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Cloud Computing and Data Management

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ABSTRACT

Cloud computing is the use of the Internet to access data storage, computational resources, apps, servers, etc. Comparable to having data stored and accessible online as opposed to on our personal hard drive or database. A scalable and effective approach to large-scale data management is emerging:cloud-based data management. Increasingly businesses are migrating their data management systems from high-end, pricey servers to the cloud, which is made up of less expensive, commodity hardware. A growing number of people are interested in contracting out database administration work to outside companies since they can do it more cheaply because of economies of scale. The ability to buy resources on demand is a benefit of cloud data management. Moreover, data can be shared within on-premises storage and across public and private clouds. A cloud-based data management system performs the same duties as a traditional data management system with modifications made to meet cloud requirements. In this paper, we will discuss about the growing usage of cloud technologies for data management and the challenges faced by it.

INTRODUCTION

Database outsourcing has grown in importance as a part of cloud computing in recent years. Over the past ten years, the cost of sending a terabyte of data over vast distances has considerably lowered as a result of the quick improvements in network technology. Also, the overall cost of managing data is 5 to 10 times greater than the cost of acquisition. As a result, there is rising interest in contracting out database administration work to third parties who can do it on a much more affordable basis. The cost of running a Database Management System (DBMS) alone can be decreased thanks to this innovative outsourcing approach. In addition, virtualization makes it possible for consumers to scale resources flexibly and only pay for what they actually

use. The cost/performance benefits of the shared-disk DBMS have firmly turned in its favour. It won't take long for the shared-disk DBMS to take control of the cloud. A distributed database that offers computation as a service rather than a product is known as a Cloud Database Management System (CDBMS). It involves multiple devices sharing resources, software, and data across a network, mostly the internet. This number is anticipated to increase dramatically in the next years. Software as a Service, also known as SaaS, is an illustration of this. SaaS is a programme that is given to users through a web browser. Applications that use the cloud link to databases that are hosted there and vary in their level of efficiency. Some are native, some are preconfigured, and some require manual configuration. Native cloud databases are traditionally better equipped and more stable than those that are modified to adapt to the cloud.

BACKGROUND

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. Database administrators (DBAs) and other specialists can easily create databases for a variety of applications for businesses. An integrated grouping of data records, files, and other items is known as a database. A DBMS enables several user application programs to access the same database at once. To conveniently describe and support applications, DBMSs can make use of a variety of database models, including the relational model and object model. It frequently supports query languages, which are high-level programming languages specifically designed for databases, and which make it much easier to create database application programs.

2. Cloud Characteristics

The flexibility of cloud computing in the face of shifting circumstances is one of its frequently mentioned benefits. For instance, extra computational resources can be allocated instantly to handle an increase in demand for a product sold by an online retailer during a seasonal or unanticipated spike in demand, or during the exponential growth phase of a social networking website (instead of the many days it can take to procure the space and capital equipment needed to expand the computational resources in-house). Similar to that, in this

environment, one only pays for what they really use, allowing for the acquisition of more resources to address spikes in load and their release when the spike has passed. The process of obtaining extra computational resources, however, is often accomplished by allocating more server instances to a work rather than by magically upgrading to a bigger, more powerful machine on the spot. Having a DBMS in the cloud will benefit quick and flexible computing.

DBMS as a Cloud Service

The majority of database management systems, also known as DBMS, are only software programs that customers can buy to build, administer, or use a database. However, with the advent of cloud computing, DBMS has transformed into a completely new class of service with its own task-specific advantage and unique benefits. In order to truly give clients exceptional access to data and databases, any kind of cloud service model will need to use a specific cloud DBMS.

The demands of cloud computing are simply too much for traditional DBMSs to handle. Moreover, DBMS would undoubtedly perform its tasks considerably more effectively and less cost in the long run if it were offered as a service as part of a broader package. Since the inception of commercial computers, there have been DBMSs, such as the 1960s navigational DBMS.

One of the earliest foundational elements of computers, database management systems primarily allow for the scanning, retrieval, and organization of data on networks and hard drives. Whether traditional or cloud-based, all DBMS fundamentally serve as intermediaries between the operating system and the database. What distinguishes a cloud DBMS from a conventional one? One reason is that cloud-based DBMS are very scalable. They can manage data and processing volumes that would overwhelm a standard DBMS. Despite their scalability, cloud DBMS still have significant limitations when it comes to scaling up to extremely big processes; however, this is anticipated to change in the upcoming months and years. Although a standalone DBMS can be utilized on a cloud architecture, the most of them are not built to fully utilize cloud resources. Models that use DBMS as a cloud service aim to take advantage of the gap between outdated DBMS architectures and their lack of complete cloud capability. These elements may all be used by cloud DBMS, or new combinations of these elements may have been developed (like combining data structures and the data query language). Many businesses are looking into the possibility of expanding their cloud models using pre-

