Design and Analysis of Content Management System Based on Factory Pattern

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Abstract   Content management is an integrated application of many IT advanced technologies, and the acquisition, management, utilization, transfer and increment of various digital resources can be mainly solved by it. This paper introduces a system frame based on robust, complying with the design idea of the websites content management system based on open standards. The author discusses the design pattern and module architecture of scalable integrated websites content management system under framework of Net.
Key words   Content management system; Factory rattern; Module

1 Introduction

With the enrichment and development of network applications, many websites can not promptly follow up the steps of lots of information derivation and business model reform. It is a more complex work to integrate intranet, internet and branch websites, even need reconstruct websites when websites expanding. Continually, users always upgrade and integrate websites in a high cost and low efficiency circulation.

2 The Meaning of Content Management System

2.1 The concept of content management system

CMS is the abbreviation of Content Management System, which means "content management system"[1]. The industry has not a uniform definition to content management, different institutions have different comprehension. Gartner Group holds that content management should include enterprise internal content management, web content management, electronic commerce transaction content management and Extranet information sharing content management according to connotation, and web content management is a focal point currently. Content management system emphatically solves acquisition, management, utilization, transfer and increment problems of various kinds of unstructured or semi-structured digital resources, and it can be organically integrated into business intelligence environment of structured data, such as OA.

The content management system is an application system specially oriented to websites content editing and publishing in this paper, which is based on robust system frame, complying with open standards[2], easy to integrate with other applications and extend different functions, and deploying quickly. Development CMS aims at alleviating the workload of websites maintenance and the complexity of establishing various kinds of information websites, standardizing the web background information management and publication procedure, unifying the format of data storage, reducing the investment of websites maintenance, strengthening the privilege management of information publication, making the operation management and content maintenance of websites simple and quick. The content creator, editor and publisher use content management system to submit, modify, approve and publish the content. The content here maybe include files, tables, pictures, data in database, even videos and all information which you want to publish on Internet, Intranet and Extranet.

2.2 The demand of content management system

1) It can assign roles according to system users, in order to guarantee the accuracy and high efficiency of information publishing (For example, it can set corresponding privilege and real-time management function for checker, auditor and publisher.);

2) It can define management procedure and create collaborative task, setting event notification content in order to remind managers to concern with procedure change and task finish. (For example, after a content creator submits the content to deputy editor, the deputy editor modifies the content and informs chief editor that the content has been changed and finished, then the chief editor approves and publishes it.);

3) It can track and manage multi-version operation information of one case content (For example, it

can examine corresponding events according to case content through content management log module.);

4) It can publish content and control content according to set rules, supporting content search and retrieval.

3 The Design Pattern of Content Management System

The design pattern[3] of content management mainly includes creational pattern, structural pattern and behavioral pattern under the framework of .Net. The creational pattern is used for creating objects, which is an abstracted and instantiated process, it helps one system be independent to create, combine and represent its objects. There are two characteristics in creational pattern: firstly, it packages concrete class information which used by system; secondly, it hides how to create and organize the cases of class.

Factory pattern is one of the patterns in creational, core factory class is no longer responsible for creating all products in factory pattern, but giving concrete creation work to subclass. This core factory class is only responsible for giving interface realized by concrete factory, but not contacting detail such as which product class is to be instantiated, which makes factory method pattern can allow system to introduce new product without modifying factory roles. In factory pattern, factory class and product have parallel hierarchical structure, they are   one-to-one correspondence.

The method to realize the design of factory pattern in content management system is as follows: create an interface of C#, and make sure that there is a method of declaration for every class of database access. The system must create a concrete class to realize specific codes for each database supported, in order to execute each operation of interface. It needs to create a third class, factory class, in order to support system to ensure which concrete class is to be loaded during running, factory class reads in a value from configuration file to ensure which procedure set is to be loaded through using reflection. Namespace by reflection of .Net can load one specific procedure set and create one object case of this procedure set.

The configuration in web.config file according to the type of database used (SQLSever or Oracle) during configuring system is as follows:

<add key=" WebDAL " value=" webpub.SQLServerDAL "/>
<add key=" OrdersDAL " value=" webpub.SQLServerDAL "/>
or
<add key=" WebDAV " value=" webpub. Oracle DAL "/>
<add key=" OrdersDAL " value=" webpub .Oracle DAL "/>

then calling the database connection of Data Access class in DAL Factory project, and the codes are as follows:

private static read only string path = Configuration Manager. AppSettings["WebDAL"];

executing following codes finally:

public static webpub. IDAL. ICategory Create Category() {string class Name = path + ".Category"; return (webpub. IDAL. ICategory) Assembly. Load (path). Create Instance (class Name);}

In this way, users do not need to know which database is to be used in background, as long as calling the interface. The method used is defined in interface, so it will call an access operation of bottom data when it calls an interface according to concrete conditions. The DAL Factory is key here, it will use one of the generated procedure set SQL Server DAL or Oracle DAL again according to concrete conditions when business logic layer operates database, the advantage of doing it is that business logic layer and web page layer will not be affected when access procedure of bottom data has been changed, because it needs to call interface in business logic layer.

