PROFIT MAXIMIZATION IN DISTRIBUTED CLOUD COMPUTING

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I. ABSTRACT

The goal of this paper is to find methods to reduce the costs incurred by Network Service Providers, and in turn, increase their profits. As distributed cloud services are increasingly becoming the go to option for all kinds of enterprises and end users, there is an increased demand for more service providers at lower rates. Hence there is a need for efficient use of hardware and also money effective way of running the services.
We start by formulating and employing an online algorithm that, based upon the geographical location of the user, geographical location of the data centers, source of information, the routing paths, hop counts etc. will deliver the requested information at minimal cost and in a timely manner. The cost reduction part of the algorithm lies in the fact that it takes into account the prices of electricity in the places where the data centers are present, and tries to avoid high priced locations. Also grouping data based on the size of the file and grouping the data centers according to the memory and bandwidth available, increases the efficiency in the allotment of the data centers.
The present day clouds are focusing on provisioning web services for developers like Amazon Elastic Compute Cloud, Go Grid etc. And then there are cloud services such as Simple Storage Service and Amazon Simple DB which are taking a. Different route by providing data storage and management services and it is very important for services like these to have good caching and storage structures to optimize their profits. There are various models which can be used to charge for the service like Amazon Web Service charge for the infrastructure elements they provide, meaning charging for each instance of CPU, I/O or bandwidth being used. The current static pricing strategies are based on pay-as-you go schemes and they may not be the best way to make money. The need of the hour for the service providers is to have dynamic pricing scheme, wherein a simple price-demand model is used which is re-evaluated as and when errors, model mismatches and external disturbances occur along with taking into consideration the real time system behavior feedback and infrastructure efficiency monitoring. Thus we need an optimal pricing model which is based on the efficiency of the system architecture and dynamic enough to incorporate market influences.

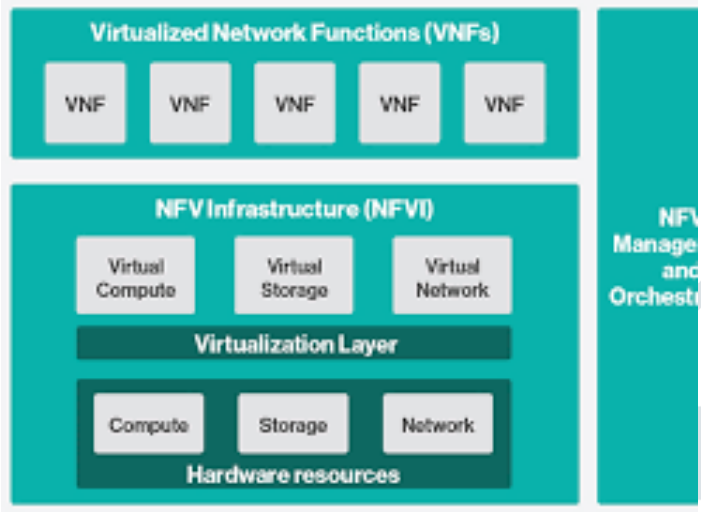
II. INTRODUCTION

Cloud computing is widely being used to store and access data remotely via software and hardware. It makes it cheaper for people by providing all the resources required for performing in its rawest form download, upload and computing and all this as a pay as you go service. So it can be an enterprise, an industry or an end user and all of them can use this to their advantage. It can be upscaled or downscaled as required with the click of a button these days and that's what makes it the most selling technology.

Now, distributed computing provides with an architecture where multiple devices are used for a single task. It does so to reduce the load on one single computer doing the whole task and thus splits the tasks into parts, which are then divided across multiple computers which complete their tasks to compete the whole.
Next, by combining the above two technologies what you get is instantly attractive for the service providers and the users because they together provide scalability, resource sharing and redundancy which would otherwise not be possible by using just one of these. Hence by having a network of hardware devices and a host of software functions making use of this combined technology make it historically cheaper to store, access and compute data and that too faster than ever before.
Furthermore conveyed registering is quickly converting into a practical and beneficial technique for managing resources. Conveyed registering can give the most fiscally sharp and imperative technique for figuring resources distribution. Distributed processing change's information advancement into ordinary items and utilities by using the compensation per-use assessing model. An enterprise supplier leases hardware and other resources from the low level suppliers, configures the required multi server structures and gives varying setups to customers. A customer requests the required arrangement from an organization supplier, wherein there are multiple levels and types of the organization setup. The customer then pays for the preferred type and level of the organization. An organization supplier can make different multi server structures for various application spaces, such that organization sales of different natures are sent to different multi server systems. Due to redundancy of PC structure frameworks and limited cloud solutions the security of the vast amount of data is a concern. But as the adoption of the cloud based solutions continue to improve faster than ever before, advancements have been made to the security systems, which are currently successfully direct and transparent. Applications no more continue running on the archaic Personal Computer technology but now continue running in the cloud. This infers the Personal computers don't require taking care of heavy payloads or hardware space as required by standard desktop programming.
The infrastructure of the cloud can help the internal resources a lot. The enterprise, organizations or users using these service don't have to worry about setting up, installing, deploying and maintaining the hardware infrastructure required. They also do not have to worry about scaling up or down as the infrastructure can be rented in whatever capacity required as it is a pay as-you-go facility. Distributed cloud computing is one of the most efficient and cheaper technologies to setup and administer assets. The administration supplier does also not have to worry about buying the hardware upfront for setting up the service and can rent all the hardware required from the retail or wholesale suppliers. This also makes it easier for the administration provider for setting up multi server frameworks which can be

