Development of a Conceptual Ontology Model based Cloud computing

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ABSTRACT: - Cloud computing architecture will be efficiently designed and developed by using the deficiencies with respect to existing clouds in this paper. To provide better architecture, additional modules on query retrieval and query refinement are added for better performance. The criterion which is adopted for query refinement to extract results with respect to relevance. For achieving the best results after transforming the user query the customers from the cloud to get good flexibility, scalability and provided services per user by different cloud vendors. Most important is the cloud security.

Keywords: -Cloud Computing, Ontology Model, Conceptual, Logical View

I. INTRODUCTION

Cloud is basically meant for location-independent online utility service, which is available on-demand for subscribed users. It is a pool of large number of computing infrastructure that supports different workloads, including batch processing of back-end jobs and interactive web applications [1]. Hence, cloud offers several computing infrastructure as a service. It also offers many advantages over conventional computing like online resources, offline access, flexibility, cost savings, etc. and the same is illustrated in figure 1. Cloud computing includes everything that The cloud architecture [2] is basically a service oriented architecture meant for providing software, platform and infrastructure as a service. Wherein, SaaS permits cloud user to utilize the required software in the pool of computing infrastructure, and the PaaS offers resources like system software, OS interface and frameworks for software development [3]. Whereas, IaaS facilitates the basic computing infrastructures like virtual machines, storage blocks, and networking utilities. Further, each service layer is has its own issues like transparency, security and integrity. Although IaaS provides some security features such as firewall, load balancing utility etc., the demand of applications that migrate onto the cloud basically require better security features from the host. As major design issue 2 concerned with Cloud computing is with security, one of the prime objective of this research work is to study, suggest and develop better security features at each layer of the Cloud [4].

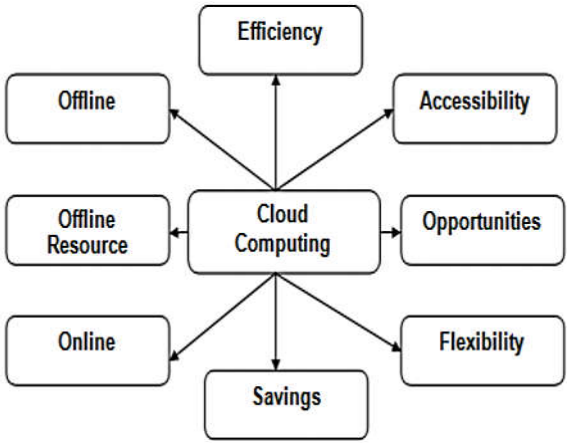

Figure 1: Cloud Computing and its Applications

Cloud computing is comparable with mobile phones where, user avail subscribed services on a pay and use model and the charges are depending on the usage of services. Typically, in Cloud, the technical details regarding the network establishment and service provisioning are hidden from the user, wherein, all those details are handled by the service provider [5].

II. ISSUES IN CLOUD COMPUTING

As in, some issues arise while adopting cloud, which can be categorized as social, technological, business, and performance related issues. Few major technical issues are Scalability, Dynamic Resource Allocation, Load Balancing, Data Security, and Quality of Service [3,4].

- Scalability in cloud is its capability to dynamically allot and ensure the computing resources to meet the application demand without compromising on quality of service parameters.
- In cloud, the resources are allocated dynamically by the service providers against the demand by the user confining to SLA, as chances of large number of heterogeneous applications requesting more and more resources, allocation and reallocation of resources dynamically is a major challenge in cloud.
- Further, to match innumerable resources with demanding applications against their SLA load balancing is an important issue to be dealt with cloud service providers.
- Securing the data on cloud and transparency of the location of data without compromising on the legal rights of the owners of the data is a major challenge in cloud computing.
- As the resources like virtual machines are dynamically allocated to applications, while applications migrate from one VM to another VM the cloud service provides are required to ensure the Quality of Service against their SLAs. This is a major challenge in cloud computing.

The other issues in cloud deals with cost and business which involve Return on Investment, Pricing and Trustworthiness. Typically, the major business issue with cloud is the cost versus benefit. As the major cost lies with maintaining huge data centers, the cloud service provides need to work out on proper RoI, so that they will not lose their business. Other major issue is pricing or billing the customers. As such, there is no proper cost estimation models are derived for cloud based application development, it is slightly difficulty to bill the customer for their resource use. Finally, the trustworthiness is an important issues that pinches both cloud service provides and its customers. Deciding on the right service provider is a major issue [4].
The other issue in cloud computing is related to its performance. For example, the performance of a data-center lies on the server cores, workstations and the request handling mechanism. Such issues are detailed below:

Server Consolidation: Towards achieving the higher resource utilization, all the cloud servers are effectively consolidated to minimize the power consumption. Usually, in every single server, all the virtual machines are set into energy saving mode during their idle period. This may lead to resource congestion at the server side by changing footprints in virtual machines on the data centers. This scenario helps to achieve effective server consolidation and thus, whenever the resource congestion occurs in the server side, this consolidation scheme works fast and effective.

