

# The Commercial Bank Card System Based on SOA

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**Abstract.** SOA has been the effective technical solution to enterprise application integration and business process rebuilding. The paper presents a reference implementation scheme of Commercial Bank Card System based on SOA. In requirement tier, the implementation plan first establishes the full concept model and logical model of Commercial Bank Card System from business request(business use case-business step-atomic business) to system request (system use case-system step-atomic component), then in semantics tier, we give out full description of the model through the combination of OWL and BPEL. At last a SOA's three-tier framework of "requirement-semantics-service" has been built for the Commercial Band Card System.

## Introduction

SOA (Service Oriented Architecture) has become a new and effective technical solution to enterprises application integration of the Commercial Bank [1]. The paper presents an implementation scheme of the Commercial Bank Card System based on SOA. The SOA three-tier framework, "Requirement-Semantics-Service" model of the Commercial Bank Card System is as shown in Fig.1. The model can resolve requirements diversity in the development of software system, and realize the connection from business to system, which achieves the rapid development of application system.

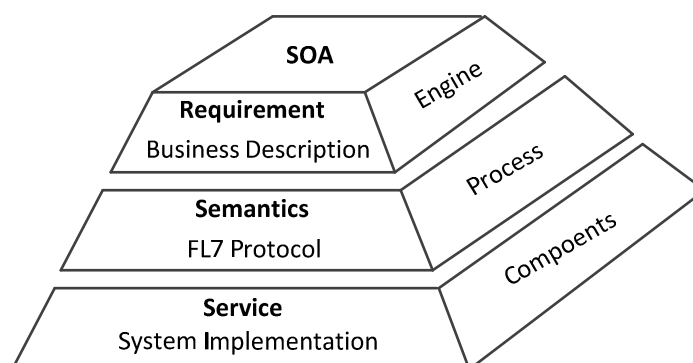


Fig. 1 SOA application system model

First, we build the business model of the Commercial Bank Card System by recognizing the business use cases and business use case scene of card system and defining the minimum business unit in business layers as atomic business. The logical combination of atomic business can generate any business, so to implement atomic business collection means the implementation of the Commercial Bank Card System. The atomic business collection consists of independent and inseparable business steps. By analyzing the process of business use case scene, the atomic business collection of the Commercial Bank Card System can be extracted.

Then building the system model of the Commercial Bank Card System by mapping the atomic business collection to the system tier: mapping each atomic business in the atomic business collection to system use cases of the system tier and extracting the system use case scene. The implementation of system use case scene is called business component. By analyzing the implementation process of system use case scene, the basic components of the Commercial Bank Card System could be extracted, corresponding to the basic steps of the system use case scene,

which is the physical model of the Commercial Bank Card System. We extract the minimum system unit of system tier-atomic component by further analyzing. The atomic component is the minimum unit in the system layers. The atomic component collection consists of independent and inseparable system steps. The logical combination of atomic components can generate any system process, and then to implement all basic components of the Commercial Bank Card System [2,3].

Finally, defining the application tier language FL7 (Financial Level 7) recur to the atomic component. By describing the mapping relation between business model and system model of the Commercial Bank Card System with semantic description, the logic model will be got which is mapped from concept model to physical model, and the business process will be formed and then it will be handed over to the corresponding engine for parsing and execution.

## Business Modeling

First, building business model and getting business requirements of the Commercial Bank Card System by adopting the UML (Unified Modeling Language) thought [4,5].

**Select business Domain.** The Commercial Bank Card System mainly includes three major functions:

- (I) Card management function not involving account processing, including open card, change card, modify card, cancel card, register loss and card maintain, etc;
- (II) Transactions routing function involving account processing, which distribute transactions to the core deposit system or other third systems;
- (III) Generate kinds of reports for account reconciliation.

By analyzing business functions above, the business domain of the Commercial Bank Card System could be divided into four parts, as shown in Fig. 2.

