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5-Layered Architecture of Cloud Database Management System

Bashir Alam[1], M.N. Doja[1], Mansaf Alam[2], Shweta Mongia[1]*

1. Department of Computer Engineering, Jamia Millia Islamia, New Delhi-110025, India
2. Department of Computer Science, Jamia Millia Islamia, New Delhi-110025, India

Abstract

Cloud Database Management System is a new emerging concept recently introduced in the world. In Cloud the concept of Standard architecture of Cloud Database Management System is not yet been implemented. In this paper we are proposing a framework for 5-layered architecture in cloud database management system. First layer introduced is the External Layer, this layer is closest to the user, in which manageability, providing transparency and security are the important issue that should be considered. Second layer is the Conceptual Middleware Layer, as there are heterogeneous databases and clouds are available in the market, so here interoperability is the major issue. Third layer is the Conceptual Layer in which programming techniques, transaction management, query processing and optimization are the issues that should be considered. Forth layer is the Physical Middleware Layer, as there are various platforms available so here also, interoperability between various platforms are the biggest issue and the last layer is the Physical Layer in which how data can be stored so that it can be easily accessible without so much overhead so here data security, storage, backup, load balancing, partitioning, scaling, elasticity, fault tolerance and replication are the important issues that should be considered.

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* Corresponding author. Tel.: 9654572859
E-mail address: shweta.mongia@yahoo.com.

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1. Introduction

1.1. Cloud Database Management System

Data management applications are potential candidates for deployment in the cloud. A cloud Database is a database that typically runs on a cloud-computing platform such as Google, Microsoft, Salesforce.com, Rackspace, Amazon EC2 etc. [3]

Database-as –a –service (DBaaS) is attractive for two reasons.

- *Hardware cost:* Due to economies of scale, the hardware and energy costs incurred by users are likely to be much lower when they are paying for a share of a service rather than running everything themselves.
- *Software cost:* The cost incurred in a well-designed DBaaS will be proportional to actual usage (pay per use)- this applies to both software licensing and administrative costs [5].

The cloud Database was conceived for the purpose of online data management by using the variety of distributed databases. Cloud computing in general, with the flexible pay-as-you-go pricing models and different plans it presents the one of the best solutions for startup and small companies that are developing new products. In this way, cloud computing is reminiscent of application service provider (ASP) and Database-as-a service (DBaaS) paradigms. DBaaS offerings are tightly integrated with other Platform–as-a Service (PaaS) gives the organization the opportunity to focus on developing their products and do not waste any resources on administration of the platform and gives an opportunity to fully focus on the development of the product. Data centre are used for hosting theses services. Data centres use commodity hardware for computation and storage.

2. Current State of work

The Three important challenges like Efficient multi tenancy, privacy of database and elasticity of scalability have not been address in earlier databases. Curino et al.[5] have presented the key technical feature of Relational cloud as follows:

- A workload aware approach to multi tenancy that identifies the workloads that can be co located on a database server achieving higher consolidation and better performance than existing approaches.
- The use of graph based partitioning to achieve elasticity for even complex transactional workloads.
- An Efficient security scheme that enables Structured Query Language (SQL) queries to run over data encrypted using some efficient encryption algorithm.

These all are based on workload awareness [5].

Technological changes advances have put shared disk performance at par with shared nothing and cloud computing strongly favours the shared disk architecture. Cloud computing economies leveraging the power of multi tenancy delivers extremely fast shared storage at dramatically minimized cost. Virtualization adds these advantages by enabling users to scale elastically and to pay only for the resources they use. Because of all these changes in the technology now shared disk is equally considerable for the clouds [4].

Sometimes data stored in the cloud often need to be combined with the data stored in relational databases. A system named “Bigintegrator”[6] to enable queries that combine data in the cloud based data stores with relational databases, there are several cloud based systems available but with limited query languages.

A system “SQLMR”[1], which is a hybrid approach to fill the gap between SQL-based and MapReduce data processing. Map reduce provides a framework for large data processing and is shown to be scalable and fault tolerant on commodity machines. However it is very difficult to learn than SQL-like languages and maintaining and reuse are not easy. On the other side traditional SQL-based processing is not scalable but

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