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ENERGY-AWARE LOAD BALANCING AND APPLICATION SCALING FOR THE CLOUD ECOSYSTEM

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Abstract- To introduce an energy-aware operation model used for load balancing and application scaling on a cloud. The basic philosophy of our approach is defining an energy-optimal operation regime and attempting to maximize the number of servers operating in this regime. Idle and lightly-loaded servers are switched to one of the sleep states to save energy. The load balancing and scaling algorithms also exploit some of the most desirable features of server consolidation mechanisms.
Keywords– load balancing, application scaling, idle servers, server consolidation, energy proportional systems.

I. INTRODUCTION

The load balancing model given in this article is aimed at the public cloud which has numerous nodes with distributed computing resources in many different geographic locations. Thus, this model divides the public cloud into several cloud partitions. When the environment is very large and complex, these divisions simplify the load balancing. The cloud has a main controller that chooses the suitable partitions for arriving jobs while the balancer for each cloud partition chooses the best load balancing strategy.

Cloud computing is an attracting technology in the field of computer science. In Gartner's report, it says that the cloud will bring changes to the IT industry. The cloud is changing our life by providing users with new types of services. Users get service from a cloud without paying attention to the details. NIST gave a definition of cloud computing as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. More and more people pay attention to cloud computing. Cloud computing is efficient and scalable but maintaining the stability of processing so many jobs in the cloud computing environment is a very complex problem with load balancing receiving much attention for researchers.

Since the job arrival pattern is not predictable and the capacities of each node in the cloud differ, for load balancing problem, workload control is crucial to improve system performance and maintain stability. Load balancing schemes depending on whether the system dynamics are important can be either static and dynamic. Static schemes do not use the system information and are less complex while dynamic schemes will bring additional costs for the system but can change as the system status changes. A dynamic scheme is used here for its flexibility. The model has a main controller and balancers to gather and analyze the information. Thus, the dynamic control has little influence on the other working nodes. The system status then provides a basis for choosing the right load balancing strategy.

II.PROBLEM STATEMENT

The Problem as Follows,
1. Server gets overloaded due to excess of request from different host then it goes into the sleep mode.

2. Server consolidation properties transfer the request from sleep mode to running mode on other server.
3. Use Auto scaling and peak energy level

III. LITERATURE SURVEY

Anton Beloglazov a,, Jemal Abawajyb, Rajkumar Buyya. Cloud computing offers utility-oriented IT services to users worldwide. Based on a pay-as-you-go model, it enables hosting of pervasive applications from consumer, scientific, and business domains. However, data centers hosting Cloud applications consume huge amounts of electrical energy, contributing to high operational costs and carbon footprints to the environment. Therefore, we need Green Cloud computing solutions that can not only minimize operational costs but also reduce the environmental impact. In this paper, we define an architectural framework and principles for energy-efficient Cloud computing. Based on this architecture, we present our vision, open research challenges, and resource provisioning and allocation algorithms for energy-efficient management of Cloud computing environments.

Wu-chun Feng. Massive data centers housing thousands of computing nodes have become commonplace in enterprise computing, and the power consumption of such data centers is growing at an unprecedented rate. Adding to the problem is the in ability of the servers to exhibit energy proportionality, i.e., provide energy-efficient execution under all levels of utilization, which diminishes the overall energy efficiency of the data center. It is imperative that we realize effective strategies to control the power consumption of the server and improve the energy efficiency of data centers. With the advent of Intel Sandy Bridge processors, we have the ability to specify a limit on power consumption during runtime, which creates opportunities to design new power-management techniques for enterprise workloads and make the systems that they run on more energy-proportional.

Danilo Ardagna, Barbara Panicucci, Marco Trubian, and Li Zhang, With the increase of energy consumption associated with IT infrastructures, energy management is becoming a priority in the design and operation of complex service-based systems. At the same time, service providers need to comply with Service Level Agreement (SLA) contracts which determine the revenues and penalties on the basis of the achieved performance level. This paper focuses on the resource allocation problem in multitier virtualized systems with the goal of maximizing the SLAs revenue while minimizing energy costs. The main novelty of our approach is to address—in a unifying framework—service centers resource management by exploiting as actuation mechanisms allocation of virtual machines (VMs) to servers, load balancing, capacity allocation, server power state tuning, and dynamic voltage/frequency scaling. Resource management is modeled as an NP-hard mixed integer nonlinear programming problem, and solved by a local search procedure. To validate its effectiveness, the proposed model is compared to top-performing state-of-the-art techniques. The evaluation is based on simulation and on real experiments performed in a prototype environment. Synthetic as well as realistic workloads and a number of different scenarios of interest are considered. Results show that we are able to yield significant revenue gains for the provider when compared to alternative methods (up to 45 percent). Moreover, solutions are robust to service time and workload variations.

