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Business Objects and Enterprise Applications

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ABSTRACT

Enterprise applications are, in practice, considered to be related to either OnLine Transaction Processing (OLTP) or OnLine Analytical Processing (OLAP). However, in fact, there are no strict borders between these two categories of enterprise applications.This papers aims at addressing this issue and suggesting the deployment of Business Objects (BOs) for realising OLAP applications besides OLTP applications, and using the applications of one category in the domain of the other category with minor changes.The basic needed characteristics and functionality in order to follow this approach are listed, and the resulting advantages are named.

1. INTRODUCTION

Enterprise information is acquired from (large) data sources located in enterprise database(s) and spread over networks. Making effective use of all these data and extracting information thereof is a critical issue facing the enterprise today.

Enterprise applications deploy enterprise data in different manners for different purposes. In practice, these applications are divided into two major categories, namely OnLine Transaction Processing (OLTP) and OnLine Analytical Processing (OLAP).

This paper aims at indicating that there are no strict borders between these two categories and suggesting that Business Objects (BOs) can be deployed for realising the OLAP applications besides the OLTP applications. This implies that applications of one category can be applied in the domain of the other category with minor changes.

In the following, first, the major characteristics of enterprise applications and the differences between the two categories are mentioned, and it is concluded that it is not always possible to impose rigorous boundaries between their domains. Then, the concept of BOs and its role within the enterprise information system is briefly reviewed. Finally, realising enterprise applications, based on extending the deployment domain of BOs from OLTP to OLAP applications, is discussed, and the resulting advantages are mentioned.

1.1 Enterprise Applications

The domain of enterprise applications is extensive. It encompasses a wide range that can be divided into two major categories. The one is involved with the enterprise day-to-day activities and the other is involved with the enterprise decision-making activities. Therefore, each of these two categories possesses its own special characteristics.

1.2 Online Transaction Processing Applications

OnLine Transaction Processing (OLTP) applications are process-oriented, that is, they are concerned with series of activities in order to fulfil defined tasks. The amount of data that these applications are involved with is relatively small and the number of maintained relationships that are effective in a given point of time is limited. The basic functions that form OLTP processes are insertion, updating and deletion of data. Therefore, transaction management is an essential subject to this kind of applications. Furthermore, OLTPs are often of critical importance for the enterprise, since the basic activities concerned with the outside world are embodied in, and exploited by, this kind of applications.

1.3 Online Analytical Processing Applications

OnLine Analytical Processing (OLAP) applications are data-oriented, that is, they are concentrated on data in order to extract (new) information out of it. The amount of data that these applications are involved with is relatively large and a large number of maintained relationships are effective simultaneously. Since data used by these applications is mainly applied for off-line analytical means, it is not needed to be updated at any given moment. Moreover, in order to achieve data suitable for this kind of applications, data filtering and data summarisation may be applied. This kind of applications is, mainly, used by managers.

1.4 OLTP Versus OLAP

The following table gives an overview of some of the essential differences between the two mentioned application categories.

Although we draw a line between the two main application categories, it is not always completely obvious which category we are dealing with. In other words, the borders are not strict. For instance, an OLAP may also be involved with processes or possess a critical nature, and an OLTP may also need to deal with large amounts of data. One of the basic known features of OLAPs is the summarising characteristic of their data, which is a relative concept.

The level at which data should be summarised may vary in different situations for the same decision support goals and in the same situation for different decision support tasks. Besides, the data used by OLTPs could be deployed for OLAPs as is. In summary, it is not always possible to impose rigorous boundaries between the applications as well as end-users regarding different enterprise tasks.

2 . THE BUSINESS OBJECTS

2.1 The Definition

The concept of Business Objects (BOs) is based on applying Object Oriented (OO) method in modelling business activities and realising business management [2]. Therefore, BOs can be considered as specialisation of the general concept of object that can represent real world business facets, their relationships, processes (or operations) involved with them and rules about (or constraints on) them. In practice, each BO abstraction is implemented by one or more objects. Accordingly, utilising this concept leads to known advantages of OO paradigm, like encapsulation of data and code, reusability of source code, convenient prototyping

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through production cycle, etc.

This concept is in conformance with the Three-Layer-Architecture (TLA) [3]. In this approach, business logic, the set of rules and constraints that govern the procedures and manipulation of data related to business, can be embedded in a separate layer between the front-end user interface layer and the back-end (data) service layer. In this way, the business logic is freed from any other issue than the regarding business.

Frameworks of co-operating BOs can result in business models that are more flexible and profound than those provided by traditional monolithic and client-server approaches, since they can be composed, decomposed and modified in a relatively easier manner. Therefore, realisation and modification of business applications based on BO frameworks is more manageable. Hence, the business applications can get better tuned to the business requirements and are able to deal with business changes easier and faster. Reuse of the same BOs in different applications can result in reduction of development time and cost. Besides, BOs can wrap monolithic applications and provide the opportunity to reuse legacy code and data.

To take the advantage of this concept efficiently, especially with respect to distributed environments, standards and globally accepted conventions are necessary. This guarantees the BOs' openness and their interoperability, and results in scalable systems. The Object Management Group (OMG) is engaged with devising such standards and conventions in different domains [4].

2.2 The Main Types

In general, BOs are divided into three main types [5]:

- Entity: Represents all tangible and intangible business elements and is closely related to the concept of entity in entity/relationship modelling.
- Process: Represents the activities that take place to fulfil the concerning business and reflects the (flow of) work needed to accomplish the defined tasks.
- Event: Represents persistent records or notification means for changes, happenings and occurrences that are important for the concerning business, related to particular actions or time periods.

