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Energy Adaptive Load Balancing VM Migration Approach in Cloud Environment

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Abstract: A cloud system provides the distributed environment to vast number of users. Each user want to allocate the most effective cloud server. But these cloud servers or the associated virtual machines are having the limitations in terms of load and energy specification. As the load over the machine increases the energy consumption increases and the overall performance of the machine decreases. Because of this, it is required to use the capabilities of the virtual machine or the cloud server in an effective way. In this present work, an energy effective approach is defined for cloud server allocation so that that load over the machine will not be increased. The work will be able to manage the energy balanced load over the virtual machine. If the energy criticality will be identified, the virtual machine can be migrated to the more effective resource environment so that the capabilities of services will be improved. In this present work, a layered framework is defined in which at the earlier stage, the machine allocation to the user request will be performed under parameteric algorithm. This algorithm will consider the machine performance analysis, load analysis and the machine capabilities analysis to perform the allocation. In second stage of work, the analysis on the allocated machines will be done under energy vector and identify the requirement of migration. If the requirement identified, the work will migrate the machine in better environment so that the capabilities of machines will be improve and the effective executions of requests will be done.

Keywords: PDAs, VM

I. INTRODUCTION

Cloud computing provides the distributed environment to share the resources, services and the platform. It provides the global connectivity via internet and provides the different technologies associated with cloud system. These all facilitate the services in an easy and convenient way. The work is defined to reduce the opportunistic criteria so that the processing over the system will be improved[1]. Cloud computing systems are defined with the specification of server so that the incorporation of associated application and the service will be obtained. The cloud system is defined with service specification that is provided in public environment for free and for private or licensed user after paying the cost. The cloud system is able to reduce such cost by providing the licensed access to the reliable and effective software system[1].
Cloud system is described in association of two phenomenon called cloud and the computing. Here cloud actually represents the global network that connects thousands of users via availing services. The computing is defined as the scientific model so that the effective resource utilization will be done. The cloud system is also designed along with the specification of model respective to which the service distribution is performed. This cloud system also provides the service level distribution so that the cloud service derivation and association with the environmental constraints is defined [2].
The features of this cloud system are described in this section.

1.1 Characteristics

- **Request based Service Access:** A Cloud System provides different kind of services on user request. These services include the hardware as well as software access services. Some of these services are application oriented. These services are available to the clients on request without any human interaction at the provider end. Some of the cloud servers that provides direct system access or service access comes under request based service system.
- **Larger Network Access:** It is one of the basic characteristic of cloud computing that defines the standard mechanism of cloud access over the heterogeneous environments. This heterogeneous environment is available in the form of thin or thick client and also available on different platforms such as laptops, mobile phone, PDAs etc.
- **Resource Pooling:** Each cloud server is having the vast collection of resources that are available in the form of resource pool to satisfy the parallel requests of multiple clients. These resources are available physically as well as virtually. Some of these resources include memory, storage, network bandwidth, email services etc.

- **Rapid Elasticity:** Elasticity improves the robustness of cloud system to work on different scale of network as well as under different network capabilities. The cloud system scaled itself based on the property analysis of sub-network capabilities. Based on this elasticity vector, network capabilities can be configured.
- **Measured Service:** The analysis on cloud computing resources is required to perform controlled allocation of resources. These services are analyzed under the service as well as network capabilities so that the effective control usage will be obtained.

1.2 Cloud System Architecture

In this architecture, the user resides at top level that will perform the service or the cloud request. Actually the cloud system is designed to satisfy the end user or the customer. The end user can be a single user of the organization. The cloud server specification defined by the user is analyzed under different vectors. User can select the service required from the cloud server as well as user can also decide the particular cloud server from which the service will be retrieved. A cloud user can exist in different cloud environment such as public environment, private environment or the community environment. With each level, the cost specification, security specification is differ [1].

The second level of cloud architecture is the application level interface. It is the actually the layer, where the application requirement of cloud is defined. This layer is defined as the cloud to user interface.

