Volume: 08, Issue: 05 Pages: 41-45 (2017) Special Issue

Highlights Some of the Major Issues in Cloud Services and Analysis of Various Data Center Selection Algorithms

M.Nagavalli
Department of Computer Science, Thassim Beevi Abdul Kader College for Women, Kilakarai
Email: nagavallidharma@gmail.com
Dr.A.R.Nadira Banu Kamal
Department of Computer Science, Thassim Beevi Abdul Kader College for Women, Kilakarai
Email: nadirakamal@gmail.com

ABSTRACT

Resource virtualization is one of the most prominent characteristics of cloud computing. The number of cloud users has been growing exponentially leads to effective scheduling of virtual machines. In cloud computing a user may require a set of virtual machine co-operating with each other to accomplish one task. VMs need to be scheduled on the cloud in order to maximize the utilization with cost effective. The purpose is to minimize the maximum inter-DC distance. In present condition, data center should be selected for multiple incoming from the client is an important issue in cloud computing. Cloud application Service Broker determines which data center should service the request from each user base. Service proximity-based routing selects the data center which has lowest network latency or minimum transmission delay from a user base. If there are more than one data centers in region in close proximity, then one of the data centers is selected at random to service the incoming request. To select appropriate data center for executing a task is an important parameter to improve the performance of cloud computing environment. In this paper we propose the analysis of various data center selection algorithm as well as VM placement techniques. Cloud also faces many issues. Service availability on demand, unpredictability of performance, on-time availability of resources and security are the major challenges in cloud computing.

Keywords – **Cloud Computing, Cloud service broker, data center Selection, issues in cloud Services, VM Placement techniques**

1. Introduction

The cloud computing paradigm provides a number of benefits through the virtualization technologies. Virtualization technology offers applications an abstract view through interfaces of the underlying hardware platform and resources. The multi-tenancy nature of cloud computing, along with its higher consolidation level, constitutes also one of the factors raising many challenges still to be properly tackled. The increased level of sharing of physical resources among multiple software components and applications to be hosted on behalf of different customers makes it more and more difficult to provide stable and predictable performance levels to each one of them. Indeed, virtual machines (VMs) can be executed concurrently in a virtualized platform simultaneously competing for physical resources that are scheduled by an underlying hypervisor. VMs and activities/tasks within VMs adjust to a hierarchical scheduling view where time can be partitioned among VMs; within VMs, the processor is further granted to tasks or threads according to the guest OS specific scheduling policy.

2. Related Work

2.1, Cloud Computing with virtualization standard

Cloud computing has gained great popularity in recent years for the efficient resource usage and convenient service access. Based on the actual standard of virtualization industry, the cores of physical machines (PMs) can be virtualized into more virtual CPUs (vCPUs).Virtual machines (VMs) can be placed on the granularity of vCPUs and thus gain a more efficient resource utilization. Efficient resource usage lays the foundation for the service level assurance and thus makes the cloud service provider business a success and of maximum profitability. So the resource allocation problem is a key challenge for cloud computing. Various aspects of resource allocation are explored, such as server integration, load balance and energy. DC selection and bandwidth saving are seldom studied in past years. The placement of VMs in one DC based on the traffic matrix is investigated in and objective is to improve the scalability of DCs. Different models are adopted to address the challenge. Bin packing and graph theory are two models widely used and they are selected based on the granularity of resources.

2.2, Virtual Machine placement techniques

Virtual Machine placement is the process of selecting the most suitable Physical Machine (PM) for a given Virtual Machine (VM). So a VM placement algorithm

aims at determining the most optimal VM to PM mapping whether it is an initial VM placement or a VM migration for placement re-optimization. The placement technique in VM consolidation can have one of the two major goals—one is power saving and other is delivering QoS. The type of VM placement approach varies from a cloud service provider to another. There is a clear conflict between these two goals. It is noteworthy here that we are dealing only with the power-based approaches which use Dynamic VM placement algorithms (the static ones being obsolete).

