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Data as a Service using Data Hibernation and Service Oriented Architecture in Cloud Computing

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Abstract: ***Nowadays, Cloud Computing is a promising research field. With the advancement of modern technology, performance improvement of the cloud network has become the buzzword today. Here in this paper, we have proposed the new technique, called 'Data Hibernation' where service-oriented architecture plays the key role for the improvement of the cloud network. Moreover, we have designed our algorithm and demonstrated our work graphically that how the overall efficiency or the throughput has reached its apex level of Quality of Service with the subtle benefit of much higher degree of parallelism.***

Keywords: Data as a Service, Data Hibernation, Service Oriented Architecture, Simple Object Access Protocol

I. INTRODUCTION

Data as a Service (DaaS) is a data distribution strategic model in which data files become available to the customers over a network. Data files could be text, images, sounds, and videos etc. DaaS service can be achieved by providing data to the cloud users as per their needs. It also follows the pay per use business model. Therefore, the customers will pay as they will consume the data from the cloud network. Cloud billing process is dependent on the cloud service providers. The service-oriented architecture (SOA) describes how the request will be sent from the client to the server and response can be received from server to the client. With the evolution of SOA, nowadays, there is no necessity of a specific platform keeping handy on which the data is exactly located. We can access to data from other platforms as well using Desktop-as-a-Service. Virtual Desktop Infrastructure (VDI) helps to provide data accessibility to the cloud users. Service oriented architecture contains collection of services that can be obtained from the cloud network by respective CSPs (Cloud Service Providers).

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Services communicate with each other by passing data. Services are the tasks that are asked for by the consumer. Web service can be provided by the service providers via Internet. In service-oriented architecture, the basic elements of services are storage, communication, user interface, application services and other services. Storage is the service to store data in the cloud temporarily or permanently.

Communication means messaging services or chats. Services include data processing, storage or backup system, resource sharing, file sharing etc. Similarly, the user interface is the platform where interactions are being done between the cloud users and the cloud service providers. It is always true that a better user interface can provide the better usability of a system to make the system even better in terms of user friendliness. Software application services are the business-driven software applications to the customers over a network using a standard protocol like HTTP. Now-a-days, most of the organizations have access to the software application services over a network as per the service level agreement due to the huge licensing cost of a specialized software, exceeding the price range after the continuous price hike and they get benefit from the application service providers accordingly. Middleware in web service is used to develop complex distributed systems. Middleware provides services by different protocols. Middleware works between the application and the operating system. A web service is a service that provides data communication among the nodes via World Wide Web over the network. Web service can communicate via Internet protocol. It can send and receive data or information in the XML form. Service providers can provide this interface by producing a service description. Again, a service requestor can also request for information from the service provider.

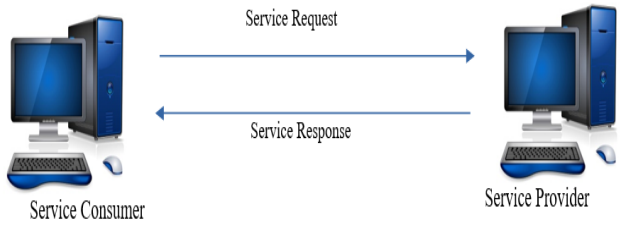

Fig. 1.Service Oriented Architecture

II. RELATED WORKS

In [1], the authors proposed a platform independent, service-oriented architectural model including its meta-model using Unified Modelling Language (UML). A survey has been made on the middleware technologies by the authors in [2]. They proposed a suitable "Middleware" which will act as a reliable platform for communication among the different interfaces, operating systems, and architectures.

In [3], the researchers discussed on cloud computing as well as service-oriented architecture along with the different services provided by the cloud. In [4], the authors made a survey on the pricing model techniques and discussed on the various pros and cons of each. In [5], the authors worked on the Model Driven Architecture. They also illustrated their research work with a suitable case study. In [6], the authors introduced an extended version of Service Oriented Architecture that offers separate levels for comprising and managing services in an open marketplace by commissioning grid services. In [7], the researchers showed the approach to link between required business requirements and IT architecture with the help of a transformation method of business processes diagrams into services diagrams. In [8], the research has been authored on the Service Oriented Software Architecture (SOSA) model within a model-driven methodological framework for the flexible development of up-to-date systems. An extensive research on SOA integration modeling is available in [9]. In [10], the authors proposed the entire architecture for cloud computing. In [11], the authors showed a SOA model that can help to reduce redundancy, inflexibility and inefficiency in key banking processes such as payments, multichannel integration and account opening etc. Banking system keeps on changing day by day with the customer expectations and needs. In the white paper [12], SOA model and web service call have been described in a thorough manner. The several process-driven Service Oriented Architecture models are integrated in [13]. In [14], the authors examined the features of model transformations and developed it with model driven architecture. In [15], we studied a complete guide on the reference model of Service Oriented Architecture.

