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RESEARCH ARTICLE

Dynamic Round Robin for Load Balancing in a Cloud Computing

Ajay Gulati[1], Ranjeev.K.Chopra[2]
[1]Student M.Tech Department of CSE/IT, BBSBEC, Fatehgarh Sahib (Punjab), India
[2]Associate Professor cum HOD, Department of Computer Science and Applications,
RIMT, Mandi Gobindgarh (Punjab), India

[1] *gulati_20@yahoo.co.in*

Abstract— Most of the load balancing works in Cloud computing is carried out under homogenous resources. But today's requirement has been diversified with the ever increasing heterogeneity of resources in the cloud resources. Our endeavour in this paper is to study the effect of Round robin technique with dynamic approach by varying the vital parameters of host bandwidth, cloudlet long length, VM image size and VM bandwidth. Load has optimized by setting dynamic round robin by proportionately varying all these parameters. Simulator CloudSim has been used for this implementation and a new approach has also been worked out.

Key Terms: - Load balancing; Round robin; CloudSim; Datacenter; Virtual Machines (VM)

I. Introduction

Cloud computing is relatively new and emerging technology. Cloud computing has recently emerged as one of the buzzwords in the ICT industry. It is a new technology of computing that is extensively used in today's industry as well as society. It is latest technology for sharing resources. Cloud computing is the Internet-based computing and this type of computing enables to shared resources, software's and information can be provided to computers and other devices on demand. Applications runs in the cloud, the user can access it anywhere through an Internet-enabled mobile device or a connected computer and available 7x24x365. With a cloud app, you just open a browser, log in, customize the app, and start using it. Amazon was the founder of the clouds and offer cloud services to public like Amazon Elastic Compute Cloud (EC2), Simple Storage Service (S3). Cloud computing is not a total new concept; it is originated from the large-scale Grid environment. Cloud computing provides all the features of grid computing, software as a service and utility computing. It utilizes the concept of virtualization. Figure 1 shows the three main types of service models and four common deployment models.

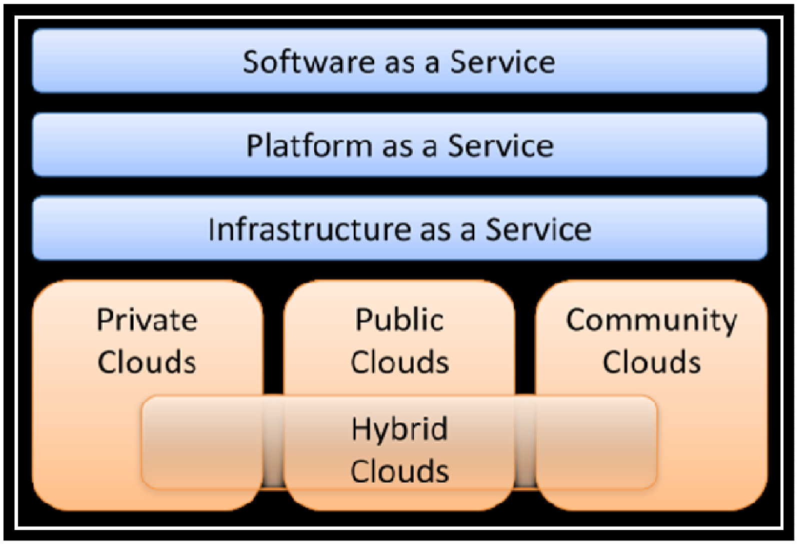

Figure 1: Cloud computing Service Models and Deployment Models

A. Service Models: A service model determines the types of computer resources offered to consumers. Three main types of cloud services are software (SaaS), platform (PaaS) and infrastructure (IaaS) covers a huge range of services. However, new service models are continuously emerging.

1. Software as a service (the top layer): SaaS is a new model of how software is delivered. SaaS refers to software that is accessed via a web browser and is paid on a subscription basis (monthly or yearly). Standard application software functionality is offered within a cloud. Example: Google Apps (Google Docs), SalesForce.com are among the providers of this kind of cloud computing.

2. Platform as a service (the middle layer): Platform as a service, another SaaS, this kind of cloud computing provide development environment as a service. You can use the middleman's equipment to develop your own program and deliver it to the users through Internet and servers. Example: Google App Engine, Force.com is among the providers of this kind of cloud computing.

3. Infrastructure as a service (the bottom layer): IaaS delivers a platform virtualization environment as a service. Rather than purchasing servers, software, data centre space or network equipment, clients instead buy those resources as a fully outsourced service. Example: Perhaps the best known example is Amazon Web Services like Amazon's Elastic Compute Cloud (EC2), and Simple Storage Service (S3). Rack space Cloud, Go Grid etc. are also among the providers of this kind of cloud computing.

