

An Application to manage data related to health care Using Database as a Service (DaaS) in cloud Environment

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Abstract

Cloud Computing has brought into picture the concept of rapid allocation of compute resource and services over the internet, at anytime and anywhere. Cloud provides an efficient mechanism which allows the service providers to save cost which eventually helps the customers to take advantage of the pay as per their usage. It allows users to free themselves from resource management which is one of the most cumbersome tasks. Not only does the service provider manage resources but they also automate the efficient mechanism for allocation and deallocation of resources depending on the real time analysis. It also allows centralization of information and resources so that users can access them from anywhere by using the internet. Many website based on social networking, file sharing, health care, etc. are being deployed on the Cloud for the advantages of scalability, economy and feasibility of the Cloud. For the past few years cloud computing provided three primary services which are IaaS, PaaS and SaaS but recently a new service has come up called DBaaS which stands for Database as a Service. Through this paper we touch upon how the DBaaS feature of Cloud Computing can bring the change in the healthcare sector

Key Words: Cloud Computing, IaaS, PaaS, SaaS, dBaaS etc...

1. INTRODUCTION

Cloud computing is defined as the set of resources or services offered through the internet to the users on their demand by cloud providers. It bears everything as a service over the internet based on user demand, for instance operating system, network hardware, storage, resources, and software. As each and every organization is moving its data to the cloud, means it uses the storage service provided by the cloud provider [1], [2], and [3]. NIST [4] describes cloud computing as “a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g, networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction”.

The cloud computing model consists of five characteristics, three delivery models, and four deployment models. The five key characteristics of cloud computing are: location-independent resource pooling, on-demand self service, rapid

elasticity, broad network access, and measured service. The three key cloud delivery models are infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS). In IaaS, the user can benefit from networking infrastructure facilities, data storage and computing services. In other words, it is the delivery of computer infrastructure as a service. An example of IaaS is the Amazon web service. In PaaS, the user runs custom applications using the service provider's resources. It is the delivery of a computing platform and solution as a service. An example of PaaS is GoogleApps. Running software on the provider's infrastructure and providing licensed applications to users to use services is known as SaaS. An example of SaaS is the Salesforce.com CRM application. This model represents the second layer in the cloud environment architecture. Cloud deployment models include public, private, community and hybrid clouds. A cloud environment that is accessible for inter-tenants and is available to the public is called a

public cloud. A private cloud is available for a particular group, while a community cloud is modified for a specific group of customers. Hybrid cloud infrastructure is a composition of two or more clouds (private, community, or public cloud). This model represents the third layer in the cloud environment architecture. To secure the Cloud means secure the treatments and storage “databases hosted by the Cloud provider”.

- Security goals of data include three points namely:
- Confidentiality, Integrity and Availability(CIA).
- Confidentiality of data in the cloud is accomplished by
- Encryption/Decryption process [5], [6], and [7].

2. FEATURES OF INDIAN HEALTH CARE

- Growing Pharmaceutical Sector:

According to the Indian Brand Equity Foundation (IBEF), India is the third-largest exporter of pharmaceutical products in terms of volume. Around 80% of the market is composed of generic low-cost drugs which seem to be the major driver of this industry.

Databases are widely used in applications of various organizations. DBaaS is a mode of service in which centrally hosted databases are provided for computer applications of organizations. This kind of service mode is operated in the following manner. A service provider may deploy various databases in a cluster of some points regarding the Indian Health Care [8]

- Rural Versus Urban Divide:

While the opportunity to enter the market is very ripe, India still spends only around 4.2% of its national GDP towards health care goods and services (compared to 18% by the US). Additionally, there are wide gaps between the rural and urban populations in its healthcare system which worsen the problem.

- Need for Effective Payment Mechanisms:

Besides the rural-urban divide, another key driver of India's healthcare landscape is the high out-of-pocket expenditure (roughly 70%). This means that most Indian patients pay for their hospital visits and doctors' appointments with straight up cash after care with no payment arrangements.

Computing systems and organizations that need to use the databases may order customized services from the service provider and become tenants of the DBaaS service. In that way, different tenants may share the databases running on the computing systems of the service provider.

3. HEALTH CARE USING DBAAS:

In recent years, personal health records [9] (PHR) system has emerged as a platform of health information exchange. It is a kind of health record related to the health care and medical information maintained by the patient. As wearable devices are becoming more and more powerful, patients can learn more on their own health indicator anytime anywhere. They can also upload their collected PHR to the cloud through mobile devices. This technology allows a person to gather, save, manage and share his own health information pervasively. PHR can save patients' money and time by avoiding the repeated routine medical tests or complicated document administration.

