SOA기반 P2P 비즈니스 프로세스 모델링

(P2P Business Process Modeling Based on Service Oriented Architecture)

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요 약

소프트웨어 개발에 있어 XP, UP, CBD와 다른 케이스 툴과 같은 전통적 접근은 다양한 소프트웨어 컴포넌트들을 구축하기에 유용하다. 그러나 그러한 접근은 개방된 환경에 직면하여 서비스를 중점으로 설계된 것은 아니다. 서비스 지향 아키텍처(SOA)는 서비스는 애플리케이션간의 서비스라는 서로 다른 기능적 단위를 상호간 연결하는 컴포넌트 아키텍처이다. SOA는 잘 정의된 인터페이스들과 비즈니스 서비스간의 컨트랙트를 통해 비즈니스 프로세스를 통합할 수 있는 좋은 방법을 제공한다. 본 논문에서는 SOA에 기반 하여 P2P 접근 방법을 통해 비즈니스 프로세스를 모델링하는 방법을 제안한다. 또한, 전체적인 P2P 비즈니스 프로세스 모델링 시스템이 구현된다. 본 논문은 서비스에 기초하여 변경되는 엔터프라이즈의 실제를 받아들이고 보다 효율적이고 가시적인 방향으로의 엔터프라이즈 간 프로세스 통합을 제안한다.

Abstract

The traditional approaches to software development, such as XP, UP, CBD and other CASE tools, are useful for constructing various software components. However, they are not designed to face the challenges of open environments that focus on service. The Service-Oriented Architecture(SOA) is a component architecture that interconnects an application's different functional units, called services. SOA provides a good way to integrate the business process through well-defined interfaces and contracts between business services. In this paper, we propose a method of business process modeling based on SOA with a P2P approach. Also, A P2P business process modeling system is presented. This results in admitting the reality of enterprise that changes on the basis of services, and suggests more efficient and visual direction for the process integration between enterprises.

Keywords : SOA, Process Modeling, P2P, UML, Process Integration.

Ⅰ. Introduction

Business activities involving manufacturing products or executing transactions with other companies can be classified into 'processes', which are a collective form of task sequences in which the tasks are described in the most efficient, simplest and easiest to understand manner. In addition, these processes are regrouped into an overall business process in order to achieve the objective of enterprise organization.

In particular, as the various types of transactions based on governments, businesses and consumers, such as government to business(G2B), business to business(B2B), and business to consumer(B2C), are converted into electronic commercial transactions, which is the new concept of commercial transactions, by making use of the extended infrastructure of information and communication, the business process is also attempting to evolve.

As such, the business process has become a core element that is indispensable in transactions within an enterprise and between enterprises. Along with

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the business process, there has been increasing interest in the integration of processes and the interface between enterprises, as transactions between e-marketplaces across industries become increasingly substantial. This process integration between enterprises requires that related enterprises exchange the information necessary to carry out business activities according to the given business process and that they implement a B2B interface and process. The objective of such integration is to connect the enterprise to the related transaction parties through the exchange of organized business events, including business data, in order to conduct business between enterprises[1].

This paper analyzes the business process between enterprises, models the business process with UML and derives a P2P common interface with processes, and implements the SOA based on the P2P approach.

In this paper, we solve the problem more visually and efficiently by providing services after analyzing and modeling them from the high-level enterprise problem to the low-level detailed process by using UML, a visual modeling language based on SOA.

II. Related Works

XML and Web Service standards are helping system architects to improve the definition of services and provide a consistent framework for realizing the promise of the service-oriented architecture(SOA)[2].

The evolution of Web services is at a point where designers can now start to see how to implement a true SOA. They can abstract a service enough to enable its dynamic and automatic selection and Web services are finally offering a technology that is rich and flexible enough to make SOA's Reality[3].

Also, recently, the peer to peer approach(P2P) has been much used as a related technique for collaboration and business modeling. The P2P approach is a method that allows for efficient peer-to-peer communication without a centralized hub or server environment.

III. Modeling And Implementation

The overall process modeling sequence is described in Table 1.

표 1. 비즈니스 프로세스 모델링 순서
Table 1. Business process modeling sequence.

