EXAMINING BANDWIDTH PROVISIONING ON CLOUD COMPUTING AND RESOURCE SHARING VIA WEB

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Abstract

Cloud computing works on the basis of multiple server based resources via a digital network over the web. The cloud service providers allow users to charter computing resources from the extensive data centers. Resource sharing is the major part in the cloud computing. Sharing the data in the cloud depends on the network performance of the data centers. While data centers provide many mechanisms to schedule local compute, memory, disk resources and bandwidth allocation for apportioning network resources. The Data centers which resides at different location to compute the resources needed by the cloud service consumer. Bandwidth allocation places a major role in sharing the resources towards the data center networks. This paper presents with the analysis on bandwidth allocation mechanisms, comparison between the different cloud vendors and their cost analysis.

Index Terms: *Resource sharing, Data centers and Bandwidth provisioning*

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1. INTRODUCTION

Cloud computing is the term used to refer "almost anything "can be accessed [1]. In cloud computing environments, the trusted and non trusted tenants deploy their services in a shared datacenter infrastructure. Each tenant consists of a set of one or more virtual machines placed on one or more physical machines. The maintainenance of the network bandwidth in the cloud is the key to handle the growing range of workloads that pressure network resources in the data center. The simplicity of the interface between cloud service providers (CSP) and multi-tenants has vitally contributed to the fame of cloud data centers presents on-demand use of the computing resources. The multi-tenants are asked for the usage of the compute and storage resources which they require and are charged on a pay-as-you-go basis. Cloud providers do not offer a guaranteed network bandwidth to the tenants.

The services offered by the cloud in distributed environment are:

a) Hosted Desktops
b) Hosted Email
c) Hosted Telephony (VOIP)
d) Cloud Storage
e) Dynamic Servers

1.1. Data Centre

Data centre is the foremost ingredient of the cloud computing. The Data Center (DC) contains the collection of various hardware and software resources that are linked and incorporated for the IT application. The cloud users can remotely or locally store their resources and they can remotely or locally share the resources at the less computational cost. As the Data centers grew up, the cloud users and cloud service provider incur the problem of managing the tenant and non-tenants resources. Some cloud users share the same or different resources using different cloud vendors. The cloud vendors are:

- Google
- Microsoft
- Rackspace
- goGrid
- Amazon EC2 Cloud Compute
- Apple
- NetFlix

Data center can locate in different places but data are shared among the cloud users from different cloud vendors. Managing these resources is an efficient task of the IT organizations. Cloud computing depends on the utility computing. Utility computing refers how the resources are outsourced and

managed effectively. Resources can be utilized either locally or remotely. Each action of the cloud user's is monitored and they pay according to their utilities of the resources .Utility computing has some benefits:

a) It will reduce the cost of operating expenses
b) Turn IT from fixed to variable assets
c) Simplify IT by reducing complexity

1.2 Service Oriented Architecture

Nowadays, many new technologies has been emerged and resources develop into a web based oriented and to provide interoperability among the users, they introduce the concept known as Service Oriented Architecture(SOA).SOA is a component model based on the Service Level Agreements(SLA) .Multiple Hosts can be run on multiple virtual machines .Each Host should access the data based on their Service Level Agreements(SLA).The service level agreement is termed as the deal between the two parties i.e. service user and service provider for the ample amount of the time. The service registry has been introduced that act as a middleware between the service user and service provider. The illustration of the SOA

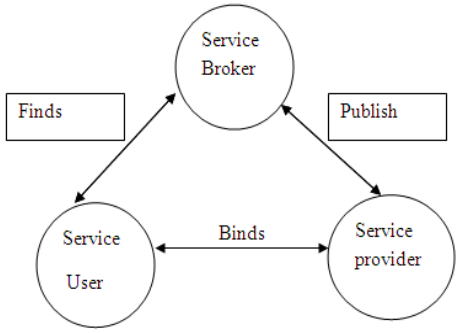

Fig-1: Service Oriented Architecture

SLA concentrates on the

a) Clarity of services
b) Performance measurement
c) Problem management
d) Customer duties
e) Warranties
f) Disaster recovery
g) End time of the agreement

