Approximation of Task Computation in Virtual Platform Implementing Evolutionary Method

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Abstract- **The concept of cloud computing practically is associated with most demanded as well as powerful infrastructures to be constrained to mobile devices in the network. The applications in such cases require better processing with real time data. In such scenario, it is somehow essential to perform higher scale computations in cloud with the existing data sources. In some cases, fog computing provides better methodologies in this domain. Basically, fog computing is associated with dynamically instantiated resources. Moreover, its infrastructures sometimes are linked with mobile devices as well as cloud. It is seen that as compared with cloud computing, fog computing provides an efficient and dynamic support towards various heterogeneous physical devices. Also the dynamisms in the services need the instances of data with application while predicting the patterns as well as access data. Considering the cloud infrastructure, the data associated with IoT devices are processed with proper scalability. In this case, when the IoT devices are connected to fog devices, these will be located closer to users and will be quite reliable towards computation and storage. However, the main challenge while being associated with the application is associated with resource allocation and task scheduling.**

Key words: Big data, Fog computing, Virtual machine, Data centers, Fog nodes

I. INTRODUCTION

Many times it is seen that the big data cannot be processed properly in cloud environment. Also partly the applications linked to internet of things require to be processed much efficiently in virtual environment. In such case, it may be thought of deploying fog

Computing to resolve the issue. In general, this is a decentralized computing approach linked to cloud computing. Many times it overcomes the high latency problems associated with virtual platforms and resolve the complex computations. The computing

paradigm in such cases may be accomplished in both virtualized and non virtualized manner. But the services linked to these may not be completely associated with network edges. So having the distributed computing approach, it primarily focuses on facilitating applications. In deed the devices linked with fog may be a great support towards instantaneous storage facilities as well as time sensitive computation.

II. REVIEW OF LITERATURE

O. Tickoo et al.[1] in their work have analyzed the utilization of physical infrastructures and employ the data centers to facilitate the virtualization towards large number of applications.

J. L. L. Simarro et al.[2] in their work have focused on dynamic pricing schemes to minimize the investment in the data centre. Also in their research they have considered the internal cost for virtual machines as well as physical machines.

S. Martello et al.[3] during their study have focused on multiple-knapsack problem also known as NP hard problems. They observed that the execution time and quality of solution are very much required for data centres.

N. Bobroff et al.[4] in their work have introduced the dynamic server and algorithm to manage the historical data which also forecasts future demand and focuses on virtual as well as physical machines. To perform mapping between virtual machine to physical machine they have implemented an heuristic method based on approximation.

W. Shi et al.[5] in their work have implemented time series method to resolve virtual machine placement problem in a Cloud which is absolutely generalized assignment problem to maximizes the profit under the service level agreement.

M. Wang et al.[6] in their work have suggested energy saving by minimizing the number of idle resources in a cloud computing environment. They have tried to quantify the performance and compare the same with energy aware task consolidation.

A B. Asgari et al.[7] during their study have focused on Markov Decision Process. Also based on reinforcement learning for auto-scaling resources, they proposed the automatic resource provisioning system to obtain better performance linked to Service Level Agreement.

T A. Mohazabiyeh et al.[8] have proposed optimal technique associated with adaptive threshold model to minimize energy consumption. They observed that the virtual machines can be migrated between these clusters on the basis threshold values using mathematical modeling approach to minimize energy consumption.

S.-H. Wang et al.[9] in their work have discussed regarding energy-efficient and QoS aware VM placement mechanism which is a combination of hop reduction, energy saving and load balancing. Practically it uses virtual machine placement technique to minimize the number of server in the datacenter without service level agreement violation.

H. Jin, D et al.[10] in their work have considered deterministic resources towards formulating Multi-

Dimensional Stochastic Virtual Machine Placement Problem. As it is a NP-hard problem, they proposed polynomial time to maximize the minimum utilization ratio of all the resources of physical machines in large scale data centers.

A. Anand et al.[11] in their work have focused on virtual machine monitor , CPU cycles and migration overhead towards the virtual machine placement problem to maximize the performance of applications and reduce the number of physical machines.

III. PROBLEM FORMULATION

While considering the strategies linked to heuristic, it is really essential to consider the probability of mutation and crossover, and the population size. So to characterize the significance of sensors as well as computational power of the fog nodes, it is essential to aggregate and filter data from sensors. Also the cloud data center accumulates the information processed by the fog nodes. In this present situation, 07 numbers of sensors per each node has been considered. Accordingly the interconnection between fog nodes and sensors is characterized by a delay and the average delay is actually consistent to the existing network. The data center is connected to the fog nodes through low latency links without optimality.

