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### RESEARCH ARTICLE

# Studies and Analysis of Popular Database Models

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**ABSTRACT:** *Data is most valuable part of today world because it is used in everyday of life from a single individual to large organizations. To make the selection and maintenance easy and support strong data protection it is stored in a data model. A data model is a repository of subjectively selected and adapted operational data which can successfully answer any, statistical, complex or analytical queries. Nowadays the database is shared by a globally competitive environment where large amounts of data are required to be processed faster and efficient way .data model keep a subject oriented data which gives the support for management's decision making process. This paper discusses in detail four existing database models like Hierarchical, network, relational and object oriented database and does an analysis to understand the advantages and disadvantages of these database models.*

**Keywords:** *RDB, OODB.*

## Introduction

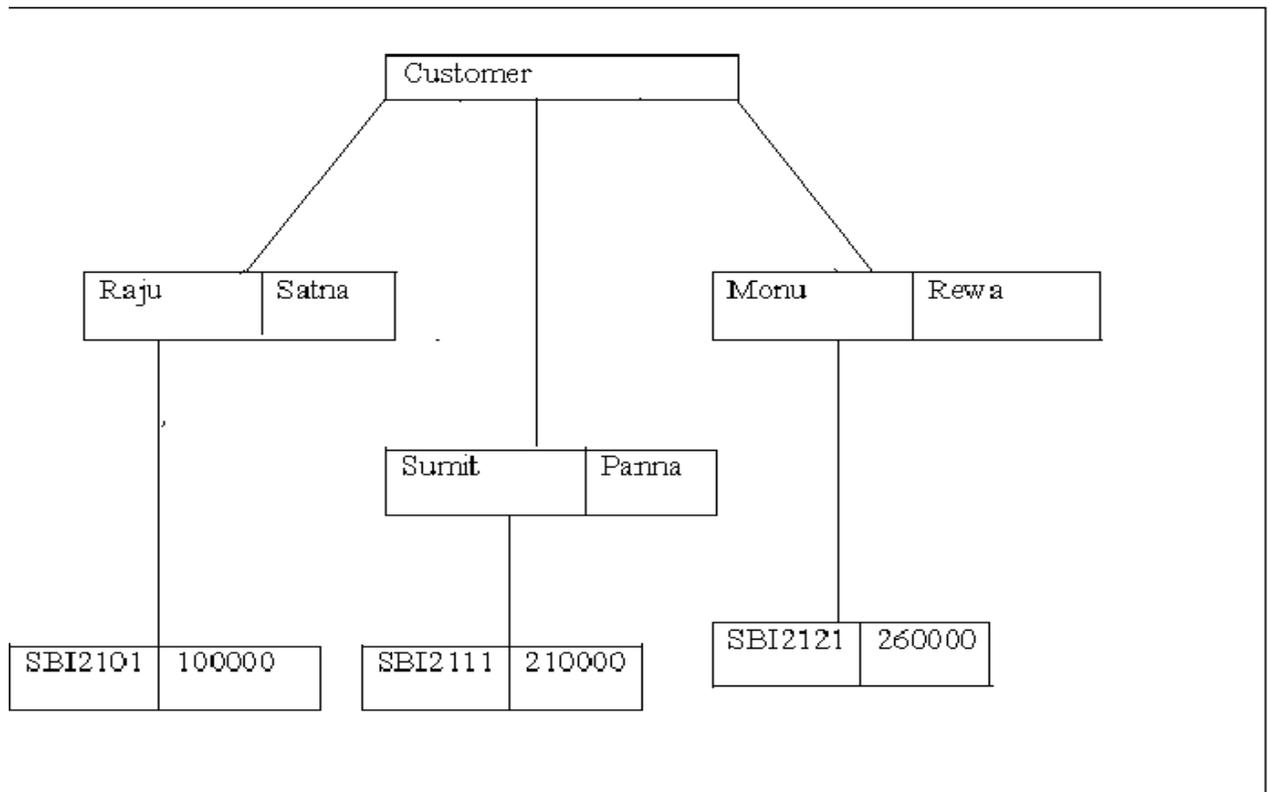
A Database is an important part of any organization because all information is store in the database where all users can easily access this information in well organized manner. The database Model is a logical structure of database which determines how the data will be stored, retrieved and updated and what relation exist between data items. There are different data model has been emerged over the years. In this study, four popular database technologies, Hierarchical, network, Relational and Object-Oriented are introduced in short and their basic characteristics are discussed. The main purpose of this study is to find out and compare the features of these databases, for understanding the pros and cons of these technologies before implementing them.