Process	Task
Domain Selection	Business Modeling Domain Selection and Overall Architecture Description
Business Process Requirement Analysis	Requirement Elicitation Business Use Case Modeling Narrative specification Activity Diagram
Business Process Definition	UML Stereo Type Definition about Business process − Class − Operation − Attribute
Business Process Modeling	Business Use Case Diagram Business Class Diagram Sequence Diagram Collaboration Diagram
SOA based on P2P business process modeling	Conceptual Service−Oriented Architecture Implementation SOA based P2P business process modeling

1. Domain selection

When business processes are classified into similar ones, they can be classified into 5 main processes with 8 subprocesses, as shown in Fig 1[4].
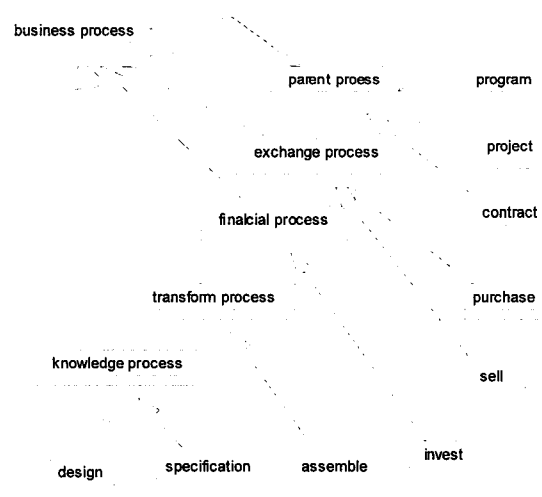

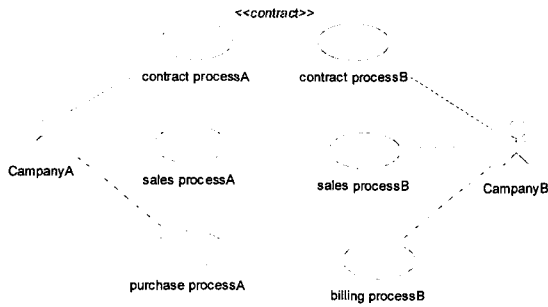표 1. 비즈니스 프로세스 분류
Fig. 1. Business process classification.

Fig. 2. Contract process between CompanyA
          and CompanyB.

The domain can be defined by the UML business class diagram shown in Fig 2.

2. Business process requirement analysis

Requirements analysis allows various levels of efficiency to be obtained by integrating processes between enterprises in different ways.

In requirements analysis, Use Case modeling is performed by extracting the requirements with processes regarding the contract, the business process previously selected. The requirements which were extracted through a common domain analysis between CompanyA and CompanyB, are shown in Table 2.

The actor and use case are extracted based on the requirements obtained from the common domain requirements analysis of the business process. Table 3 shows these requirements and the extracted actors and use cases.

Fig 3 shows the business use case diagram which

표   2. CompanyA와 CompanyB간 일반적 요구사항
Table 2. Common requirement between CompanyA and CompanyB.

A. Process administrator defines the generic process.
B. Process administrator defines the contract process, purchase process and sales process that inherit the generic process of the upper concept.
C. CompanyA defines contract process A using the contract process inherited from the generic process.
D. CompanyB defines contract process B using the contract process inherited from the generic process.

표   3. 액터와 유스케이스 요구사항 할당표
Table 3. Assignment of requirements to actors and use cases.

| Req#	Requirement	Actor	Use case
1	Process administrator defines the generic process.	ProcessAdmin	Generic process
2	Process administrator defines the contract process, purchase process and sales process that inherit the generic process of the upper concept.	ProcessAdmin	Sales Process Purchase Process Contract Process
3	CompanyA defines contract processA using the contract process inherited from the generic process.	CompanyA	Contract processA
4	CompanyB defines contract processB using the contract process inherited from the generic process.	CompanyB	Contract processB
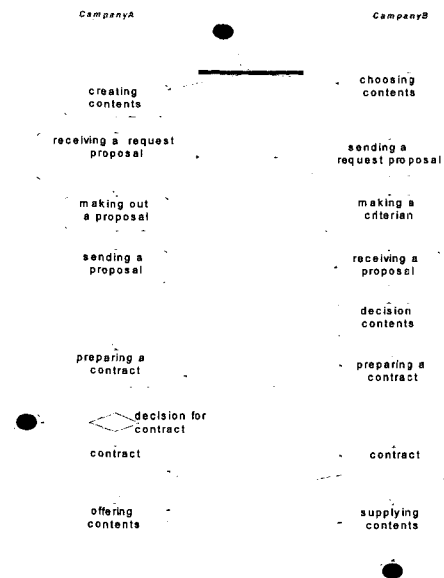
그림 4. 유스케이스 'contract process' 활동 다이어그램
Fig. 4. Activity diagram for use case 'contract process'.

represents the interaction between the use cases provided by the actors and systems of the companies based on Table 3.