configured with varying bandwidths, speed, memory and workload bearing capacities.

Now the administration user can simply request for the asset with his set of requirements taking into consideration the type of the asset required and the nature of the application of the asset. Thus an administration provider can fabricate diverse setups depending on the various application areas, level of administration required and the power of the asset.



III. PROFIT MAXIMIZATION IN CLOUD COMPUTING

The paper is based on the formulation of a sound pricing model for cloud computing. It takes into consideration various factors that influence a cloud computing business and proposes the usage of a queuing model to find the optimal pricing scheme. The various factors it considers are-

- Workload of an application environment
- Requirement of a service
- Service level agreement
- Penalty of a low quality of a service
- Configuration of a multi-server system
- Customer satisfaction
- Cost of energy consumption
- Cost of renting
- Service provider's margin and profit

By utilizing an M/M/m lining model, they have defined and tackled the issue of ideal multi-server setup revenue driven amplification in a distributed computing condition. The talk can be effectively stretched out to other administration charge capacities. The approach can be connected to other estimating models. A three-level cloud structure, which comprises of framework merchants, specialist organizations and end clients and the specialist co-ops and end clients are specifically compelling to them. Clearly, planning methodologies in this circumstance ought to fulfill the ultimate objectives of both these parties. Their commitments incorporate the advancement of an estimating model utilizing processor-sharing for mists, the utilization of this valuing model to composite administrations with reliance thought, and the improvement of two arrangements of benefit driven scheduling algorithms.

IV. SOFTWARE AS A SERVICE FOR EFFICIENT CLOUD COMPUTING

This paper extensively talks about software as a service for efficient cloud computing. Multi-tenant architecture in IT infrastructure is used to provide SaaS applications with a rich user experience and a convenient way to access data quickly, cheaply and get work done. In Saas model software is provided as software where the user can access it from his web browser without the hassle of deployment, installation or maintenance. These are also called Web-based software, on-demand software or hosted software for the same. The best part about this service is that the user can get started without paying any upfront costs or wasting time deciding about the hardware or installing it. With the advancement in there web architecture mainly of Web 2.0 and HTML 5 standards, faster internet speeds and enhanced modern GUI the software run on the browser as if it was on the same device and this is the beauty of the service.

As the software is provided by service providers who have multiple devices and hardware in abundance(much more than a single user would ever own) computing at peak hours or scaling for handling more loads is no problems at all. Add the advantage of having this software on more than one device and its ability to communicate with software locally present on the user's device, its a breeze to collaborate and hence big organizations can use them for their workforce too.

The advantages from a service provider point of view are-

- Scalability
- Customizability
- Maintainability
- Flexible costs based on usage

The disadvantages are-

- Varying internet speeds at the user end and low speeds in the developing nations
- Security issues

This paper hence talks about the importance of this technology which is rapidly increasing its user base and this is one of the reasons where our paper wants to help grow it in a better way.

V. MAXIMIZATION OF PROFIT IN MULTI SERVER CLOUD COMPUTING

This paper extensively talks about the economics about the cloud computing and its importance. Here there are two major costs talked about, the revenue and the cost which is the cost for utility cost plus the renting cost to provide the infrastructure. So for an effective service to be provided, we need to understand the business costs, the service charges and how these costs play out with the use of a multi server architecture.

The proposed system treats the multi server as a M/M/m queuing model which is assumed to have Poisson probability of request arrivals at an average of λ customers per unit time. By using probability analysis for various cases and comparing them they come to a conclusion that using a M/M/m queuing model is the best approach to handle requests in multi server system and to reduce costs in the cloud computing domain. They also tell us that if the costs are to be cut down mainly then we should have two servers, if we want to minimize the waiting time then, it is best to have maximum number of servers and if we need the optimal solution then we need to consider both.

VI. SAAS PROFIT MAXIMIZATION IN COULD COMPUTING

This paper talks mainly about reducing the costs infrastructure costs and satisfy the customers by the SaaS providers. SaaS is the provision of supplying software to the users through the

internet rather than installing them on the user's device. This way they can use the software across an array of devices with the same data without the need t reinstall the software and the data every time there is a change in the data and also the user is not restricted to use the software only on one device. The provider takes care of maintaining and upgrading the underlying hardware as and when it is required. The user renders the service the help of an internet connection and any device that can access the internet, all of it as a pay-per-use service.

