

Research and Application of Software-reuse

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Abstract

Reuse-based software technology is a process of designing software for the reuse purpose, which can great reduce the time and expenses of developing and can enhance the flexibility, maintainability and reliability of the software. Reuse-based software technology is software developing trend and a hot spot of this century. In this paper, the technology of software reuse is studied, and a software reuse idea of stock managing domain is put forward. At the same time, the process of build a software reuse model of stock managing domain is described.

Key words: Software Reuse; Spare Parts; Stock Managing; component

1. Introduction

The “software crisis” exists with the development of software for many years, which made people began to pay attention to the research of software structure and producing pattern and resulted in the conception of “software engineering” finally. Reuse-based software technology has developed for about thirty years, since McIlroy put forward the conception of software- reuse formally in 1968. The object of reuse extended to all the useful information in the process of software developing which included requirement, requirement regulation, design, code, testing plan and

testing case etc. from only code reuse early. The practice about thirty years proved that software-reuse can enhance the quality and productivity of software and was a feasible way to solve the “software crisis”.

The software field also put forward many software-reuse methods from different angles. The putting forward of particular domain thought makes the large-scale software- reuse possible. By particular domain analysis to that engine in the process of software developing, the particular need of that engine becomes the typical need and special need of that domain. After getting the software frame of the particular domain and installing corresponding reuse component, the development of the software will complete ^[1].

In this paper, the spare parts stock managing system is prototype and the process of establishing stock management domain software-reuse model is elaborated including the domain analysis, the establishment of domain system structure DSSA and the extraction and realization of component etc. combining the theories with technique of software-reuse.

2. Brief Introduction of Software-reuse

2.1 The Definition of Software-reuse

The software-reuse is a process of reusing "the

software designed for reuse purpose". Software-reuse is the solution that avoids a repeated labor in the software development and Can make use of the knowledge and experience getting from the past software development and concentrates the especial part of application. It's aim is making the software development from zero no longer.

2.2 The Scope of Software-reuse

Software-reuse can be divided into product reuse and process reuse according to the reuse object .Software-reuse can be divided into product reuse and process reuse according to the reuse object .The product reuse means the reuse of software component, getting a new system from component integration and construction. The process reuse means the reuse of past software development process, automatically or half-automatically producing the system using the reuse generator. The process reuse depends on the technical development in the software automation, only applicable to some special applied domain currently, but the product reuse is a realistic and essential path now.

2.3 The Mode of Software-reuse

The software-reuse can be divided into black box reuse and white box reuse according to the reuse mode of reuse information. The black box reuse means to use the component directly without modification. This is the ideal way. The white box reuse means that the component can't meet the customer need completely also and can not be used until be properly modified according to the customer need. But in the mostly applied construction process, the adaptability modification of the component is essential^[2]

2.4 The Process of Software-reuse

a. domain analysis phase: This phase is to come certain whether deserve to reuse the infrastructure for the domain development mainly through the definition and analysis of application domain.

b. domain engineering phase: This phase is to acquire general system structure according to the domain commonness getting from domain analysis phase and regulate how the property match the system structure and how to bind variable point.

c. property obtaining phase: This phase includes development of reuse, may also includes some exterior adopt of reuse property.

d. Property categorizing phase: This mission is a database management mission actually, including categorizing and saving reuse property.

e. Property maintaining phase: This mission is a maintenance mission actually, and to combine configuring management and edition control.^[3]

3. Domain Analysis Phase

Domain Analysis is put forward by Neighous at the first time in his doctoral dissertation "the software construct of the using component " in 1981 ^[4].Its meaning is "the process of identifying, catching and organizing the reuse information of alike object and operation inside the system in the particular domain . Its purpose is to suppose the systematized software-reuse

During the period of domain oriented development, domain analysis is the work of the first stage. It's task is Mainly to qualitatively, extensively and thoroughly analyze the applied system belonging to the domain, then to analyze the commonness and denaturalization of the applied system in the domain. After that, the domain border model will come into being. Then form the domain model and compose the requirement regulation direction.

