The Dynamic Web Services of 3G/Mobile eCommerce Based on SOA

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Abstract

Since 2000s, the eCommerce has increasingly been used for business service between enterprises and consumers. In the past, many telecommunication corporations have implemented a fewer functionalities on the internet and most of telecommunication corporations use traditional development methodologies to realize telecom services for their customers. These behaviors provide lower QoS (Quality of Service) and monotonous added-value services to their customers. Now, the 3G technology can provide more quickly transmission rate and diversity of added-value services to the customers. In order to speed up the development duration, this research will get rid of traditional development and adopt service oriented architecture to redesign the platform of 3G eCommerce environment. In this research, we propose a dynamic web service of composition framework to support SOA approach for telecommunication business process. Then, we construct a fully new eCommerce environment to realize our intentions.

1. Introduction

In the past, the system development is used by several methodologies such as SDLC, CASE tools and so on. Widespread Internet access is deciding it possible for management around the world to move information and services online. Since the information communication technology (ICT) is emerged by internet, the development environment of distributed network architecture (DNA) is also changed. In traditional software development process, the developers always use remote method invocation (RMI) or distributed component (DCOM) to implement their DNA functionalities in the practice. But these traditional software development methodologies are not design to face the challenges of changeable environment. Hence, several scholars and experts [1,2,3] have to bright up the new software development concept with service aspect that also called service oriented architecture.

Service oriented architecture (SOA) represents a methodology to distributed computing environment that treats software resources as available services on the Internet/Intranet. The analyst use service aspect to analysis user's requirement and implement application with information technology based on this architecture. In practice, implement SOA typically necessitated working with DNA and several information techniques. Although, DCOM, CORBA, and RMI can realize these distributed architectures, but they do not have a consistent standards and specifications. Hence, the web services improve these heterogeneous information techniques weaknesses.

In this research, the telecommunication has many legacy systems such as ordering, billing, QoS and so on. Therefore, this research tries to provide several integrated services that compose by several legacy systems' services.

In order to aggregate these heterogeneous legacy systems and platforms, this research will use web service and SOA to implement dynamic web service, and then provide several services to 3G/mobile eCommerce. The Fig. 1 depicts the development process in this research.
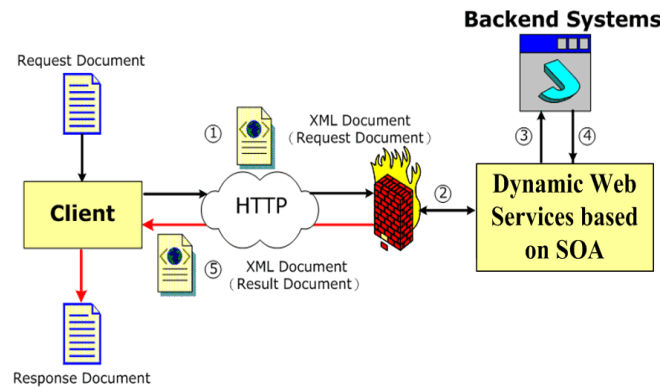

Fig. 1   The development process in this research

In order to achieve these concepts, this research will illustrate as follows. In section 2, this research surveys some of relative issues that illustrate relative researches. In section 3, this research proposes a system model for 3G/mobile eCommerce based on SOA and then use a real case study to realize this research's proposal. Finally, this research concludes the research and illustrates future works.

2.   Related works

There are several approaches in the software development aspect such as CASE tools and modeling frameworks, but they are not designed to face the open computing environment such as internet service. At this time, service-oriented architecture provides a new approach to create architecture from the service point of view.

2.1. Service-oriented architecture

In order to develop application more easily, many research start to study the design model of software development [1,2]. In the Fig. 2, it depicts the SOA that includes service layers, functionality and roles [2].
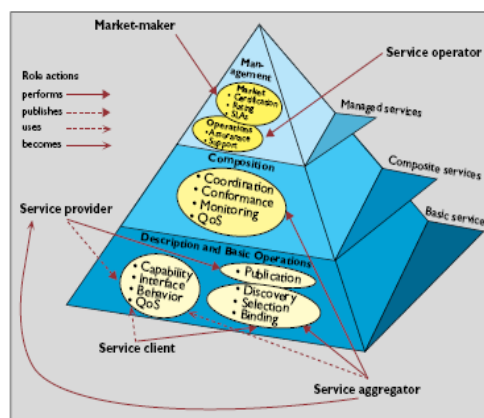

Fig. 2   The SOA Concept [2]

According to Jason [3], SOA represents an approach to distribute computing environment that treats software application as services available on the inter/intra network. In the past, we use many kinds of information technology to implement the distribution computing environment such as CORBA and DCOM. However these traditional technologies were tightly coupled, the developers need more time and effort to implement new application in the distribution environment. Hence, the new technology-web service is invented by this situation.