The paper then goes to talk about the different ways in which cloud computing can be deployed. Public cloud is where the recourses are dynamically provisioned and for self-use purposes. Private clouds are similar to public clouds interns of the resource pooling, self service, pay by use and elasticity. But that's where the similarity ends, Private clouds are usually dedicated to an organization and they may have the resources on-premises in the data centers. Community cloud is where a set of organizations with similar set of requirements come together and form a cloud. This helps in sharing the expenditure. Lastly, Hybrid cloud is the cloud architecture where any of the above three architectures are used with one another, for example, an organization can use a Public cloud for archived data and a Private cloud for its operational data.

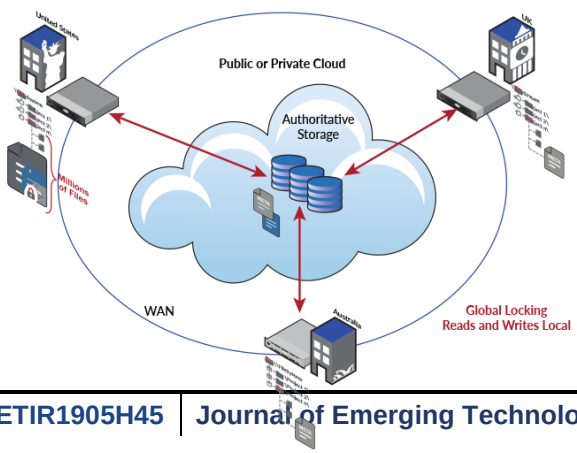
The study of this paper enlightens us on the importance of cloud computing and the importance of improving techniques to provide the services with minimal cost.

VII. INTEGRATION OF MULTI-SERVER FOR PROFIT EFFICIENCY IN CLOUD COMPUTING

This paper extensively talks about the multi server architecture in cloud computing, increasing the profits while using such an architecture, its pros and cons and the implementation of such system. The system they propose uses an infinite queue to admit requests in the form of a M/M/m queue assuming that all incoming requests are poisson requests. The requests are admitted on a First come First Serve basis. The profits are intended to maximize based on power consumption, server configuration, planned reservation, space utilization, performance analysis, prioritization and task scheduling.

Their approach to calculate the power consumption is to take into consideration all the parts of the server rather than just the processor. So, all the major components such as the RAM, ROM, CPU, I/O etc are monitored for a certain period of time to understand their consumption needs and then they propose to reduce the power consumption by trying to run all these more efficiently.

The other parameters mentioned are basically categorization of tasks on hand and assigning them to the most feasible and capable server. This paper therefore gives us an insight about the methods to increase profits in a multi server cloud, emphasizing more on power which is also our area of interest for this paper.

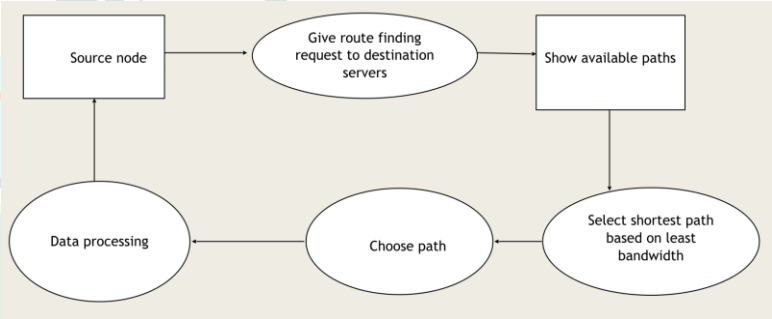


VIII. OUR PROPOSAL

As we go about the process of improving the profits in distributed cloud computing for the service providers we face three very important challenges. First, how do we go about admitting as many user requests as possible with as little expenditure possible, which is the most basic problem the solution for which will increase the profits made by the service providers. This can be achieved by using and implementing the neighbor detection algorithm by installing it in all the servers so as to find the most optimal routing of requests. Next, different users may have different payloads and end-to-end delay requirements which means each of their requests might need a different configuration of the server. Now, servers are present in varying configurations in different geographical locations and each location might have varying electricity tariffs. So we need to consider the configuration of the server, payload demand of the user and the electricity price of the server to solve this problem. Finally, the solutions can be used as far as requests arrive one by one, but how do we dynamically handle requests. For this we need to consider and track all servers, their current state, usability and assign requests to the servers based on their capability.

We reach out to solve these problems by taking into consideration the following parameters-

- Distance of the data center from each other



- The bandwidth available at the data center
- The electricity price at the geographical location where the data center is located
- The memory available to bear the computation load
- The size of the file requested for access

These parameters are used to find all the paths available to reach the most optimal data center, therefore increasing the speed of access and at the sometime using less resources.

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