

The Component Model Design of Object-oriented Database System

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Abstract: Object-oriented database represents the future direction of development of the database, the author reads a great deal of relevant literature, and researches the object-oriented database model, and analysis its object identifier, category level, the evolution of polymorphism and patterns. This article accords to the concept of object-oriented, bases on the java language, designs a object-oriented database system component model, in order to provide the components for other programs.

Keywords: object-oriented; component model; database system; Java

1. Introduction

Object-oriented database system is extremely active. Early representative Atkinson article was published in 1989 equivalent to the "Declaration of Object-Oriented Database System" It describes object-oriented statement of the essential characteristics of database systems, optional features and other options of the object-oriented statement.^[1,2] Many studies have made significant achievements, including the basic object model, support for complex object, models of the evolution of object-oriented query language and query processing mechanism, object-oriented database indexing mechanism, and based on the indicators link method, the client and server with architecture, as well as performance testing, such as quasi-steamed^[3,4]. Small number of emerging companies OODB introduced products, such as Gemstone, Objectivity, ObjectStore, Ontos, Poet, Versant, etc. Now the market has been above some object-oriented database design tools which is and the more mature technology Computer Association Ltd. The launch of Jasmine, Jasmine is a pure object-oriented object database and a combination of tools. This article talks about^[5] object-oriented database design and the object-oriented thinking is the basis for the design of an object-oriented database system for the engine, and use the java language development, and also in the way of components for the using of other systems.

2. The Object-Oriented Database System Component Design

Object-oriented database system to support the definition and operation, should meet two criteria: First of all, it is a database system, and secondly, it is also object-oriented systems. The first standard-the basic capacity of the database system, it should have the capacity (persistence, transaction management, concurrency control, recovery, query, version management, integrity, security). The

second criterion is to require the full support of object-oriented database and object-oriented concepts of integrity and control mechanisms. To sum up, object-oriented database we will be abbreviated as follows: object-oriented database=database Object-Oriented System + capacity. Here are the contents of object-oriented the design of the database system components^[6-8].

2.1 System-level structure and components figure

Figure 1 describes the design of object-oriented database system which involves three main parts, including the user interface layer, cache management and physical storage layer. Corresponding to the design of Figure 1, we designed a system component model.

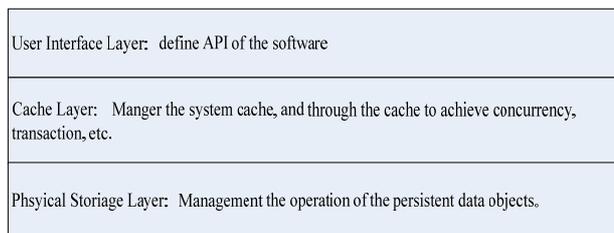


Figure 1. The system Hierarchy

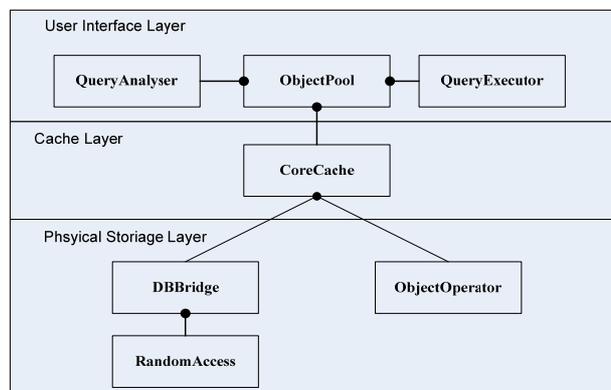


Figure 2. The system component model

The components that consist of the system model are as follows:

Table 1. The components of the system model

Component	Component Description
ObjectPool	Call by the user, additions and deletions to the database, cache view, query, such as vector operations.
QueryAnalyser	Query analyzer.
QueryExecutor	Query actuators.
CoreCache	The core of the cache, and the cache management system, as well as through the cache to achieve concurrency, affairs.
DBBridge	The storage devices and the bridge of the object are used for storing data objects and the conversion.
RandomAccess	Storage devices are to operate on a collection of tools.
ObjectOperator	JAVA reflection mechanism used to extract/set all object attribute values.

