



# Journal of Applied Sciences

ISSN 1812-5654

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## Design and Realization of Personal Internet Banking System Based on Multi-tier Architecture

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**Abstract:** The emergence of Personal internet banking is changing people's way of life and working. It decreases the cost of production and operation essentially. But the co-existence of security and usability is a hard and complicated problem to solve. This article raised a personal internet banking system based on the structure of jQuery EasyUI+Struts+Spring+Mybatis. Firstly, in terms of usability it adopted the technique which combined jquery and esayui together, therefore, the front desk of Windows is Metro style that users only need to do few buttons-operations, then the operations can be done. Lastly, in the background desk it adopted Struts+Spring+Mybatis to enforce the maintainability and extensibility of Personal internet banking system.

**Key words:** Personal internet banking system, multi-tier architecture, UML modeling, three layer of approval, transfer the remittance

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### INTRODUCTION

Recent years with the rapid development of network technology and widespread of computer, the speed of economic globalization is faster and faster, several business activities and business investment through electronic commerce is spreading all over the world. The development of electronic commerce prompts a new way of trading in banking industry (Jiang *et al.*, 2009) to satisfy its needs. Therefore, the emergence of personal internet bank is the need of the generation and history. The emergence of Personal internet bank is changing people's way of life and work and it greatly changed the capital information transfer mode and also it raised the efficiency of fund flow. However, people on one hand enjoy the convenience of internet bank and on the other hand, they are worried about the security of internet bank. Internet bank for today is just like the competence between the lock and the key: The lock is the majority installed security measures of the internet bank; the key is what makes the users enjoy the usability of network through convenient ways. Although the functions of internet banking are more and more plentiful and the efficiency tends to be high, the security problem is what the customers mostly concern about. Therefore, how to solve the problem of the co-existence of security and usability of personal internet banking system and how to solve the security problem is the most important thing.

This article raised a way to use JavaEE (Zhang, 2010) to design and realize personal internet banking system (shortened as IBANKING System (Zhang and Zhang,

2009, 2010) based on Oracle database. The problem it has to solve is that how to realize the co-existence of security and usability. In terms of usability it can be achieved by the beautiful interface of front desk and simple and practical forms. In terms of security it can be achieved mainly by the approval of administrator and system automatic validation. In terms of administrator approval it mainly uses administrator's three layer of approval and in terms of system automatic validation it mainly uses jQuery+jQuery EasyUI based on AJAX to validate, combining the usage of regular expressions.

### MVC DESIGNING MODEL AND ITS REALIZATION

The full name of MVC is Model View Controller which is the short name of model, view and controller. It is a model of software design, used to organize the code to separate business logic and data display. The premise of this assumption is that business logic is gathered in a component and the interface and customers' interaction about the data can be improved and personalized, rather than rewrite business logic. MVC is developed exclusively to be used to make the mapping traditional input, process and output in one logical and graphical user interface. The advantages of MVC design model are:

- Low coupling
- High usability
- Cost of life cycle is low
- Fast deployment, high maintainability
- Conducive to engineering management

## OVERVIEW OF JQUERY FRAMEWORK

jQuery is another excellent Javascript framework after prototype. It is a lightweight JS base it is compatible with CSS3 and other browsers. jQuery is free of charge and is opened it uses MIT license agreement. The grammar design of jQuery is more convenient, for instance, operating on document object, choosing DOM, making animation effects, using Ajax and some more functions. Besides, jQuery supplies API which is easy for developers to write plug-in. It can make the developers to develop other static and dynamic web page easily. The jQuery EasyUI is a UI plug-in collection of jQuery. The aim of jQuery EasyUI is to help web developers to create more plentiful and beautiful UI interface. The developers needn't to write complicated JavaScript and needn't to acknowledge css deeply, what the developers need to do is to understand some simple html labels.

## INTRODUCTIONS OF STRUTS

Struts is a nice MVC framework (Metsker and Wake, 2009) it used Servlet and JSP as a part of realization. Struts inherit the all kind of advantages of MVC and it makes some changes and extensions according to the characteristics of J2EE. There are three main components of Struts: one controller and one Action class which responsible for business processing; one JSP (view); one business logic encapsulation (Model). The central controller of Struts (ActionServlet ) receive the request from customers and it requests other Action objects according to system configuration( Struts-config. xml) through HTTP. To undertake business operation in these Action objects, after processing, transfer from ActionServlet to JSP and give the result back to client side. At the same time, encapsulate data through ActionForm between Model and View. Struts working map is showing in Fig. 1.