3.1The Analysis of the Stock Management

Domain Workflow

The domain workflow is as follows: firstly, put forward the yearly purchasing plan and the monthly purchasing plan, then hand over them to equipment management department. The department will collect and balance the plans, then build the purchasing plan and hand over it to the purchasing agent. The purchase is divided into local purchase and abroad purchase. The local purchase process is: sent out inquiry price lists toward the suppliers, then do comparative price and comparative quality according to the price lists sending

back from the suppliers, then makes sure which supplier's goods will be purchased. The abroad purchase process is: look for supplier, sign a list, do a purchase. Then supplier delivers goods, quality check by the quality check section, then accept goods by the warehouse management section and store in warehouse. In the meantime, the finance section pay the money and the workshop personnel can go to warehouse to pull down the spare parts.

3.2 Build of Domain Border



Figure 1. Domain border diagram

The domain border is the function realm that the current domain engineering covers. First, we can analyze the relation of current domain and external entity. Second, we can identify general character. Third, we can analyze and predict the denaturalization. Finally, we can get the domain border model. Figure1 is the diagram of the domain border.

4. Build of the Software System Architecture

The software system architecture elaborates the ruler of the organization, alternation and adjustment of

the software system high level computation parts. In essence, it is an abstraction of high level, provides a kind of path to carry out software-reuse based on component from head to foot. If it is a foundation of system structure and evolving , we can carry out large-scale and systematized software-reuse.

Professor Mei hong put forward ABC method which is the Architecture-Based Component Composition. The method combines software system architecture with software development based on component together and regards software system architecture as blueprint of system development. It

guides analysis, design, implement and maintenance of the system during every lifecycle. Finally, we can carry out the software-reuse based on component.

In ABC method, software system architecture is an important software product throughout the whole software lifecycle and the conformation of the software

system will proceed surrounding the software system architecture^[5].

Here, we decide to adopt delamination model as structure model of the stock management domain system based on ABC method after compare kinds of present mainstream structure model.