As shown in the Fig 3, the total composition is

표   4.   유스케이스 'contract process'의 서술식 명세
Table 4.   Narrative   specification   for   use   case   'contract
          process'.

Use case	Contract Process
Brief description	This use case defines the contract between CompanyA and CompanyB.
Actors	Process Admin
Preconditions	Generic Process should be defined.
Main flow	CompanyA provides contents according to its own business use. CompanyB selects contents to provide for customers according to its business pattern and objective. : : CompanyA provides the contents in compliance with the contract clauses. CompanyB is provided with the contents based on the contract clauses.
Postconditions	The use case Contract Process must be saved as a file for use by the actors in CompanyA and CompanyB

made up of three actors and six use cases.

And   Table   4   demonstrates   the   narrative
specifications for the 'contract process' use case
among the identified use cases.

Fig   4   shows   the   activity   diagram   between
company A and company B.

3. Business process and stereotype definition
for P2P

Business processes can be divided into three main
types. In other words, similar behavior in different
processes can be used to group these process
together into packages. First, the generic process
package represents the standard business process
previously defined by the process administrator. The
packages of CompanyA and CompanyB are the
processes that these companies actually implement
based on the inherited generic process. And making
contractA is the process which belongs to ContractA,
representing the contract execution. The UML
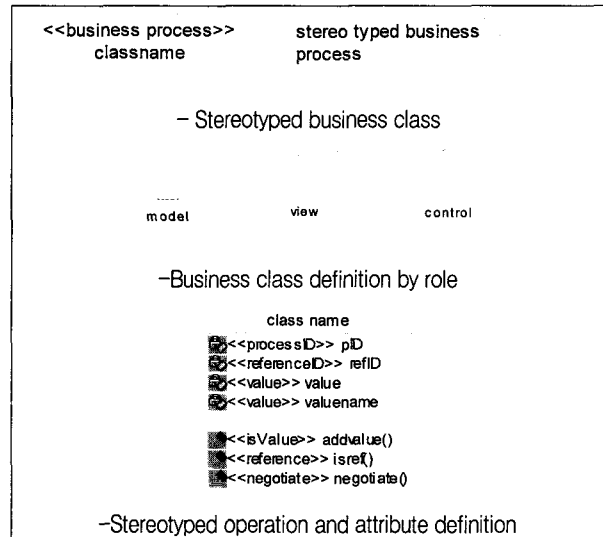stereotype definition for modeling is shown in Fig 5.

그림 5.   스테레오타입 정의
Fig.   5.   Definition of stereotype.

4. P2P business process modeling

In order to model the working business processes,
2   models   are   developed   separately: one   for
stereotyped negotiation and the other designed to
make P2P possible by adding the stereotyped process
ID and reference ID in order to insert the identifiable
ID into the pre-defined process ID.

In   this   paper,   we   apply   the   attributes   and
operations defined above that can add a value to the
transactions between companies. Although it might
be difficult to define the attributes for value, this
paper modeling the value with ROI(Return On
Investment), which makes it possible to obtain an
objective evaluation of an enterprise's profit.

Condition #N) It can be said that the weight of ROI(Return On Investment) is significant in calculating the profit of an enterprise. Especially, the objective profit rate is considered to be important in transactions in the field of digital contents.
Let us study a contract between Company A producing multimedia contents and Company B which provides these contents.

