Modern Approach of OODBMS Comparison of OODBMS with RDBMSE

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Abstract— in the 21st century after a long journey of application development at least reached at Object oriented programming approach. This new technique of programming and application development is widely used in the front end application. But in back end database usually RDBMS work with front end application there is a difference between front and back end. The mapping between front and back end needs extra effort in this scenario because front end application completely depended on back end for data manipulation. Although this mapping is not easy job, it creates many problems like wastage of processing power and data storage efficiency. To reduce the mapping problem new approaches of OODBMS is rising that is completely different form previous and have compatible with front end application of object oriented programming approach. Many computer programmers are thinking to adopt this approach and start work on it. In this paper we throw light on the silent feature of OODBMS and compared new dimension of OODBMS with old and traditional approach of RDBMS.

Index Terms— DBMS, OODBMS, RDBMS, OID, SQL, OQL, ODL

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1 INTRODUCTION

Database Management System software is used to arrange, operate and maintain large amount of data through the use different models. A data model is a set of instruction; operation and constraint .DBMS provide different facilities which include persistency, concurrency, recovery, Query Management and security [2]. One of the DBMS model is Relation Database Model which used the concept of relation .But we find limitation in this model as we progress toward the complex application. Large application code is required in this model which is expensive. OODBMS is developed to solve these issues. This approach used Functionality of database with object oriented feature. A simple formula may explain this concept. Formula is OO+DBMS=OODBMS which clearly shows that it is mixture of both object oriented and database management system A formal definition of OODBMS is "An OODBMS is also called "object database" is a DBMS that stores data in a logical model according to application program's object model. It must conform all kind of optimization requirements in physical data storage with its application" [3]. In object oriented database system modeling is done with the objects and classes which is the beauty of this concept. OODBMS is like a merger which combines two paradigm of traditional feature of database like atomicity, consistency, isolation etc. and modern approach of object oriented database system like inheritance, encapsulation and objects.

2 HISTORY OF DATABASES

In the year of 1960 the need of new technique is highly occurred to manage large amount of data of any organization that time DBMS is discovered to support and arrange the large amount of data in disk and drum storage for the purpose of record management and extending business of the public and private sector. That time DBMS also used to manage the diverse information. In 1970 concurrency control and maintain the data independency through the logics of programs are the main objectives of database to main the integrity of data in large amount [4]. According to The Evolution of Database we called the first generation of database "navigational" because data is accessed through pointers and maintained in a flat file earlier technology of punched cards are used to store data for permanent storage then files are become available to use but files storage have several limitations major disadvantage is storage of data at various file mean data duplication so there need another type of technology that become more suitable for large data but no duplication or no wastage of storage. To reduce the limitation and for the purpose of efficiency Second Generation is introduced.

In 1970 The Second generation of DBMS is followed by relation model as a main component which emphasis on relation and relational algebra. That relational DBMS are more efficient and till use able for large data evaluation. In this generation Codd replacing the pervious system with rows and column and data is stored in the form of table that is accessible through simple primary key and concepts of keys are also introduced with this generation of DBMS. And Generation is most widely used till several years.

New Invention in the area of graphics especially in digital computer based games and other discovery of 2D and 3D graphics allows the demand of 3rd generation of DBMS, which is based on object oriented programming concept. Due to widely use and increasing

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the demand of object oriented programming based application that are less compatible with Relational DBMS or have limitation the concept of object based DBMS is introduced. Formally in 1980 Object oriented database is discovered which brings new technologies in the field of databases and occupy major market share of the DBMS market. In the object oriented approach data is stored in the form of objects in memory and permanent storage that is more suitable for complex application, after some time it become useable with business and other traditional application. Object oriented programming used the concept of object with database tradition approach like ACID Properties, classes' inheritances and so on. We can summarize the generation of Database in a table form

TABLE 1: Database Generations

Generation	Year	Character tics
1st	1960	Simple database
2nd	1970	RDBMS
3rd	Late 1980	OODBMS

3 DATABSE MODELS HISTORY

Data Model is considered the pillar and foundation of database where the house and repository of database is to be built. It must be simple, easy and user friendly.