By Jayant Baliga, Robert W. A. Ayre, Kerry Hinton, and Rodney S. Tucker Network-based cloud computing is rapidly expanding as an alternative to conventional office-based computing. As cloud computing becomes more widespread, the energy consumption of the network and computing resources that underpin the cloud will grow. This is happening at a time when there is increasing attention being paid to the need to manage energy consumption across the entire information and communications technology (ICT) sector. While data center energy use has received much attention recently, there has been less attention paid to the energy consumption of the transmission and switching networks that are key to connecting users to the cloud. In this paper, we present an analysis of energy consumption in cloud computing. The analysis considers both public and private

clouds, and includes energy consumption in switching and transmission as well as data processing and data storage. We show that energy consumption in transport and switching can be a significant percentage of total energy consumption in cloud computing. Cloud computing can enable more energy-efficient use of computing power, especially when the computing tasks are of low intensity or infrequent. However, under some circumstances cloud computing can consume more energy than conventional computing where each user performs all computing on their own personal computer (PC).

Alaaeddine Yousfi, Adrian de Freitas, Anind K. Dey and Rajaa Saidi, Due to the cut throat competition among organizations, business process improvement is now an everyday activity. A relentless activity that makes business processes more complex than ever. As they get more complex, the improvement rounds become time-consuming, costly and the quality of each outcome is put into jeopardy, which is somehow paradoxical with the concept of improvement. In this paper, we propose a business process improvement technique based on ubiquitous computing. First, we couple business processes with ubiquitous computing and define a ubiquitous business process. Then, we explain how ubiquitous computing positively impacts the performance metrics of business processes. Afterwards, we set a specification for designing ubiquitous business processes by extending BPMN. Finally, we propose a concrete case study about time-banking to corroborate our theory. A comparative study of the same process, in ubiquitous and non-ubiquitous versions, is established. The results clearly illustrate that ubiquitous computing impacts positively the business process performance metrics. Still, the case study corroborates that ubiquitous computing not only improves a business process but also enables it to get improved with the least of human interventions.

IV. EXISTING SYSTEM

An important strategy for energy reduction is concentrating the load on a subset of servers and, whenever possible, switching the rest of them to a state with low energy consumption. This observation implies that the traditional concept of load balancing in a large-scale system could be reformulated as follows: distribute evenly the workload to the smallest set of servers operating at optimal or near-optimal energy levels, while observing the Service Level Agreement (SLA) between the CSP and a cloud user. An optimal energy level is one when the performance per Watt of power is maximized.

In order to integrate business requirements and application level needs, in terms of Quality of Service (QoS), cloud service provisioning is regulated by Service Level Agreements (SLAs): contracts between clients and providers that express the price for a service, the QoS levels required during the service provisioning, and the penalties associated with the SLA violations. In such a context, performance evaluation plays a key role allowing system managers to evaluate the effects of different resource management strategies on the data center functioning and to predict the corresponding costs/benefits.

DISADVANTAGES OF EXISTING SYSTEM:

- On-the-field experiments are mainly focused on the offered QoS, they are based on a black box approach that makes difficult to correlate obtained data to the internal resource management strategies implemented by the system provider.
- Simulation does not allow to conduct comprehensive analyses of the system performance due to the great number of parameters that have to be investigated.

V. PROPOSED SYSTEM

There are three primary contributions of this paper: a new model of cloud servers that is based on different operating regimes with various degrees of \energy efficiency" (processing power versus energy consumption);

A novel algorithm that performs load balancing and application scaling to maximize the number of servers operating in the energy-optimal regime; and analysis and comparison of