When this ROI is applied to a stereotype having a
value of <<value>>roi=0.1, it can be utilized as the
basic   material   negotiable   for   transactions.   If
stereotypes having such values are applied, a more
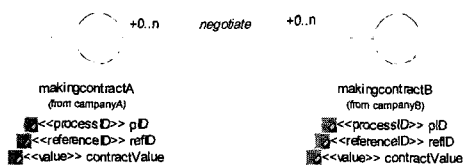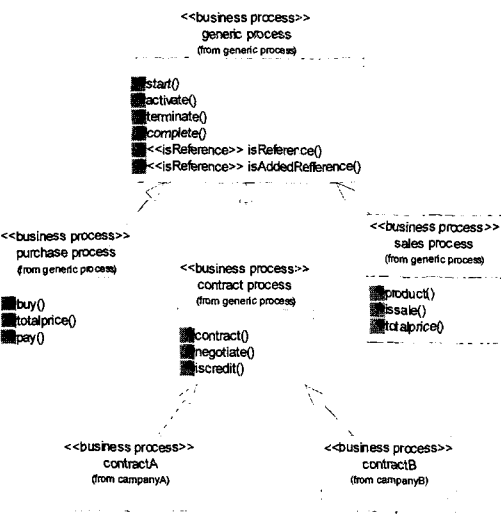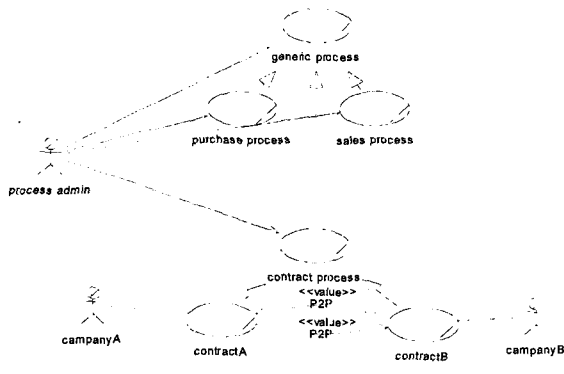efficient and accurate selection can be made.

그림 6. P2P접근을 이용한 확장된 비즈니스 유스케이스 다이어그램(위) 과 클래스 다이어그램(아래)

Fig. 6. Extended business use case diagram(up) and class diagram(down) using P2P approach.

The process proposed in this paper is a P2P approach which is a hybrid model in which the process model for general services is mixed with a process model leveraging value in order to enhance the efficiency among the enterprises. For this purpose, after first drawing up the extended business use case diagram and business class diagram in Fig 6, the sequence diagram and collaboration diagram for the activity diagram 'Contract' in Fig 7 is drawn automatically.
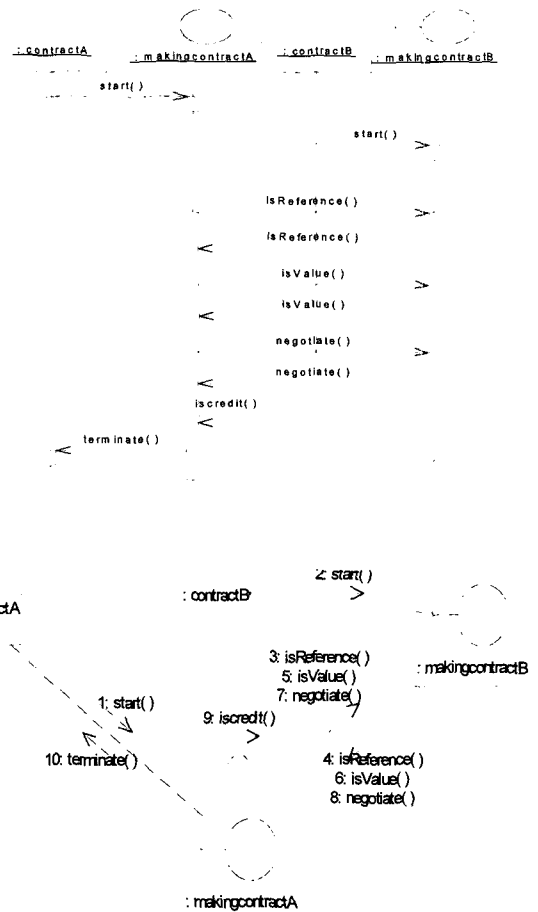

그림 7. 'Contract'에 대한 시퀀스 와 협력 다이어그램

Fig. 7. Sequence and collaboration diagram for 'Contract'.

5. SOA Based on P2P Business process modeling

By modeling each business process between enterprises in serviceable units, the common parts between processes are applied to the interface and the P2P service centering on the interfaces is implemented. The architecture comprises XML based interfaces using WSDL and sends messages using SOAP and, by using a modeling language called UML, those units related to services are composed and modeled.

