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A COMPARATIVE STUDY OF RELATIONAL DATABASE MANAGEMENT SYSTEM AND OBJECT ORIENTED DATABASE MANAGEMENT SYSTEM

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Abstract: This project presents a described study of comparison of different data saved in databases using relational database technique and object oriented database technique. The approach of this study describes the development, implementation, maintenance of large and complex data using RDBMS and OODBMS. Nowadays, web scale is increasing immensely and so increasing mobile application, technologies, social media, etc. the rapid growth of these technologies produces different structured and unstructured data of different form with different security implications. In example we take database of fingerprints on web and on mobile is different and handled by different technologies like MySQL and so in case of different data produced with different means. Moreover this paper discusses advantages and benefits of respective databases and find out best database system for organization. However it is very difficult to say that which is best suited database but some has more usefulness and advantages over others.

Keywords- RDBMS, ODBMS, Comparison, Complexity, Inheritance, Object identity, Object oriented architecture, Evolution of object oriented database

I. INTRODUCTION

Data management programs are software programs that provide modelling services, managing, and managing a large amount of relevant information shared by multiple users over a long period of time. The Database Management System facilitates the efficient and effective use of the company's database. A company, small or large, has to deal with large amounts of data of customer or clients, user information and other internal and external information. It is not easy to create, update or convert large data technically without the use of an efficient database system. DBMS makes the database easier to manage, more productive, enabling new and smarter systems, and providing more detail.

There are mainly three types of database management systems, they are

- RDBMS (Relational Database Management System)
- ORDBMS (Object Relational Database Management System)
- OODBMS (Object Oriented Database Management System)

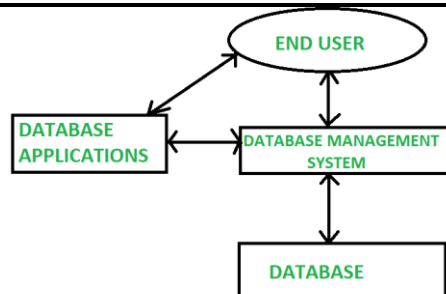


Fig.1.1 Diagram of Relational Database Management System

Here in this paper we discuss a detailed analysis RDBMS and compare it with OODBMS.

RDBMS stands for Relational Database Management System. It is a database management system formed on the relational model i.e. the data and relationships which are represented by a collection of inter-related tables. It is a DBMS that allows the user to control the databases through creating, updating, administering and interacting with a relational database. However,

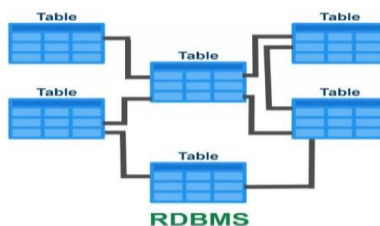


Fig.1.2 Basic Model of Tables in RDBMS

OODBMS represents the Object-Oriented Database Management System. It is the DBMS where data is represented in the form of objects, as used in object-focused programs. OODB uses concepts focused on object such as object categories, object ownership, polymorphism, encapsulation, and inheritance. An object-oriented database maintains complex data compared to a related database. Other examples of OODBMS are Versant Object Database, Objectivity / DB, ObjectStore, and ZODB (Zope Object Database).

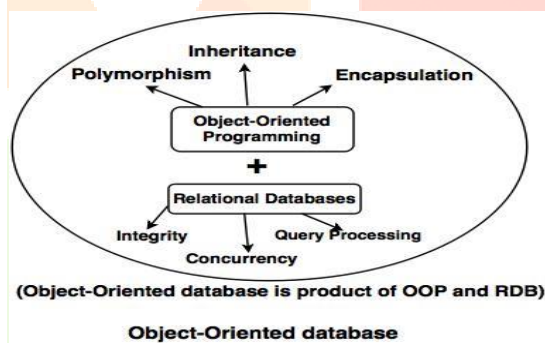


Fig. 1.3: Object Oriented Database

Following are some features of OODBMS:

- **Complexity:** OODBMS has the ability to represent complex (object) complex structures that have a multilevel problem.
- **Inheritance:** Creating something new from an existing object in such a way that the new object acquires all the features of the existing object.
- **Encapsulation:** It is a concept of data encryption in object oriented programming language that binds data and works together that can mislead data and not be seen in the outside world.
- **Object Identity:** The system defines and maintains separate identifiers for items representing organizations. This allows equal items (items with the same attributes and equal responsibility values) to combine. Frees users from the need to define different keys to business conditions.