The Service Based SLA is used between the Cloud Service Provider (CSP) and Cloud Service User (CSU). The real usage of cloud computing in the companies depends on the bandwidth usage among the network resources and the resource sharing in the cloud data centers. It describes the services such as:

a) Availability
b) Performance
c) Security / privacy of the data
d) Location of the data
e) Access to the data
f) Portability of the data
g) Process to identify problems and resolution expectations.
h) Optimized usage of Bandwidth

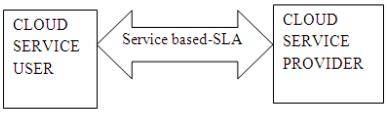

Fig-2: Service Based SLA

The rest of the paper is organized as follows: Section 2 explores the resource sharing and its management in the network. Section 3 analyzes the different network bandwidth mechanisms used in cloud computing. Section 4 explains the comparative study on different cloud vendors. Section 5 shows the cost analysis of the different cloud vendors. Lastly, the paper is concluded in Section 6.

2. SHARED RESOURCE MANAGEMENT

Sharing the resources, network is the major resource agent of the utility computing environment. Some hardware is present to monitor and control the network handling in the cloud network settings. Data bandwidth has been organized to allocate limited resources for certain cloud users and unlimited resources for the cloud users. Dynamic reconfiguration allows us to reconfigure the network usage among the cloud users when the traffic is generated. Dynamic reconfiguration is done in both hardware and software applications. The provisioning component is the one that can take any hardware resource from the group of redundant hardware and reallocate with the operating system and software applications. The rate at which the number of messages can be transferred from one point to another point in a given amount of time is known as bandwidth. It can be measured as baud rate, rate of data transfer and bit rate or throughput. The bandwidth used in cloud computing is the network bandwidth. The network bandwidth can be stated as the amount of data shared over the network in a given time. Network administrator is responsible for the optimized bandwidth allocation for the cloud users. Sometimes the client requests may generate "service interference". The act of one cloud user may influence the act of another cloud user in the cloud environment is known as service interference. This leads to the network latency, low response time, less throughput, unable to maintain the overload when high efficiency is reached. The generated traffic can be avoided by allocating and rebalancing equal loads to the multiple hosts.

3. BANDWIDTH MECHANISMS

The multiple hosts use the services from the multiple cloud vendors. Each cloud vendors are specialized in allocating the resources and rebalancing the overloads .The different bandwidth mechanisms and their usages are listed as:

1. Fair-Share Bandwidth allocation

The Fair-share 'V' is the maximum flow of the data between the CSC and CSU in a short period of time. It is based on the Throughput T and Network weight C. The fair share value is calculated as the difference between the throughput T and network weight C of local entity and it is updated [4] .The packets are transferred when the fair share values reaches the random values otherwise the packets are dropped. This is used to ensure the fairness among the data flows.

2. TCP

TCP designed for an end to end congestion controls. It is used for sharing the bandwidth among the cloud users.TCP is a connection oriented, reliable, ordered and byte stream protocol. When data flows from the different host, the TCP shares the network links among the data flows [5].TCP guarantees only the flow of data but not among the tenant service. The data are divided into packets. Packets are partitioned into the segments .Each segments has a sequence number to indicate the order of the dat. The packets with the sequence number are transmitted to the beneficiary in a period of time. If the packet is arrived, an acknowledgement is send back to the transmitter or else the packet is retransmitted. Using TCP, it limits to achieve fairness among the data flows but not on the tenant service .It suffers from the service interference i.e. the action of one cloud user affect the action of the another cloud user which leads to the heavy congestion on the networks.

3. Bandwidth Capping

Bandwidth Capping is the mechanism used for transmitting the data at the maximum rate over the virtual network interface. It implements hypervisor technique that allows different operating system to run on the host computer in a simultaneous time. It guarantees the bandwidth transmission over the hypervisor to limit the allocated bandwidth. When compared to the TCP, it guarantees the maximum rate at both transmitter and receiver direction. When non-trusted tenant utilize the reserved bandwidth, the bandwidth capping couldn't control the links. Linux Hierarchical Bucket (LHB) can be used to utilize the bandwidth in virtual machine. LHB is well organized in transmitter side.