2.2 OODBMS Object Model

2.2.1 Class Configuration

When a class object is loaded by OODB, the system will automatically generate a file which contains all the configuration information of this class, which including the object memory address, free address block, index information and other object information.

2.2.2 Index

When a class is stored, we can get index field through java notes, such as: private String year .the model will generate the index information according to the type of filed notes, and save to the hard disk.

2.2.3 Free Segment

When the data is stored inside in the hard disk, the user will can certainly do a lot of operations such as insert data, delete data, modify data. It will generate a lot of free address block in the data files. In our model, we can make use of the free address block to record the corresponding free block and reuse them.

2.2.4 ClassInfo

When a class object is loaded by OODB, it will be regarded as a data model, the definition of the model is decided by ClassInfo.

2.2.5 FieldInfo

FieldInfo is a part of ClassInfo, the FieldInfo and it includes five basic statements: filed type, filed size, the ID information, the index information, and the long text information. A Class has a lot of fields, so that a Class-Info will has many FiledInfo objects.

2.3 Database File Structure

The database file structure is built by the following components:

-Root

location of the database which is defined by the user.

-1st package, 2nd package

A class has it's own package which is divided into much classes in java. We generate the path of the data by means of the corresponding package.

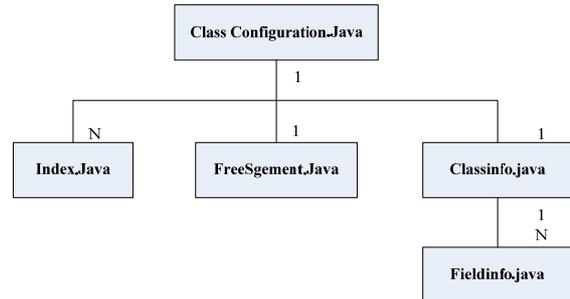


Figure 3. The OODMBS Object Model

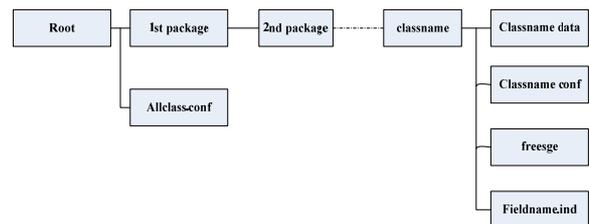


Figure 4. Database File Structure

-Allclass.dcnf

It stores all class names in the file, you can get all class information through this file.

-Classname

It stores the directory of the class name, all configuration files and datas will be stored in this place.

-Classname.conf

This file can be used to the store class detail information such as: the number of class fields, size of fields, index information.

- Classname.data

It stores object data information.

- Freeseg

This file can be used to store free block information

- Fieldname.ind

This file can be used to store index information, which includes the content of the field index.

2.4 Data Type Structure

The proposed model can store the data type and length in the ClassInfo file, so we can load correct information of the data structure which was stored in the disk. In order to improve the retrieval efficiency, the hard disk address must be the same as the index retrieved value. The ID is the unique identifier for an object,and the proposed model will automatically generate an index for ID.

The proposed model supports the following data types:

Table 2. Type name and type length

Type Name	Type Length
Integer.class	4 bytes
Double.classDouble.class	8 bytes
Float.classFloat.class	4 bytes
Byte.class Byte.class	1 byte
Short.class Short.class	2 bytes
Boolean.class Boolean.class	1 byte
Long.class Long.class	8 bytes
String.class String.class	Uncertainty byte
TextObject.classTextObject.class	4GB
StreamObject.class	4GB

3 Conclusions

In this paper, we propose a components model of OODB which can be used on many management information systems. The OODB component can make the program o be writed easier and faster, the implementation of efficiency will increase a lot compared to the traditional OODBMS. The component also has some disadvantages, this solution components was implemented in Java, so it only can be used in Java development environment. In the future work, we will implement and evaluate the proposed component model, and it will support more development environment and languages.

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