



Architecture of DBMS as Integrated Cloud Service and Its Advantages & Disadvantages

Md. Ashraful Islam, Md. Mahbubur Rahman, A. H. M. Tajul Islam, Md. Zahid Hasan Siddiquee, A. S. M. Muntaheen

GIS-ICT Division, Institute of Water Modelling (IWM), Dhaka, Bangladesh

Email address:

afl@iwmbd.org (Md. A. Islam)

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Abstract: Database Management Systems (DBMSs) is a critical component of modern computing of research and development in both academia and industry. Database Management Systems were among the earliest multi-user server systems to be developed and thus pioneered many systems design techniques for scalability and reliability now in use in many other contexts. Different resources and information between different devices are located in different places always based on internet connection are shared by Cloud computing. Additionally, cloud DBMS is a database management system which acts through cloud computing. The number of these DBMS which act through cloud computing is expected to increase in the future which is worth mentioning. This paper presents an architectural discussion of DBMS design principles including process models parallel architecture, query processor and optimizer architectures and typical shared components and utilities. Open-source systems are used as points of reference, when multiple alternative designs have been adopted by different groups. Additionally, in this paper, also discussed about DBMS advantages and disadvantages, and focus on the way how to offer a cloud DBMS as one of the best services. The research focus on three main characteristics of cloud computing which are considered as the most worried issues of cloud platform and review cloud database challenges such as: internet speed, multi-tenancy, privacy and security. This Paper thus express the need for a new DBMS designed specifically for cloud computing environments.

Keywords: Architecture, DBMS, Cloud Computing

1. Introduction

Database outsourcing has become an important component of cloud computing in recent years. The cost of transmitting a terabyte of data over long distances has decreased significantly in the past decade, Due to the rapid advancements in a network technology [1]. The total cost of data management is five to ten times higher than the initial acquisition cost. As a result, there is a growing interest in outsourcing database management tasks to third parties that can provide these tasks for much lower cost due to the economy of scale. This new outsourcing model has the benefits of reducing the cost for running Database Management System (DBMS) independently [2]. Cloud computing economics leveraging the power of multi-tenancy delivers extremely fast shared storage at a dramatically reduced cost. Virtualization then compounds these

advantages by enabling users to scale elastically and to pay only for the resources they use. The performance advantages have decisively shifted in favor of the shared-disk DBMS [3]. It is just a matter of time before the shared disk DBMS establishes dominance in the cloud. A 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 [4]. It is expected that this number will grow significantly in the future. An example of this is Software as a Service, which is an application that is delivered through the browser to customers [5]. Cloud applications connect to a database that is being run on the cloud and have varying degrees of efficiency. Some are manually configured, some are preconfigured, and some are native. Native cloud databases are traditionally better equipped and more stable than those that are modified to adapt to the cloud. Most recently

technological advancement especially those of the cloud services have reached a high point of development and research. Whatever, the technology and principles change rapidly and there is an increasing number of open problems. Nowadays DBMSs outsourcing is one of the most required features of cloud services [6]. Technological advancements around transmission of data through the network have largely influenced the cost of transmitting the data per terabyte over long distances [7]. DBMSs have achieved progress in two comparisons dimensions, data management and data transfer. Data management happens to be costlier than data transfer [8]. There is a rapidly growing interest in outsourcing DBMSs tasks to third parties that can provide these tasks for much lower cost due to economy of scale. Designation of a new outsourcing model has few benefits but the most significant benefit is reduction of the cost for running DBMS on one own [9]. A cloud DBMSs is nothing else but a cloud database service which is available and accessible from anywhere. The main way of communication that cloud DBMSs uses is over internet whereby it shares information between multiple devices and number of these devices is expected to increase. There are a lot of companies that offer DBMS as a cloud service such as: Microsoft Azure, Google, Amazon EC2, GoGrid, Garantia Data, Mongo Lab, etc. [10] These companies offer cloud services with two usual deployment models: we can use database independently from a virtual machine or we can purchase a cloud service database which are retained by mentioned cloud companies [11]. This paper the deployment models, architectures and common characteristics of cloud DBMS were described and also attempt to capture the main architectural aspects of modern database systems, with a discussion of advanced topics. Some of these appear in the literature, and we provide references where appropriate. Other issues are buried in product manuals and some are simply part of the oral tradition of the community [12]. Where applicable it uses commercial and open source systems as examples of the various architectural forms discussed. At the end an architecture of DBMS in cloud and give some of its advantages will be described.