3.1 Hierarchical model

Consist of tree like structure that support the parent child relationship .In this structure relationship is represented by through arc and nodes
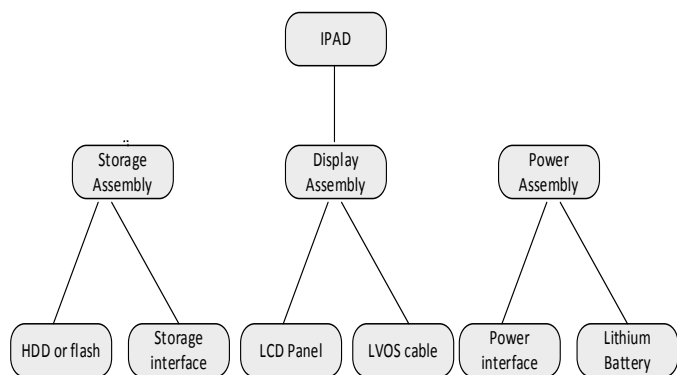

Figure 1: Hierarchical model

3.2 Networks model

Is similar to Hierarchical model but provide more flexibility for example allow the many to many relationship.
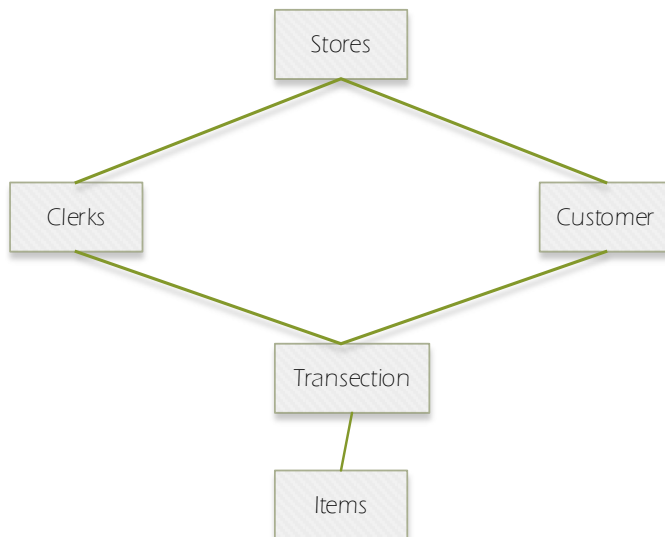

Figure 2: Networks model

3.3 Relation Model

Store data in the form of relation like tables, each table consist of rows and columns .Keys is introduced in this model.
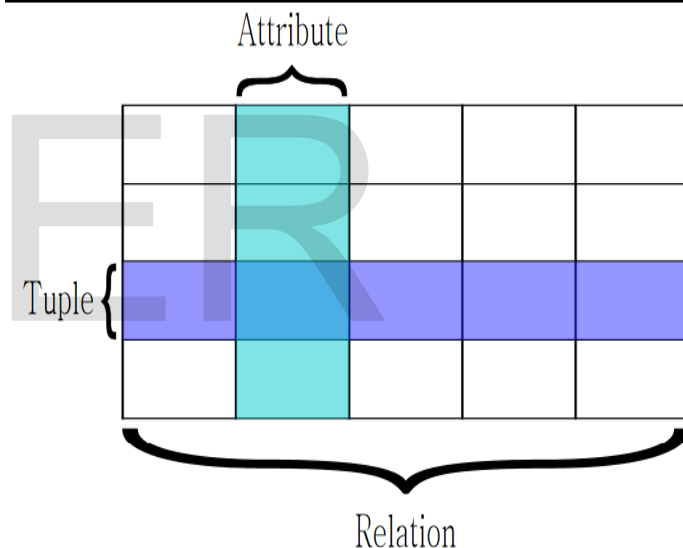

Figure 3: Relation Model

3.4 Object Model

Is Consists of object to reduce the burden of converting database to specific programming architecture. This model used in complex 3D application and store data in the form of objects.
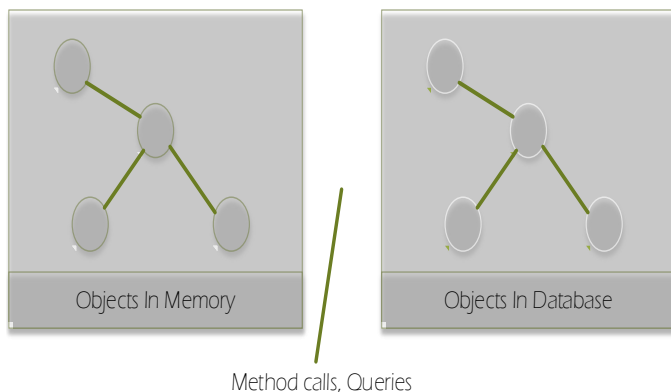
Figure 4: Object Data Model