II. LITERATURE REVIEW

In history there was dramatically use of RDBMS (Relational Database Management System) for storing data in the form of structured data. Moreover, data are growing rapidly such as structured data and unstructured data due to increases of giant technologies as well as mass data produced by users. However, for storing the huge data i.e. Unstructured data OODBMS (Object Oriented Database Management System) is used.

Sirish Shetty B and Akshay KC [1] had realized that the non-relational databases perform better than the relational databases.

Mahesh S. Raisinghani and Gabriel Custodio in paper [2], has expressed about Object-Oriented Database Management Systems architecture and application. He concluded that businesses increasingly require high performance access to complex data, and object databases provide superior performance and scalability compared to relational database alternatives. On the other hand, the World Wide Web has highlighted the reality that many businesses have complex structured data and unstructured data that need to be seamlessly integrated. Moreover, Kwok K. Yu, Byung S. Lee, Michael R. Olson had worked on paper [3] the scalability of an

Object Descriptor Architecture OODBMS. They conducted the benchmark to see how scalable it was with respect to the number of objects that are loaded into a database. They found that, it most important that the application should be capable of releasing unused cached object descriptors (CODs) from the object cache before the cache space is filled up.

However, in paper [4] Hardeep Singh Damesha explored in system-concepts, advantages, limitations of Relational Database Management Systems with Object Oriented Database Management System. Relational database are very popular and there are found everywhere whereas the object oriented database comes into action in mid-1984's to remove the limitation of relational database management system and to support some advance database application like CAD, CASE etc. Object based database is developed due to popularity of object based programming. So, in the field of database researchers think to combine the object oriented programming concepts with database to enhance database into the powerful database management system.

Shengli Wu and Nengbin Wang has been done their researched on the paper [5]. It can support both unidirectional and bi-directional associations among objects, which is indispensable for most object oriented database systems. Moreover, directed graph based association algebra is helpful to query optimization, particularly putting some conditions on the commutativity of Association and A-Complement operators ensures it to support effectively and efficiently their implementation of 'materialization' operator in 0-0 database.

The paper[6] of Roopak K E, Swati Rao K.S, Ritesh S, Satyadhyam Chickerur delivers information and shows the reasons why oriented programming object is essential as well as beneficial and how it could be used for object oriented databases

Theresa Beaubouef and Frederick E. Petry [7], how the security is an important issues in databases, and applications involving statistical databases and data mining are relatively critical in preserving the security of secured data. However, related to this type of database security also apply to rough relational databases.

III. METHODOLOGY

3.1 THEORETICAL ANALYSIS

3.1.1 Architecture Overview of OODBMS

The architecture plays important role in database management system to manage the data. The architecture, properties, construction, design, decisions affect data rules for transferring data a data server to a client and client to data server and vice versa. There are various architectures discussed and studied of OODBMS such as Six Layer Architecture of OODBMS, System Architecture of OODBMS, Stand Alone Architecture (using C++), Architecture with Existing Data Sources, Container Based Architecture, Page Based Architecture, etc. [2]. However in this paper we discuss about system architecture of OODBMS that uses web server.

The object program consists of a collection of CORBA (Component Object Request Broker Architecture) servers that process incoming web applications requests and return presentation information back to the user. The web server translates these standard or custom HTTP requests into objects on CORBA servers, then collects the retrieved data and integrates it into referral applets to the user interface. These applets are cached to the web server memory to reduce the amount of incoming traffic and reduce the response time of the request, also known in the object community as "Servlets".