4. Secondnet

The virtual machine pair is connected to the network link for the effective communication pattern. It guarantees network bandwidth allocation between each virtual machine pair [6] .The communication patterns between the multiple pair of virtual machine can vary with respect to the time and data transferred and received between them. The bandwidth allocation in the network link of the VM pair is inefficient. In large data centers, some allocated resources are idle at some time and it is inefficient to use. So, statistical network bandwidth allocation is employed for the tenant applications. This mechanisms led to limitation of finding accuracy between each VM pair is difficult.

5. Netshare

Netshare is the mechanism used in the large data centers as a centralized bandwidth allocator in virtual cloud [7]. It reduces the workload of the cloud data centers. Each tenant is linked to the different network resources. The network is divided into different slices. Each slice has a bandwidth allocated to the network links. The reserved bandwidth which is in inactive state can be allocated to the active network slices. The fairness is achieved among the network slice using min/max fair share allocation that predict the future traffic with past traffic. Resource Reservation Protocol (RSVP) is used for reserving the resources at the transport layer. The data is transferred from the ingress link to the egress link when the network slice does not exceed the share value.

6. Approximate Fairness- Quantized Congestion Notification (AF-QCN)

Quantized Congestion Notification (QCN) is the IEEE 802.1 Data bridging standard. AF-QCN is the switch based congestion control mechanisms for data centers. It suggests the QCN for multi-tenancy. It partition the network bandwidth among the transmitter direction to the VM [8] .It enhances the lightweight communication and computation cost. AFD is an active queue management scheme that manages bandwidth allocation between the classes that share queuing system.

4. COMPARISON OF THE CLOUD VENDORS

	Amazon	**GoGrid**	**Apple**
Cloud Services	Platform as a service(PaaS) Infrastructure as a service(IaaS)	Infrastructure as a service(IaaS)	Content – Sharing service
Language supported	Language independent	Ruby ASP. Net	It functions

			on MAC OS X
Supporting Tools	1.Amazon CloudWatch 2.Auto Scaling 3.ElasticLoad Balancing API Tools	1.GoGrid's Cloudcontrol 2.GoGrid Exchange	1. iCloud
Data Storage	1.Amazon S3 - Store object up to 5 GB 2.AmazonEC2 [Elastic Block storage] - Volume sizes ranging from 1GB to 1TB	1.10 GB FREE Cloud Storage 2.FREE data transfer to and from your cloud servers to Cloud Storage	1.5 GB of storage was available without charge
Pricing Policy	Premium Support - Silver and Gold support available and are charged accordingly	FREE 24/7 Phone Support Free 24/7 Premium Support	Premier Support with Administration. Developer Support is only available for a fee, on a per-case basis

Table-1: Comparison

5. BILLING STRATEGY OF THE CLOUD VENDORS

Billing is the simplest strategy tracked in a shared application environment. Each cloud users has subscribed to the monthly fee as a charge which is easy to administer the cloud users. There are many type of billing models:

Per-user billing model:

Depending on the services and applications subscribed to the cloud users the bill is calculated. It's a monthly fee that is easy to value and simple.

Concurrent -user billing model:

Based on the functionalities used in several applications, it charges among the group of users accessing the on-demand applications. It provides incentive to the group.

Usage Billing:

The users are charged for the resources utilized by them.

Hybrid billing model:

The combination of the per-user, concurrent- user and usage billing model is the hybrid billing model. It promote the more use of the application and deject the violence.

CONCLUSION

In the provisioning based computing environment the bandwidth utilization and major concern about the data centers, resource sharing via web which is accessed and bundled in a cloud. The analysis is made on datacenters; shared resource management, SLA's and different bandwidth mechanisms to cope with fair sharing and other strategically focused issues are stated. The comparative study is undergone with different cloud vendors such as Amazon, GoGrid and Apple is basically enclosed with existing featured supports are cloud services, language specific, supporting tools, persistency, pricing strategy. Finally the billing strategies are as follows per-user, concurrent user; usage billing and hybrid billing models are examined with its attributes. In future the issues related to the pricing models of different cloud vendors are focused and performance evaluation can be categorized.

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