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COMPARATIVE STUDY OF RELATIONAL DATABASE MODEL AND MULTIVALUE DATABASE MODEL

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Abstract

In the current business processing management operations, most of the companies and organizations use Relational (SQL) databases tools which are prevalent, owing to the IT marketplace being dominated by the big companies like IBM, Oracle, Microsoft as well as some companies which give open solutions for database management through relational data model but one more technology coming up these days at large scale, use the concept of Multivalue database which in many ways is considered more efficient by the supporters of this concept. We have done the comparative study of these two types of models ,one is relational database and other is Multivalue database.

Keywords: Cache, Logical Data Model, Multivalue Database, Relational Database.

1. Introduction

Multivalue database is not a new concept. It was started in mid 1960's by first designing a model and then its implementation. It is an efficient and flexible database technology which when compared to relational (SQL) database has some features, which makes it useful for many applications. Unlike Relational Database Management System, in Multivalue database, we can have repeating values in a single record/row (item in Multivalue) and each value can have multiple sub-values. Each attribute, value and sub-value is dynamic in length – All records are of variable-length, and field and values are marked off by special delimiters, so that any file, record, or field may contain any number of entries of the lower level of entity. Multi-value has been called an evolution of the post-relational data base.

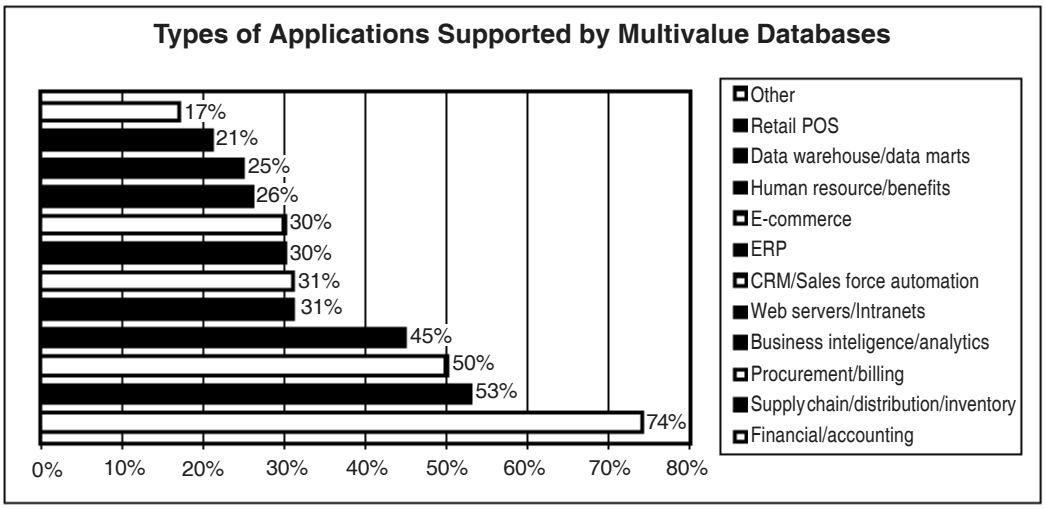
2. Applications of Multivalue Databases

In the old days, Multivalue databases were characterized as being found in small and medium-sized enterprises, but now a days Fortune 500 companies are also involved in this project and use Multivalue database models for most of their business processing. It includes Blue Cross/Blue Shield organizations across the U.S. and many major government organizations. Of the more than 10,000 automobile dealerships in the U.S. today, probably greater than 95 percent are running on Multivalue solutions. IBM estimates that the Multivalue database market is now a $3 billion.[1]

Around the world, probably 80 percent are using Multivalue-based solutions. Various examples are Healthpac Selects InterSystems CACHÉ for Medical Billing Software System, IBM's U2 Web DE 4.4 for setting dates of University Ladybridge Systems, OpenQM used in PDAs

They are most popular in Financial and Accounting According to a proprietary study [2], sponsored by Revelation Software, InterSystems and DesignBais. Sixty-seven percent of the respondents indicated that they had developed financial or accounting applications using Multivalue technology. These are most commonly used in automotive industry, banking sector, insurance sector, retail management, health care centers, and telecom companies and even in life sciences section for drug discovery

So from the above observations, we may conclude that Financial /Accounting related operations mostly use Multivalue database, then comes supply chain/inventory management and then billing, business intelligence, web servers, CRM, ERP, E-Commerce, Human resource, retail management and so on [3].



3. CHALLENGES IN USING MULTIVALUE ENVIRONMENT

There are lots of applications for Multivalue databases but still there is the need to overcome the challenges faced in using Multivalued environment over relational database environment. Market Uncertainty is one of the biggest challenge because most of the big companies are still sticking to relational data model and uncertain about the market in Multivalue database. Moreover there is lack of management awareness also about this concept. Already the set is made for relational database model for database management for long time, using new tools and learning them, is always a problem.

Moreover we have to modernize every application with Multivalue database which requires change in the existing applications. There should be proper integration among various databases if we have to do data processing which involve multiple types of database environments. Still there is a lack of support tools and integrator support as for larger level this database environment is still coming up.

More of the main vendors of database management tools should come up so that all the above challenges can be overcome and more confidence is gain for Multivalue database environment.

4. Advantages of Multivalue Databases

When compared to relational databases the features of Multivalue alone typically provide Multivalue Databases with higher performance, it uses lower volumes of stored data, lower total cost of ownership, while being much more adaptable for application building and redevelopment. Multivalue business software is portable across all computer hardware and major operating systems." – International Spectrum

Relational databases are built following a set of rules known as the Laws of Normalization [4]. The process of transforming data to fit the rules of a relational database is called normalization and the steps in this process are referred to as first normal form, second normal form, and so on. The First Law of Normalization states that we may not have repeating data. In practical terms this means that we cannot add extra columns to the right of the table to allow a customer to order more than one item at the same time.