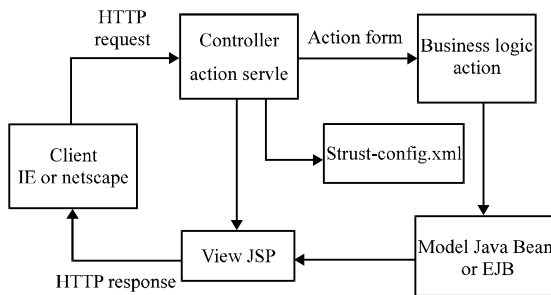


Fig. 1: Struts working map

## ANALYSIS OF BUSINESS CHARACTERISTICS OF PERSONAL INTERNET BANKING SYSTEM AND THE DESIGN OF FUNCTIONAL MODEL

Personal internet banking (Zhang, 2010) is the representative of e-bank. The characteristics of internet bank can be summed up as 5W: To realize whoever in whenever at wherever to pay and settle with whomever in however way safely. So, the general client, any customers' need is the core need of the whole system and the need of administrator is established on this basis. The customers' need is mainly analyzed from two aspects of usability and security and how to realize security and the security flow is considered from the perspective of administrators. Due to that internet banking needs only few workers, many businesses can be put on internet to let customers do it themselves and hence, to use this system can greatly reduce cost of bank industry and can speed up the efficiency and speed of fund flow. Meanwhile it meets the need that customers want to invest and manage the funds easily and quickly. According to the above analysis, now the personal internet banking can be divided into 10 models: Log in and register model; the user information management model; transfer remittance model; credit card request model; bank card management model; investment management model; payment model; points exchange model; information query model; common tools model. The system model is showing in Fig. 2. These functional models are finished by administrators and users. Take transferring money as an example, after users submit the transferring forms, confirmed submit, the system will create a transaction number automatically for this and then it will hand to administrators to be approved hierarchically, at this time, there are messages in each layer's approval sending to clients to let the clients know the transaction status and finally there will be a status of this transaction feed back to users. Till here, the transaction is finished.

## DESIGN OF SYSTEM PROCESS

This system (Zhang, 2010) can be visited by three identities; they are users, administrators, tourists. The tourists can visit all the other services except business functions, including front page, register, member club, points mall to acknowledge the latest website information. Users can do all sorts of business on the basis of tourists and at the same time, they can register to be VIP and they can use points to change products. The administrators enter the system and they can manage the business