2. Conceptual Framework

2.1. Database Management System (DBMS)

A database management system (DBMS) is a software package with computer programs that control the creation, maintenance, and use of a database [13]. It allows organizations to conveniently develop databases for various applications by database administrators (DBAs) and other specialists. A database is an integrated collection of data records, files, and other objects. A DBMS allows different user application programs to concurrently access the same database. DBMSs may use a variety of database models, such as the relational model or object model, to conveniently describe and support applications [14]. It typically supports query languages which are in fact highlevel programming

languages dedicated database languages that considerably simplify writing database application programs.

2.2. Cloud Characteristics

One of the oft-cited advantages of cloud computing is its elasticity in the face of changing conditions. For example, during seasonal or unexpected spikes in demand for a product retailed by an e-commerce company or during an exponential growth phase for a social networking Website additional computational resources can be allocated on the fly to handle the increased demand in mere minutes [15]. Similarly, in this environment one only pays for what one needs so increased resources can be obtained to handle spikes in load and then released once the spike has subsided. However, getting additional computational resources is not as simple as a magic upgrade to a bigger more powerful machine on the fly rather the additional resources are typically obtained by allocating additional server instances to a task [16]. Having DBMS in the cloud will give advantage in fast and elastic computing.

3. DBMS as a Cloud Service

Most DBMS or database management systems are simply software packages that users can acquire to create maintain or use a database. However, since the introduction of cloud computing, DBMS has morphed into an entirely new type of service with its own unique benefits and task specific advantages. For one thing, any type of cloud service model will have to employ a dedicated cloud DBMS in order to truly provide customers with excellent access to data and databases [17]. Traditional DBMSs are simply not set up or equipped to deal with the demands of cloud computing. If DBMS was deployed as a service as part of a larger package provided it would likely be much more efficient in its duties and therefore cheaper in the long run [18]. The concept of the DBMS has been around since the beginning of commercial computing; such as the navigational DBMS of the 1960s. Database management systems are one of the oldest integral components of computing essentially making it possible to scan retrieve and organize data on hard drives and networks. All DBMS, despite whether traditional or cloud based are essentially communicators that function as middlemen between the operating system and the database [19]. Cloud DBMS may utilize all of these components or may have devised new strategies that combine one or more elements. Many organizations are exploring the option of utilizing pre-existing modeling languages as a basis for expansion in a cloud model. Since traditional modeling languages are more than adequate for handling data, this strategy ultimately saves on the time spent developing cloud DBMSs as well as enhances their overall effectiveness [18]. Despite the benefits offered by cloud-based DBMS, many people still have apprehensions about them. This is most likely due to the various security issues that have yet to be dealt with. These security issues stem from the fact that cloud DBMS are hard to monitor since they often span across multiple hardware stacks and servers.

Security becomes a serious issue with cloud DBMS when there's multiple Virtual Machine that might be able to access a database without being noticed or setting off any alert. A malicious person could potentially access pertinent data or cause serious harm to the integral structure of a database putting the entire system in jeopardy [20]. There is however a proposed method for dealing with these types of incongruence. An obvious solution is the deployment of an autonomous network agent is rigorously monitor and defends all activities related to database access. The limitation of this method is that a network agent may be unable to handle extremely large and dense volumes of activity traffic [21].

4. DBMS in Cloud Architecture

A proposed DBMS in Cloud Architecture including, first layer is the storage, followed by databases and the upper layer is application layer. it provides efficient data access with a better distribution of values for some data, in terms of performance. Stores frequently used SQL statements in memory avoiding the need for time consuming recompilation at runtime [22]. detailed report is Produced on each step used for data access allowing you to accurately implement performance enhancements. Data is encrypted when stored or backed up without any need for programming to encrypt and decrypt [23].

5. Dealing with Cloud DBMS

The development of cloud computing affected on DBMS too, and now a cloud provider should offer a stable cloud database in order to convince the customers. A DBMS is nothing else just a software package which enables us to create and maintain a database. Conventional DBMS are not constructed for handling cloud computing demands, and the cloud providers now should be able to offer this migration with cheap and low cost and help customers planning to use this cloud DBMS for a long-time use [24]. First concepts of cloud DBMS has started early in 1960s and the point was not changing the function way but only enable users to exchange the data over the network. What makes the difference between conventional DBMS and cloud DBMS is scalability which is the most important characteristics of the cloud DBMS [25]. According to this scalability cloud DBMS are able to handle data and process them without any obstacle for a conventional DBMS would be extremely exhaust. Cloud DBMS have reached a high point of scalability; nowadays however cloud DBMS providers are still looking to offer something more stable and based on the development of technology this is expected to happen. As mentioned above the ball should be in software side because they should be able to absorb full advantages of cloud resources. Cloud DBMS now is working on a new model is trying to combine different services like data structure and data query language [24]. Many programming companies are looking forward to suit many programming languages in cloud platform and with this achievement will help the users to save the time on