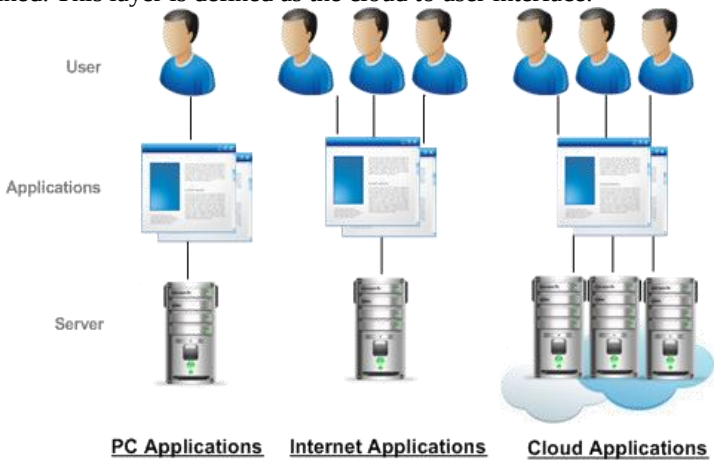

Figure 1 Cloud System Architecture [1]

The physical layer or lower level of cloud architecture is represented by the cloud server itself. This layer contains the database layer integrated with virtual cloud. This layer is responsible to perform the actual service allocation and the execution. The cloud system defined at this level is most complex respective to the user. As the cloud system is present in web form, it is more complex but provide effective services.

II. PROPOSED WORK

2.1 Problem Statement

A Cloud system is shared distributed system in which multiple clients requests to a server for specific services. But as the number of requests on a server increases, the load on the server increases which actually increases the energy consumption over the cloud server. Because of this there is the requirement of some load balancing mechanism. This balancing mechanism must be defined respective to the service type. It means, the group of cloud servers will be generated that have common type of services. Once the servers will be identified the next work is to use some load balancing and scheduling algorithm to optimize the cloud system. In case of energy specific cloud system, heavy load on cloud system is always a challenge.

2.2 Problem Solution

A cloud system provides the distributed environment to vast number of users. Each user want to allocate the most effective cloud server. But these cloud servers or the associated virtual machines are having the limitations in terms of load and energy specification. As the load over the machine increases the energy consumption increases and the overall performance of the machine decreases. Because of this, it is required to use the capabilities of the virtual machine or the cloud server in an effective way. In this present work, an energy effective approach is defined for cloud server allocation so that that load over the machine will not be increased. The work will be able to manage the energy balanced load over the virtual machine. If the energy criticality will be identified, the virtual machine can be migrated to the more effective resource environment so that the capabilities of services will be improved. In this present work, a layered framework is defined in which at the earlier stage, the machine allocation to the user request will be performed under parameteric algorithm. This algorithm will consider the machine performance analysis, load analysis and the machine capabilities analysis to perform the allocation. In second stage of work, the analysis on the allocated machines will be done under energy vector and identify the requirement of migration. If the requirement identified, the work will migrate the machine in better environment so that the capabilities of machines will be improve and the effective executions of requests will be done. The work will be implemented in cloudsim integrated java environment.

2.3 Research Methodology

In this present work, a VM allocation and migration scheme is defined under energy and performance analysis. The work is about to improve the performance of VM machine itself that will itself provide the effective service time to all users. The work is the improvement over the traditional allocation mechanism where the effective machine allocation will be done under multiple vector analysis at the earlier stage. In this work, the machine capability analysis, machine performance analysis and energy level analysis will be performed to perform the effective allocation of machines for user requests. During this allocation, the regular watch will be kept on the virtual machine to check the energy level. Based on this energy effectiveness, the identification of migration requirement will be done. If some such requirement is identified, the identification of the effective cloud server configuration will be done to which the VM can be migrated. This identification will be done under energy and performance vector. The VM switching will improve the performance of all the allocated processes. The work will be implemented in cloudsim environment. The work will be able to improve the performance of VM under energy vector.

Different stages of the work:

- Configure the cloud system with energy and other parametric specification.
- Perform the multiple requests from users to define server load.
- Analyze the virtual machines and cloud system under energy and load parameter.
- Identify the requirement of VM migration.
- Perform the analysis under execution rate and energy parameter.