2.2. Dynamic web service

In order to improve DCOM and CORBA weakness, web service is standards-based and loosely coupled. The web service is based on URI [4], which can be accessed via the internet through its open interface such as WSDL. The web service operation can be depicted in Fig. 3.
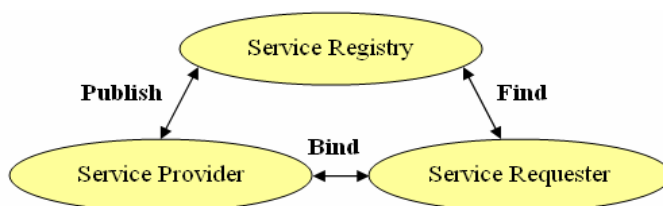

Fig. 3   The operation of web service

But these web service is represented in a passive discover policy, it can not reflect the dynamic activities in the enterprise. Therefore, there are several research start to discuss the dynamically compose web service [5,6,7]. Some of them study the semantic of web service and some of others are discussing the composition strategies. But none of them can realize their concept into the really world especially in the large telecommunication corporation, hence this research will start to use this technology to implement flexible system.

2.3. Mobile service

In recent years, the 3G technology has broken through the limitation of data transmitted and add-in service. There are many mobile commerce platforms in the telecommunication, they are technology platform, infrastructure and mobile equipment, application platform, content platform, mobile portal, 3G mobile network platform, mobile service platform. In the [8] also integrates these platforms into mobile commerce value chain and depicts it in Fig. 4. From the point of view in Fig. 4, there will have many heterogeneous platforms and the telecommunication will need technologies has mentioned above to implement SOA environment with dynamic web service.

Fig. 4   The mobile commerce value chain[8]

3. System model

This research uses a service-oriented architecture to explicit the workflow in the 3G/mobile of telecommunication. In order to raise the system performance and integrate heterogeneous platform's services, this research will adopt the dynamic web service to realize these concepts.

3.1. System functionalities

In the mobile aspect, the mobile services include many categories of functionalities that include provision, SMS/MMS services, billing services and query services. Most of these mobile services need to integrate more than two heterogeneous services. Hence, this research will use several information technologies to design dynamic services and then use these dynamic services to invoke relevant backend systems.

Fig. 5 provides an overview representation of functionalities of the mobile services. The mobile services introduce several system functionalities in the ecommerce environment of telecommunication after 3G/mobile users login the system, there are several services will be selected:

- Apply for Account: the 3G/mobile User need to apply a new account for navigating telecommunication's service on the internet.
- Update Account Info. : the users can change property of their account such as communication information, list of applied services.
- Add-In Mobile Services: there are several extend services in the add-in mobile services, obstacle service, SMS/MMS service and 3G mobile service.

Each of functionality will compose by several services from the backend system. This research will use service-oriented architecture to design the dynamic service and according to the user request to provide suitable dynamic services. This methodology is different from tradition development method.
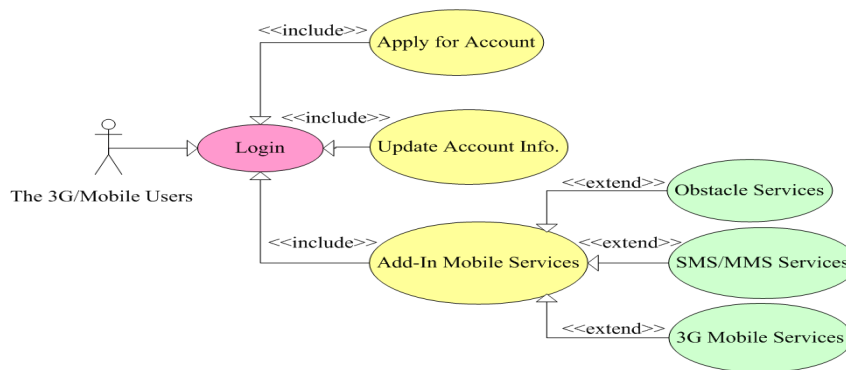

