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Framework for a complete migration from a relational database RDB to an object relational database ORDB

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Abstract
This paper discusses the overall migration of the relational database to the basics of object-relational database, showing highlights and low points of the relational model, why having a migration
and how to proceed this migration.
The Framework begins with the semantic enrichment to a new model containing all the principle of the object concepts including inheritance, then determine the physical schema of the object relational database, from these two points we realize the migration of the data of the relational model towards the object relational model, knowing that the whole migration is made in an automatic way without the interference of the human factor.
Keywords: *ORDB, RDB, Schema Migration, Data Migration, Semantic Enrichment.*

1. Introduction

The relational model is one of the simplest models because it is considered as logical model record-base, consists of tables called relations, and relationships are the only structures of the model. But this simplicity penalizes the model due to the fact that there is only one concept, hence the birth of the object-relational model. the object-relational model provides a broader and more complex modeling because it incorporates new concepts, data encapsulation, the creation of new types, use of complex relationships (inheritance, aggregation, composition, association), and the use of Lob large object [6].

Several approaches discuss the passage of the relational database to the basics of object-relational database, an approach that takes the relational database and stores it in a tabular format structured according to several criteria including cardinality, as a way of reverse engineering of the relational model to a conceptual data model, and establish the translation [1]. An approach that is based on the semantic enrichment which results in a table that contains the minimum information for the completion of the migration, the entire process takes place in an automatic way, in order to have to the final physical object relational schema equivalent to the relational database [3].

Approaches that discusses the migration of relational database to the basics of object-relational database; based on the design made from the UML, to provide guidelines for designers and developers of database applications for more effective implementation [4] [5].

A migration that shows the passage of data from a relational database to an object relational database, which is based upon methods to optimize the selection and integration of data [7] [8].

Approaches that discuss the migration of relational databases to the basics of object-relational database while using the collections, preserving collections in aggregations, compositions and associations [9] [11].

This article shows all stages of transition from a relational database to the target object relational that starts with the semantic enrichment, then the creation of the physical schema and finally data migration.

2. Semantic Enrichment

The migration approach starts with the realization of semantic enrichment, which is based on the implementation of some data structure and metadata to simplify the interpretation of the system [1].with treatment and metadata, NDM is realized

(new data model) which transforms the scheme of a relational database in a table form with the necessary information, that differentiates the relational model of the object-relational model, with the emergence of the concepts of inheritance, aggregation, composition, and association.

NDM will be defined as a collection of class:

NDM: = {C | C: = (cn, degree, cls, a, contributor)}

Cn =the name of the class.

Degree = first degree (the tables that contain PK) | 2nd degree (the tables that contain FK without PK).

Cls=aggregation, association, inheritance, simple class (the class that does not belong to the other classifications).

Contributor=class list.

A=attribute:={a | a := (an, t, tag, l, n, d)} (An :name of the attribute, T:type of the attribute, Tag: primary key(PK) | foreign key(FK),L: length of the attribute, N:if the attribute takes the parameter null, D:the default value of the attribute)

Cn	Degree	Classification	Attribute						Contributor
			An	Type	tag	l	N	D	
Person	1st	inherBy	Pno	Varchar	PK		N		Kids
									Works_on
									Trainee
									Employ
			Pname	Varchar			N		
			Bdate	Date			N		
			Address	Varchar		255	N		
			Dno	Int	FK		N		Dept
			PnoSup	Varchar	FK		Y		Person
Trainee	2eme	Inherts	Pno	Varchar	FK		N		Person
			Level	Varchar			N		
			Type	Varchar			N		

Fig. 1 NDM fragment generated from the RDB

3. Schema Translation

Translating the physical relational schema to a physical relational schema object is proceeds with some rules that respects the SQL standard 3, respecting the passage of data definition language and data manipulation language including insertion and selection queries of SQL to quering complex objects SQL3.

Creating types proceeds as follows:

```
CREATE [OR REPLACE] TYPE nameRDB1_Type
AS OBJECT

(column1 type1, column2 type2,...)

 NOT FINAL

/

CREATE [OR REPLACE] TYPE nameRDB2_Type
under nameRDB_type

(column1 type1, column2 type2,nameRDB1_t
nameRDB1_type,...)

FINAL
```

Creating tables proceeds as follows:

```
CREATE TABLE [schema.]nameTable OF
[schema.] nameType

        [(column [DEFAULT expression]

        [ constraintOnLine
        [constraintOnLine]...

        | constraintREFOnLine ]

        | { constraintOffline |
        constraintREFOffline }

        [,column...] )]

        ;
```

4. Data Migration

The migration of the data of a RDB towards an ORDB is based on the NDM which is extracted from the RDB, and according to the degree and the classification a request of insertion is established which adapts itself to any complex situation of insertion; for the selection; a request is realized which will also make the selection in an automatic way further to the name extracted from the NDM and which crosses in parameter in the query.