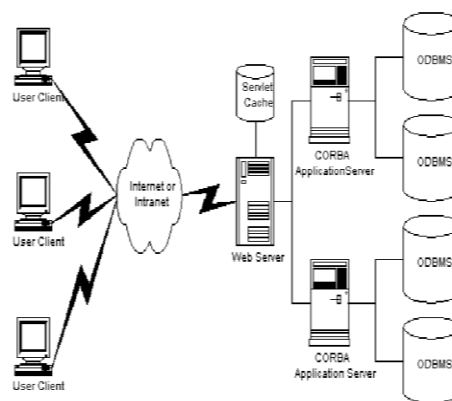


Fig.3.1.1: Object oriented System Architecture

The key feature of this architecture is that it separates HTML elements of a dynamic page modelled in backend as C++ or Java objects where a single object is used to show a site index that allows users to navigate through the site. Moreover, this site index changes its appearance dynamically based on the structure of the back-end database. The key advantage of using objects to represent page elements is that these objects can encapsulate algorithms as well as data, so that intelligence and dynamic behaviour can be built into site components [2].

3.1.2 Characteristics of Object-Oriented Databases in Depth

We can say that object oriented database management system or technology as combined product of object-oriented programming and database technology. The following figure will depict how the object oriented programming and database techniques came together and gave concept of object oriented or object based database technology or system.

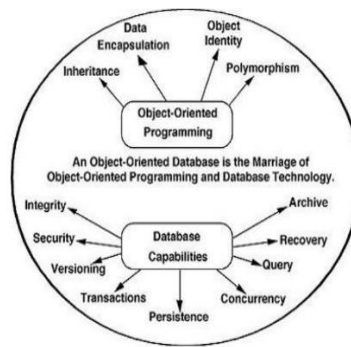


Fig.3.1.2: Evolution of object oriented database

The most important feature of object-oriented data technology is that it integrates object-focused programs with domain-based technology to provide an integrated system development plan. There are many benefits to including performance and data definition:

- Defined functions are ubiquitous and do not depend on the specific data request currently in use.
- Data types can be expanded to support complex multimedia data by defining new object classes that work to support new types of information.

Some power of the object-focused model is unknown. For example, inheritance allows a person to develop solutions to more complex problems by defining new things in terms of previously defined objects. Polymorphism and strong binding allow a person to define the function of one object and share details of the operation with other objects. These items can further add to this function to provide a different behaviour to those items. Strong binding determines the time of implementation of which of these operations is performed, depending on the category of the object requested to perform the task. All of these capabilities come together to provide maximum product benefits for data application developers. A distinctive feature of objects is that they have an independent identity of the object. For example, if a person owns a car and we redesign the car and change its appearance, engine, transmission, and wheels to look completely different, it will still be known as the same thing we had in the beginning. Within a database focused on an object, one can always ask the question, "is this the same thing I had before?" By assuming that one remembers the ownership of the object. Object ownership allows items to be related and shared within a distributed computer network [8].

3.1.3 Comparison of OODBMS to RDBMS

According to Mary Loomis, developer of Versant OODBMS [8]:

- "The formation of relationship-related data is a process of trying to determine how real objects can be represented within tables in such a way that good performance can maintain the integrity of the data."
- "The data design of the objects is very different. For the most part, object data structure is a fundamental part of the overall application design process. Subject classes used in the program language are classes used by ODBMS. Because of their formation of Object-Oriented Databases models are flexible, there is no need to convert the system object model into something different from the data manager."

Table 3.1.3: Some important differences and depth comparison of OODBMS and RDBMS [9]

Parameters	OODBMS	RDBMS
Full Form	Object Oriented Database System	Relational Database Management System
Objective	It ensures data encapsulation	It keeps data independent from application and programmes
Query Language	Depends on products. Easy to handle recursive queries.	Standard Query Language (SQL) It is difficult to handle recursive queries.
Advanced Applications	It supports advanced applications.	It does not support advanced application.
Normalizations	No need of normalizations.	Normalization is strongly recommended.
Use of Algebra	Objective algebra.	Relational algebra.
Representation	Effective representation for real world entities.	Poor representation for real world entities.