B. Deployment Models: Different deployment models are designed to support a variation of consumers' privacy requirements for cloud adoption. NIST defines cloud deployment models as public, private, community, and hybrid [1]. A cloud system can be operated in one of the following four deployment models:

1. Public cloud: The cloud infrastructure is generally owned and managed by the service provider. Multiple customers share the computing resources provides by a single service provider, customers can quickly access these resources and only pay for the operating resources. The customer has no visibility over the location of the cloud computing infrastructure and infrastructure is shared between organizations. Public clouds are shared on a large scale. Benefits of public clouds include ease of on-demand scalability as they are larger than a company's private cloud. Very popular providers of Public cloud include Amazon Elastic Compute Cloud (EC2, IBM's Blue Cloud, Sun Cloud, Google App Engine and Windows Azure Services Platform.

2. Private cloud: The cloud infrastructure may be owned by and managed by the organization or the designated service provider. Computing architecture is dedicated to the customer and is not shared with other organizations. They are expensive and are considered more secure than Public Clouds. The main advantage of this model is that the security, compliance and QoS are under control of the enterprises.

3. Community cloud: The cloud infrastructure is shared among several organizations that have common requirements or concerns and operated specifically for a targeted group. Their ultimate goal is to work together to achieve their business objectives.

4. Hybrid cloud: The cloud infrastructure is a composition of two or more clouds (private, community or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability (e.g. cloud bursting for load balancing between clouds) [1]. This cloud is used by most of the companies and they are designed in a manner as to quickly scale the company's needs.

II. LITERATURE SURVEY

Milan E. Sokile [2], in this paper he has studied the comparison are made between various techniques but static load balancing algorithm are more stable and it is also easy to predict their behaviour, but at a same time dynamic distributed algorithm are always considered better than static algorithm. Experimental results of performance modelling show that diffusive load balancing is better than round robin and static load balancing in a dynamic environment, which manifest in frequent clients' object creation requests and in short objects' lifetimes. Ankush P.Deshmukh and Prof. Kumarswamy Pamu [3] have discussed/described different load balancing strategies, algorithms and methods. They investigate that comparative behaviour of load balancing with different parameters; dynamic load balancing is more reliable and after that they conclude that efficient load balancing can clearly provide major performance benefit. Jingnan You et al. [4] with the advent of powerful network processors (NPs) in the market, many computation-intensive tasks such as routing table look-up, classification, IPSec, and multimedia transcoding can now be accomplished more easily in a router. An NP consists of a number of on-chip processors to carry out packet level parallel processing operations, ensuring good load balancing among the processors increases throughput. However, such type of multiprocessing also gives rise to increased out-of-order departure of processed packets. In this paper authors first propose an Ordered Round Robin (ORR) scheme to schedule packets in a heterogeneous network processor assuming that the workload is perfectly divisible. The processed loads from the processors are ordered perfectly. This paper analyse the throughput and derive expressions for the batch size, scheduling time and maximum number of schedulable processors. Jaspreet Kaur [5] has discussed an algorithm called active vm load balancer algorithm to find the suitable VM in a short time period. She has stressed to count the maximum length of VM for the allocation of new request. If the length of the vm is not sufficient then a new VM would be added. Zhang Bo et al. [6], in this paper authors proposed an algorithm adding capacity to the dynamic balance mechanism for the cloud. The experiments demonstrate the algorithm is obtain better load balancing degree and using less time in loading all tasks. Soumya Ray and Ajanta De Sarkar [7] have discussed various algorithms of load balancing like Round robin algorithm, Central queuing algorithm and Randomized algorithm and their analysis is carried out MIPS vs. VM and MIPS vs. HOST. Their results demonstrate that these algorithms can possibly improve the response time in order of magnitude with respect to number of VMs in Datacentre and they conclude that execution analysis of the simulation shows that change of MIPS will affect the response time. Increase in MIPS vs. VM decreases the response time. In order to handle the random selection based load distributed problem dynamic load balancing algorithm can be implemented as future course of work to evaluate various parameters.

III. STRUCTURE AND TECHNIQUE

Our algorithm will be implemented by using packages like CloudSim and CloudSim based tool kit. Tentatively CloudSim contains various data centres and one data centre have 50 virtual machines with 1024mb of memory in each virtual machine running on physical processor having speed 100MIPS (millions of instructions per second). In this research main purpose is to balance load of all virtual machines in a cloudlet. In our research Cloudlet long length is examined with respect to Host bandwidth (Cloudlet long length vs. Host bandwidth). We use simulator CloudSim-3.0 [8] in our experimental setup and thereafter Java version [9] is installed, path and class path is set for compilation and execution. In this way setup requirements are fulfilled. Here study of load balance is taken place by varying long length of the cloudlet and this is examined by selecting various values of host bandwidth and varied within the range of 10000 to 40000. We will compare these parameters within the range to ascertain the pattern which implements optimized load balancing by using dynamic round robin technique. Our work is slightly different from the previous work. There is a vital need and significance for this research work. Many concepts are put forward by other researchers in parallel manner which have been already mentioned in the literature survey.