developing cloud DBMSs. Despite the benefits that cloud DBMS have there are still users that have fright migration on it and the biggest fright is in security section. This is the biggest fright because monitoring of cloud DBMS is more difficult and as we know the security becomes more serious when we use few virtual machines are connected to a cloud DBMSs. This becomes more serious because at the same time a database will be accessed by a few number of application and it might be able to access database without alerting or noticing. In this situation, it will harm our data and will harm the integral structure of the data otherwise will put the system in a condition which is known as jeopardy or danger condition [26]. When we are in this point now we should be take care about the security. To take care about the security the only choice is to employ database auditing which are able to do this auditing of a database as analyzing and reporting all activities regarding on database access and notably the doubting database access. All these reports should be send in another database which is not located on cloud and should be presented to a responsible person which will maintain the security of our cloud DBMSs despite and this can configure algorithms which can alerts for all doubting access on databases and sure then than measures will be taken to all these threats. This is a new field and all doors are opened for new achievement that happen in this field, based on researches. This is an important research area because as we mentioned cloud DBMS are designed to run in thousands to millions of nodes and are able to serve data range starting from petabytes and up. If it is, try to compare with traditional DBMS cloud DBMS will offer less capability of querying and often it might be weak regarding to the consistence but the scale is bigger offering us availability and load-balancing better than none. A desirable field from all programmers in the world is a technology which will enable to combine DBMSs capability with the cloud scale and it might be considered too that the research doors are opened for it too [26].

6. Challenges to Cloud Database

To provide a successful cloud database we have to opposite with few challenges, however if we arrive to handle all these challenges we will have a strong and sustainable cloud database [18].

6.1. Internet Speed

Speed of internet affects directly on the performance of cloud database and it could be considered as a barrier of performance. while sending, queries doesn't require too much internet they will be sent to the database very fast, the problem is with receiving of results while it takes time to retrieve data which directly depends on the internet connection, in cloud databases.

6.2. Query and Transactional Workloads

Another challenge about query workload and transactional

workloads which is not able to control the transactions, and not able to control query workload. The main cause of this problems is depending on the number of queries and do not know the number of the users that are waiting to execute queries. applying parallel processes where a query can be executed in different CPUs giving the feeling is the solution for this challenges that the query is being executed by a single process.

6.3. Multi-Tenancy

Multi tenancy is called a single software instance serves hundred users at the same time. because of growing the number of machines affects in efficiency of database, Cloud providers always think that increasing the number of machines will affect in providing better results but increasing the number of machines it is not always the best solution. As it is mentioned on [14] there is a solution which by creating virtual machines for each database but this is not considered as successfully which is considered as a better solution is to use the same database in different virtual machines which gives us higher performance and speed, while the cloud database can be considered as a well multi-tenancy database [25].

6.4. Elastic Scalability

It has tried to find better cloud databases which are able to handle any sort of workloads. the best cloud database is considered to be as pay per use database and elasticity database. As mentioned above it always talk about big data which increases day after day and a critical point for cloud database is when increased workload. The solution of this is by providing elasticity in addition elasticity allows a consolidation of the system to consume less performance during high workloads [25]. one of other reason why elasticity of a cloud database is important is about live migration which is the migration from centralized databases into the cloud system.

6.5. Privacy

The privacy is the most important issue for plan migrating their databases to the cloud of user. The cloud databases are accessed and available through the network due to the fact that it is an interested and important place for hackers trying to break the system even if there is no important information. Encryption provides additional security including largely reducing the risk of information leak in case of an unauthorized access to the data stored in a cloud databases.

7. Conclusion

Database Management Systems as a cloud service are designed as an elastic service and scalable available on a cloud infrastructures on database management. DBMSs of Cloud will have an impact for vendors desiring a less expensive platform for development. This paper presented the idea of DBMS in the cloud in possibilities to be offered as one of the services offered by promising capability of

cloud computing which is to be a DBMS as a Services. The database services can offer more secure environments since it is in the cloud provider responsibility to keep our data secured and recoverable any time that anyone need. At last it decreases storage and network resources that are not used optimally management.

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