Firstly, the details of a single order are now split across multiple rows of our table. Secondly, we have been forced to add an extra column so that we can know how many lines there are in the order. Also, we have duplicated some information, a step which actually breaks another of the laws of Normalization. To avoid this last complication, a typical implementation of this sort of data in a fully normalized system (e.g. Oracle or Access) would break the order into two separate tables, but Multivalue database products avoid this complication by removing the need to adhere to the First Law of Normalization. We allow a single cell of our table to hold more than one value (hence "Multivalue").

The end result of this is that our Multivalue view of the world is typically much faster than its fully normalized counterpart though there will always be situations where this model is not ideal. In such cases, we can freely revert to using the fully normalized approach. Notice that fully normalized data can be stored in a Multivalue database. The opposite tends not to be true.

A typical application will have many tables, perhaps hundreds or even thousands though the Multivalue model usually results in far fewer tables than in other data models.

Each table is stored as a file. The rows of our table are known as records and the columns as fields (some users refer to these as attributes). The data stored in a field may be made up of multiple values.By adopting this data model instead of using additional columns, the data model imposes no limit to the number of items that may be included in an order. In a Multivalue database, the tables can gain a fourth dimension (sub values).Multivalue queries are also som*ewhat shorter, easier to understand and more efficient in resources to process.*

Multivalue record structure favors a "denormalized" decomposition, where all of the data for an entity is stored in a single record, obviating the need to perform joins. When managing large, sparse data sets in this way can result in efficient use of storage space.[5]

In one of the tests simulating a data analysis application typical for a telecommunications software firm, Cache (supporting Multivalue database) was 41% faster than Oracle 9i (supporting relational database) when creating a data mart of mobile phone information. When the resulting data mart was queried using SQL, Cache's response times ranged from 1.8 to 513 times faster. Clearly, Multivalue unique multidimensional data engine make it a good choice for applications that require rapid analysis of large amounts of data. [6]

5. LIMITATIONS OF MULTIVALUE DATABASE MODEL

Multivalue databases have an edge over Relational databases with respect to many features and applications, but still there are some limitations of using this data model which limit its use in some cases For relatively simple application, say for example "project reporting by state and fiscal", hierarchical representation happens to be convenient; no consideration is given to other applications, which it likely complicates. Multivalue was not "first *considered* in the original theories and mathematics surrounding relational database rules." According to the opponents of Multivalue databases, the relational model was invented explicitly to *replace* hierarchical technology, of which Multivalue is one version, the latter having nothing to do with mathematics. Moreover there is no reference to integrity constraints. The focus is only on some certain types of applications, and integrity of the data is still a question., the flexibility which it provides means that *integrity control generally has to be done at the application level rather than the DBMS level Those who are against Multivalue database concept say that i*t is neither new, nor a replacement of Relational Model, nor a solution to anything. And if the "solution" is physical, then it has nothing to do with the data model, or repeating groups. Normalization is purely a logical concept, so it has nothing to do anything at physical, repeating groups are logical too and a violation of relational principles. It is technology that does not replace relational – it is a formal model that sits between the

logical *R* level and the physical level, based on theory. The Multivalue approach has been around forever and Codd declared it to be in violation of relational principles years ago. It is neither new, nor a replacement of Relational Model, nor a solution to anything. And if the "solution" is physical, then it has nothing to do with the data model, or repeating groups. There is no such thing as "naturally occurring repeating groups"—it's a matter of representation and we can choose to represent it with repeating groups, or relationally, without. The former was tried and failed, the latter has not yet been tried properly but even so, it's much better. However, none of this has anything to do with physical implementation or performance, it's purely logical. physical record layouts, made multi-dimensional by how they are retrieved and handled by the data base implementation software code. It is only the limitation of current disk cylinder/ track/and sector which gives these *n*-dimensional physical layer records their left-to-right appearance.

6. CONCLUSION

In the above paragraphs we have discussed both the points in favor as well as against the Multivalue database when compared with relational database concept. We can conclude that though multivalve databases are coming up in a big swing now days but still has a long way to go to overcome the limitations they have. For the maximum coverage from an enterprise perspective, the Multivalue solutions tend to be less complete. Historically, the capabilities of the Multivalue systems have not have been as comprehensive as in traditional systems but that is not the case anymore. Major vendors like IBM, jBASE, Northgate Information Solutions, Revelations Software have designed database systems based on Multivalue data model are as robust as they would be in an Oracle or DB2 system. It depends on how specific we are these days. The overall database market is growing modestly... Data being handled in an XML format (which is mostly used in web pages). lends itself to a Multivalue set of tools more readily than it does to a traditional relational structure. The whole approach to how data is structured, transported and dealt with is changing very rapidly. As new systems evolve, they are being built on a different foundation. This structure will bring some opportunities to us. We have most of the fundamental technology in place to allow us to deal with that. Even after some limitations we have availability of systems which can develop and maintain Multivalue applications with relational and object relational tools. ONware is one such example. Without re-engineering and without the need for the DBMS or Multivalue environment in which they were developed, business applications perform just as they do in their original Multivalue environment, regardless of what type of database stores the data. With version 2.0, all MITS report functions can be used with nine additional databases. MITS Report supports multiple databases; users can create reports while remaining in a single, familiar environment and interface.[7]

So both types of database environment can work together to overcome the limitations of each and finally give a product very well suited according to different requirements of different types of applications.

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