Now, if the traditional methods of storing data is followed then the database for storing the records of patients would reside on a local machine and each time data is to be manipulated the interaction has to occur on the local level. But with the coming up of Database as a Service provided by Cloud Computing the patient's data can be stored in the database on the Cloud directly and accessed from anywhere, anytime. This helps the patient to manage his health from any location and any time he/she wants.

In a DBaaS environment, databases may be running directly on physical machines. Alternatively, virtual machines [10] (VM) may be employed to run

databases. A virtual machine is software designed to be able to execute computer programs like a physical machine, comprising software components capable of running a variety of executable codes, e.g., operating system codes, application programs and software drivers, etc. One or more than one virtual machines may be installed on a single physical machine. In other words, a physical machine may be divided into one or more VM instances. Each individual VM instance may have corresponding operating system installed eventually. On the operating system, a database server is installed, and then a database may be created. DBaaS services allow multiple applications from different tenants to be connected to a single database running in the computing system. Applications from different tenants need to be isolated, and they consume different computing resources (hereinafter also briefly referred to as “resource”). Therefore, DBaaS may select a distinct sharing mode of service for a tenant according to SLA (Service Level Agreement).

4. SHARED DATA AND LOCKING:

Cloud operators must work on many databases at the same time. This certainly requires automation otherwise it would be of no use dBaaS. In order to automate these functions in a flexible manner, the DBaaS solution must provide an application programming interface (API) to the cloud operator. The regulation API model used for cloud operations is REST (REpresentational State Transfer).

Simply running a database in a virtual machine does not provide database virtualization. If the cloud operator wants to provide database virtualization it also needs: (a) shared data; and (b) distributed locking.

Shared Data: The various database instances must operate across a shared set of data so that each instance has a consistent view of the required data. This is to say that each database instance must see the exactly the same data at any point in time. This ensures data consistency and proper management of the database over the internet.

Distributed Locking: Whenever one database

instance attempts to write to the database—such as a bank withdrawal—the other database instances must wait for these changes to take place. A mutually exclusive lock manager is required to coordinate these changes. This ensures concurrency control between the various transactions which ultimately helps to maintain the database properly.

The ultimate DBaaS requires full virtualization of the database and 100% consonance and congeniality with MySQL. There is only one solution that achieves both of these goals: ScaleDB. Because ScaleDB cork into MySQL via the standard storage engine API, it uses the complete MySQL environment, without modification. ScaleDB also enables database nodes to extend and compress elastically, while allowing them to operate over shared data under the guidance of a distributed lock manager.

To provide actual DBaaS effectiveness, the underlying database must also support the following capabilities.

1. The capability to move database instances and schema on the go: Whether you need to move a database instance because of a busy server or network segment—to provide QoS—or to move to a larger or smaller instance, this is a core requirement of the DBMS upon which a DBaaS is built.
2. High-Availability: A DBaaS must always work, it cannot fail, or customers will start losing faith in having someone else run their database and they'll start running their own database.
3. Elasticity: The database must be able to scale onto supplementary servers. If the database cannot burst onto other servers, then the cloud is contrived to commit dedicated servers to each database and run them at low utilization. This cripples the core business structure of the cloud.
4. No Change to Applications: If the DBaaS requires modifications to the application, as is required to handle cross-shard functions like joins, then scaling is sometimes not so seamless. It is to be kept into mind that seamless scaling is a requirement for a DBaaS solution.

The ultimate goal of a DBaaS is that the customer doesn't have to think about the database. Today,

cloud users are exempted of taking care of server instances, storage and networking, they just work and that is what is the soul of the Cloud. Virtualization facilitate clouds to provide these services to customers while automating much of the conventional trouble of purchasing, installing, configuring and controlling these capabilities. Virtualization of the database is now doing the same thing for the cloud database and it is being provided as Database as a Service (DBaaS).

The main goal is to provide patient-centric PHR access and management of that data at the same time using the DBaaS. The user data consist of users who make access based on their professional roles. In practice, a data can be mapped to an independent sector in the society, like the health care, government or insurance sector.

5. CONCLUSION

From the above information we conclude that using Database as a Service, the management of health related data can take a great revolution. Cloud computing allowed the easy access of data on the go. And now with the coming up of Database as a Service the management of data has also becomes very easy and efficient. Not only is the user now free with the headache of how the data is being stored but also with the tedious task of management of data which was earlier done locally rather than on the cloud. The data can be made accessible the various sectors such as health sector, insurance sector, government agencies for surveys as well as for personal use.

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