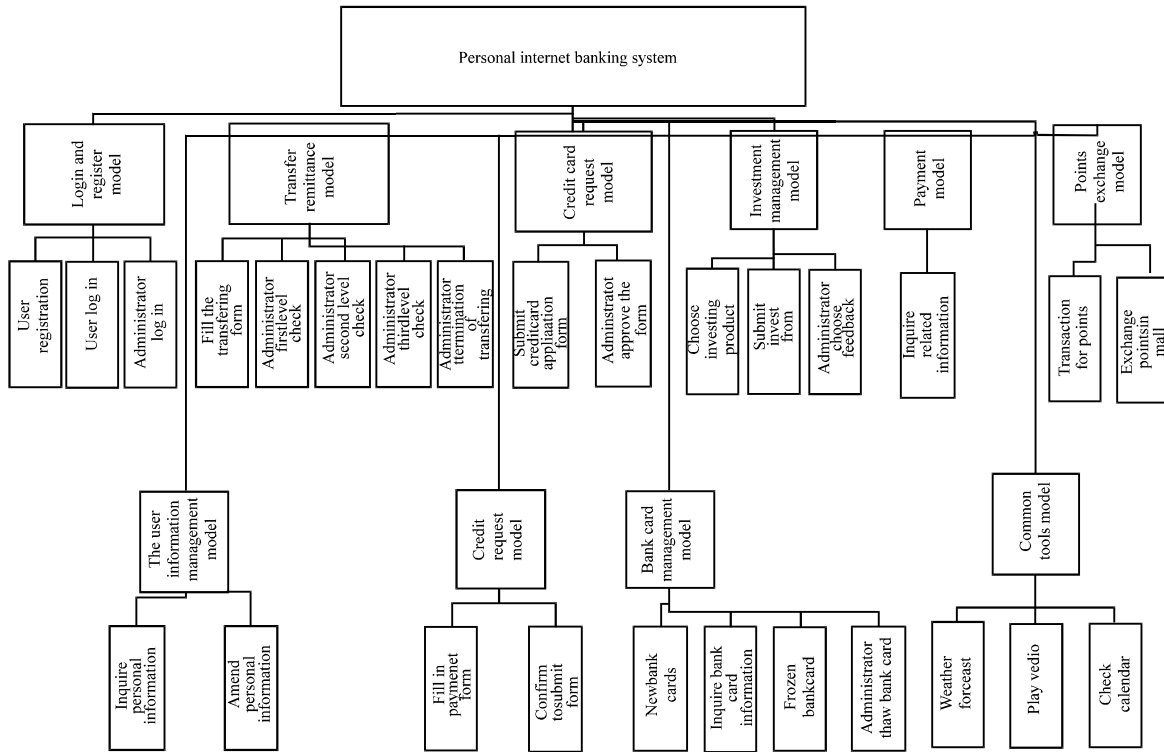


Fig. 2: Personal internet banking system functional diagram

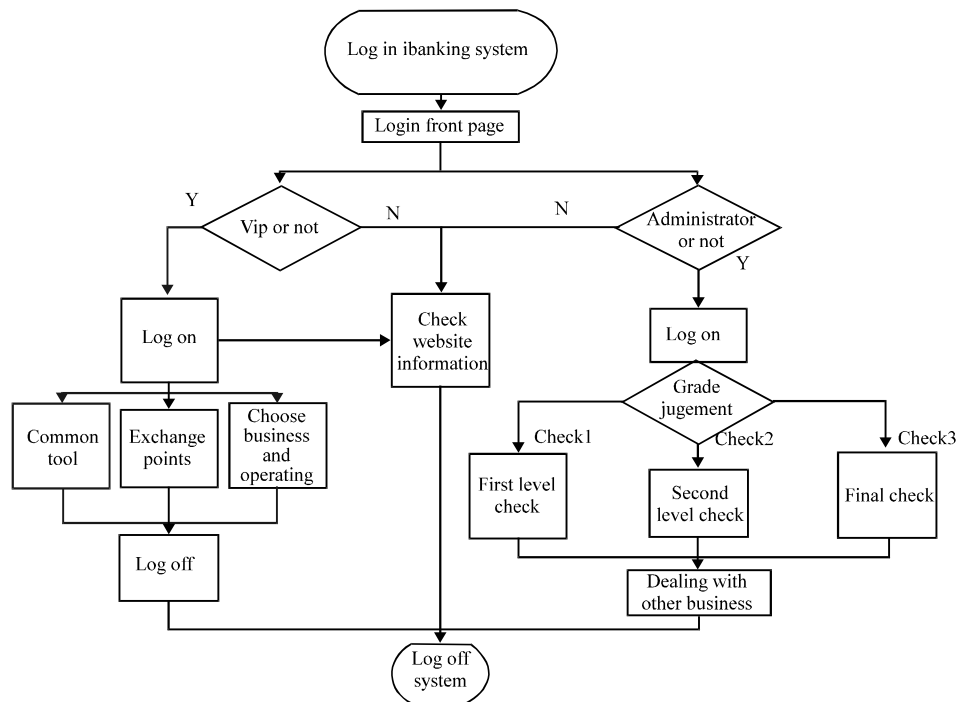


Fig. 3: System process of internet banking

process. The system process is showing in Fig. 3. This process is designed for three identities that tourists have

rights to scan most web pages, they can read the latest news and information and they can register to be users.

Users can log in to do business operations. The administrators offer services to users, doing the check hierarchically and guarantee the security.

**DETAILED DESIGN OF INTERNET BANKING SYSTEM FRAMEWORK**

From Fig. 4, there are four layers based on MVC in this system (Zhang, 2013). They are Presentation layer, controller layer, business layer, logic layer. The first and the last connect to browser and database. The main responsibilities of these four layers architecture are as followings.

The main responsibility of presentation layer is to use JSP in Struts to present and feed back some application forms and data. In the design of MVC it is just like VIEW. In the realization of this layer its main purpose is to make VIEW more beautiful. Here, the function of jquery and jquery easyui will be described more. The function and meaning of Javascript in front desk is its plasticity it means that it can be created and the codes can be organized to reach the best effect. The function of jquery and easyui is to make this step much easier and more convenient.

The main responsibility of controller layer is to use some pointed Servlet JSP to find its specific position in Web.xml. Servlet, as the core of controller layer it controls the transmission and match between data and forms and it encapsulates them. It is the controller in MVC. IN this system, the filed and forms read from the front desk then

will be sent to the back by Servlet to do the detailed inquiry. And the returned value will be encapsulated to be a list and will be handed to VIEW for display.

Business layer is for undertaking. When Servlet finished the task, the data filled in the front desk form will be sent to Service for next step operation. The function of Service is similar to communication platform in the external interface.