IV. CONCLUSION

In this paper, we have done the comparative study about Relational Database Management System and Object Oriented Database Management System. However it is very difficult to say that which is best suited database but some has more usefulness and advantages over others. While coming through some additional benefits of OODBMS, in some cases we can say OODBMS is more effective rather than RDBMS. RDBMS is suitable for structured data which can manipulate the data accordingly. However, OODBMS can handle the complex data i.e. Big Data (Structure data and Unstructured data) efficiently in the real world entities. After reading various research papers on RDBMS and OODBMS, their architecture, their benefits, their comparisons on different parameters, we can say that both the databases are shining as diamond in their respective field and areas, both renowned and used efficiently in respective areas.

We have illustrated following some advantages of Object oriented database over relational database

- There are so many advance applications are emerging with the evolution of technology. However with the help of object oriented database we can easily operate and support advance application rather than relational database.
- There is issue in relational database in management and computation of complex data, which is handled easily and efficiently in object oriented database

Another important observation that we have made in our analysis of this paper is that relationship-related information is intended to ensure data independence. The normalized (general data) is divided into processing and processing that is consistent with the requirements for satisfaction. Object-oriented database have a larger purpose to store together in simple word data encapsulation. They are inseparable. It is much appreciated that RDBMS holds largest part of database and it will exist for a long time in future with OODBMS.

V. REFERENCES

- [1] Sirish Shetty B and Akshay KC "Performance Analysis of Queries in RDBMS vs NoSQL", Published in "2019 2nd International Conference on Intelligent Computing, Instrumentation and Control Technologies (ICICICT)." Available: <https://ieeexplore.ieee.org/document/8993394>
- [2] M AHESH S. R AISINGHANI, University of Dallas and G ABRIEL C USTODIO, Associates Information Services, Inc. "Object Oriented Database Management Systems: Architecture And Application", Published in "Journal of Information Technology Theory And Application"
- [3] Kwok K. Yu, Byung S. Lee, Michael R. Olson "The Scalability of an Object Descriptor Architecture OODBMS" Published in "1999, Proceedings. IDEAS'99. International Database Engineering and Application Symposium (Cat. No. PR00265)"
- [4] Hardeep Singh Damesha "Object Oriented Database Management Systems-Concepts, Advantages, Limitations and Comparative Study with Relational Database Management Systems" in "Global Journal of Computer Science and Technology : C Software & Data Engineering" Volume 15 Issue 3 Version 1.0 Year 2015 Type: "Double Blind Peer Reviewed International Research Journal", Publisher: "Global Journals Inc. (USA) Online ISSN: 0975-4172 & Print ISSN: 0975-4350"
- [5] Shengli Wu and Nengbin Wang "Directed Graph Based Association Algebra for Object-Oriented Databases", in 1-1 Sept. 1997 and Published in "Proceedings. Technology of Object-Oriented Languages. TOOLS 24 (Cat. No.97TB100240)"
- [6] Roopak K E, Swati Rao K.S, Ritesh S, and Satyadhyan Chickerur "Performance Comparison of Relational Database with Object Database (DB4o)", Published in "2013 5th International Conference on Computational Intelligence and Communication Networks"
- [7] Theresa Beaubouef and Frederick E. Petry "Database Security Issues in Rough Relational Databases", Published in "2010 42nd South Eastern Symposium on System Theory University of Texas at Tyler" Tyler, TX, USA, March 7-9, 2010
- [8] Sunanda Luthra "Architecture in Object Oriented Databases", Lecturer, Department of CSE/IT, Amritsar College of Engg. & Tech, Amritsar. 143001, Punjab, India, Email: er_sunanda@yahoo.co.in
- [9] <https://www.tutorialspoint.com/difference-between-rdbms-and-oodbms>
- [10] <https://www.geeksforgeeks.org/difference-between-rdbms-and-oodbms/>