So the fundamental tenants of the object model are

i. Objects are too utilized.
ii. Same objects can show common behavior and characteristics.
iii. Sets of operation are used to define the behavior of objects.
iv. State of object can also define by its value and these sates can also inherits

4 SILENT FEATURES OF OODBMS

4.1 Object identity

Is used to specify objects form large number of objects without OID objects cannot be accessible or manipulate able. It is a very critical feature of object oriented database management system. It can implement all the feature of objects keeping in view the requirement of OOP. It can eliminate the use of keys because keys has one attribute value but OID is a unique identity of the object that if behavior or attribute of object will be change the OID cannot be changed other view if Keys changed so whole value is changed that is the drawback of the keys. The concept of **Classe**s is the beauty of the ODBMS that make possible of inheritance**.** It is used to create template of the objects, all methods and data are defined with in class and that data become accessible where that class is used. Classes are also the container of properties and operations. Classes are easily reusable in any other application where changes are needed.

4.2 Encapsulation

Is used with the concept of abstraction which provides facility in doing operation on DBMS to manipulate operation data and function are bind together.

4.3 Generalization and composition

Is that feature which is used in inheritance fetcher of one class at various stages. Inheritance makes the programmer to reuse the

existing component to create more things, class is like a template of things if one template is available with this template we make many thing as same like that template. Operations and objects are not limited in particular domain so this **extensibility** of OODBMS makes it more workable and various option of code reuse is increased.

4.4 Ad hoc query

Language with encryption methods used for secondary storage management systems to facilitate managing very huge data any of the organization. So we can truly say that OODBMS is complete blind of object oriented paradigm and Database Management System [5]. That make possible to compete with complex application and fulfill the demand of object oriented programming application.
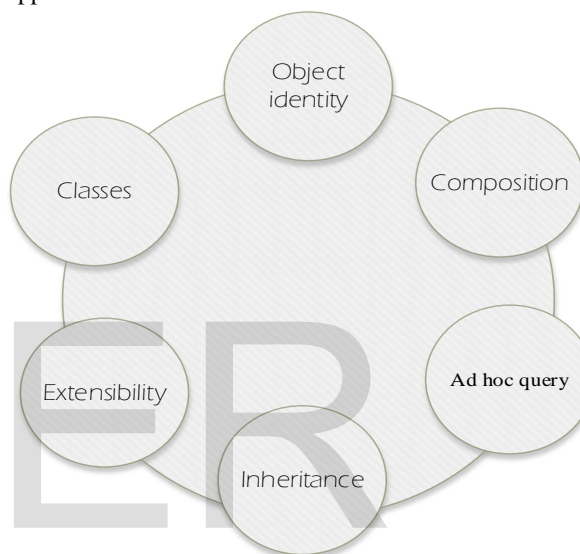