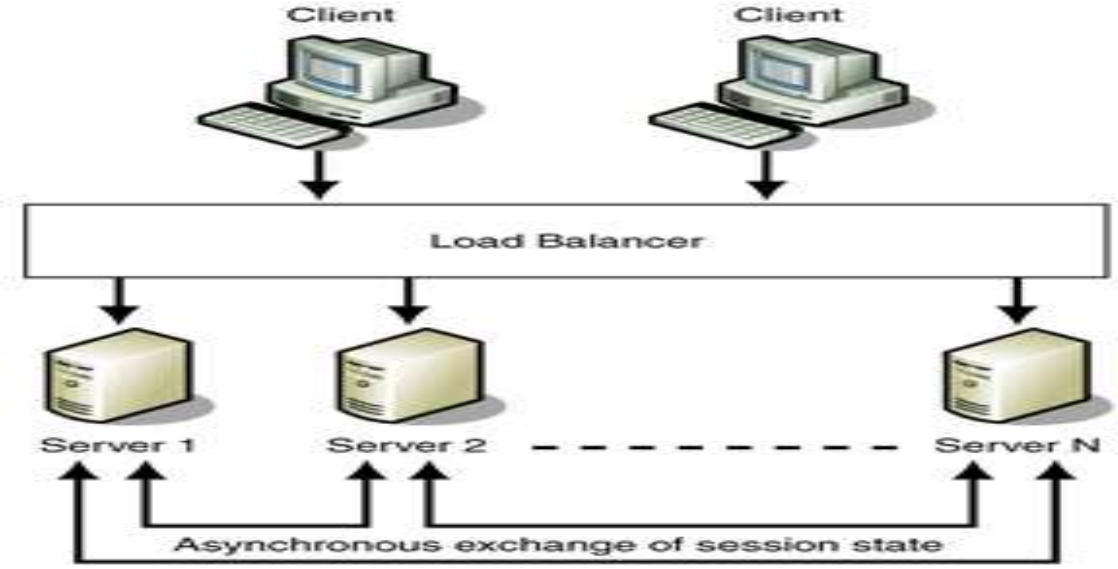
techniques for load balancing and application scaling using three differently-sized clusters and two different average load profiles.

The objective of the algorithms is to ensure that the largest possible number of active servers operate within the boundaries of their respective optimal operating regime. The actions implementing this policy are: (a) migrate VMs from a server operating in the undesirable-low regime and then switch the server to a sleep state; (b) switch an idle server to a sleep state and reactivate servers in a sleep state when the cluster load increases; (c) migrate the VMs from an overloaded server, a server operating in the undesirable-high regime with applications predicted to increase their demands for computing in the next reallocation cycles.

5.1 Advantages of Proposed System:

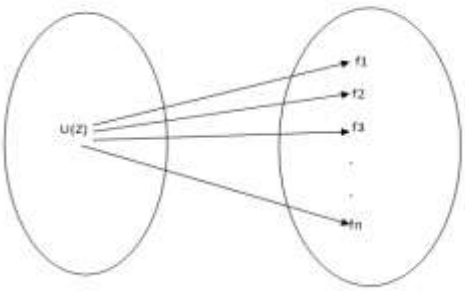
- After load balancing, the number of servers in the optimal regime increases from 0 to about 60% and a fair number of servers are switched to the sleep state.
- There is a balance between computational efficiency and SLA violations; the algorithm can be tuned to maximize computational efficiency or to minimize SLA violations according to the type of workload and the system management policies.

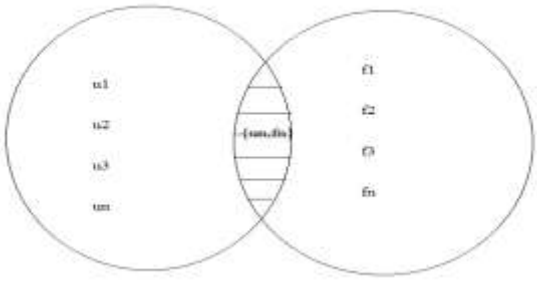
5.2 System Architecture



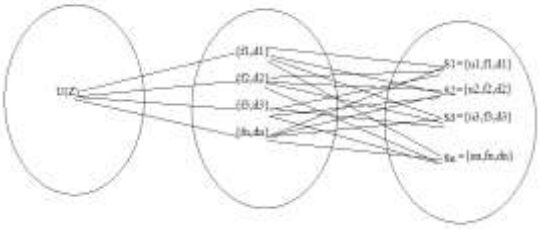
5.3. Mathematical Module

Input :
U(Z) = { u1,u2,u3.....un}.....user
F(Z) = {f1,f2,f3.....fn}.....file
S(Z) = { s1,s2,s3}.....server
D(Z) ={ d1,d2,d3....dn}.....data
M(Z) ={m1,m2,m3....mn}.....migration
U(Z) -> F(Z) :{(un,fn)}->uploading





U(Z) U F(Z)
U(Z) U F(Z) U D(Z) U S(Z) :



Success Condition :

1. Cold Spot & Hot Spot Manage Properly.

Failure Condition:

2. Security Problem for Vm

5.4 Algorithm

Input:

Workload (W) -> {w1,w2,w3.....}
Resource (R) ->{R1,R2,R3...}

Output:

Migration List (M)->{m1,m2,m3...}

5.5 Energy Efficient Algorithm:

1.START
2.Extract Total workload list
W(Z)->{w1,w2,w3....wn}
3.Access total Resource list
R(Z)->{R1,R2,R3.....Rn}
4.User upload file
U(Z):F(Z)->{{un , fn }
5.check first cloud server work load
6.limitation of server depends on energy level
7.if server is go to energy threshold
8.file migrate to another server->HOT SPOT Process.
9.check remaining server workload.
10.find Min(workload Resources)->optimization
11.Manage workload of every server->Green Computing.
12.check energy level
13.end

VI. OBJECTIVE

To consider the resources like requests on network, memory of requested data and CPU utilization of server and by checking and analyzing such a resources, we can balance the load by migrating or switching the workload to the different server.