The business in front desk will be transferred to the next logic layer DAO through this platform and to realize the the specific operations. After DAO makes inquiry, delete and insert it will return a value or a series of characters to Service and it will be handed to controller by Service and then controller will do the encapsulation of data and traverse to the form in front desk. In business layer, use Spring and use IoC to assemble and manage the business, the aim is to let the coupling among classes be the lowest. And use AOP to do the declarative management.

Task of Data layer is to do the series of operations on database. In this system, when data transfers to DAO and do the operations, data should be returned and post processing will be done. When inquiry is successful, there will be a Boolean value returned, true means finding the information and getting the feedback, false means no data and the wrong information will be feed back. The specific information feedback will be a List and will be traversed and displayed to front pages.

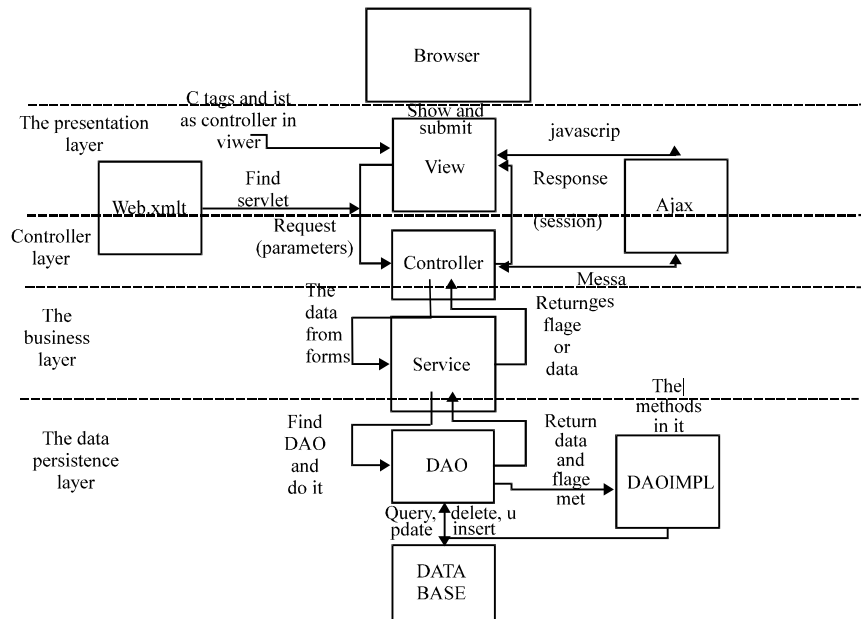


Fig. 4: System structure of personal internet bank

**REALIZATION OF THE SYSTEM**

Among all the businesses of personal internet banking, the most important one is transferring remittance. The most significant thing and the users care most is the security and I will be displayed in this part sufficiently. On one hand, transferring remittance is the purely input and output it is different from investment, there is no fixed return. And it has to make sure that if money has been reached or deducted in the account.

In this process, getting constant information in this transaction is very vital. Hence, how to ensure the information be returned is the most important step in this process. In this system, the security check is done by administrators with the three layers check, this can guarantee and prevent that the transferring is illegal; meanwhile it can monitor the response of the users, when users find something unusual and they can call customer service to stop this transaction, for the sake of security. In this process it is very important to reflect the check and to let the users to know the information and what is the status of transaction, has it done. Thus, there is another data design in the system to record the information. At the same time, these will be sent back to users for check, these include log-in, investment, payment.

Take transferring remittance as an example its functional models are showing in the Fig. 5.

From the diagram above (Zhang, 2010) it is obvious that users can monitor if their money has been approved from Browser. Firstly, the users fill the forms, confirm to submit, send a request to transfer function, transfer will create a transferring ID and this will exist throughout the whole process and will be sent to check 1, check 1 finished check it will send message to users. In the same way, check 2 and check 3 will finish the same task and give a latest status feedback to users to announce this transaction has been done and the corresponding points. If the users find some problems during the transaction, they can stop the check it calls cancel check. After canceling it, give the information back, if this transaction is canceled, the latter checker will not get any further information. The message that when this transaction is finished it is showing in Fig. 6. Besides, the administrators' hierarchically check is showing in Fig. 7.

