International Journal of Advanced Information Science and Technology (IJAIST) ISSN: 2319:2682
Vol.5, No.2, February 2016 DOI:10.15693/ijaist/2016.v5i2.30-33

Cost Reduction for Data Processing and Dynamic Capability Stipulation

M. Nagalakshmi
Research Scholar, Department of Computer Science, Jamal Mohamed College, Trichy, Tamilnadu, India.

Dr. K. Gokulraj
Assistant Professor, Department of Computer Science,Thiru. Vi. Ka. Govt. Arts College, Tiruvarur, Tamilnadu, India.

***Abstract*— Dynamic capability stipulation is a hopeful approach for reducing energy utilization by dynamically regulating the number of active machines to contest resource difficulty. Data centers become a money- making platform for hosting large-scale service applications in the cloud. Data computation, storage, and communication in data center which hence incur considerable operational expenditure to cloud data hub providers. Therefore, cost reduction has become a developing issue for the forthcoming big data in the cloud. We mitigate this concern by designing a dynamic capability stipulation system that controls the number of active servers in the data hub according to demand fluctuation, variability in energy prices and the cost of dynamic capacity reconfiguration. Aim is to find a good transaction between energy savings and capacity reconfiguration. This will reduce the cost and time. Aim of the existing system is to minimize total energy utilization and scheduling delay. The heterogeneity-aware framework uses the static method. To address this limitation, we present K-means clustering algorithm to process the big data and divide workload into different task classes with similar characteristics in terms of resource and performance requirements. Bluetooth devices and GPRS used to trace the server location. This can reduce the cost and the time.**

Index terms - Cloud data centers, Cost minimization, Data placement, Clustering.

I. INTRODUCTION

A group of efforts have been taken place to inferior the computation cost of data centers. Data Center Resizing has been proposed to minimize the computation cost by regulating the number of activated servers via task placement. With the help of DCR, some studies have discovered the geographical distribution nature of data centers and heterogeneity to lower the electrical energy cost [1].

In existing solution, cost efficient data processing occurs because of the following weaknesses: Data Placement, Network Links and Quality of service. First, data placement may result in a waste of resources. For example, a large amount computation resource of a server with less popular data may stay idle. The low resource utility further causes more servers to be activated and hence higher operating cost. Second, the links in networks differ on the transmission rates and costs according to their unique features [2]. Third, the QoS: Quality-of-Service of big data responsibilities has not been considered in existing work. Cloud is a parallel and distributed computing system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements (SLA) established through negotiation between the service provider and consumers. The QoS of any cloud computing tasks is first determined by where they are placed and how many computation resources are allocated.

The rest of the paper is organized as follows: Section II summaries the related work, section III introduces our system model. In Section IV discussed about problem formulation. Evaluation process of clustering data expressed in section V. Future work is addressed in Section VI. Finally, section VII Concludes our work.

II. RELATED WORK

Data explosion in recent years leads to a rising demand for data processing in modern data centers that are usually distributed at different geographic regions. example Google's 14 data centers (includes America - 8 data centers, Asia – 2 data centers and Europe – 4 data centers) over 8 countries in 4 continents [3]. On the other hand, data has previously transformed into great price due to its high requirement on computation and communication resources [4]. Gartner predicts that by 2015, 71% of worldwide data center hardware expend will come from the massive data processing, which will surpass $126.2 billion. Therefore, it is very important to study the cost minimization problem for massive data processing in geo-distributed data hub.

We propose a workload classification of Google traces by isolating tasks into task classes using the K-means algorithm. However, Different from previous work [6], [7] whose main objective is to understand workload characteristics, our goal is to find accurate workload characterization.

Large-scale data centers have been deployed all over the world providing services to hundreds of thousands of users. According to [9], a data center may consist of large numbers of servers and consume megawatts of power. Millions of dollars on electricity cost have posed a heavy burden on the operating cost to data center providers.

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III. PROPOSED SYSTEM

A. Objectives

Our objective is to optimize the data placement, task assignment, routing and DCR such that the overall computation and communication cost is minimized.

B. Overview of the proposed Mechanism

Our main contributions are summarized as follows:

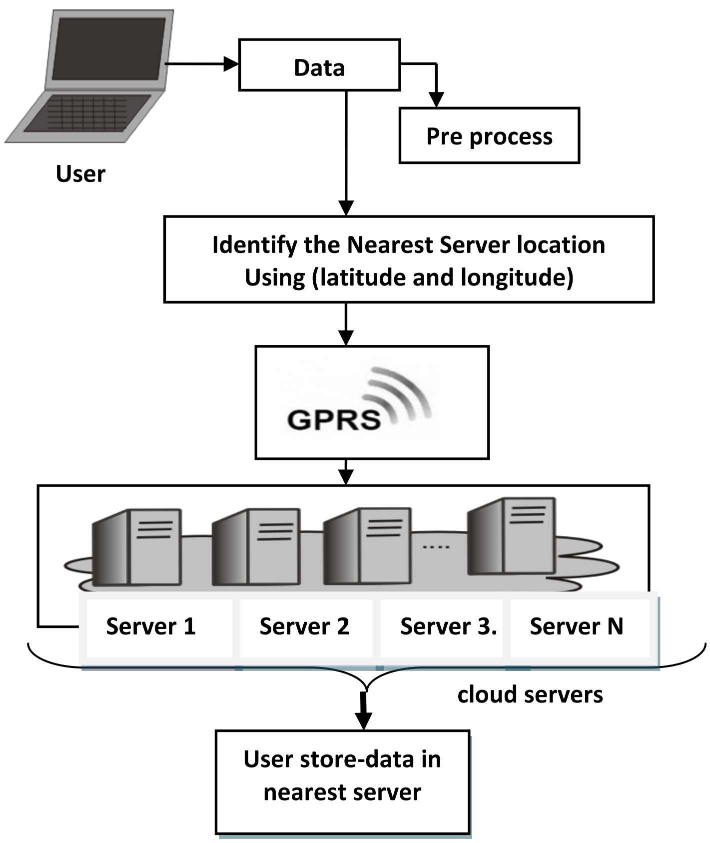

Fig. 1: System Architecture Model

Using standard K-means clustering, we show that the heterogeneous workload can be divided into numerous task classes with similar uniqueness in terms of resource and performance objectives. We present a workload characterization of Google traces by dividing tasks into task classes using the K-means algorithm.

We plan the cost minimization problem in a type of mixed integer nonlinear programming (MINLP) to answer the following questions:

(a) How these data chunks placed into servers,
(b) How to allocate tasks into servers without breaking the resource constraints, and
(c) How to achieve the operation cost minimization goal by minimizing data centers.

Merits of proposed system: Cost for high computational data is minimized. Reduce the system operation increases system reliability. Energy Consumption is minimized.

IV. SYSTEM MODEL

In this section, we introduce the system model in figure 1.

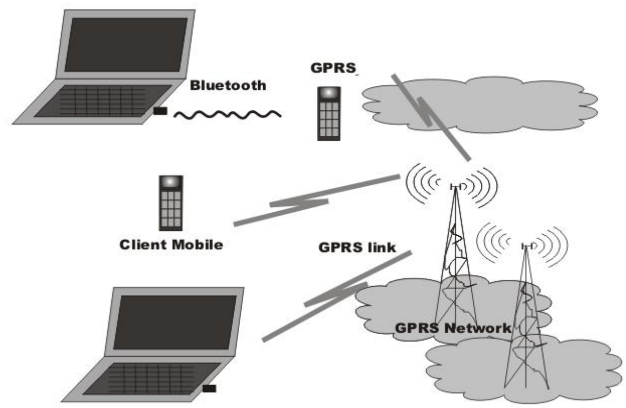

Fig 2: Nearest Server Location Finding

In this paper the system model includes three components. They are client, inter-mediator and server. In client, the cloud user extracts the data and cluster that data based on certain criteria. After that, processed data can be stored on nearest server. In inter-mediator, helps to the client for finding nearest server In Fig 2. GPRS, Bluetooth and mobile devices used to find the nearest server location and based on the location inter-mediator place the clients data. In server, stores the client data.

At first, users register their data then they will get unique number to place their data into cloud data centers. Next process is to extract their big data from client location so that, client must select the data set. Extracted big data set should be preprocessed. To remove null values from the preprocessed dataset it must be clustered. Finally, send the big data into cloud server. Before that inter-mediator find nearest server location using Bluetooth device, GPRS system and mobile devices. After the fine finding of nearest server location, this will be addressed to the user's mobile device. Using this location address user can store their data into cloud server.

V. PROBLEM FORMULATION

We first use the algorithm of K-means clustering to divide workload into different task classes with comparable characteristics. Then, we use Mixed-Integer Non-Linear Programming form to find total energy cost.

i) Task Classification:

Task classification goal is to divide tasks into classes with similar resource demand and performance characteristics. For the purpose of resource provisioning and cost

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minimization, it is necessary to consider task priority group, task size (CPU, memory) as well as task running time as the features for clustering. Working only on numeric data limits the use of this k-means algorithm. Let ***X*** be a set of *n* objects described by *n* numeric attribute:

$$F(W, Z) = \sum_{l=1}^{k} \sum_{i=1}^{n} w_{li}^{\alpha} d(Z_l, X_i)$$

subject to

$$0 \leq w_{li} \leq 1, \qquad 1 \leq l \leq k, \ 1 \leq i \leq n$$

The usual method toward optimization of *F* is to use partial optimization for *Z* and *W*. Fix Z and find necessary conditions on W to minimize F, Fix W and minimize F with respect to Z.