Figure 5 Features of OODBMS

5 OBJECT ORIEBTED ARCHITECTURE

The manifesto of Object oriented database system develop two basic standards to make a DBMS as an Object Oriented DBMS that fallow and fulfill two criteria that is must which are it consists of all the major concept of DBMS the main fetcher of Database like concurrency faster access and it will be an object oriented programming feature of modern world. For maintain this manifesto there are three main architecture of object oriented database system. One is standalone architecture where data is store in the form of objects. Data is easily mapped with application objects. Second Architecture is Object Relational DBMS, in this model objects in relation data base mapped with object oriented .In the third architecture SQL is mapped with object oriented to get the full optimization of data query.
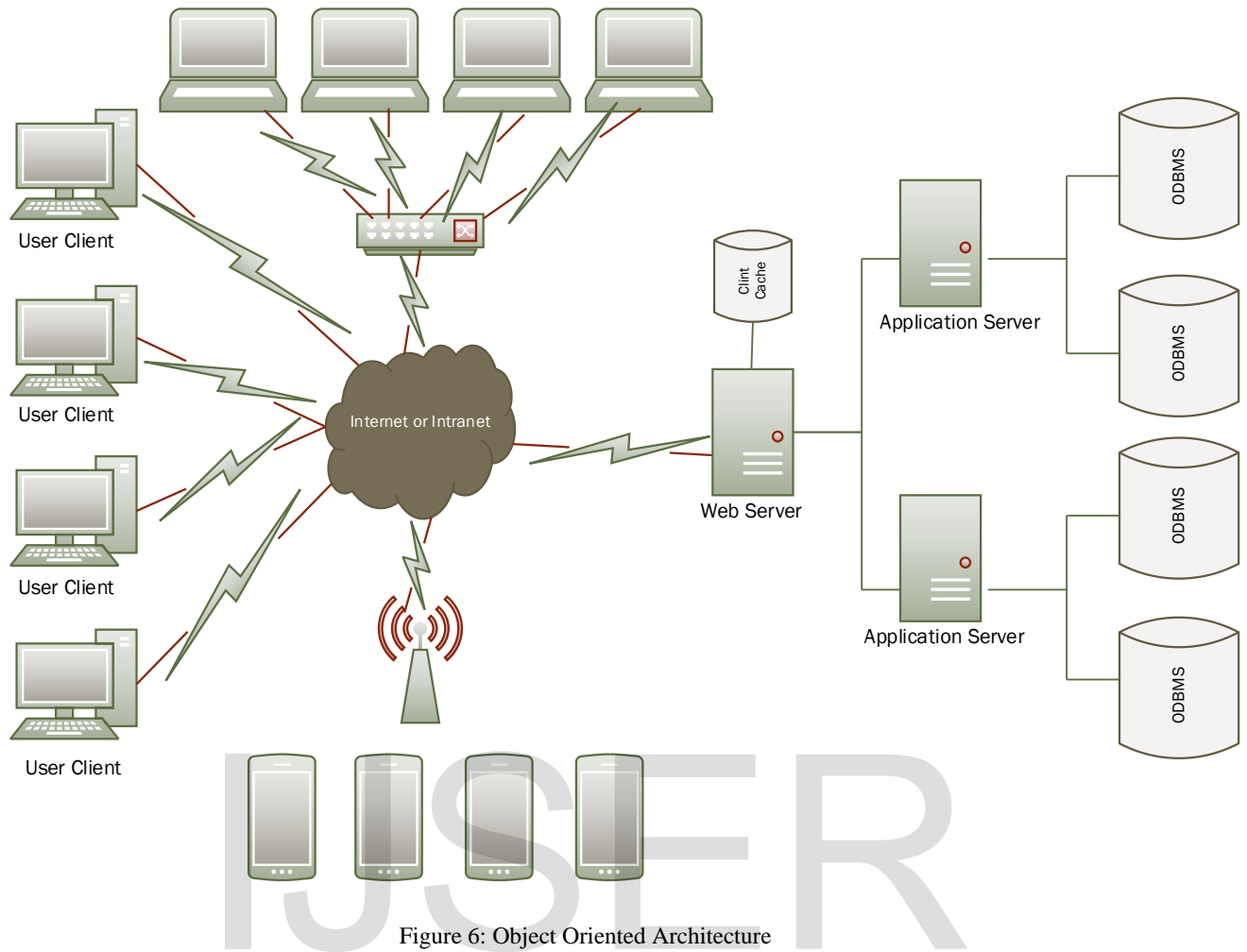
Figure 6: Object Oriented Architecture

TABLE 2: Comparison of RDBMS with OODMBS

6 COMPARISON OF RDBMS AND OODBMS WITH RESPECT TO DATA MODEL,OBJECTIVE AND ORDBMS

In this section I compare the both approaches so that the concept of OODBMS may lucid more.

First comparison is done with respect to data modeling. Object oriented used the objects whereas RDBMS used the entity [6].Beauty of objects is that it defined behavior too. Classes are used based on the common behaviors but RDBMS used the entity types. Schema is used in RDBMS which consists of the concept of keys whereas class hierarchy is used in OODBMS. Message passing, inherence, encapsulation is not found in tradition approach of relational database. The joins that are the fundamental of the traditional approach are high expensive so to remove that coast of the traditional approach the objects oriented approach is more reliable so that complete data is stored at single place as compare to traditional approach where data is divide into chunks and stored in the table in form of relation and keys are used to retreated information.