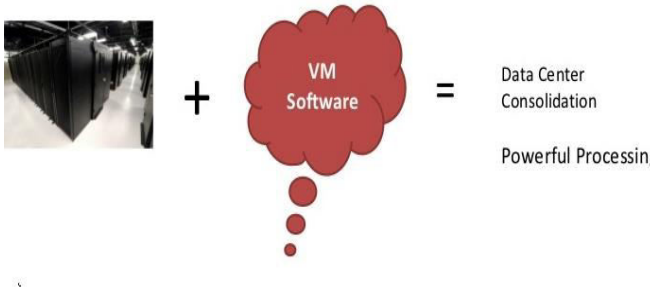

Fig.1.consolidation allows reducing operating cost.

2.2.1, Classification of VM placement algorithms

Depending on the goal of placement, a VM placement algorithm can be broadly categorized into two types:

1. **Power-based approach**
   Aims to obtain a VM-PM mapping which results into a system that is energy-efficient with utmost resource utilization.
2. **QoS-based approach**
   Aims to obtain a VM-PM mapping to ensure maximal fulfillment of quality of service requirements.

VM Placement techniques are mainly classified as under:

Constraint Programming

It is a kind of logic programming, as a contrast to mathematical approaches, to solve complex combinatorial problem of optimal VM placement. It uses a set of constraints which can easily be extended further to involve more aspects.

Bin Packing

The classical problem of Bin packing consists of a series of items having sizes specified in the interval (0, 1) which need to be packed into least possible number of bins with capacity one. To model this problem as a resource allocation algorithm, we consider each item as a Virtual Machine (VM) to be tightly packed in minimum number of bins, each considered as a Physical Machine (PM). The bin packing problem is NP hard. The quality of a polynomial time approximation algorithm, A is measured by its approximation ratio, R (A) to optimal measured by its approximation ratio, R (A) to optimal algorithm, OPT:

$$R(A) = \lim_{n\to\infty} \text{Sup}_{OPT(L)=n} AL/OPT(L)$$

Where, A (L) is the number of bins used under the algorithm A, OPT (L) is the number of bins used under the optimal algorithm OPT and L is the list of input sequence. In this section we throw some light on the existing VM scheduling techniques which aim at improving server consolidation using Bin Packing approach.

Stochastic Integer Programming: In contrast to logical approach, this is a mathematical optimization technique in which the future demands are uncertain. They make use of estimation models using probability distributions of the concerned data. Here, the future demand of a VM or an application is unknown and therefore, some VM placement techniques use this approach to predict the suitable VM-PM mapping.

Genetic Algorithm: Being a part of evolutionary computation, it performs natural selection of suitable solution from all possible solutions. This heuristic can be called as bin packing extended with additional constraints.

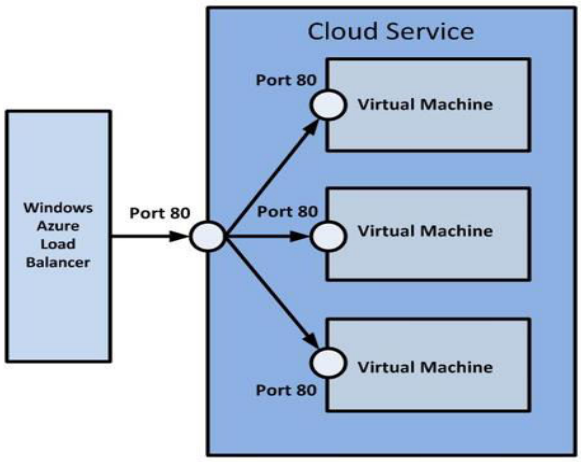

Fig.2.Increased performance and computing capacity the high end side of the pc market, where super computer can provide an immense compute power that can accommodate the execution of hundreds or thousands of virtual machines.

3. Data Center Selection

This paper aims to investigate more efficient algorithms for the data center selection .Many data center selection algorithms are derived by generalizing a sorting algorithm, and conversely some sorting algorithms can be derived as repeated application of selection. Round Robin (RR) and Weighted Round Robin (WRR) are most commonly Static Load Balancing Algorithm used in Cloud Computing. Round Robin Algorithm does not consider server availability, server load, the distance between clients and servers and other factors. In this algorithm

server selection for upcoming request is done in sequential fashion. The main problem with this approach is inconsistent server performance which is overcome by WRR. In WRR the weights are added to servers and according to weight amount of traffic directed to servers however for long time connections it causes load tilt.

