

Providing Availability, Performance, and Scalability By Using Cloud Database

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ABSTRACT: With the development of the internet, new technical and concepts have attention to all users of the internet especially in the development of information technology, such as concept is cloud. Cloud computing includes different components, of which cloud database has become an important one. A cloud database is a distributed database that delivers computing as a service or in form of virtual machine image instead of a product via the internet; its advantage is that database can be accessed from anywhere and anytime.

In this paper, we explain the cloud computing database issue in general, cloud database in especially, selection the important characteristics of cloud database, types of cloud deployment models and finally decide which primary methods to run a database on the cloud.

Also, we focus on two subjects, the first one, we tried to determine which type of the deployment model is the best to deliver database services and discuss the reasons for this determination. The second, we explain how the user dealing with database in the cloud computing. Depending on the second, we explain the main challenges which are affecting the cloud performance, and suggest a method to handle these challenges.

Keywords: Database; Cloud Deployment; Availability; Scalability; and Efficiency.

1. INTRODUCTION

Cloud is a combination of several concepts such as virtualization, distributed application design and grid. Cloud concept is a solution that provides new ways of using external resources that you can configure according to your needs such as servers, storage, application and services. Otherwise Cloud Computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the datacenters that provide those services. These services themselves have long been referred to as Software as a Service (SaaS). The datacenter hardware and software is what we will call a Cloud [1].

An effort of standardization for the cloud computing definition, made by the National Institute of Standards and Technology (NIST): “Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is

composed of five essential characteristics, three service models, and four deployment models.” [2].

2. CLOUD DATABASE

Database has become an important component of cloud computing. When talking about databases in general, they were more effective mechanism for storing data, for many reasons. The main one was, they made metadata (data definition data) available, so that many different programs could use the same data store. The situation further improved with the emergence of a standard data access language; Structure Query Language (SQL). This meant that, for the most part, the programmer no longer needed to think about how data was stored [3].

In cloud databases, data is stored on multiple dynamic servers, rather than on the dedicated servers used in traditional networked data storage. When storing database, the user sees a virtual server. In reality, the user's data could be stored on any one or more of the computers used to create the cloud. The actual storage location may differ as the cloud dynamically manages available storage space. But even though the location is virtual, the user sees static location for the data and can manage the storage

space as if it were connected to his/her own PC and this complex stuff is hidden from the cloud consumer [4, 5].

The Cloud Database Management System (CDBMS) is a distributed database that delivers computing as a service instead of a product. It is the sharing of resources, software, and information between multiply devices over a network which is mostly the internet; CDBMS will not concentrate all query traffic through a single node. A peer-to-peer architecture will be far more scalable with any single node able to receive any query. In such an arrangement, each node needs to have a map of the data stored at every node and know the performance characteristics of every node. When a node receives a query its first task is to determine which node is best able to respond to the query. It then passes responsibility for the query to that node. That node executes the query and returns the result directly to the user [3].

3. CHARACTERISTICS OF CLOUD DATABASE

The characteristics of using Cloud database are the following:-

- 1- Fast query from database and fast recovery from failures.
- 2- Easy Managed backups, restores, automated scheduling and better performance.
- 3- Lower cost in uses cloud database.
- 4- Pay per use and may be able to pay little or nothing for unused time.
- 5- Support for multiple database management system.
- 6- Database services are provide transparent to the user and does not require any operating system knowledge.
- 7- Database services are scalability and high availability of the database.
- 8- On-demand self-service when user can manage computing capabilities without human interaction from the service's provider.
- 9- Widely accessible when user access promoted through the use of many different technology devices.
- 10- Device independence and resource pooling when the provider's computing resources are pooled to serve all consumers with different resources assigned according to the user's demand.

4. THE DEPLOYMENT MODEL

Cloud Computing services and applications are deployed over different types of models based on the characteristics of these models, the deployment models include [6]:-

- A. **Public Clouds:**-This type is providing resource to multiple consumers by a service provider via a web application or web service over the Internet.
- B. **Private Clouds:** -This type is providing resource to specific consumers.
- C. **Community Clouds:** -This type is providing specific resource from public cloud to several organizations and supports a specific community that has shared interests to general consumers.
- D. **Virtual Private Clouds:** - This type is providing resource from public cloud resources and infrastructure to create a private or semi-private virtual cloud, usually via VPN connectivity.
- E. **Hybrid Clouds:** - This model of cloud computing is a composition of two or more clouds.

Organization may be used any type of deployment model to deploy database to anywhere. The hybrid cloud is the best for different points like:-

- Security, it is sprite the secrete application in private cloud and limitation who access to this application, and the general application in community or public cloud.
- Deployment database service, when organization need use some of level DB for exclusive of internal use then use private cloud, when organization need some of level DB are made available to multiple consumers then use public cloud, and when organization needs some of level DB are made available to other organization then use community cloud.
- Responding, there is a fast response to user requirements because it does not depend on one type of cloud. Its division application in the deployments models depending on the kind of this application, then distributes the user's requirements by applications that need in any computing.

The organization can use any type's deployment model to run and deployment database, any previous types of deployment model should include two primary methods to run a database on the cloud:-

- a. **Virtual machine Image** - cloud platforms allow users to purchase virtual machine instances for a limited time. It is possible to run a database on

these virtual machines. Users can either upload their own machine image with a database installed on it, or use ready-made machine images that already include an optimized installation of a database [7].