| RDBMS	OODBMS	OODBMS plus point
Relation or table	Class	**Multiple inheritance, unlimited no of objects can be included, parent to child strong relationships and locking**
Tuple	Object or instance of class	**Extra capabilities of behaviours than tuple**
Column or field	Attribute	**Simple or complex (may be of type of an object)**
No Methods (programming language procedure)	Methods	**No programming language procedure is provided by the DBMS**
Primary Key	**Object Identity**	**OID is not needed by programmers to manage**
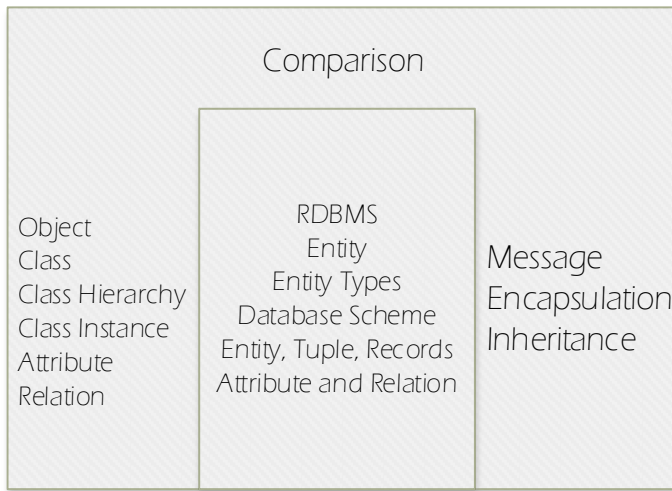
Figure 7: Comparison of RDBMS and OODMBS with respect to objective

Figure 8: Comparison of OOD and RDM

Now I compare OODBMS with respect to objective. Information hiding is main objective of OODBMS but the main objective of relation database is independence. OODBMS can store data, data methods and procedure where as RDBMS store only data. Message passing is used in object oriented data base so that it is an active data base as compared to relation which is passive in nature.

Data are chained together for maximize the performance of database whereas data is stored in separated method. When we compare the relation database model with An ORDBMS, then it clears that ORDBMS support this model .Sql3 extension includes tuples.rows, column, and user defined function and built in function. B tree are used in relation database management system and this structure work well with ORDBMS. When we compare ORDBMS with OODBMS, it is clear that both work together optimizing the query language. OODBMSs and ORDBMSs both support, reference types structured types, object identity and, user-defined ADTs and in-heritance. Both help to achieve the concurrency control and recovery of data. ORDBMS further support the functionality of the programming language, this provide a great support to data base developer and programmer to develop a efficient and speedy data base system [17].
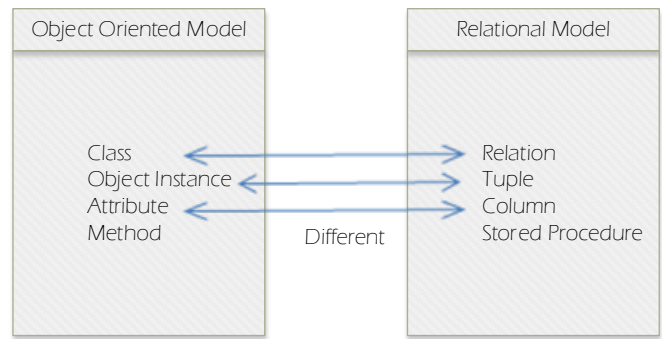
7 ANALYSIS OF OODBMS

At this stage of our research paper we analysis the benefits provided by the OODBMS for the user and user application. If we talk about the traditional data model tuple are used to store data which further used join to combine them as a complete relation and useful information. Regarding to object oriented database in term optimization Join is an expensive and takes too much processing power to produce complete join procedure. To considering in mind that joins are too expensive and that expensive problem is solved by object oriented Data base by storing data in objects the object procedure adopted by the object oriented programming language the modern technique of programming based on classes and inheritance. We can easily manipulate the objects unlike joins of relational DBMS objects manipulation are less expensive.

In the size of class there is no limitation classes can be inherit or created unlimited number of time. We can declare large classes as we need by the recommend or demand the procedure. In Real word representation adds enhancement in this modern approach of object oriented programming language. Here is beauty of the OODBMS, that most important thing is we cannot imagine database without query but thanks to OODBMS where we can manipulate objects without query on the basis of OID and other behavior of the objects.

If we consider object relational approach Mapping time is high in traditional relation database approach because table has to covert in objects because a top level layer is added in front of relational schema, on the secondary storage data is stored in the form of relation but manipulation is in the form of objects and vice versa. This approach needs time and efforts to convert or mapping objects with relation tables.