The request selection in combination with the Java language is as follows:

```
public String[][] selectAll(String tableName)
{
    String req = "SELECT * FROM " +
tableName;
    try
 {
        Statement sql =
db.createStatement();
        ResultSet rs =
sql.executeQuery(req);
        ResultSetMetaData rsm =
rs.getMetaData();
        int columns =
rsm.getColumnCount();
        String data[][];
        rs.last();                    int
rows = rs.getRow() + 1;
        data = new String[rows][columns];

        for (int i = 1; i <=columns; i++)
 {
            data[0][i-1]              =
rsm.getColumnName(i);
            }
        int row = 1;
        rs.beforeFirst();
        while (rs.next())
 {                    for (int i=1;
i<=columns; i++)
 {
            data[row][i-1]      =
rs.getString(i);
            }
        row++;
        }
        return data;
        }
    catch (Exception e)
 {
            e.printStackTrace();
        return null;
 }
    }
```

The entire migration is shown schematically in the figure below which shows the steps and technologies used:

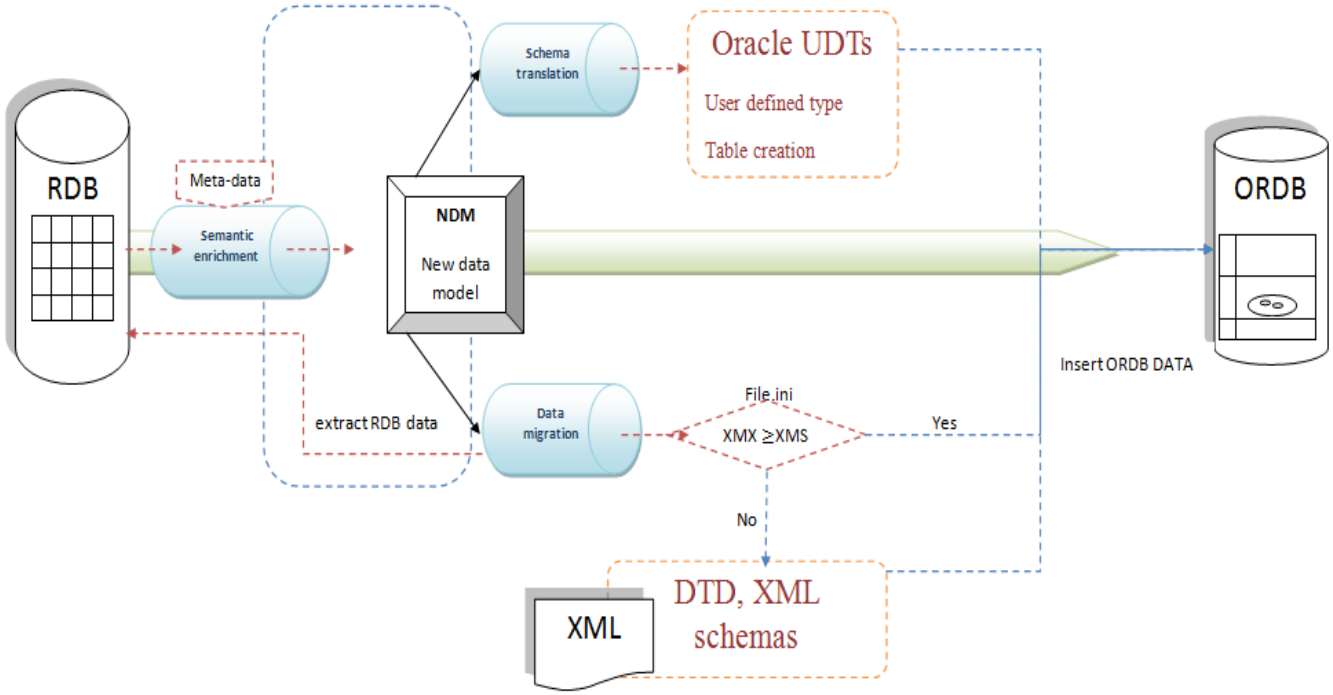

Fig. 2 Framework for the migration of a RDB to an ORDB

4. Conclusions

This paper presents a Framework for migrating relational database to an object-relational database, Since the migration of physical schema passing through semantic enrichment and construction of a new data model, to data migration which begins with data extraction and insertion towards object relational physical schema target in an automatic manner, while complying with the SQL standard and rules naming, knowing that all the treatments mentioned in this paper are achieved an automatic way without the interference of the human factor.

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