Load balancing is to achieve optimal resource utilization, maximize throughput, minimize response time and avoid overload. Dynamic algorithm is self-adaptive algorithm which is better than the static algorithm. This algorithm makes changes to the distribution of load among virtual machines of the cloud at run time. The algorithm always uses recent load information while making distribution decisions. It includes two processes monitoring the load states of the virtual machine. Due to these results dynamic load balancing algorithm provide a significant improvement in performance over static algorithms [3]. Although dynamic load balancing exerts immense stress on a system and each node needs to interchange status information periodically yet it is more advantageous when most of nodes work in individual manner with partial interaction with others.

SIMULATION IN CLOUD: CLOUDSIM

CloudSim: In CloudSim, cloud computing infrastructures and application services allowing its users to focus on specific system design issues that they want to investigate [8]. Simulation in a CloudSim means implementation of actual environment towards benefit of research. The users or researcher actually analyse the proposed design or existing algorithms through simulation. Resources and software are shared on the basis of client's demand in cloud environment. Essentially, dynamic utilization of resources is achieved under different conditions with various previous established policies. Sometime it is very much difficult and time consuming to measure performance of the applications in real cloud environment. In this consequence, simulation is very much helpful to allow users or developers with practical feedback in spite of having real environment. In this research work, simulation is carried out with a specific cloud simulator, CloudSim [7]. Figure 2 shows Layered CloudSim architecture.

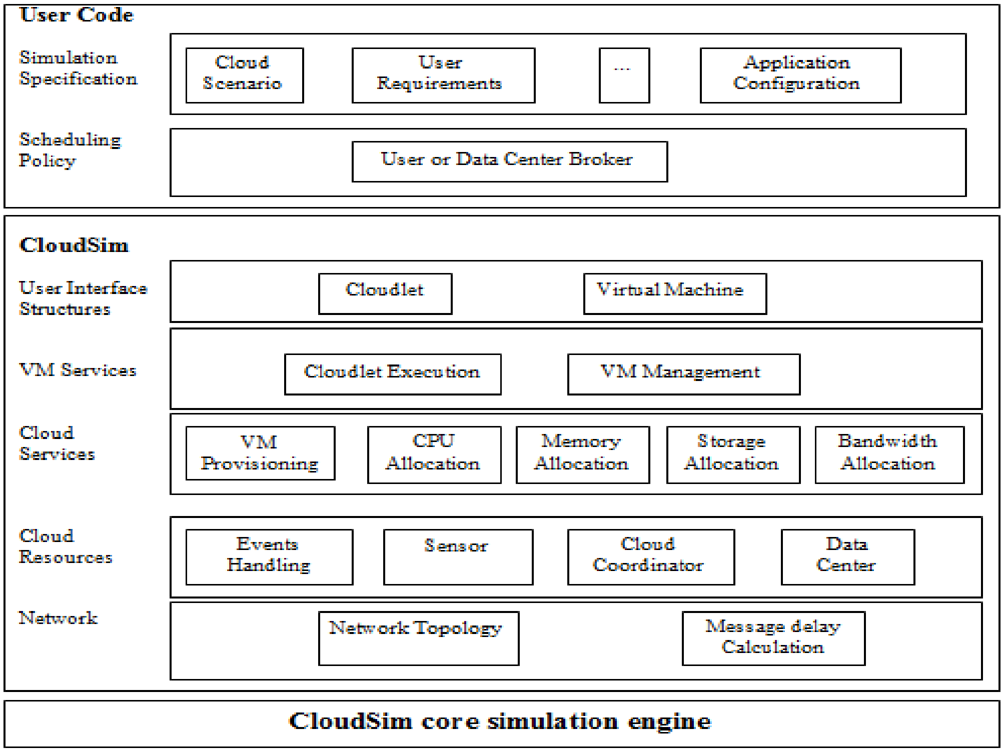

Figure 2: Layered CloudSim Architecture [10]

A brief description of these vital components and the working relationship between them is presented in the following [7].

Data centre: Data centre encompasses a number of hosts in homogeneous or heterogeneous configurations (memory, cores, capacity, and storage). It also creates the bandwidth, memory, and storage devices allocation.

Virtual Machine (VM): VM characteristics comprise of memory, processor, storage, and VM scheduling policy. Multiple VM can run on single hosts simultaneously and maintain processor sharing policies.

Host: This experiment considers VM need to handle a number of cores to be processed and host should have resource allocation policy to distribute them in these VMs. So host can arrange sufficient memory and bandwidth to the process elements to execute them inside VM. Host is also responsible for creation and destruction of VMs.

Cloudlet: Cloudlet is an application component which is responsible to deliver the data in the cloud service model. So the length, and output file sizes parameter of Cloudlet should be greater than or equal to 1. It also contains various ids for data transfer and application hosting policy.

IV. CONCLUSION

This paper aims towards the establishment of performance qualitative analysis on Host bandwidth and cloudlet longlength and then implemented in CloudSim with Java language. Here major stress is given on the study of load balancing algorithm with heterogeneous resources of the cloud, followed by comparative survey of other algorithms in Cloud computing with respect to scalability, homogenity or heteroginity and process migration. When the longlength and bandwidth varies then average response time also varies in the same proportionality after optimizing load with Round robin technique based on dynamic approach.

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