Fig. 5   An overview representation of functionalities of the mobile services

3.2. The design of service oriented architecture

First at all, we need to analysis the functionalities of telecommunication in mobile with service aspect. The Fig. 6 will depict the hierarchy of function with service concept. In the top node of function plays the summarize role, it also can be divided into several level of subfunctions in according to the categories of mobile service. This hierarchy can be built up with some senior telecommunication engineers and component of the composition service bus will invoke relevant web service from the service pool. Then the system not only provides dynamic service to each subfunction and also completes the user request.
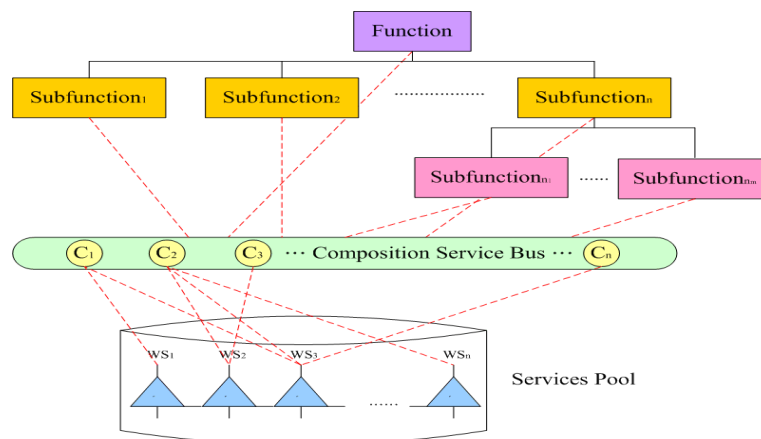
Fig. 6 The hierarchy of function with service concept

4. Case Study

In this case, we present an example to illustrate how the architecture discussed in the previous section can be applied to the realization of our goal and can replace the legacy of mobile service in telecommunication corporations. We illustrate exactly not only how the dynamic web service work with SOA but also the benefits it can bring to the customers and telecommunication corporations.

4.1. Introduction

The company in question is the largest telecommunication corporation in Taiwan and is also the top 500 largest companies in the world [9]. The company's scope of services covers local phone services, long-distance phone services, international calls, mobile communication, data communication, Internet services, broadband networking, satellite communication, intelligent network, mobile data, and multimedia broadband. The company is the most experienced and largest integrated telecommunication provider in Taiwan, providing these telecommunication services to more than 10 millions customers.

The web information systems for the mobile service were constructed in 2000 and it was extended since 2004. But they offered more than ten mobile services in relation to the web. The Fig. 7 depicts the web interface of 3G/mobile services.

4.2. The service oriented architecture of mobile service – Apply for mobile code

In Fig. 7, there are several functions provided by the telecom corporation on the left-hand of Fig. 7 such as apply for mobile code services and dealings with other applications for mobile service. If customers have any problem with their mobile phone equipment, they can use the site to submit their requests but they need to use the mobile code to navigate these functions.