Performance Unpredictability: Because of virtualization technology, the computing elements like CPU and memory can be easily shared across multiple users. Whereas, it becomes a bottleneck when it comes to sharing of I/O, as I/O interrupts slow down the overall system performance. Usually, many VMs keep the workload of I/O interrupts in a random way, so that it very difficult to predict the performance in case of batch processing [4].

Latency: Latency is the measure of performance of the server and it increases with the number of applications deployed on cloud.

Other prominent issues of cloud computing includes energy management and developing a unified software framework for cloud application development. In case of energy management, where in the performance of the server depends upon the energy efficiency, necessary measures need to be taken to save energy and still maximize the server performance [5]. The other major issue is to develop a unified software framework for hosting data intensive cloud applications. Even though, Hadoop and Map Reduce architectures provide infrastructure and programming support, better IDE based frameworks need to be designed to improve efficiency. The following are the several risks associated with cloud computing.

Security and Privacy: Providing security for the customer's data and maintain their privacy in cloud is a biggest challenge. As the Infrastructure and Data Management are outsourced to third-party, there is some risk involved while handing over some sensitive information to those providers. Even though, some primitive security features like password protection for the customer accounts, secured log-in and log-out process are being used, it is not enough while handling data from heterogeneous group of applications with diversified geography.

III. VARIOUS CLOUD MODELS

The different cloud deployment models that are being in use are shown in figure 2 and the details are given below.

Private Cloud: It is dedicated to an organization, which is basically managed within the premises. It offers better degree of control on many performance related issues which also include reliability and security. A typical private cloud set up is depicted in figure 3.

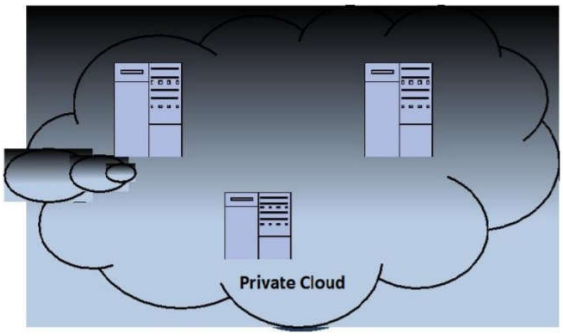

Figure 3: Private Cloud

Public Cloud: Basically this is an infrastructural facility being used by many different organizations and customers. The benefits of public cloud include zero capital investment with pay based on use mechanism. But, the major issue with public cloud lies with handling security and privacy related matters that may be a major concern for business users. A typical public cloud setup is shown in figure 4.

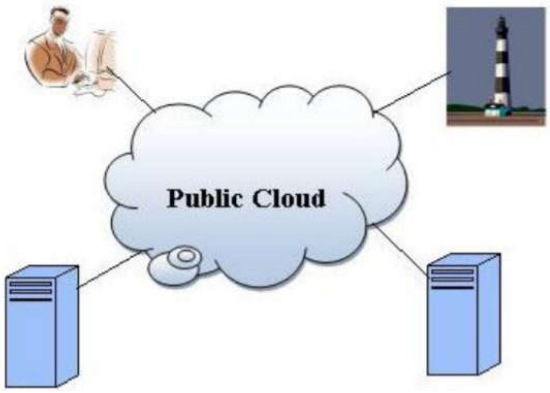

Figure 4: Public Cloud

Hybrid Cloud: It is the hybrid mix of both private and public clouds. In the case of hybrid cloud setup, basically organizations work within the geographical limits of private cloud, and the public cloud is used as an extension service to cope up with scale and replication. Hybrid clouds are more flexible than that of public or private clouds. An example hybrid cloud is described in figure 5.

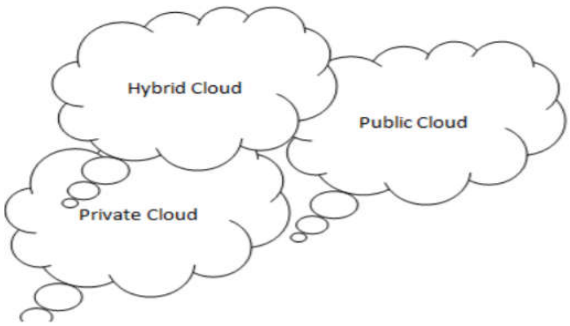

Figure 5: Conceptual View of Hybrid Cloud

IV. ONTOLOGY BASED CLOUD COMPUTING ARCHITECTURE

It is built in order to cope with large scale complexity data processing.