3.1 Cloud service broker

Service broker algorithm is created by combining the Round Robin Service Broker Algorithm and Service Proximity Service Broker algorithm. Service Proximity Service Broker is the simplest Service Broker implementation. In Service Proximity Service Broker the **earliest region** is selected based on the minimum communication delay and maximum available bandwidth from user base (client) to data center residing region. The region selection is based on the earliest/ highest region in the proximity list and any data center of the selected region is then selected randomly for the user requests to be processed. In Round Robin Service Broker algorithm the data centre selection is done sequentially in serial fashion.

3.2 Clustering based data center selection

A clustering is an effective technique for ensuring high availability. A computer cluster consists of a set of loosely or tightly connected computers that work together so that, it can be viewed as a single system. A data center cluster should be found firstly to accommodate the requested VMs.The purpose is to minimize the maximum inter –DC distance. Data center selection problem aims to find a DC cluster to accommodate the requested VMs where each VM requires a certain number of vCPUs. The maximum inter-DC distance of the cluster needs to be minimized so that the latency of the application is reduced.

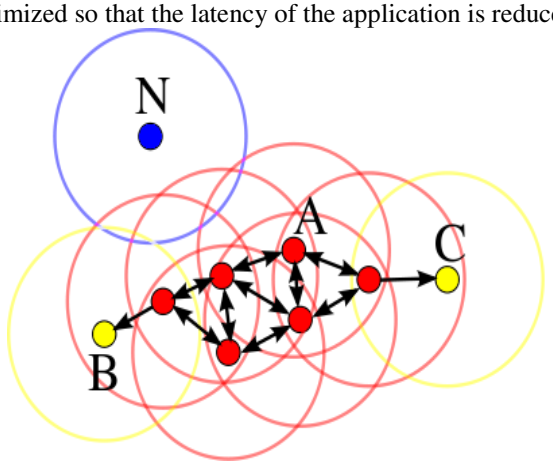

Fig.3.In this diagram,minPts=4. Point A and the other red points are core points, because the area surrounding these points in an ε radius contain at least 4 points (including the point itself).Because they are all reachable from one another,they from a single cluster.points B and C are not core points,but are reachable from A(via other core points)and thus belong to the cluster as well.point N is a noise point that is neither a core point nor density-reachable.

Algorithm 1 ModFindMinStar

Input: G = (N, E, w): a complete graph with vertex, edge length
matrix and weight
m: required weight of the subgraph, i: starting vertex
Output: Subgraph G′ = (N′, E′) of weight at least m formed by i
and its closest neighbors
1: Let e = (e1, e2, ..., en−1) is the i-th column vector of E excluding Eii sorted in non-decreasing order: e1 ≤ e2 ≤ ... ≤
en−1. The corresponding vertices of e are (Ne1 , Ne2 , ..., Nen−1)
and the weights are (we1 ,we2 , ...,wen−1)
2: N′ ← i, m′ ← wi
3: for j = 1, . . . , n − 1 do
4: if m′ < m then
5: N′ ← N′∟
Nej , m′ ← m′ + wej
6: else
7: E′ ←submatrix of E corresponding to N′
8: return G′ = (N′, E′)
9: end if
10: end for
11: if m′ < m then
12: No subgraph of size m in G
13: return NULL
14: end if
15: E′ ←submatrix of E corresponding to N′
16: return G′ = (N′, E′)

For a given DC, ModFindMinStar orders all other DCs in increasing distance to this DC, then the closest DC is added to the cluster. If the cluster can accommodate all the requested vCPU and the corresponding VMs, the program terminates. Otherwise the second closest DC is added until the cluster meets the VMs number requirement or all DCs have been added. Because of the heterogeneity of VMs, the feasibility to accommodate the concrete VMs combination is necessary. But for a real DC which can supply thousands of vCPUs, it can be negligible.

A new algorithm [1] Clustering Based MinDiameter to find a DC clusters with minimum diameter. CBMinDia includes three phases:

Phase 1: selects an arbitrary vertex and uses the radius of its minimum feasible subgraph (all the minimal feasible subgraphs in this algorithm are found by ModFindMinStar) as the initial radius ϵ.

Phase 2: judges whether each vertex is core object w.r.t. (ϵ, m) and then labels.