Figure 1 shows how to operate mutually among business logic class, factory class and database access class. The most important advantage of the created solution is that database access class can be compiled after business logic class, as long as database access class realizes interface of IDAL. This means that it does not need to change business logic layer (or UI layer) if creating application of MySql version. The steps of creating MySql compatible version are as follows:

1) Creating the database access class of MySql, and it must realize the interface of IDAL;
2) Compiling the access class of MySql to a procedure set;
3) Testing and deploying the new data procedure set to a server which is running;
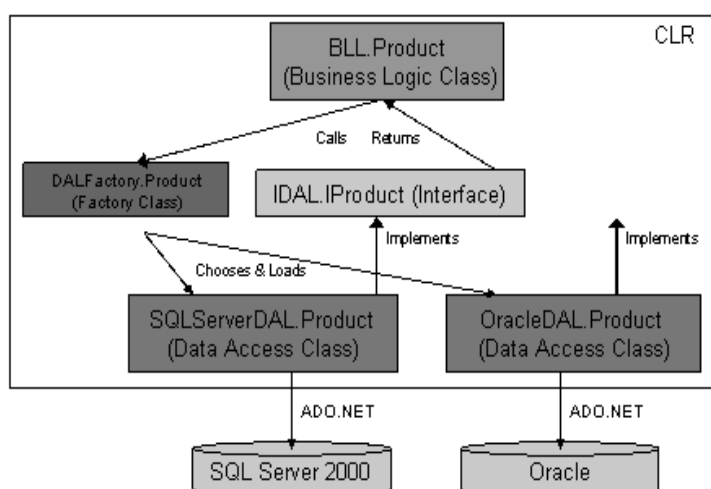4) Modifying the configuration file, pointing to new database access class.

Figure 1   The Realization of Factory Class

4 The Module Design of Content Management System

It always uses modularization idea to design large application in software design. Because content management system is involved with a lot of aspects, it always adopts modularization idea to deal with problems. A content management system with full functions needs following modules to support it according to the aforesaid requirements, and it realizes the functions of content management system through coordination among each module.

4.1 The module of user management

The module of user management is divided into two parts: user group management and user management, in order to reach the purpose of role assignment according to different system users in system design. The user group management is a management area where it carries on various operations to system management user group. This part incorporates the module of windows user management, and combines various system operation authorities together, which is called user group. The concrete operations include creation, deletion, authority setting and search for user group. Different management type user groups embody different concrete authorities to users. The user management is a management area where system management users carry on various operations. The concrete operations of this part include creation, edit and deletion.

4.2 The module of information management

The module of information management is a core part in content management system, which includes creation, edit and deletion functions for category, special and content.

Any category attribute of a complete information is determined in order to make information more methodical, at the same tine, more convenient to manage, and quicker to publish in content management system. The category may infinitely include subcategory in content management system, but the category included subcategory does not permit content to be concluded to it. System demands that the operator make sure there is no information in category and subcategory in order to maintain the certainty of information category when deleting it.

It needs to get different category information together to increase the special attribute of information in order to satisfy some situation. The distinction between information special attribute and category attribute is that, the category attribute is unique and determined, but the special attribute is not unique or determined. The same information can belong to various special or not belong to any one special at all.

Combined with the need of news publishing, the content management system divides information into three classes: common information, header information and link information. The header information and link information have not content, they only display one header or one jump link on page. System can satisfy various demands of information publishing through classification like this. Moreover, it also defines a status attribute to information, which indicates the state of information circulation. The content management system divides information status into following classes: abandonment, deletion, auditing and publishing. Any information status is unique and determined, so the information can be displayed on page only when the information status is publishing. The distinction

between abandonment and deletion is that, information with deletion status will automatically be deleted physically from database after one week of operation, but information with abandonment status will not.