ii) MINLP Formulation:

MINLPs have been proposed for many diverse and important scientific applications, including the efficient management of electricity transmission, contingency analysis and blackout prevention of electric power systems. Total energy cost can be calculated by adding the cost on each server across all the geo-distributed data centers. Our goal is to reduce the total cost by choosing the best location. We can formulate this cost minimization as a Mixed-Integer Nonlinear Programming (MINLP) problem.

iii) Anonymous Processing of Query in Server Networks:

The rising availability of location-aware mobile devices has given rise to a flurry of location-based services (LBS). We suggest the NAP - Network-based Anonymization and Processing framework, for K- anonymous query processing in road networks. We identify the distance and ordering characteristics that affect subsequent processing and compare alternatives. Then, we suggest query evaluation procedures that exploit these characteristics. Our procedures utilize existing network database infrastructure, requiring no specialized storage schemes or functionalities.

VI. EVALUATION PROCESS

In general, storing of data to cloud is in a static way and takes more energy and time. User doesn't know where their data is stored. It will results in high cost to the user. Dynamic way used by user who knows where their data is stored. Using GPRS, Bluetooth device and mobile device we can find nearest server based on latitude and longitude. The result of nearest location send to users mobile. Finally storing of data in the cloud based on nearest location. It will result in cost minimization for data placing.

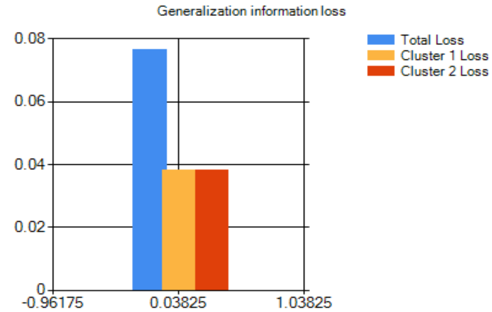

Fig 3: (a) Generalization information Loss

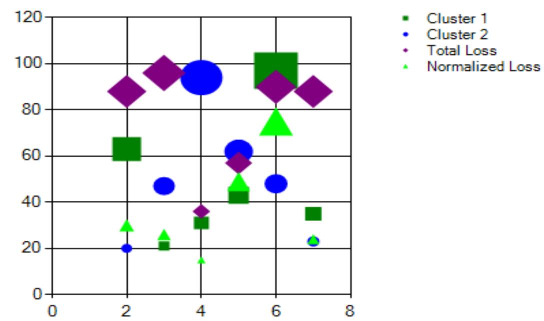

Fig 3: (b) Structural Information Loss

Also, we present evaluation process of cluster data. The data loss information process splits into two: One is Generalization Information Loss in the above fig 3: (a). In which total loss is more compare to clustering loss while data transferring. Another one is Structural Information Loss in the above fig 3: (b). In which Normalized loss is less compare to total loss.

VII. FUTURE WORK

In this paper, we dynamically adjust the data into cloud data centers and minimize the cost based on energy and time. Heterogeneity is a major challenge for resource management in Cloud computing environments. Virtually, we get the nearest location using latitude and longitude from mobile message service by the use of general packet radio system and Bluetooth device. To enhance our cost minimization approach, we will provide the intermediate server between inter-mediator and main cloud server. This intermediate server can reduce the traffic in the clouds and also the energy utilized by system is minimized. For data processing, advanced algorithms will be used to process the data and also some security consideration will be take place.

VIII. CONCLUSION

Dynamic capability provisioning has become a hopeful solution for minimizing energy utilization in data centers in modern days. However, existing effort has not addressed a key challenge to this issue, which is the heterogeneity of workloads and physical machines. In this paper, we jointly study the data placement, task assignment and data center resizing to minimize the overall operational cost in wide-range geo-distributed data centers for data processing. We first characterize the big data process using K-means algorithm and Non- Linear Programming techniques used to separate null values in the data set. The proposed system minimize the users cost. This proved to be tremendously useful even when experimented on a small scale. Hence, the proposed system is user friendly and it works efficiently.

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Authors Profile

M. Nagalakshmi received the **B.C.A.,** degree from N. M. S Sermathai Vasan College for Women, Madurai, Madurai Kamaraj University, Madurai, India, in 2011. In 2014, she received the **M.C.A.,** degree from Fatima College, Madurai, India. She is now doing **M.Phil.,** degree in Computer Science at Jamal Mohamed College, Trichy – 20, India. Her research interest includes Cloud Computing and Distributed Storage.

Dr.K.Gokulraj received the **Ph.D.,** degree in Computer Science from Bharathidasan University, Tiruchirappalli, India in 2013. He is now an Assistant Professor in the department of Computer Science at Thiru. Vi. Ka. Govt. Arts College, Tiruvarur, Tamilnadu, India. His research interest includes Microprocessors, Computer Networks, Network Security and Software Engineering.