- The problem of using multiple machines at a time is reduced.
- Provides distribution and coordination of complex tasks on various machines.
- User can switch to another machine for accessing resources in case of failure of one machine.
- Provides free space in cloud after completion of tasks by destroying previous machines that were installed on cloud.

V. CLOUD INFRASTRUCTURE MODELS

The cloud architecture is loosely coupled which comprises of different components, that can be broadly classified into two types i.e., front end and back end. Both of these are connected through a communication network connected via Internet. Figure 6provides graphical view of the entire cloud computing architecture. The logical view and conceptual view of the cloud architecture are shown in figures 6 and 7 respectively.

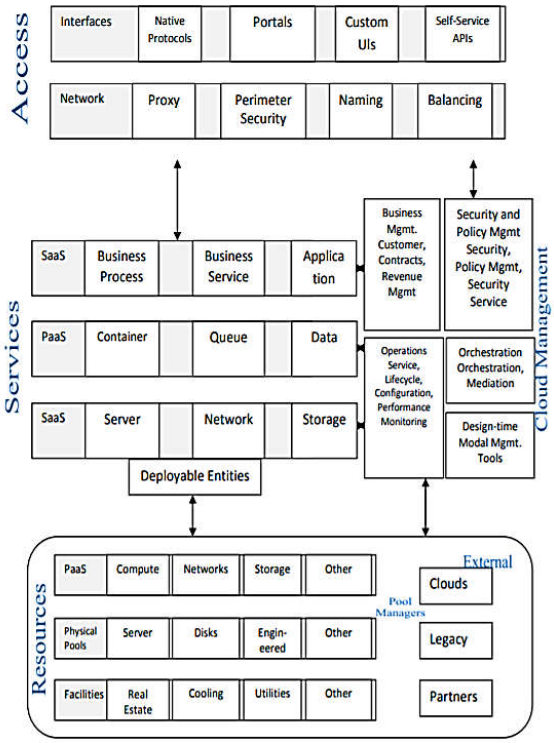

Figure 6: Logical View of Cloud Computing

In conceptual view the front end refers to the client side and the back end refers to the application side. The front end consists of applications and interfaces that are required to access cloud platforms like browser. Whereas, the back end refers to the cloud which consists of PaaS and IaaS services. The back end consists of virtual machines, data storage, security facilities, servers and deployment models.

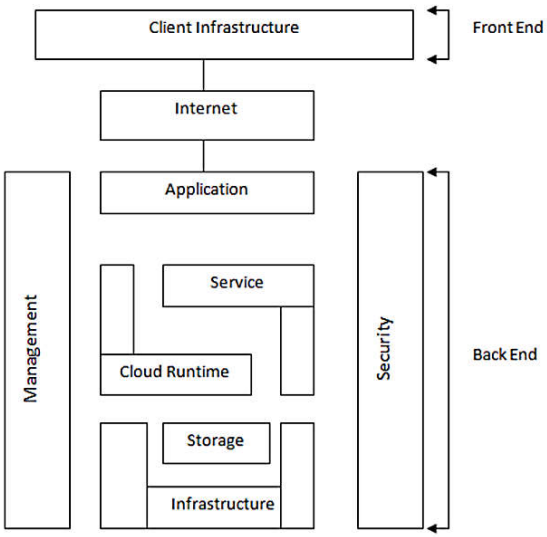

Figure 7: Conceptual View of Cloud Computing

Cloud Computing Open Architecture: The CCOA is a generic architecture containing seven layers and ten different modules by integrating both SOA and hardware/software Virtualization technologies. The current CCOA architecture is extensible and configurable in nature which provides normative guidance for developing customized cloud architectures and thus enables business process, software, hardware, and application sharing in a unified manner.

VI. CONCLUSION

There are several other models of cloud computing. There exists much open architecture, multi-source information architecture, security enriched architecture available in literature, but not even one of them is able to provide complete solution for refinement of query terms which are extracted from Internet. Hence, its solution lies in the concept of ontology, which means to create relationships and associations among these extracted documents so that user may comfortably identify such documents and utilize their services through clients. The cloud providers offer such services as pay per use. This proposed cloud information architecture suitably deals with the ontology generation for standard representation of cloud resources and messages which are stored on cloud clients.

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