IV. ALGORITHM

Step 1: Conceptualizing the variables as well as data in this approach is very essential. Accordingly it is required to accountable with randomly generated population of individuals.

Step 2: After applying each individual to fitness function, the objective function towards optimality is to be evaluated.

Step3: Towards each individual, the fitness score is to be assigned to value the objective function

Step 4: The population of individuals is to be associated with number of generations to get the overall fitness value

Step 5: The fitness function is to be applied to every individuals generated through mutation and crossover.

Step 6: The measure of selection depends on individuals from the nth generation to the (n+1)th generation .

Step 7: Perform mutation randomly to part of data in single gene or in a group of genes to add new genetic instantiation.

Step 8: Merge the chromosomes in individuals by exchanging part of their values to permit successful genes in the parent solutions.

Step 9: Apply the selection operator to define the individuals linked to generation and also establish mechanism to return one individual for each invocation to be passed in the current generation focusing on tournament selection.

Step 10: Obtain the chromosomes from the population with a probability that is proportional to its fitness score.

Step 11: Define the chromosome as a set of genes Ts where Ts signifies number of sensors. The generic sth gene, g can be represented from 1 to T (T belongs to number of fog nodes) as well as captures the information on which fog node will receive the output of that sensor.

Step 12: Define the storage of the information of decision variable $C_{i,j}$

Step 13: Define the generic gene , $s_i = \{j : C_{i,j} = 1\}$.

Step 14: Evaluate chromosomes, based upon fitness parameter, and map among chromosomes and optimization problem solutions

Step 15: Obtain the functional parameter, λ_j comparing with related objective function and coefficient factor, μ_j , i.e. $\lambda_j \le \mu_j - \varepsilon$ and obtain the processing time , $1/\varepsilon$.

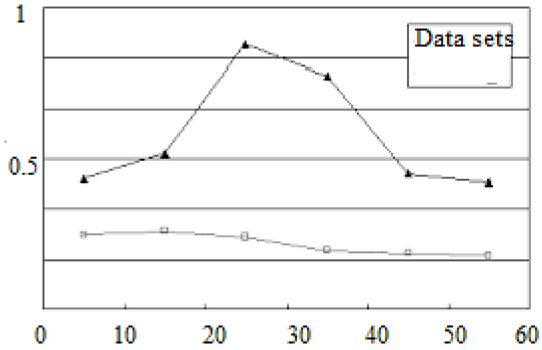

Figure I. Fog nodes Vs Elapsed Time (DATA SETS)

Sl. No.	No. of fog nodes	Elapsed time(Data Sets)(ms)
01	10	0.39
02	20	0.51
03	30	0.61
04	40	0.64

Table I. Significance of elapsed time of data sets with fog nodes

V. EXPERIMENTAL ANALYSIS

In the experimentation, different parameters have been considered to analyze the performance of sensors. In this case, the functional parameter, λ_j is set to 0.8 and the coefficient factor, μ_j is set to 0.01. It is seen that the delay in network is very less as compared to the average job service time, and the processing demand on the system is high. It symbolizes that towards managing the computational requests it is essential to optimize the objective function. Also it is required to characterize the load intensity as well as delay linked to the service time to optimize the objective function.

VI. DISCUSSION AND FUTURE DIRECTION

Many times the data centers are required to be concerned with green computations along with their linked functionalities. In such cases, it is essential to minimize the active servers as well as components of data centers. Accordingly, the cost of maintenance may be reduced. Considering the service level agreement, the performance may depend on inter data center as well as intra data center traffic. The schemes associated with virtual machine replacement may also be significant towards addressing the network traffic as well as distribution of the network traffic. To optimize the cost of maintenance in such cases, it is highly essential to monitor the cost of virtual machines as well as instantiation of time which should also be linked with data centers.

VII. CONCLUSION

The technologies associated with virtualization can be implemented by enabling the virtual machines to be transferred between physical systems. Accordingly, the cloud providers achieve optimality towards virtual machine replacement. As per previous computation it is clear about the solutions associated with multi-objective as well as mono-objective functions. Accordingly mechanisms are to be carried out to minimize the energy consumption, to optimize the cost, to minimize the network traffic, to manage the resource utilization and ensure high quality of service. Some different algorithms linked to heuristic, meta-heuristic, deterministic and approximation has already been focused towards placement of virtual machines. It is also observed that the primary focus towards heuristic as well as meta-heuristic techniques provides better solutions.

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