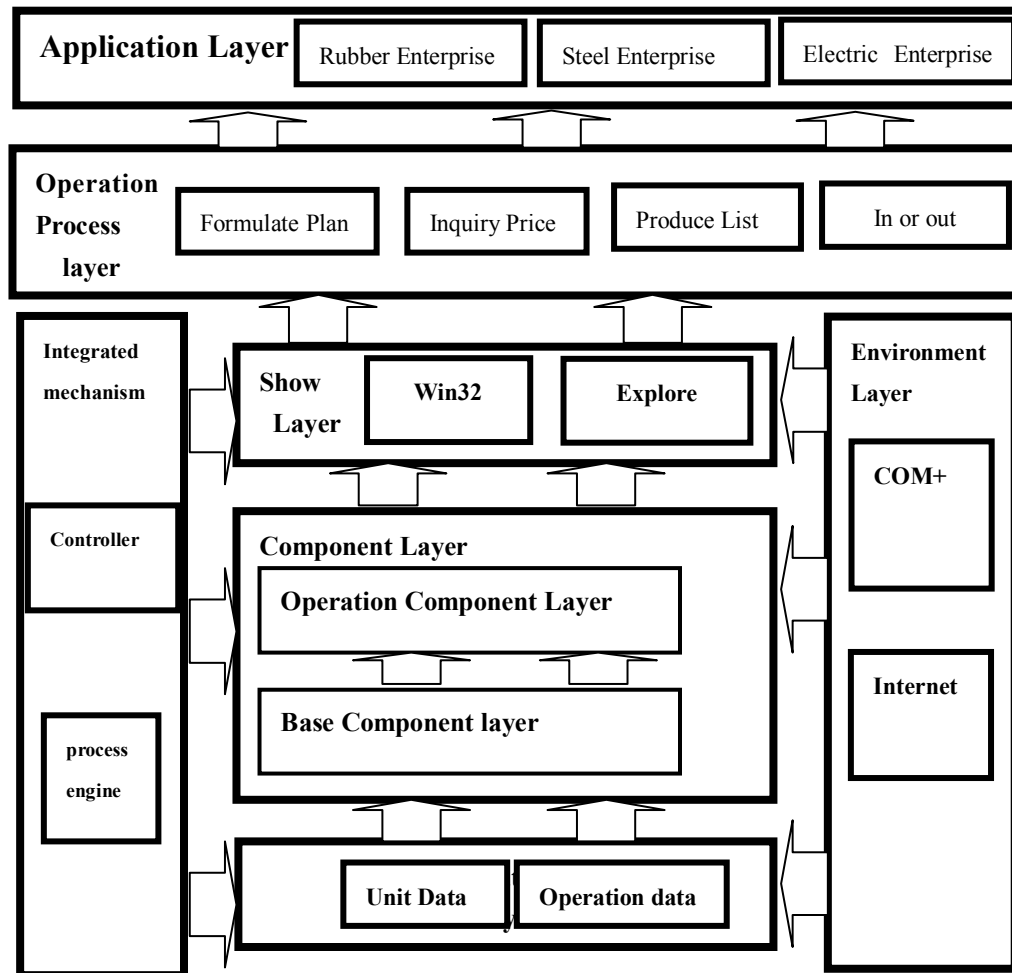


Figure 2. **System architecture view**

Such as figure 2, we divide the system into 4 module according to ABC design principle and carry on organization according to layer structure . Then, illuminate the function of each layer.

Foundation Data Layer:

(1) The layer includes the public foundation part of the whole system, namely the foundation data and system serving part. This layer is the foundation of

other layers

(2) Data Access Layer:

The layer provides a uniform data access interface for the operation logic layer. The operation logic layer reads/write through that layer.

(3) Operation Logic Layer:

The layer is the core of the whole system. All the judgment and realization of the whole operation

logics and operation rules are finished in this layer. The emphases is the realization of operation logics and operation rules in this layer .

(4) Show Layer:

The layer is the interface between customer and system and the layer can be transferred to provide a service for the customer through that related function of the operation logic layer.

(5) Environment Layer

Mainly is the basic environment that the system request, for example COM+, Internet and the correspondence agreement etc..

(6) Integrated Mechanism

It is the key of the system reuse. The controller is mainly used to order various customer interfaces that accord to customer's request, but the process engine is realization of the customer's operation logic and operation process.

(7) Operation Process Layer

The layer is some ordered related operation modules.

(8) Application layer

The layer is some material cases of application templet combination.

5. The Extraction and Realization of Reuse Component

By above analysis, 11 components are extracted. Then, illuminate the design and the realization of the component taking "goods place management" component as example.

5.1 Function Description

Have the function of accepting goods, keeping accounts and inquiry about the information of entering warehouse and carry the spare parts that sent according to the order by the supplier into the warehouse. After receive the invoice, the financial affairs confirm the purchase accept indenture.

5.2 Application Scene

Enter warehouse:

the operator chooses warehouse, fill in the information of in and out date.

For each record

IF specifies a goods place

THEN inputs the goods place information

END IF

modify the information of out quantity and price

End for

save

keep accounts:

find the in bill

fill in the information of keep accounts date and invoice number during accountant

For each detail

Fill in the information of price

End for

modify the bill state

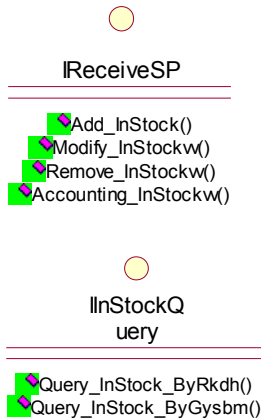
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5.3 Use Restriction

Depends on some base components such as "stock accounts form", "in form", "in form list", "supplier information form", "spare parts base information form", "warehouse management form", "goods place information form" and "spare parts place relation form" etc..

5.4 Interface Design

This component designs two interfaces: accept goods (IReceiveSP) and store in warehouse information query (IInStock Query).



Other components' description are omitted.

6. Summary

A stock management domain software-reuse thought is put forward in this paper after research the software-reuse technology. The domain analysis, the foundation of domain system architecture (DSSA), the extraction and realization of reuse component are researched and realized in detail.

It is a worthy and potential problem for theory and practice that introduce the software-reuse technology into software development. But, the software development thought need research and perfect farther and there are a lot of work to do for it.

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