Hence, this section will use "Apply for mobile code" to be the case study of SOA with dynamic web service. The Fig. 8 shows the state diagram of applying mobile code and this mobile service can be divided into Fig. 9. Once customers finish these services and submit the request to web system, our backend system will be triggered and the request will enter into our service flow. While our system completes the process of this service, the backend system will send an email notification or an SMS notification to the user and conclude the service. Then the 3G/mobile users can use the unique mobile code to submit mobile services which they need.
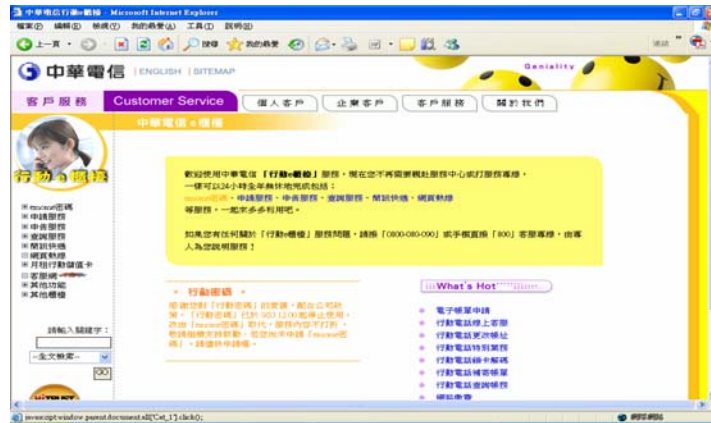
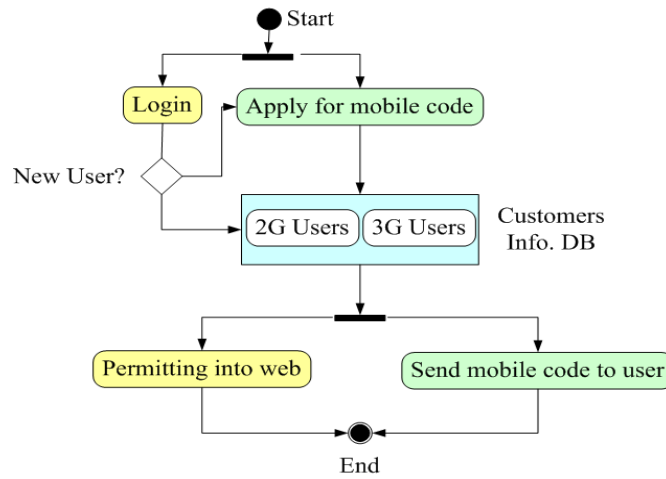**Fig. 7   The web interface of 3G/mobile service**

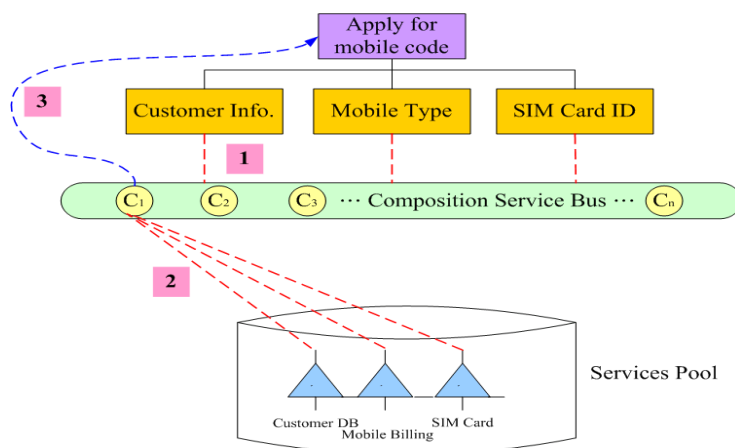**Fig. 8   The state diagram of applying mobile code**

Fig. 9   The service map of applying mobile code

5. Conclusions and future works

In this research, we use service oriented architecture to design a dynamic web service and realize these concepts in the telecommunication corporation of internet. This is convenient for telecom customers to apply mobile service and they do not need to go to physical store for applying services. Telecommunication corporation have expressed considerable interest in the development of SOA. In particular, enterprises can use SOA to create a flexible and dynamic web service for routing and controlling business processes. Our research here applies these methods to a real telecommunication corporation. Security and internationalization are vital success factors. To address the issue of hackers' intrusions into telecom e-Commerce, we propose a mobile code service to control the 3G/mobile user identification.

Therefore, we believe that the SOA can certainly operate many kinds of telecom service, reduce a corporation's costs, and increase users' satisfaction. To implement a telecom e-Commerce environment is not an easy job; moreover, it is difficult to plan the scope of requisite system analyses. To address these obstacles, our research here proposes a dynamic web service method that can strengthen Website performances, the integration of business processes, enterprises' agility, and users' satisfaction.

In the future, we will plan to integrate SOA (service-oriented architecture) model and ontology theory (such as OWL-S) through which will integrate an on-demand business process into dynamic e-business environment. This effort will facilitate the study of possible interaction patterns between other partners and will ensure proper collaboration.

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