III. PROPOSED WORK

In this paper, we have proposed the novel concept of data hibernation in cloud network using service-oriented architecture. Data hibernation means keeping the data in unused condition for a user for a specific period. Data hibernation is required when a user is not really using the data, or the user is busy with some other tasks. If any user can keep the data in hibernate condition, and then other users can access the data at that point of time in the same communication channel. A single channel will be used for accessing the data and access to channel will be mutually exclusive in nature. When a user is not using the segment of data or whole amount of data, then it can be allocated to any other user only if the current user keeps it in hibernate condition. Thus, throughput of the data usage over the network will be increased as data is not wasted anymore over the time. Consequently, Time and cost of the data usage over the network will also be decreased significantly.

A. Data Hibernation Algorithm

Step 1. Initialize a Queue with n users ($u_1, u_2, u_3 \ldots\ldots u_n$).
Step 2. Allocate and activate Data communication Channel.
Step 3. Send request for data accessibility from the cloud users.
Step 4. Receive response from the cloud server about the data availability to the cloud users.
Step 5. Initialize data transfer.
Step 6. If status_data_transfer = 'hibernate'
Step 7. Then send response from the cloud server with a message so that other user can access data through that channel.
Step 8. Calculate cost = data_usage_time × cost per unit time
/* Cost will be calculated separately for all users */
Step 9. If status_data_transfer = 'resume'
Step 10. Then concerned user can access data.
Step 11. If status_data_transfer = 'stop'
Step 12. Then data transfer is finished for the user.
Step 13. Repeat Steps 1 to 12 for n users ($u_1, u_2, u_3 \ldots\ldots u_n$).
Step 14. End.

Consider the following figure,

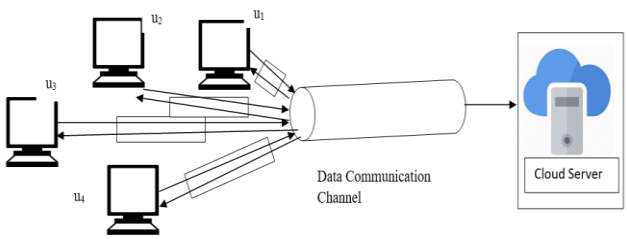

Fig. 2.Channel Allocation during data communication

In service-oriented architecture, a web service is called by the user and it will be activated. If the current service is not required, then it can be suspended. The architecture is shown below.

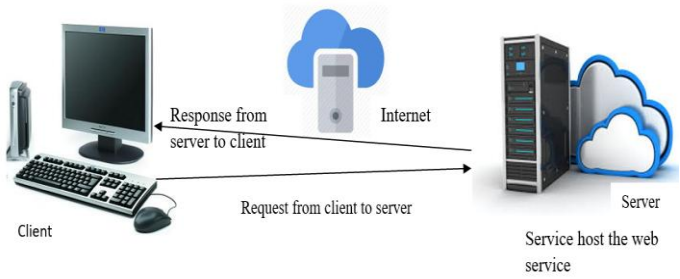

Fig. 3.Web service call using SOA architecture

B. Concept Of Data Hibernation

Data Hibernation is the process where the usage of data can be suspended temporarily as and when the user is no longer using the data. It may also happen that some portion of data is already used and that is not required in future, so the user may go for temporary suspension of the data usage.

During data hibernation, current process can be suspended by calling web service process_id.suspend() and the suspended process can be resumed by calling web service process_id.resume().

Data is transferred between the client and the server using the web service. Simple Object Access Protocol (SOAP) acts as a messaging protocol over the network that invokes web services. It works on the XML document. Web service call only depends on the user. Whenever a user is using a service, the user will call it and pay as per the usage. By suspending and resuming a service,

many people can access a resource at the same time and cost of usage is decreasing. Service providers will get the information about data usage from the log file that will be maintained separately in the server. The log file will contain start time, start date, end time and end date. The amount of data usage will also be stored in the server. The service providers can get benefit when they calculate the incurred cost to the customers accurately. Also, the service providers can allocate data to the requesting users very efficiently.

IV. RESULT AND DISCUSSION

Our experiment has been carried out successfully in MATLAB. Here in our experiment, we have tried to capture the beneficial aspects of Data as a Service with the suitable comparison graphs below.

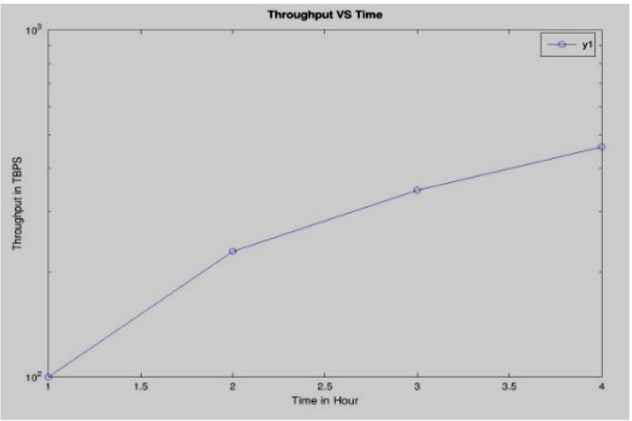

Fig. 4.Time versus Throughput

Time versus Throughput graph is shown in Figure 4. It shows the overall time of accessing data is increasing, and the throughput is also increasing. Throughput is termed as the number of process completed per unit time. With the data hibernation process, data usage time will automatically be reduced. As a result, many users can be allowed to access the data at a time and, therefore, throughput is going to increase eventually. Time versus Throughput comparison result is stated in the following table.