## Introduction to Hierarchical Model:

In the hierarchical data model, information is organized as a collection of records which constructs an inverted tree. The tree may be of arbitrary depth. The record at the root of a tree has zero or more records called child records. a record at the top of the tree is called as parent record for their immediate descendants[10] .This parent-child relationship recursively continues to form a tree. Each record contains

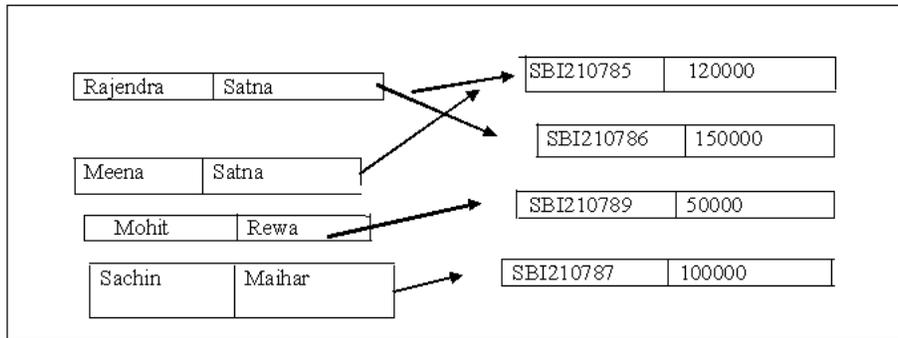
multiple fields, where each field may contain either data values like integer, real, text or a pointer to a record. The pointer is not allowed to form a cycle. Some hierarchical DBMS support null values or variable-length fields [8].

Applications can Travail a hierarchical database by starting at a root and successively Travail downward from parent to children until the desired record is found [7] . Searching of any record in a hierarchical tree is very fast since the hierarchical databases uses contiguous storage for hierarchical structures. For hierarchical data model, DDL must support the definition of field's types, record types, pointers, and parent-child relationships. And the DML supports parent-child relationships through pointers. Therefore navigation of programs is very close to the physical data structure level. The hierarchical data model supports only very limited data independence and fails to express complex information models. ,data are replicated into same tree or different trees ,in this data model it is possible that the same information will be store many times, it is a drawback of this data model. The hierarchical data model does not support much consistency and security [6].



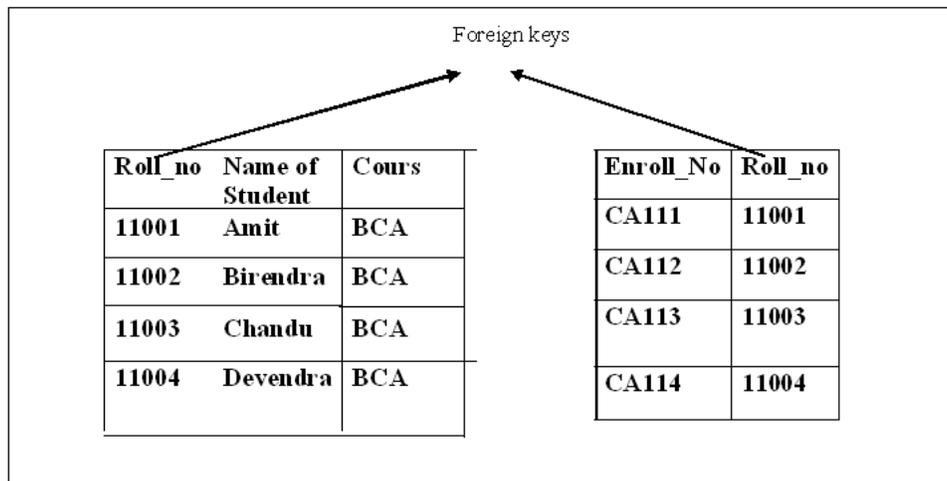
**Introduction to Network model:**

Data In network data model is organized as a collection of graphs of record that are related with pointers. A pointer is a physical address which identifies where the next record can be found on the disk. A Network data model is flexible than a hierarchical data model and still supports efficient navigation [13]. The network data models contains records which is a collection of fields where each field contains a simple value either fixed or variable size. The network data model also supports indexes of fields and records, sets of pointers, and physical placement of records. For network data models A DDL must allow the definition of record types, field's types, pointers and indexes. And the DML must support navigation through the graphs, pointers and indexes [14]. The network data model, navigates closely to the physical storage structures. Data are replicated into same graph or different graph, in this data model it is possible that the same information will be store many times, it is a drawback of this data model. The network data model supports limited data independence and doesn't support much consistency and security [15].



