A NOVEL APPROACH TO REDUCE NETWORK TRAFFIC IN CLOUD ENVIRONMENT

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ABSTRACT

In the era of extensive use of cloud computing, resource utilization has certainly improved. Consumers do not have to bear the burden of buying hardware and software resources, paying a lot to maintain and upgrade resources. Cloud Service Providers (CSP) provide different types of services- 'XaaS' ('X' is primarily replaced as Software, Platform, and Infrastructure) to its authorized consumers. Accessing and availing all these resources and services is done with the help of internet connection. As a result, it causes huge network traffic over the internet. This paper focuses on reducing the network traffic generated due to accessing cloud resources and services.

KEYWORDS: *cloud service provider, cloud, resources, Big Data.*

I. INTRODUCTION

Increasingly the field of cloud computing is getting popular among different industries. Especially, with the birth of Big Data, cloud computing has been gaining more importance among consumers. Here, we use a term cloud consumers (shortly, consumers) to refer those authorized consumers who access various cloud resources and/or services over the internet. Here, we categorize the cloud consumers to the following types, depending on their nature of usage, i.e., the amount of resources and/or services they consume (see fig. 1).

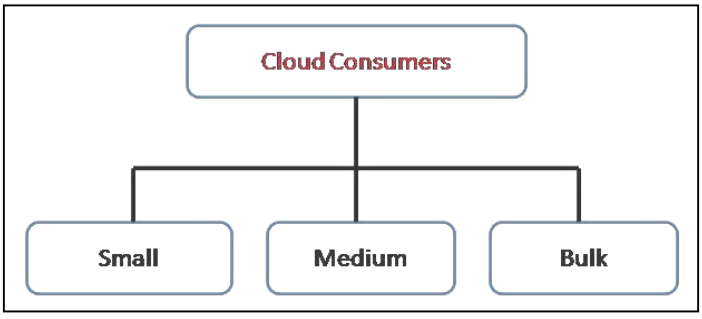

Figure 1: Different types of cloud consumers

1. **Small**: These types of cloud consumers consume very less amount of resources and/or services provided by CSPs. Examples of such consumers include—individuals (home users), students (schools and colleges), small enterprises etc.
2. **Medium:** These types of users borrow relatively significant amount of resources from CSPs. Their usage pattern may not be same throughput a year. Examples of such consumers include: schools, researchers, medium sized organizations, small restaurants and hotels etc.
3. **Bulk**: These types of consumers consume bulk amount of resources and/or services from CSPs on a regular basis. Their usage pattern is more or less the same throughout a year apart from exceptional spike usage. Examples of such consumers include banking sectors, international

airports, major railway stations, PoS (point-of-sale of shopping malls), large size business organizations etc.

All these different types of consumers access cloud resources through internet. These accesses are being performed by generating numerous numbers of requests that consume network bandwidth (see fig. 2). The following section of the paper covers the problem and then the proposed solution is given along with its benefits. Finally conclusion and future work is presented.

II. PROBLEM

CSPs have been providing different numbers and types of resources and services to its authorized consumers. CSPs are also trying to increase the number of services provided, not only to retain its existing consumers but also availing new consumers. As a result, the number of cloud consumers is also increasing day-by-day. The access to the various cloud services generates massive number of requests that may flood the network and exhaust the available bandwidth in the world of internet. Consequently network congestion occurs. This may also cause delay in response across network. Different categories of users generate different numbers of requests. The maximum number of accesses to cloud resources/services is being done by category 3 consumers; i.e. Bulk consumers. This paper proposes a novel approach to reduce this network traffic.

III. PROPOSED SOLUTION

Instead of providing all required cloud resources from CSP's end, the entire setup is being accommodated at consumer's end, as far as practicable. In other words, the CSP will setup all required resources at consumer's end. Personnel form CSP will be available at the consumer's site to operate and monitor all the resources and services. The setup at the consumer's end must be maintained by CSP.

The proposed approach is very much useful for bulk cloud consumers. There are several sectors which require rigorous use of cloud resources on a daily basis. These sectors not only generate huge amount of data in a regular basis (in the order of GB), but also need to store it, manage it and thus consume bulk amount of cloud resources. And such cloud consumers have been fulfilling their requirements over the internet connection by borrowing cloud resources/services from CSPs. The proposal this paper presents, is to setup those required cloud resources at the consumer's end (see fig. 3). The cloud consumer will provide the required space (*floor(s) in a building/an entire building*) to accommodate all needed cloud resources. For bulk cloud consumers it will be a better choice.