**TECHNIQUE CHARACTERISTICS**

This system adopted B/S framework, the advantage is that the client can use browser directly to visit the system and database resource, therefore, the needed information can be got. It to a large extent decreases the application cost of the system. In terms of view it adopted jQuery+jQuery EasyUI, to make the client request and the server response be asynchronously exchanged. It saved

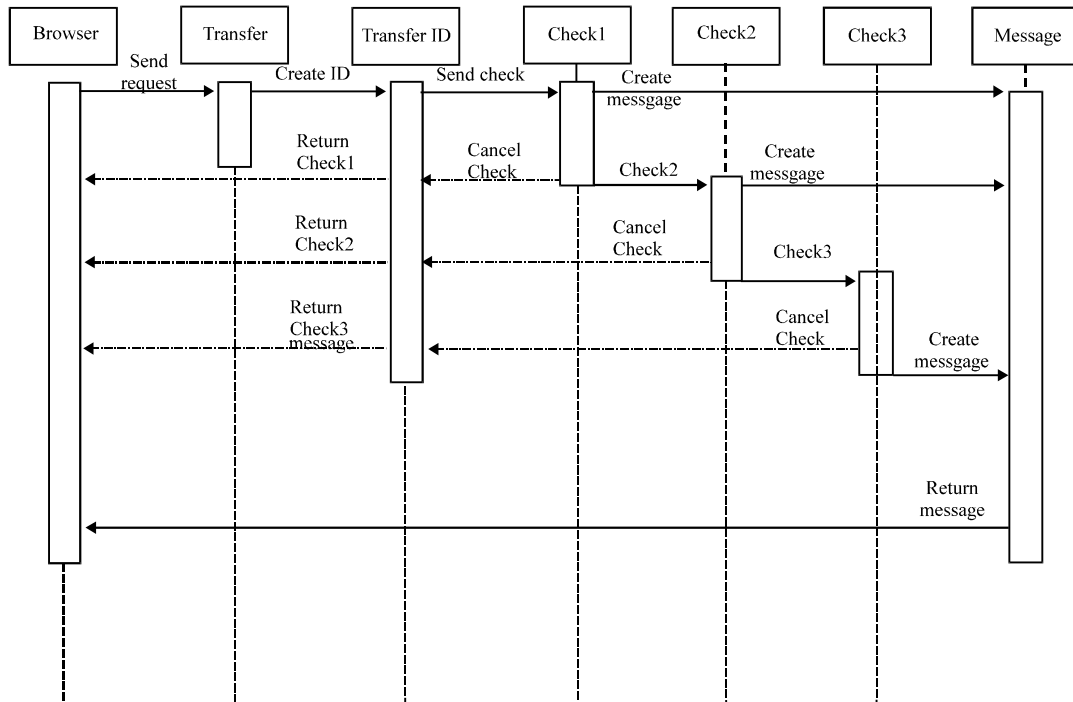


Fig. 5: Transferring remittance



Fig. 6: Inquiry of status in



Fig. 7: Hierarchically check

the band width greatly and shortened the time. It makes the system fast, flexible, maintainable and extensible and it solved the problem that huge database can share the information in long distance.

### CONCLUSION

This article made a specific analysis and design on personal internet banking system and it solved the two main problems of this system that the interaction between usability and security. In terms of interaction it mainly used jquery and esayui together, the main interface of business imitate Metro of Windows, to make the system more contemporary. Besides, the business processes are all undergoing by filling forms. Most forms are all drop-down boxes. It makes users feel convenient and quick. In terms of security it is displayed by administrators. When forms are submitted, administrators of background will do the three layers check. In this

process, the order may be canceled in any minutes; it can ensure the security and mobility of the transaction. Except these, the amount of transaction will not be shown in everywhere in system; this can protect the privacy of user. The application of hierarchical framework in personal internet bank speed up the system developing speed, declined the coupling of system and improved the performance of the system greatly, hence it makes great contribution to the construction of personal internet bank.

### ACKNOWLEDGMENT

This work was financially supported by Education Ministry of China with Grant No. 08KJD520005.

### REFERENCES

Jiang, H.C., Y.X. Yin and X.J. Ban, 2009. Struts framework application based on SOA. *Comput. Eng.*, 35: 21-23.

- Metsker, S.J. and W.C. Wake, 2009. Design Patterns in Java. Addison Wesley, USA.
- Zhang, L. and W.X. Zhang, 2009. Design and implementation of fixed assets management system based on JavaEE. *Comput. Eng. Design*, 30: 3797-3800.
- Zhang, L. and W.X. Zhang, 2010. Design and realization persistence framework of tourism e-business system. *J. Wuhan Univ. Technol.*, 32: 113-117.
- Zhang, L., 2010. Application of MVC pattern in data middleware. *Comput. Eng.*, 36: 70-72.
- Zhang, L., 2013. Design and Implementation of online sales system for prepaid card based on sh architectures and dao factory pattern. *Comput. Appli. Software*, 30: 123-126.