Phase 3: In this phase vertices which cannot be more optimal are cut off by a criterion and the vertex with the smallest diameter is found. The criterion is d, i.e., the diameter of the minimum feasible subgraph with the smallest core distance. The solution is updated when a smaller diameter is found.

4. Major Issues in Cloud Services

Cloud also faces many issues. Service availability on demand, unpredictability of performance, on-time availability of resources and security are the major challenges in cloud computing.

4.1 Service availability on demand

This is important threat to any type of availability since in case of lock-in customer cannot move his data to different service provider. Secondly in dynamically changing world of cloud computing services and service providers end user might not even be aware of possible lock-in problem in case when his service provider (or one of providers inside link of providers) is going out-of-business. In such case the data might become unavailable for an indefinite period of time and the risk of losing all data entered into the cloud cannot be underestimated. The availability concept is quite complex one. The same rule applies to consumers (private users) as well as business ones. The one important difference between consumer and a business user is that the later one should be able to define the requirements for his understanding of availability.

4.2 Unpredictability of performance

The success of Cloud deployments is highly dependent on practicing holistic performance engineering and capacity management techniques. A majority of the obstacles for adoption and growth of cloud computing are related to the basic performance aspects, such as availability, performance, capacity, or scalability.

1. Potential cloud solutions to overcome these obstacles need to be carefully assessed for their authenticity in real-life situations
2. Performance engineers need to get to the bottom of the technical transactions of underlying cloud services before advising cloud computing users and cloud computing providers for the cloud services.

An individual enterprise may produce terabytes of log data Per month which contain millions of events per second. The techniques for gathering monitoring data have become a lot better through the development of performance tools for in-house enterprise systems. However the analysis of the large volume of data collected has been still a major challenge.

4.3 Security

Security has been one of the most challenging issues for the IT executives particularly in cloud implementation. There exist numerous security anxieties that are preventing companies from captivating advantages of the cloud. Various security threats with deployment and service models have been noticed. This makes us aware about the fact that cloud deals majorly with internet; and one need to examine various security threats with network as well.

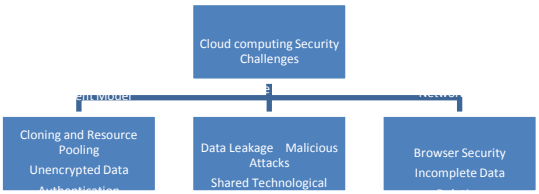

Fig.4.represents hierarchy of the cloud computing with security challenge

Both the cloud service provider and the customer should make sure that the cloud safe is enough from all the external threats, so there will be a strong understanding between the customer and the cloud service provider.

5. Conclusion

Server Consolidation in data centers has been an active area of research in the past few years. This paper reveals on such consolidation mainly detailing the VM placement algorithms and methods used to reach an optimal solution for this placement problem. This also presents a more efficient algorithm, CBMinDia, for the DC selection problem. This study has analyzed almost every security threat found across both the cloud models and the network and has also revealed solutions to some of them.

References

[1] Jiangtao Zhang a,b , Xuan Wang a,c , Hejiao Huang a,d,∗ , Shi Chena,d, *Clustering based virtual machines placement in distributed cloud computing. J. Zhang et al. / Future Generation Computer Systems 66 (2017)*

[2] Sunny Nandwani, Mohit Achhra,Raveena,Aditi Tamrakar,Kiran Joshi,Sowimiya Raksha, Weight based data center selection algorithm in cloud computing environment.*proceedings of ICAIECES 2015.*

[3] Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, *mastering Cloud Computing (Tata McGraw Hill Education Private Limited).*

[4] Amit Sangroya, Saurabh Kumar, Jaideep Dhok, and Vasudeva Varma, Towards Analyzing Data Security Risks in Cloud Computing Environments,*Springer-Verlag Berlin Heidelberg 2010, pp. 255-265.*

[5] [5] Zoha Usmani,Shailendra Singh, Senior Member IEEE,a, A Survey of Virtual Machine Placement Techniques in a cloud Data Center,*International Conference on Information Security & Privacy (ICISP2015)Procedia Computer Science 78 (2016) 491 – 498.*

[6] https://www.cmg.org/.../1-Paliwal-**Performance**-Challenges-in-**Cloud**-**Computing**.pdf