4.3 The module of procedure definition

The module of procedure definition serves to the module of information management, in which it can define the process of information circulation. For example, the procedure of figure 2 is defined as following:
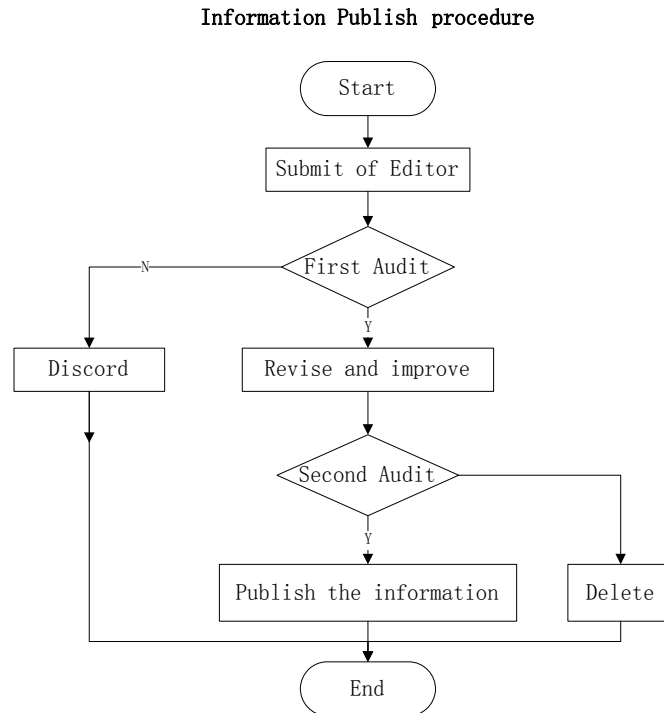
Information Publish procedure

```
                    ┌─────────────┐
                    │    Start    │
                    └──────┬──────┘
                           │
                    ┌──────┴──────┐
                    │Submit of Editor│
                    └──────┬──────┘
                           │
              N         ◇─────────◇
         ┌────────────<  First Audit >
         │             ◇─────────◇
         │                  │ Y
    ┌────┴────┐      ┌───────┴────────┐
    │ Discord │      │Revise and improve│
    └────┬────┘      └───────┬────────┘
         │                   │
         │             ◇─────────◇
         │            < Second Audit >─────────┐
         │             ◇─────────◇             │
         │                  │ Y                │
         │          ┌───────┴────────┐    ┌────┴────┐
         │          │Publish the information│  │ Delete  │
         │          └───────┬────────┘    └────┬────┘
         │                  │                  │
         └──────────────────┼──────────────────┘
                     ┌──────┴──────┐
                     │     End     │
                     └─────────────┘
```

Figure 2   Self-defined Procedure

The process of information circulation is defined like this: Firstly, information circulates to deputy editor, and it can be abandoned or circulate to chief editor after audit by deputy editor. Secondly, information can be deleted or circulate to publishing procedure after audit by chief editor when it reaches chief editor. Finally, information can be displayed on websites if it reaches the publishing procedure.

The procedure definition above indicates that the module of procedure definition can satisfy the demand of division responsibilities and information accuracy.

4.4 The module of event log

The function of the module of event log is to satisfy the demand aforesaid that it can track and manage multi-version operation information of one case content. For example, the deputy editor modifies the content and informs chief editor that the content has been changed and finished after submitting the content by creator during the process of information circulation. It can record the operator, time of event occurrence, IP of operator and content of event involved in the procedure through this module.

It is very easy to search events and persons responsible for problem happened through the module if there is a problem in the information circulation. Moreover, it has the function that it can export information to EXCEL or XML documents. It also can clear early log according to rules set in order to save the space of server.

4.5 The module of content retrieval

This module can help users finding information needed from plenty of information. The content retrieval module in early content system retrieves directly from database through constructing complex SQL languages. It brings the problems that it can increase the burden of database server, consequently, affecting the throughput of websites, furthermore, it brings security problems to database. But in present content management system, it makes data search quicker and websites data safer through using

database of Lucene.net.

Lucene is an open source program library[4] used for full text retrieval and search, which is supported and provided by Apache software foundation. It provides a simple and powerful application interface, which can realize full text retrieval and search. Lucene is a mature tool providing free open source. It is the most popular program library for java information retrieval freely in recent years and nowadays in terms of itself. It has been transplanted to the platform of .Net presently, so the open source is called Lucene.NET.

4.6 The module of system template

It abandons the former idea of putting program and page together in constructing websites, and comes up with new idea during the development of websites construction technology. Program and design is separated in the new idea, so the program is independent from page, and it is called through other methods in page. In this way, page without program forms template in usual meaning.

The using of template makes combination work between complex page and program easier than former. The maker of page no longer needs to know the PHP or ASP program languages[5] and database operations, he only needs to edit page to combine page and program together, making a website with various functions; At the same time, the extension of template technology makes a great deal of repetitive work being finished once during the process of websites page making. Editing single template can finish the modification of whole website in most situations. Therefore, the appearance of template technology makes the technology threshold of websites construction lower and the manufacture efficiency upper.

5 Conclusion

A content management system with high efficiency, high looseness and low coupling, using factory pattern and modularization idea, based on the environment of .NET, is discussed in this paper. A content management system with three layer construction can provide more flexible solutions in deployment and selection, making applications self-define more easily, adapting to the change in business module. Moreover, the idea of modularization can realize the functions of content management system through tight coordination among each module, making each sub-module meet the characteristic of high cohesion and low coupling.

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