In order to solve the integration issues, SOA advocates a general approach to integrating diverse systems. We give an outline of that approach here, highlighting those details pertinent to our UML
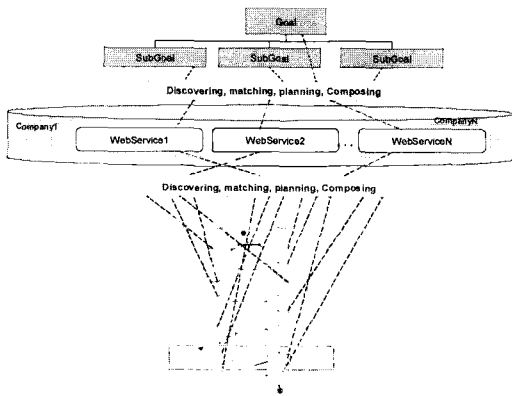
그림 8. 개념적 SOA 기반 P2P 비즈니스 프로세스 모델
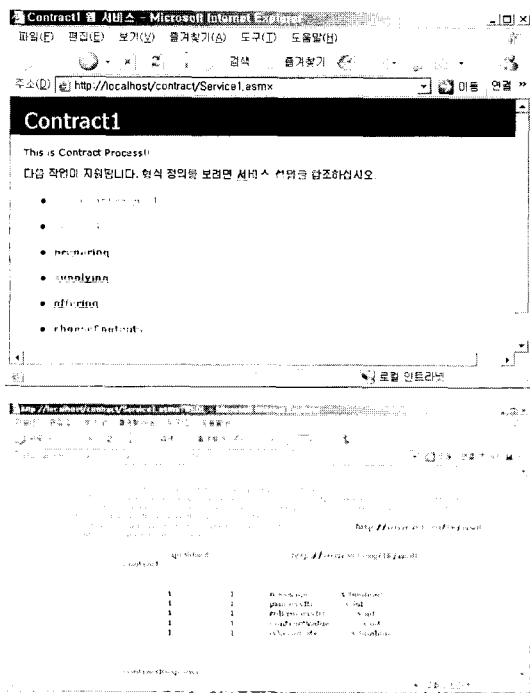Fig. 8. Conceptual SOA based on P2P Business Process Model.

그림 9. 웹서비스의 화면표시
Fig. 9. The screen display of the web service.

modeling

SOA advocates that developers create distributed software systems whose functionalities are provided entirely by services. SOA services can be invoked remotely, have well-defined interfaces described in an implementation-independent manner, and are self-contained. Service interoperability is paramount. Although various middleware technologies have been proposed to achieve SOA, Web services standards better satisfy the universal interoperability needs. Services using SOAP are typically invoked over

HTTP and have interfaces described by the Web Services Description Language (WSDL)[5].

Engineering a service-oriented computing system is a process of discovering and composing the proper services to satisfy a given specification between peers, which is expressed in the form of a goal graph, a P2P business process based workflow or some other model.

Fig 8 presents a different view of what is involved in engineering an SOA.

The conceptual SOA based on the P2P Business Process Model is implemented using web services.

Fig 9 shows the web page that is implemented based on web services using WSDL.

Fig 10 shows a SOAP message request concerning the 'Contract' service.

```
SOAPAction: "http://www.w3.org/TR/wsdl/contract"
<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
<soap:Body>
<contract xmlns="http://www.w3.org/TR/wsdl">
<message>String</message>
<processID>int</processID>
<refProcessID>int</refProcessID>
<contractValue>int</contractValue>
<isNegotiate>boolean</isNegotiate>
</contract>
</soap:Body>
</soap:Envelope>
```
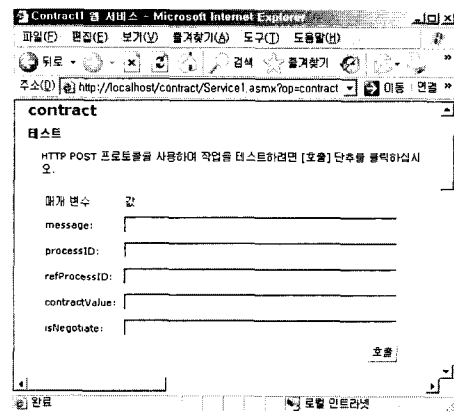

그림 10. 'Contract' 서비스를 고려한 SOAP 요청 메시지 (위) 와 웹서비스 화면(아래)
Fig. 10. SOAP Request message(up) and web service display(down) concerning the 'Contract' service.

III. Conclusion and Further Study

In this study, we perform UML integration modeling after analyzing the service oriented business process based on SOA. Each process is defined in the form of a peer in order to allow the process derived from the modeling of the business process to interact with other processes in the P2P mode.

This paper proposes an efficient method of modeling business processes in a P2P manner based on the use of SOA throughout the modeling steps, in order to enhance the efficiency of the services. This results in the accurate modeling of an enterprise and allows for the more efficient and visual integration of processes between enterprises.

A formal specification is required for the design and implementation of the interface for the sake of the future process interoperability, and the testing of the interface focusing on the interoperability between peers should be considered for the interoperability of web services.

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