existing modelling languages as a foundation. As standard modelling languages are more than capable of handling data, this method ultimately reduces the amount of time required designing cloud DBMSs and increases their overall effectiveness. Notwithstanding the advantages that cloud-based DBMS provide, there are still many people who are wary of them. This is probably because there are still many security concerns that need to be resolved. These security concerns are a result of cloud DBMSs being challenging to monitor because they frequently use numerous hardware stacks and/or servers. As many Virtual Machines (which may be accessing databases via a variety of apps) may be able to access a database without being seen or raising any alarms, security with cloud DBMS becomes a critical concern. In this kind of circumstance, a malicious person could potentially access important data or seriously damage a database's fundamental structure, endangering the entire system. There is however a proposed method for dealing with these types of incongruences. Yet, there is a suggested approach for handling this kind of incongruence. Deploying an independent network agent, which closely monitors and protects all activity linked to database access, is an apparent answer. Nevertheless, this approach has a drawback that is the network agent might not be able to handle exceptionally high and dense quantities of activity. Continuous database auditing is arguably the greatest method for resolving security problems. This entails creating up a system that systematically records, examines, and reports on all database access activities, particularly questionable database access. In the event of a breach, alarms are sent to cloud management (or to anybody else they may have selected to get this information) and all information pertaining to these activities is logged and stored in a very remote and secure location. This will give individuals in charge of security the knowledge they need to identify the offender, their location, and the particulars of their machine or hardware. A focused and comprehensive cloud DBMS hasn't been deployed yet, but one is undoubtedly in the works. A new era of cloud computing will begin when a comprehensive database management solution emerges for all cloud service models. Several of these cloud databases are built to operate in clusters of hundreds to thousands of nodes and can handle data sizes of up to a petabyte. Such cloud databases may have fewer querying options and frequently worse consistency guarantees than traditional relational database servers, but they scale significantly better because to built-in support for availability, elasticity, and load balancing. On the other hand, business analysts are frequently not technically adept and may not feel comfortable interacting directly with low-level database software, making data management solutions a crucial component of relational and analytical data management businesses. These tools often use ODBC or JDBC to connect to the database, therefore database software that wants to

work with these products needs to support SQL queries. It is therefore critically important to have a revolutionary system that combines DBMS capacity with Cloud scale scalability.

Why DBMS in Cloud?

Database management systems are designed to function as an elastic, scalable service that is accessible across a cloud infrastructure. Some DBMS are only offered in the cloud and aren't always relational. For instance, Google's Big Table, Amazon's Simple DB, and Microsoft's SQL Services are not relational and have distinct persistence models, but Microsoft's SQL Azure is a completely relational DBMS. For use in simple to complicated transactions, cloud-based DBMS services are offered in a multi-tenancy environment with elastic resource allocation. The term "DBMS as a cloud service" disqualifies those DBMS that will operate on cloud infrastructure but weren't created specifically to provide cloud services. The majority of the DBMS engines currently in use will function on cloud infrastructure but were not created particularly to exploit the cloud. Running on cloud infrastructure does not define a DBMS as a cloud service; this distinction is the basis for the term change from "DBMS in the Cloud" to "DBMS as a cloud Service". Cloud DBMS that are now accessible are all quite recent. The only fully relational DBMS, SQL Azure, started full production at the beginning of 2012 but still has some size restrictions. Microsoft intends to lower and eventually remove these limitations. DBMS as a cloud service is now mostly utilized for application development and testing, where tiny database sizes and concerns about security and user collaboration are unimportant. One of the major benefits of cloud DBMS is their elasticity: you pay more or less depending on how much you use them. When it comes to vendors looking for a less expensive platform for development, cloud DBMSs will first have an influence. Cloud implementations used for short-term projects like small departmental applications and rapid development platforms will show noticeable cost reductions compared to implementations within the IT department as cloud infrastructure with DBMSs matures, particularly in scalability, reliability, and security. Its benefits are strengthened by the fact that a cloud DBMS system can be set up without the need for expensive IT professionals. Without the typical requirements and preparation required for IT projects within the IT department, the speed of setup will be the main engine for rapid system deployment. Also, this will lessen the need for IT to respond to urgent and brief projects, lowering overall IT expenses. Applications for data management could potentially be deployed on the cloud. This is due to the fact that an on-premises business database system often has a high, occasionally prohibitive initial hardware and software cost. The pay-as-you-go cloud computing approach, together with letting someone else worry about maintaining the hardware, is

immensely alluring to many organizations (especially start-ups and medium-sized businesses). We come to the conclusion that read-mostly analytical data management applications are better suited for deployment in the cloud than transactional data management applications due to the ever-increasing need for more analysis over more data in today's corporate world and an architectural match in the currently available deployment options. Hence, we present a research agenda for large-scale data analysis in the cloud, demonstrating why existing systems are not well-suited for cloud deployment, and making the case that a new DBMS that is specifically developed for cloud computing platforms is required.

CONCLUSION

Database Management Systems as a cloud service are engineered to run as a scalable, elastic service available on a cloud infrastructure. Cloud DBMSs will have an impact for vendors desiring a less expensive platform for development. In this paper, presented the idea of DBMS in the cloud, the possibilities to be offered as one of the services offered by promising capability of cloud computing, that is to be a DBMS as a Service. In this paper we proposed an architecture of DBMS in the cloud.

FUTURE

There are many loose ends in security at the moment, scaring off many potential users. Potential consumers won't be able to take advantage of this technology's advantages unless a suitable security model is in place. This security module should address any problems that the cloud may provide from any angle. To draw in and captivate potential customers, every component of the cloud needs to be examined at both the macro and micro levels, and an integrated solution needs to be developed and delivered there. The cloud environment will continue to be cloudy till then. Research is being done on an integrated security approach that targets various data security levels for unusual cloud infrastructure.

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