- b. **Database as a service** - some cloud platforms offer options for using a database as a service, without physically launching a virtual machine instance for the database. In this configuration, application owners do not have to install and maintain the database on their own. Instead, the database service provider takes responsibility for installing and maintaining the database, and application owners pay according to their usage [7].

5. TYPES OF DATABASE IN CLOUD COMPUTING :

When we talk about database in cloud computing and how store and manage this data, we decide to use centralized model or distributed one .In centralized model, the database is located and maintained in one cloud and the users can access remotely, showing and updating the database in the cloud through the Internet.

In distributed model, is hard to deploy databases in cloud environment, because in a distributed database cluster; data must either be replicated across the cluster members, or partitioned between them. In either case, adding a machine to the cluster requires data to be copied or moved to the new node. Since this data shipping is a time-consuming and expensive process, databases are unable to be dynamically and efficiently provisioned on demand.

The vendors seeking to create public computing clouds or those trying to establish massively parallel, redundant and economic data driven applications needed a way of managing data that was almost infinitely scalable, inherently reliable and cost-effective, This model located in public cloud, community cloud and public part in hybrid cloud [4] as in Figure 1.

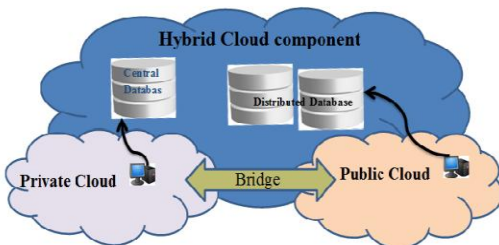


Figure 1... Hybrid Cloud Components

6. DEALING WITH DATABASE IN THE CLOUD COMPUTING

In the traditional database, the users select, create and dealing with their databases in one location and the developer or administrator of these databases is responsible for all administration tasks and limitation that exist during the access of this data. This means, the providers have full control on databases. But in the cloud database, the provider is responsible for sharing database between multiple users and devices over a network. Most of the users can access the Database by using any language, any platform, and any device through standards-based APIs.

A Cloud Database Management System (CDBMS) is a distributed database as a service instead of a product. It is the sharing of resources, software, and information between multiple users and devices over a network and dealing with database in three levels: efficient multi-tenancy, scalability, security and privacy

- A. **Efficient multi-tenancy:** The goal of multi-tenancy is shearing of resource information between multi users and devices.
- B. **Scalability:-**It is the ability to either handle growing amounts of data or its ability to improve throughput when additional resources are added, and its process such huge amount of data within a reasonable time.
- C. **Security and privacy:-**Cloud computing comes with different threats, databases is the core of Cloud environments because they contain the most sensitive and important information for both providers and users. Moving database to the cloud increases the number of potential security and privacy risks, any application running in the cloud should have full control on security and privacy in different way such as including a comprehensive approach for how, why, and by whom data is accessed.

7. PROPOSED FRAMEWORK:-

Performance is the major concept in cloud computing field, this performance depends on the three features that have been discussed previously, efficient multi-tenancy, scalability, security and privacy. The cloud computing is more vulnerable to the threats, because it is shared resources between many users. So the main challenges that effect on the three features in the cloud computing, at the same time, it effect on the performance also, are divided in two parts, internal and external challenges. To

determine these challenges should monitoring the behavior of the cloud services, then analysis it to define the challenges type, as shown in Figure (2).



Figure 2... Determine the type of challenges

In this paper, we proposed a method trying to control on the relation between user and cloud, and dealing with each factor from the internal and external challenges for the increase trust with the customer. The proposed method is to create control point, the function of this point is a function of third party who monitoring the workflow between cloud and user.

- The external factor is represent in the services stop that may be attack as Denial of Service(DOS) which means attempt to crash the servers and whole network; thus it make network resources unavailable to authorized user. Also it may be a normal update that occur causing overload on the database cloud, when many processes occurred on the database at the same time like query, add, delete and modify.

The function of control point is monitoring the job of servers, if one of the servers is stopped, the control point searching of stop reason by behavior monitoring of the process to identify the process is an attack or normal process.

If the attack is causing the server to stop, the control point is denial of service on the process source. While the server is stop by overload network, the control point is rerun the servers and it organize the process on the database cloud depending on the priority of request service from the customer.

- The internal factor is representing in the management problems on the database cloud, when the database cloud computing is distributed between different users and devices; these problems may be caused in lateness of the database query for customer, or caused error in the distribution database between users.

The database management which means the divide privilege for the cloud users depending on the type privilege, such as admin or user. Thus, the

function of control point is divide the database management for the users, and each user used the cloud based on the type user as add, delete, or alter and so on.

Conclusions

Database cloud technologies provided through Cloud computing to be a good solution for deliver service to all consumers in anywhere and anytime. In this paper, we outlined database cloud deployment models, and declare a hybrid model is the best way to deliver database service, because the hybrid cloud offering the benefits of multiple deployment models and the best for security, deployment database service, and responding.

In this paper, we discussed how database has been dealing in the cloud computing depending on three levels: efficient multi-tenancy, scalability, security and privacy. Also this paper declared the main challenges that affect the three levels and performance that caused by internal and external factors, then proposed method that identifies these factors and suggest method to solve this problem.

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