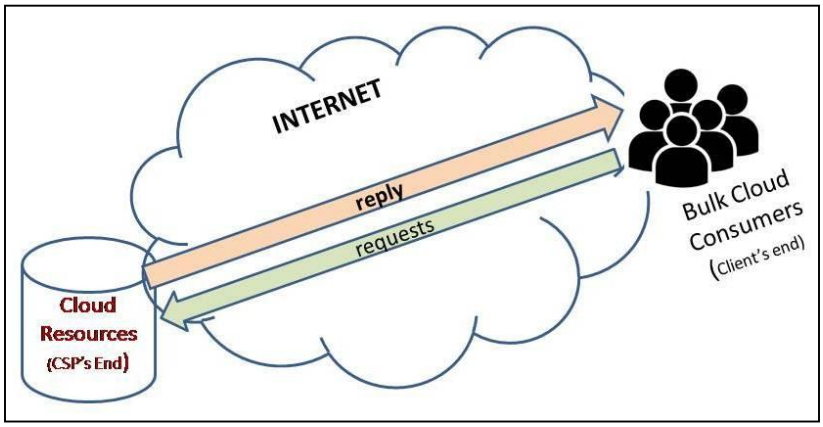

Figure 2: Cloud consumers accessing cloud resources over the Internet

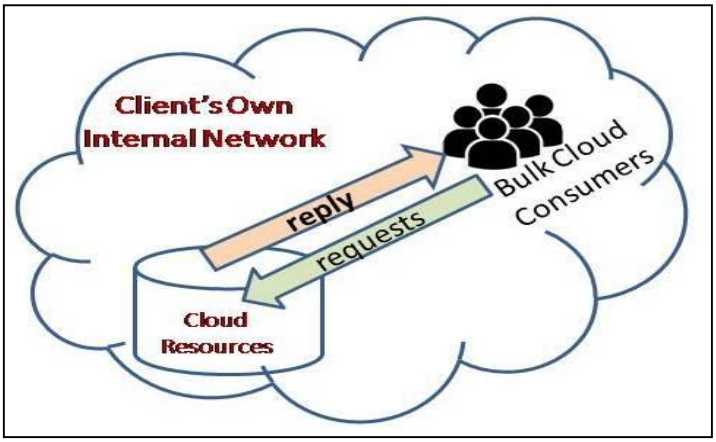

Figure 3: Cloud consumers accessing (cloud) resources within their own internal network

The proposed approach has the following advantages over the traditional setup:

1. **Increase in Availability:** Network traffic between cloud consumer and CSP, and other typical problems of internet connection can be overcome. This is due to the fact that, the borrowed cloud infrastructure becomes part of the organization's internal network. Consequently, availability of cloud resources increases.
2. **Increase in Data Security**: Since, in the proposed setup, all the data transmissions between consumer's end and CSP do not occur over internet, which is vulnerable to several different types of malicious attacks; data transmission between two parties (consumer and CSP) becomes more secure and reliable.
3. **Increase in Bandwidth Throughput:** According to the proposed approach, since all the data transmissions between consumers and CSP occur within consumer's own internal network , it results increase in bandwidth throughput that provide a more consistent network experience over internet based connection.
4. **Reducing Bandwidth Cost:** Since all the data transmissions between consumer and CSP are taking place within consumer's internal network, i.e., without using internet connection; the consumer can reduce the usual bandwidth requirement to its internet service provider. Thus reducing cost.
5. **Reducing Network Traffic:** All the requests/replies that would normally flow between consumer and CSP over the internet (*except direct connection, such as AWS Direct Connect*) may sometimes exhaust the available bandwidth and results into network congestion. With the proposed approach, since all the data transmissions between consumer and CSP take place without using internet connection, thus overall network traffic can be minimized to a significant level over the internet world.
6. **Ease of Communication:** Since sufficient numbers of CSP's personnel are at the consumer's end for operating and maintaining required cloud services, therefore communication between consumer and CSP would become very easy.
7. **Space Requirement**: The CSPs do not need to worry about accommodation for cloud resources at consumer's end, since the required space shall be provided by the consumer.
8. **Electricity Bill:** CSPs do not need to worry about the electricity consumed by cloud resources to make it available 24x7x365. The consumer is responsible for paying electricity bill.
9. **Elasticity:** The mentioned approach also proposes to have a dedicated connection between cloud resources at consumer's end and cloud resources at CSP's end (*such as **AWS Direct Connect***). Such facility makes it easy to manage high surge requirements of resources at consumer's end. In other words, if there is a certain high demand of resources from consumer's end; then such requirements can seamlessly be fulfilled by using the cloud resources at the CSP's end via the dedicated connection. The maintenance of this direct connection will solely be done by the CSP.

10. **Less Pricing of Cloud Resources:** Since the required space for setting up the required cloud infrastructure, security personnel and electricity, all are being provided by the consumer; CSP can impose reduced charge for borrowing cloud resources.

IV. CONCLUSION

By implementing the above mentioned approach, better functionalities can be achieved by the cloud consumers. Thus, by placing the required resources at the consumer's end instead of at CSP's end, above mentioned benefits can be achieved, especially reducing network traffic over the internet. This proposal offers a win-win situation for both cloud consumers and CSPs.

V. FUTURE WORK

The implementation of the proposed approach needs to be examined by the cloud consumers as well as CSPs. Whether the consumer is able to provide the space for setting up the required cloud infrastructure, is a matter to consider. Because, increase in demand of cloud resources may results in increase in required space at the consumer's end. From CSP's point of view, CSP needs to measure the actual requirement of setting up cloud resources at consumer's end and its associated cost.

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