III. EXPERIMENTAL RESULTS

The first stage of this model is to configure the cloud system. The cloud system configuration requires the setting the server level parameters. These parameters includes the specification of memory, processing limit, number of virtual machines, virtual machine capability etc. The work can be simulated under different constraints. The parameters adjustment considered in this work is shown in table1.

Table1: Simulation Parameters

Parameter	Values
Number of Cloud Servers	5
Number of Virtual Machines	10
Load on Machine	5
IO Limit	5
Memory Limit	64M
Processing Limit	1000ms
Simulation Time	100 sec

The table is showing the input parameters in terms of request requirement vectors. The vectors include process time, dead line, memory requirement etc. Once the parameters are defined, the next work is to apply the ABC integrated algorithm to perform service allocation. This allocation is performed by the employee bee.

Table2: Request Parameters

User Id	Arrival Time	Process Time	Deadline	IORequest	MemoryReq	Service Type
0	32	17	54	4	4	0
1	90	25	117	2	1	0
2	56	19	81	4	4	1
3	8	29	38	0	0	1
4	63	15	86	4	0	1
5	65	20	93	4	0	1
6	77	6	84	4	0	1
7	42	8	56	0	0	1
8	96	20	123	2	2	0
9	36	23	62	4	2	1
10	64	12	78	3	2	1
11	47	22	74	3	0	0
12	29	9	39	0	1	0
13	83	15	103	3	2	0
14	41	1	51	3	1	1
15	78	1	87	1	1	0
16	96	13	111	2	3	1

17	58	16	75	0	3	1
18	37	2	40	3	3	1
19	46	25	79	1	0	0

The table is showing the allocation under defined prioritization approach. The requirement specific mapping is performed on the prioritized cloud server system so that the effective allocation will be obtained. The proposed algorithm is here applied to arrange the input process sequence and to perform the migration.

Table3: Allocation Results

Cloud Server	Virtual Machine	User Request Index
0	0	3
0	0	4
0	0	5
0	0	6
0	0	7
0	1	11
0	1	19
0	1	12
0	1	14
0	1	15
0	2	1
0	2	13
0	2	10
0	2	8
0	2	9
0	3	17
0	3	18
0	3	16
0	3	2

The table is showing the results obtained from the work in terms of multiple vectors. These vectors include the server allocation, process time evaluation, wait time, finish time evaluation.

Table4: Final Results

Request Id	Cloud Server	Virtual Machine	Start Time	Arrival Time	Deadline	Turnaround Time	Finish Time	Wait Time
7	0	0	29	29	39	9	38	0
0	0	0	0	0	0	0	0	0
19	0	1	38	32	54	17	55	6
0	0	0	0	0	0	0	0	0
14	0	1	55	36	62	23	78	19
15	0	1	78	58	75	16	94	20
1	0	2	94	63	86	15	109	31
13	0	2	109	96	123	20	129	13
10	0	2	129	90	117	25	154	39
8	0	2	154	41	51	1	155	113
9	0	2	155	78	87	1	156	77
17	0	3	156	96	111	13	169	60
18	0	3	169	56	81	19	188	113
16	0	3	188	37	40	2	190	151
2	0	3	190	65	93	20	210	125

IV. CONCLUSION

In this present work, an energy effective priority scheduling mechanism is defined for multiple cloud system. The work is here defined to analyze the cloud servers under the load vector along with energy estimation and capacity derivation. Based on these vectors, the priorities to the virtual machines are assigned. The energy criticality is here considered to provide the adaptive and long term allocation of request to the cloud server. After the allocation, as the strength or the capability of the virtual machine is not to handle the request, the migration process is applied to switch the request on other cloud server. The analysis results show that the work has optimized the allocation process and reduced the wait time and migrations over the execution of processes.

V. FUTURE WORK

In this present work, a load and energy criticality based model is presented for effective cloud service scheduling so that the effective process allocation and execution can be done. The work can be improved in future under following aspects.

1. The presented work is defined no optimization algorithm is defined in future some such algorithm can be nitrated to improve the performance and reliability of the system.
2. The presented work is defined for the public Cloud environment, but in future, the work can be extended to private and the hybrid Cloud environment.

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