By the indentation object based databases the concepts of keys eliminated by Use of Object Identity (ODI) eliminate the use of primary key take place of the key because keys has several limitation moreover complete data is depended on keys if key is replace or changed it effect of changed the complete relation in the OID if behavior of complete objects is changed OID remains same and that objects is accessible with any kind or situation. It Save the

execution time because no need of expensive query like relational DBMS. Data model represent the real world model as mapping objects in Object oriented programming approach of the modern world. Due to communication method, navigation inside and outside the data is very easy. less coding is required to retrieved and for other recommended operations. Provide better and fast control for concurrency like relational approach it has more efficient and reliable for concurrency. This model is used in distributed approach of the object oriented DBMS [8]. Dealing with complex object   is the most important feature of object oriented data base system which provide a facility to arrange and store large size data at single chunks whereas in relational data base model there is restriction in use of large amount of data due to flat data base system and data is stored in the form of pieces whereas object oriented has stored in complete at one stage for example if we store a sketch of car it would be stored in pieces in table in relational DBMS moreover it would be stored in a single and complete sketch at single and precise stage of secondary storage of the OODBMS. This provides more power mapping structure.

Advantage of OODBMS:

  i.   Complex objects and relationship

  ii.   Class hierarchy

  iii.   No impedance mismatch

  iv.   No need for primary keys

  v.   One data model

  vi.   One programming language

  vii.   No need for query language

  viii. High performance for certain tasks

  ix.   Compatible with complex application

The object oriented DBMS use of OID object identity makes it more powerful. It support user to manipulate data base without using extra layer on the top like relational DBMS because in the relational DB there is an extra layer that is manipulated on top of relational schema that is an overhead for system. This also provide user a very easy semantic to carry on database operation although user has no concern with hidden operation of the DBMS but their normal operation are to be very easily accessible. As we discuss many advantages and useful things regarding to OODBMS although we can also find some disadvantage of this approach in term of relational schema. In Relation database model schema is independent form the data model and Change in schema cannot affect the entire architecture of the database but in OODBMS this independency are in danger because changes in architecture effect complete OODBMS. Some major disadvantages are listed below.

  i.   Often OODBMS is used in complex application. It is efficient in this case but where there is simple

application it is not so much effective a useful, useful for complex application not mean we forgive simple application as will.

  ii.   We consider relation database tables and concept more easy and simple as compare to object oriented because objects oriented programming approach is more complex as compare to normal language approach.

  iii.   There is limited number of tool are available for designing and constructing database for Object oriented Database management system.

  iv.   We can find mostly standard for traditional database for OODBMS there is no complete standard is available just like Manifesto is a paper that we fallow as a standard but standard is not to be consider as a paper only.

  v.   In the market many facilities and support are available for relation database [9].

Advantage and disadvantage in form of table as below.

Advantage	Disadvantage
Less coding	Used in complex structure
Flexible	Difficult
Deal with real world	Tool are not available
Concurrency control	No standards define
Object identity	Not support and facilities

Sometime relation database consider superior to object oriented database due to the simplicity of relation database model because object oriented DBMS is not quit simple as compare to relational DB. This modem concept cans easily engross. When we move to OODBMS we come across the complexity of objects. Relation data base support the ad hoc query language and this provide a nice query interface that is the last strong argument that is provided by relational team. Relation interface are the weakness of OODBMS because it has nothing to replay the relation of the relational DBMS.

8 EXAMPLES OF OODBMS

Examples of object oriented database systems.

8.1 Versant ODBM

It is design for object oriented systems by Versant Corporation. It used both traditional approach and object oriented approach. Chicago Stock Exchange merges his trade through this approach.

8.2 POET

Radio computing company used this POET to storing, managing and arranging large amount of data. It is used since 1980.

8.3 Objectivity/DB ODBMS

It can support variety of programming language .One of the biggest data ware house used this approach. This allows integrating different object oriented language like java, C++ with the data manipulation language like SQL etc.

8.4 Ajou University Medical

Center in South Korea is currently using Intersystem Cache Object Database Management System. [11]

8.5 SQL3

Is Provides the broad support for the object oriented feature. It is used to navigate between the objects, invoked the method and implements different operations.

