Multi-Objective Model for Data Replication in Cloud Computing Environment

K. Sasikumar, BITS Pilani, Dubai, UAE

B. Vijayakumar, BITS Pilani, Dubai, UAE

ABSTRACT

The main aim of the proposed methodology is to design a multi-objective function for replica management system using oppositional gravitational search algorithm (OGSA), in which we analyze the various factors influencing replication decisions such as mean service time, mean file availability, energy consumption, load variance, and mean access latency. The OGSA algorithm is hybridization of oppositional-based learning (OBL) and gravitational search algorithm (GSA), which is change existing solution, and to adopt a new good solution based on objective function. Here, firstly we create a set of files and data node to generate a population by assigning the file to data node randomly and evaluate the fitness which is minimizing the objective function. Secondly, we regenerate the population to produce optimal or suboptimal population using OGSA. The experimental results show that the performance of the proposed methods is better than the other methods of data replication problem.

KEYWORDS

1. INTRODUCTION

The main aim for the clients putting away the information in the cloud is to protect the information and recoup it at whatever point required. Any failure in server ought not to bring about the loss in data. Cloud applications incorporate gaming, voice, and video conferencing, online office, stockpiling, reinforcement, social networking. These applications' execution depends generally on the accessibility of superior correspondence assets and system productivity (Sasikumar & Madiajagan 2016; Kliazovich et al., 2016). Data replication is a usually utilized strategy to form the information accessibility. It requires a high transfer speed information throughput path. Cloud recreates the elements and preserves them deliberately on different servers situated at different geographic areas. Replication is making different duplicates of a current element (Haider & Nazir, 2016). A few approaches in distributed systems are occupied with improving the dependability and also the accessibility. The replication method is one of the techniques in Cloud registering, which gives a various copy of a specific service

of the client on different hubs for chopping down the client period of waiting and additionally the bandwidth utilization in the cloud framework and furthermore to raise the accessibility of data (Nguyen et al. 2016). For instance, data stockpiling frameworks such as Amazon S3 (Amazon, 2018), Google File System (Borthakur, 2007) and Hadoop Distributed File System (Ghemawat et al., 2003) all receive a 3-copies data replication methodology automatically, i.e. store 3 data duplicates at one time, for the motivations behind data reliable quality. There are two sorts of replications of data and they are the dynamic replication algorithm (Gopinath & Sherly, 2017) and the static replication algorithm (Bhuvaneswari & Ravi, 2018).

Replication is utilized to advance framework accessibility (by guiding traffic to a reproduction after a failure), prevent loss of data (by retrieving lost information from a copy), and enhance execution (by spreading the load over various copies and by making the low-latency availability of access to clients around the globe). And there are various ways to deal with replication. Synchronous replication guarantees all duplicates are cutting-edge, yet possibly brings about high inactivity on updates. Additionally, accessibility might be affected if synchronously recreated updates can't fulfill while a few copies are offline. Asynchronous replication prohibits high write latency (in demanding, influencing it to fit for wide range of replications) however allows reproductions to be stale. Besides, loss of data may occur if an update is lost because of breakdown before duplication can be performed (Sann & Soe, 2017).

High accessibility, high adaptation to internal failure and high proficiency access to cloud data centers where failures are ordinary as opposed to exceptional are critical issues, because of the substantial scale data support. Replication of data permits diminishing client waiting time, accelerating access of data by expanding data accessibility by giving the client diverse copies of a similar service, every one of them with the consistent state (Yadav et al, 2016).

So as to accomplish element replication, there are two critical inquiries in reproducing information in distributed storage groups that must be comprehended: (1) what number appropriate imitations of every datum ought to be made in the cloud to meet a sensible framework prerequisite is an imperative issue for additional research. As the framework support cost will fundamentally maximize quantity of replicas expanding, keeping excessively numerous or settled reproductions are not a decent decision. (2) Where should these imitations be set to meet the framework task fast execution rate and load adjusting necessities is another essential issue to be altogether explored. These two related issues are by and large alluded to as the replica management issue (Bijolin et al., 2017). In the replication framework, the vitality utilization increases as the quantity of reproductions increments. So as to limit the vitality cost, consequently, the quantity of reproductions ought to be as little as could be allowed. This is clashing with the previously mentioned. Thus, planning replication administration techniques include adjusting an assortment of tradeoffs. As the present replication systems don't take total data center vitality cost as the essential streamlining focus to tackle the replica management issue. A significant number of them are constrained by the way that they consider just few execution parameters. With the expanding vitality cost in data centers, a vitality effective way to deal with overseeing data and its reproductions in the cloud is very popular (Gill & Singh 2016).

To overcome the above-mentioned issues, in this paper we propose a multi-objective optimized data replication strategy for cloud storage system using oppositional gravitational search algorithm (OGSA). OGSA migration is used to change existing solutions and to adopt new good solutions. Here, OBL strategy is combined with GSA which is increase the searching ability of the replication strategy. To calculate the replica number and replica layout, here we consider the five components such as mean file unavailability (MFU), mean service time (MST), load variance (LV), energy consumption (EC) and mean access latency (MAL) to capture the relationship among replica number, replica layout and these performances. The five objectives are to provide close to optimal values for these objectives. The main contribution of the proposed methodology is given below:

21 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/article/an-efficient-multi-objective-model-for-data-replication-in-cloud-computing-environment/243704

Related Content

Training and User Acceptance in a University ERP Implementation: Applying the Technology Acceptance Model

Joseph Bradleyand C. Christopher Lee (2009). *Global Implications of Modern Enterprise Information Systems: Technologies and Applications (pp. 242-260).*

www.irma-international.org/chapter/training-user-acceptance-university-erp/18929

Business Intelligence Enterprise Solution at Abu Dhabi Finance: Issues and Challenges

Salam Abdallah (2013). *Cases on Enterprise Information Systems and Implementation Stages: Learning from the Gulf Region (pp. 310-323).*

www.irma-international.org/chapter/business-intelligence-enterprise-solution-abu/70315

Data Replication Strategies in Wide-Area Distributed Systems

Sushant Goeland Rajkumar Buyya (2007). *Enterprise Service Computing: From Concept to Deployment (pp. 211-241).*

www.irma-international.org/chapter/data-replication-strategies-wide-area/18484

Maintaining Meaning of Information when it is Shared amongst Information Systems

Janet Aisbett, Shuxin Zhao, Greg Gibbonand C. N.G. Dampney (2006). *International Journal of Enterprise Information Systems (pp. 63-77).*

www.irma-international.org/article/maintaining-meaning-information-when-shared/2102

Evolution of Computing and Networks Technologies

 (2013). *Business-Oriented Enterprise Integration for Organizational Agility (pp. 1-14).*

www.irma-international.org/chapter/evolution-computing-networks-technologies/75427