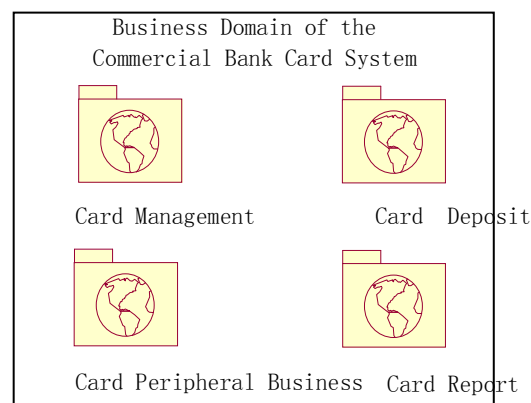


Fig.2 Business domain of the Commercial Bank Card System

**Extract business use cases.** Business actors could be defined bordered by the business domain. Business actors are people or organizations which are outside the business domain and interact with the business system. Business actors of the Commercial Bank Card System are customers who hold bank card.

Business use case is the complete value for business actors provided by the business unit. Each business unit in the business domain is analyzed to extract business use cases from the business actors' perspective. The state that business actors drive business use cases could be reflected by the use case view "business actor-business use case". Based on the analysis of business actors and business use case of the Commercial Bank Card System above, the use case view of the Commercial Bank Card System for card management and card deposit could be built, as shown in Fig.3.

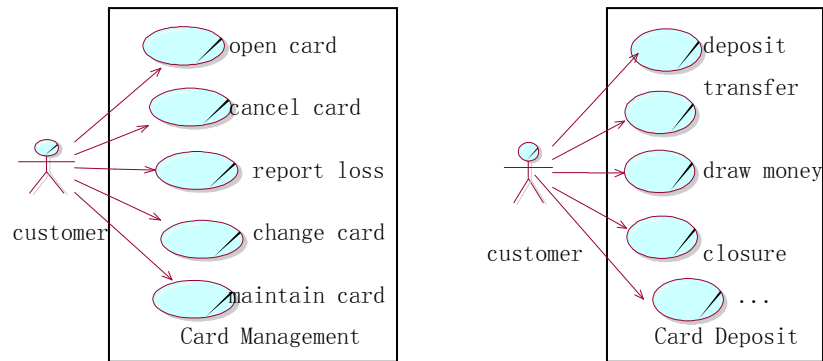


Fig.3 Business use case view

**Extract atomic business.** We have built the business use case model by analysis above. Next, to launch new businesses quickly according to the customer demands, we will present the concept of atomic business. Atomic business is the minimum business unit of the business tier, which has its own integrity and self-contained property. Through the regroup of atomic businesses, all business requirements of the business domain will be implemented, which finally meet customer demands fast. Take the use case scene-card account cash deposit as an example to extract atomic businesses. The business flow of card account cash deposit is as shown in Fig.4.

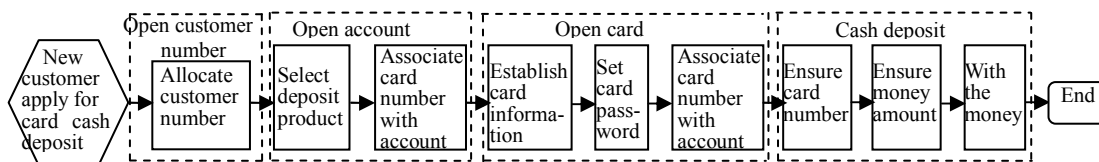


Fig.4 The business process of card account cash deposit

In Fig.4, the broke line box represents business steps and the solid line box represents the atomic business extracted, including 9 atomic businesses: allocate customer number, select deposit product, allocate account number, etc.

Analyzing business steps of other business use case scene of Card System to extract full atomic businesses of Card System, and building the business model of Card System: business domain-business use case-business use case scene-atomic business.

## System Modeling

The atomic business collection extracted from business modeling is mapped to the system tier as the system use case. Building the one-to-one mapping between atomic business and system uses case or system use case scene, and then building system model to get system requirements, which achieves e the transition from business model to system model [6].