VII. RESULT ANALYSIS

Load	0	10	20	30	40
P	92	584	1296	1712	1895
Transaction	492	1039	1204	1620	1803
Efficiency	0.18	0.56	1.07	1.05	1.05

P->Power how much consume time to execute process in nanosecond
T-> Transaction Time
Average efficency maintain (E)

Discounted cumulative gain (DCG) is a measure of Load balancing on cloud Server. The gain is accumulated from the top of the result list to the bottom with the gain of each result discounted at Hot Spot & Cold Spot

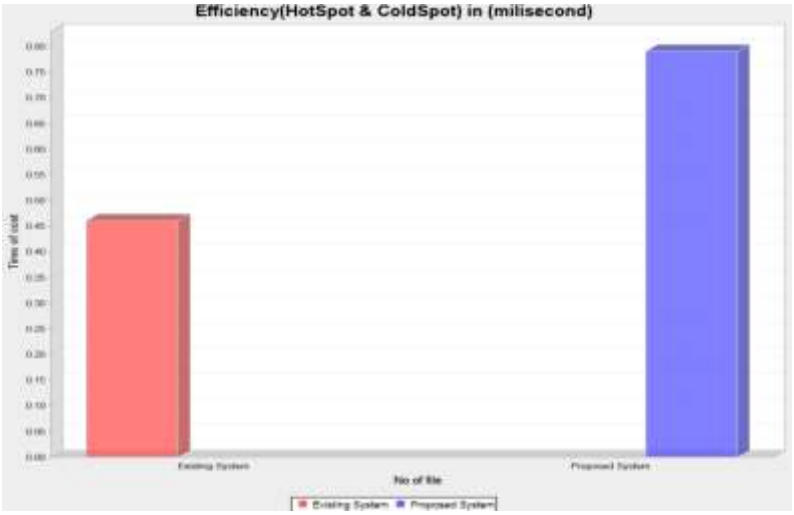


fig: DCG of proposed VS existing system

Two assumptions are made in using DCG and its related measures.
1) Highly check VM are more useful when appearing earlier in a result list.
2) Highly Hotspot Process are more useful than marginally ColdSpot Process,
DCG originates from an earlier, more primitive, measure called Cumulative Gain.

Summary :-

In this chapter we discussed about result comparison with previous algorithms
and how Energy Efficient algorithm is better than previous one is defined with the help of graph.

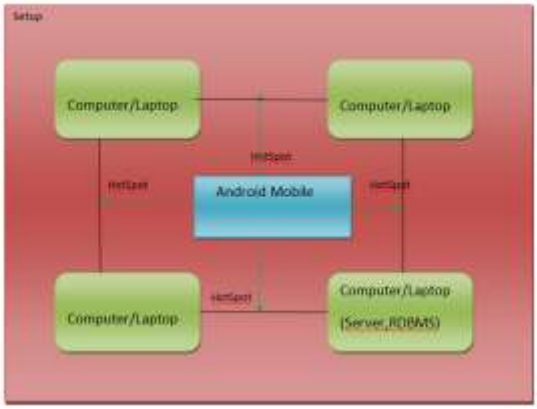
7.1 Efficiency Calculation:

Parameter =(start time , end time)

Efficiency = (end time -start time)/end time % of Time consume

7.2 Experiment Setup:

In this the Structure consist of technologies like JAVA , HTML , CSS , Java script. For back end MySql is used. Hence before investigational set up Software like Eclipse, Tomcat is predictable to be installed on server. User must have basic windows Family, good browser to view the results. Supervised Dataset or Un-Supervised dataset is used for testing in MySQL is tested.



VIII. CONCLUSION

Finally Conclude that By considering the resources like requests on network, memory of requested data and CPU utilization of server and by checking and analyzing such a resources, we can balance the load by migrating or switching the workload to the different server and get the optimal efficiency for improving the throughput and minimize the cost of the system using the Green computing that uses the auto scaling by the server.

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