Table- I: Time versus Throughput comparison

	Time in Hour	Throughput on TBPS
Case 1	1	10^2
Case 2	2	More than 10^2
Case 3	3	Slightly greater than the output obtained for Case 2
Case 4	4	Slightly greater than the output obtained for Case 3

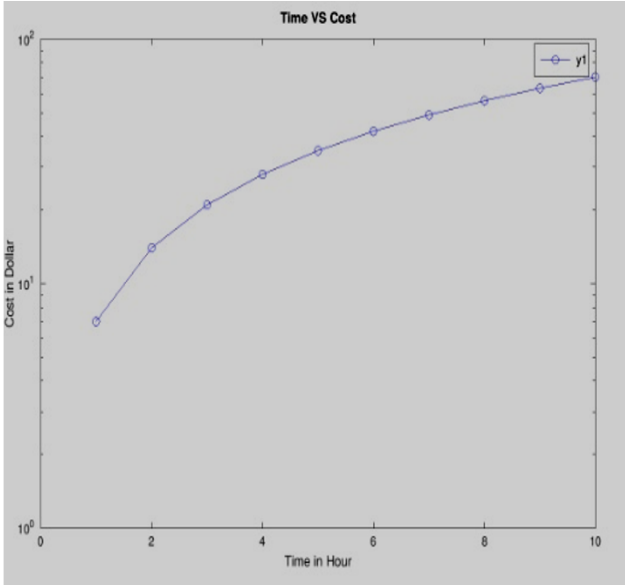

Fig. 5.Time Versus Cost

Time versus Cost graph is shown in Figure 5. It shows that the overall time of data usage determines the cost. As the overall time of accessing data is being reduced, the cost is also getting reduced. Time versus Cost comparison result is stated in the following table.

Table- II: Time versus Cost comparison

	Time in Hour	Cost in Dollars
Case 1	0	10^0
Case 2	2	Slightly greater than 10^1
Case 3	4	Slightly greater than the output obtained for Case 2
Case 4	6	Slightly greater than the output obtained for Case 3
Case 5	8	Slightly greater than the output obtained for Case 4
Case 6	10	Slightly greater than the output obtained for Case 5

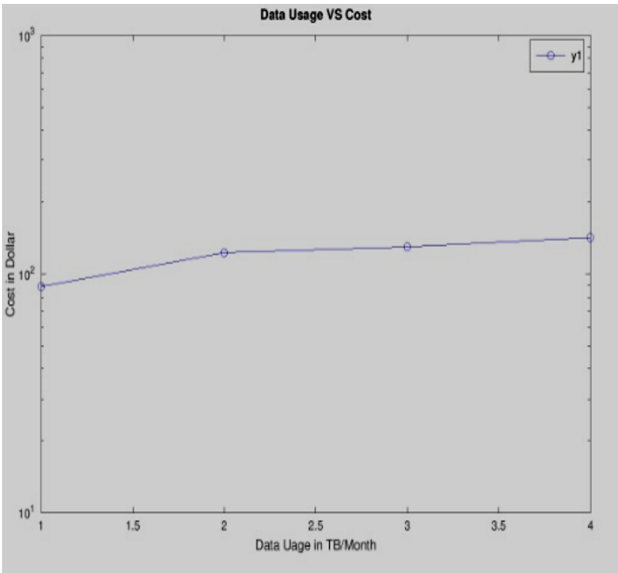

Fig. 6.Data Usage versus Cost

Data Usage Versus Cost graph is shown in Figure 6. It shows that amount of data usage also determines the cost. With the data hibernation process, the amount of data usage is decreasing at per unit time, and the cost is also decreasing simultaneously. Data Usage versus Cost comparison result is stated in the following table.

Table- III: Data Usage versus Cost comparison

	Data Usage in TB/Month	Cost in Dollars
Case 1	1	10^1
Case 2	2	Slightly greater than 10^2
Case 3	3	Slightly greater than the output obtained for Case 2
Case 4	4	Slightly greater than the output obtained for Case 3

This work can reduce the cost as the data usage is getting less than the conventional use of data from the cloud network. Service provider can also keep track of the data usage along with the overall cost of the data usage. Data is a costly resource. Each bit of data from cloud network has a specific cost. So, the proposed method could be effective way and proper method to restrict the unethical use of data from the cloud network. The proposed method also helps in process scheduling.

V. CONCLUSION

Compared to all other fields of cloud computing, Data as a Service has a wide scope of research and data hibernation is truly a very new concept in the field of Service Oriented Architecture for Cloud Computing that we have tried to demonstrate in our paper for the advancement of cloud. This concept will truly bring a newer dimension in the architectural change of the conventional Service Oriented Architecture model for Cloud Computing which helps to get the effective data usage over the network. We have conducted our experiment suitably with a simulation tool to show how time and cost are related to each other. At the same time, we have shown how throughput differs with respect to time and cost with respect to data usage.

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