### Introduction to Relation database:

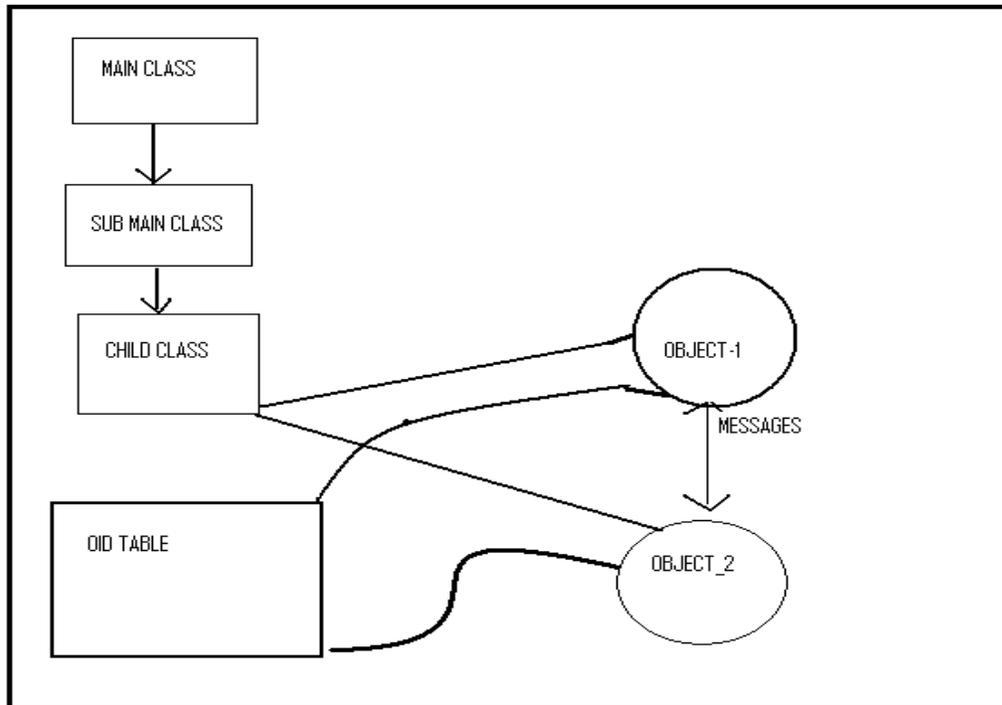
The model developed by E.F. Codd is called relational data model. In this model data and relation among those data is represented in the form of table [5]. A table is a collection of rows and columns, column contains simple data values from some domain like integer, real, text etc and row contains number of fields called record. This model is based on the relational algebra. Each column contains an atomic value for each record and each column has a unique name. The relational model supports the concept of keys to identify the records and making the relationship between two or more tables and also supports data independence and query optimization [2]. The most ordinary form of access control in a relational database is the view. The view is a logical table, which is created with the SQL VIEW command [1]. The relational database strongly supports security, consistency and avoids the redundancy of records. This model is highly supported by the concept of distributed database [9]. In common practice relational database provides an important and central platform for data management and query solving [11]. The below figure shows the relational database



### Introduction to Object-Oriented database:

The object-oriented data model is based on the concept of object oriented programming. The basic element of an object-oriented database is the object, which works as a run time entity and every object has a unique identity, states and behaviors [3]. This model supports the concept of classes where object can be defined. The class is a logical container of data and methods this technique is called as encapsulation. Methods are used to perform operation on the data items. classes is arranged in a hierarchal form. In this hierarchy at the root one class is found called parent class, and other classes which inherits (use) the properties of parent class is called child (decendent) class. According to needs of users programs these properties can be

modified in the child class. [4]. One object can interact with others by message passing, this model provide reusability of data and methods in the mean of inheritance. Data can be hidden i. e. data abstraction is apply, which provides much security and integration of database [12].The below figure shows the object oriented database



### Comparison of different database models:

#### 1. Hierarchical databases:

The hierarchical database model is conceptually very simple but implementation of this model is very complex. This model is very poor to manage huge data and supports limited database integrity and limited structural independency.

#### 2. Network databases:

The network database model is conceptually very simple like hierarchical model but implementation is very complex. This model handles more relationship types and supports much data integrity as compare to hierarchical database model. This model suffers from lacks of structural independency and standards.

#### 3. Relational Databases:

The relational database model works on the concept of set theory of mathematics.

In set theory two dimensional collection of information is called a relation. The RDBMS provide very simple way to constructs, access and update database. This model supports only text and numeric value it doesn't supports abstract data type such as audio, video and geographical information.

#### 4. Object-Oriented:

Object-oriented database model combines the concept of object-oriented programming with the database technology to provide an integrated application development system. This model supports abstract data type such as audio, video and geographical information. In OODBMS we can improve the productivity with the help of inheritance and it supports navigational and associative accessing of information.

### CONCLUSION

From the above study it is clear that the hierarchical and network data model are out dated because both model doesn't able to fulfill the current requirement of collaborated environment. Moving next we find that the relational database is an powerful and standard model but it is also unable to handle abstract type data

like audio, video, geophysics and other application like computer aided design, engineering and manufacturing systems and so on. However object-oriented technology supports the requirements of designing and implementing very large and complex database.

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