In fact, Entity objects are the players and resources that carry out the activities described by Process objects, and Event objects are usually resulted from interactions between Entity objects with respect to Process objects and can trigger other processes.

Enterprise day-to-day activities are process-oriented. Therefore, realisation of the applications concerned with this kind of activities should be concentrated on Process BOs. Entity BOs should be defined around Process BOs, and Event BOs should take care of synchronisation issues.

Enterprise decision-making activities are data-oriented. Therefore, realisation of the applications related to this kind of activities should be based on Entity BOs. Process BOs can be defined to ease data manipulation needed by Entity BOs, and Event BOs can ease their interoperation.

3. DEPLOYING BUSINESS OBJECTS

Different enterprise end-users need to access data, originating from different data sources, from different perspectives, in order to perform specific day-to-day and decision-making tasks, and produce reports.

Accordingly, important features necessary for dealing with enterprise applications can be defined as follows:

- Capability of providing the means for discovery and capture of data from different data sources, without any concern about their location and properties regarding representation, format, logic, storage, etc.
- Imposing no restrictions based on the peculiarities of the application in question, regarding target end-users, e.g., operators and managers, and target tasks, e.g., daily service systems and decision support systems.
- Ability to manipulate and modify the data views fast and reliably, without having to make intrusive changes in the applications.

BOs are currently used for applications that can be considered as OLTPs. However, the usage domain of BOs can be extended to cover the enterprise applications of the other category, OLAPs, as well. As such, models consisting of BOs can be deployed for design and implementation of different enterprise applications.

3.1 Basic Characteristics and Functionality

To be able to comply with the requirements regarding a comprehensive solution for enterprise applications in a distributed environment, there are different characteristics and functionality that should be fulfilled. This can be taken care of by BOs and their dedicated facilities.

The desired basic characteristics are:

- Possessing a unique name within the deployed domain. This is needed to make it possible to address BOs directly and without any concern.
- Possessing (state) attributes.
- Possessing methods for manipulation of (state) attributes and performing other tasks.
- Providing introspection and self-describing capabilities. This improves the search and access possibilities, and can be realised based on naming conventions as well as special methods.
- Capability of accessing to different data sources, simultaneously.
- Capability of extracting data, based on the existing data, according to predefined as well as user-specified parameters and patterns.
- Capability of storing multiple data for the same attributes at the same time, according to predefined as well as user-specified parameters and patterns.
- Capability of maintaining semantic relationships between different attributes as well as different versions of each attribute.
- Capability of restricting access to attributes. In this way it would be possible to mark attributes as read-only.
- Capability of storing (state) attributes.
- Capability of participating in relationships with (other) BOs and objects.

The desired basic functionality of dedicated facilities are:

- Supporting relationships between BOs themselves as well as BOs and other objects. This, among the other things, implies subjects like insertion, removal and iteration based on relationships.
- Supporting collections and offering iteration mechanisms.
- Managing concurrency and transaction. BOs can be shared by different users and can be recoverable or not.
- Managing security issues. This includes user authentication and ciphering services.
- Managing event notification. Changes in the internal states of BOs as well as occurrences of special actions or points of time should be made known.
- Managing life cycle, i.e., creation, deletion, activation and

deactivation at runtime. BOs can be created and deleted once and may be activated and deactivated several times.
- Managing persistence through underlying database(s). This provides BOs with the means to save and retrieve their state (attributes).
- Managing access to enterprise data, i.e. data stored in (legacy) databases and placed on network. This conveys the (basic) data for BOs and maintains their connection to the enterprise information system(s).
- Managing the (graphical) viewing of BOs. The BOs' data should be presented using meaningful views regarding the business, operation, user and session in question. This takes place through finding and assigning the suitable views, and maintaining (direct) communications between BOs and their views.

To equip BOs with the features needed for different applications, they should be constructed with the right characteristics and utilise the right facilities. For instance, BOs meant for tasks involved with decision-making activities should, especially, be able to:
- Transform data according to defined patterns.
- Summarise data according to user-defined parameters.
- Make their attributes read-only.
- Make their states persistent.

And BOs meant for the tasks involved with day-to-day activities should, especially, be serviced by:
- Transaction management.
- Event notification management.
- Access management.

3.2 The Advantages

Deployment of BOs in conformance with the addressed characteristics and functionality can result in various advantages. The main advantage is providing an integrated environment for enterprise applications. Such an environment eliminates the complete separation of applications according to their characteristics, concerning data, end-users, goals, etc.

A particular case, where this approach can be helpful, is that of Data Warehouses (DWs). That is, this approach can result in DWs that are more flexible and can be better tuned to special requirements. Taking advantage of BOs lets the end-user access and extract data from different data sources, and store (new) data in different storage facilities with the desired level of detail and granularity, in the form of BOs. These BOs can later be accessed, manipulated and applied in new applications.

1 For a discussion about the definition of BOs refer to [1].
2 Discussion about this subject and its related issues is out of the scope of this paper.
3 In spite of applying objects for the applications that can be considered as OLAPs, those objects do not come under the general definition of BOs and are, mostly, front-end objects with predefined functionality.
4 Many of the, in the following named, characteristics and functionality are addressed in different documents about BOs, as BOs' properties and related services [4]. However, for the sake of completeness, here they are not excluded. Besides, the lists are not exhaustive.
5 In general, DWs present locations, where information from heterogeneous (legacy) databases is copied to a single central database and is updated in defined periods of time to reflect the actual data. This data can then be used with out worrying about slowing down the main database systems [6].

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