9 OBJECT DEFINITION LANGUAGE

It is the standard language which defines the structure of database with respect to objects. It creates a layer of abstraction of so that data can move between different applications. Three main component of ODL is inheritance, abstraction and Encapsulation. Abstraction is implemented with the help of graph, object instances, Object identification, object classes and object references [10]. Encapsulations include the implementation of interface and application. Objects can only be manipulated through interfaces. Inheritance can add the properties of drives attributes. Class declaration in ODL includes many things like name for the class, Optional key declaration(s), Extent declaration,   Element   declarations.

class <name> {

      <declarations of element list , separated by ;>

}

10 OBJECT QUERY LANGUAGE

This is very powerful concept in object oriented databases .It allow OODBMS to provide query like SQL, entertain ODL as its schema definition language and Types of OQL are same like ODL's types. As a relation Set and Bag are just like a relation or role of relations is provided by them. It has different types of new language construct which allow object oriented language to integrate with DBMS. Its structure is very similar to traditional SQL.

Example:
Here we discuss and example and write a query on data of Bank to get account names from KPK province OQL query is as [11].
Select distinct account.name

From accounts A
Where A. province = "KPK"

Account ID	Name	Province
A1	Ali	KPK
A2	Zia	Sindh
A3	sadaf	KPK
A4	Asif	Punjab
A5	Sadia	Sindh

Result if there is sql query

Name
Ali
Sadaf

Result if there is OQL which is in the form of objects

String	String
Ali	Sadaf

Here is another example of OQL with OO Language using the set () method on the database first Create objects as in OO languages and persistent.
Employee E1 = new Employee ("Zafar", 18);
db.set (E1);

Retrieve by age (null default for string)
Employee E = new Employee (null, 37);
Object Set<Employee > result = db. Get (E);

11 APPLICATION SELECTION

Object oriented data base major focused on the area like CAD, GIS and complex multimedia application but now it also used in business application for example in financial application and designing application, but we have to choose between two extreme .so we need a clear consideration regarding choosing the databases .Some are following instruction keep in mind while selecting the object oriented data base.
1. Functional specification of the application
2. Complexity of the application and their database
3. Feature should be user friendly
4. Performance issue
5. Query Optimization

12 CONCLUSION

Many organizations leave RDBMS and move toward the OODBMS to maintain their large amount of data. The reason to adopt the OODBMS is its beauty because it is compatible with new programming approach of object oriented programming. Nature of applications are changed with every passing of day, it become more complex and structure wise more reliable to become a part of OODBMS. As we know that this is the era of multimedia technology, computer aided design and tool, computer graphics and most artificial intelligence all these applications are built on object oriented approach and need large amount of data, which we only tackle through object oriented database because the limitation of RBMS are handled through objects oriented DBMS, relational DBMS are based on relation, join and keys although the join coast is the biggest limitation of the Relational DBMS.

Major objective of Relation database concern with data independence and relations while object oriented has many different features like inheritance, encapsulation, abstraction and polymorphism. Object oriented programming is a modern approach of programming that provides facility of code reuse by classes and inheritance which gives its enrichment and freshness. It provides many rights to programmer and developers to develop flexible and extensible program that are complex in nature but compatible with OODBMS.

Large business organizations are waiting for the object oriented database system to develop their business application. Moreover at this stage there is not any accepted model for OODBMS that become foundation of it. The structural content and the other part of concept like classes, inheritance and relations are two parts of its frame work.

In the OODBMS there is a reliability of modeling, structure, coding, share ability and procedure. Rapid growth of software engineering demand new development like Object oriented programming and need encasement in database to deal with complex application but Traditional systems cannot fulfill the demand of the modern and rapid advance application development so there need to develop a new kind of databases based on Object relational programming approach of modern world. Many steps are required in developing the object oriented structure. We have to tackle the problem of integration with existing database system to adopt new approach; we discussed the new approach of database technology that is encasements in object oriented programming approach. Fast and rapidly grows of distributed object oriented system take place of traditional centralized soon we will good bye to traditional approach. Although there is a future challenge for object oriented database must be secure.

We believe that future for object oriented database will be bright to completely hold major market share, information system should be developed with the help of object oriented database approach which offers more flexibility to these complex information

systems and have more opportunities to deal with complex application. Heterogeneity is a major component of future distributed systems but relational DBMS are less heterogeneous so tackle these heterogeneity object oriented approach must be followed. More than 25 products on object oriented database are available in market that holds 50% share of databases application. In future new trends are shining in the field of object oriented database.

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