**Extract Atomic Component.** We will present the concept of atomic component in system tier. Atomic component is the minimum system step unit in system use case scene, which has its own integrity and is inseparable. The integrity means all system components could be generated through the regroup of atomic components. The inseparable means each atomic component can't be combined with other atomic components. In Fig.5, mapping the atomic business-allocate customer number to system use case, and extracting the atomic components from system steps of system use case scene.

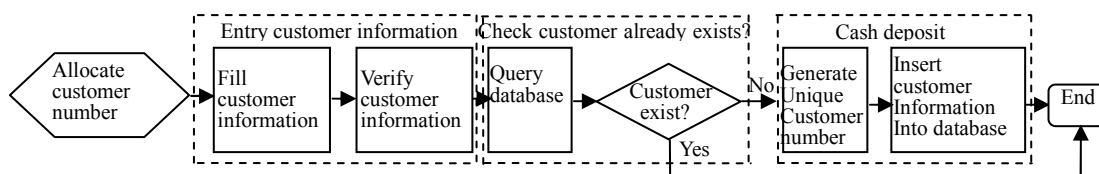


Fig.5 The system process of allocate customer number

In Fig.5, the broke line box represents system steps and the solid line box represents atomic components extracted. If encapsulate atomic components as services, the system processes will be very complex. So for the actual system development, depending on the specific circumstances, we can encapsulate the appropriate levels as basic components, which implement system steps and support the system process of business component. The granularity of basic component is large and the collection is infinite, so basic component must be analyzed to extract the atomic components.

### Semantic Description

We have build the business model and system model of the Commercial Bank Card System above, and through the mapping from atomic business to system use case or system use case scene, the overall model has been built: business use case/business use case scene/atomic business-system use case/system use case scene/basic component/atomic component. Next, we will define the application tier language FL7 which may be used to describe the business model, system model and the mapping relationship. Ontology language OWL and BPEL are good tools.

**Define Entity Classes.** Extracting entity classes from the model of the Commercial Bank Card System: business use case/business use case scene/atomic business-system use case/system use case scene/basic component/atomic component. According to Super-classes, the Subclasses can be defined as following:

```
Thing:
  BusinessApplicationArea
  BusinessUseCase
  BusinessUseCaseScene
  AtomicBusiness
  SystemUseCaseScene,
  AtomicComponent
...

```

**Define Object Property.** Object property describes the relationship among entity classes. Define the object property among entity classes as following:

```
TopObjectProperty
  hasusecasestype
  hasusecase
  hasusecasescene
  includeatomicbusiness
  mappingusecasescene
  hasatomiccomponent
...

```

**Define Data Property.**Data property describes its own datatype property of entity classes.

```
hasdatatype
...

```

### Build ontology description model.

According the definition of entity classes, object property, data property above, we describe the overall model of the Commercial Bank Card System: business use case/business use case scene/atomic business-system use case/system use case scene/basic component/atomic component.

Ontology language OWL can well describe the hierarchy and property relationships among individuals, but it can't describe the horizontal logical relationships among individuals on the same level. So we should use BPEL to supplement the horizontal logical relationships to complete the vertically and horizontally full description.

**Establishing and Implementing of Process.** First, according to the ontology model of the Commercial Bank Card System, we can find the atomic components used in business use case scene and their logical relationships; Then, the BPEL business process diagram will be built by using BPEL graphical development tools in the Eclipse platform; Finally, we start BPEL engine ODE, deploy the BPEL project to ODE server and then execute the business processes by using the Web Service Explorer in Eclipse platform

## Conclusion

In this paper, we first build business model of the Commercial Bank Card System and extract atomic business collection; Second, we map atomic businesses to system use case or system use case scene to build system model and extract atomic components; Then, we build the mapping relationships from business use case scene to atomic components, and get business requirement document and system requirement document. In semantic tier, we describe the mapping relationships analyzed in requirement tier through the combination of OWL and BPEL. Finally, we test and implement business processes in BPEL engine ODE, which at last achieve a SOA three-tier framework of “Process+Engine+Component” prototype of the Commercial Bank Card System.

Making use of the development method above, we can quickly get application system prototype based on SOA. Through refinement, testing and combination with JSP and database, the rapid deployment of application system and on-line will be implemented.

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