분산 객체 기반 CALS 표준 데이터 공유 서버 개발

Development of CALS Standard Data Sharing Server on Distributed ObjectWeb

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기업 환경이 글로벌화 됨에 따라 다수의 기업들이 하나의 공동 프로젝트를 수행하기 위해 인터넷 등의 통신 네트웍을 통해 기업 간 데이터 등을 교환 및 공유하여 하나의 기업이 업무를 수행하는 것과 같은 유기적인 비즈니스 프로세스를 지원하는 가상 협업(Collaboration) 환경의 중요성이 날로 강조되고 있으며, 이러한 환경을 가상 기업(Virtual Enterprise)이라 한다. CALS는 가상 기업을 구축하기 위한 핵심 기술로써 이질 분산 데이터의 공유 환경을 제공하기 위한 여러 형태의 요소 기술들을 정의하고 있다.

본 논문에서는 여러 기업들 사이에서 데이터를 공유하기 위한 기반 기술인 CALS 표준 데이터 공유 서버에 대해 살펴본다. 특히, CALS 환경에서 주목하고 있는 SGML, STEP 등의 표준 데이터를 공유하기 위해 필요한 분산 객체 기반 서버 컴포넌트에 대해 논한다. 마지막으로 CALS 표준 데이터 공유 서버를 응용하여 기업간의 문서 공유 시스템을 개발하여 본 시스템의 유효성을 검증한다.

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1. Introduction

CALS (Continuous Acquisition and Life-cycle Support or Commerce At Light Speed) was initiated by US Department of Defense in order to maintain its military power within the reduced military budget, after the Cold War has come to an end. During the last decade, CALS has emerged as a key technology not only in defense, but also in industrial information society[1].

In CALS environment, information must be effectively exchanged and shared, which means that CALS should integrate the required standard data distributed on the heterogeneous computing environment. Here, the word, integration means a logical single view over the heterogeneous and distributed data environment so that a variety of data could be used wherever a user resides and whenever a user needs.

A virtual enterprise, the ultimate goal of CALS, consists of the logical single view environment mentioned above and the business collaboration processes. In order to support a common project between several enterprises in a virtual enterprise environment, some business collaboration schemes should be set up, and a data sharing system be established.

As well known, one of the most difficulties in establishing CALS is to provide a data sharing environment which consists of the effective management systems handling the heterogeneous and distributed information.

In the field of sharing data in CALS, the study on an Integrated Database (IDB) has been fulfilled continuously. In the IDB, every type of data is shared and exchanged regardless of its contents and its storage type. However, because the concept of IDB is ideal and somewhat ambiguous, its implementing approach should be more realistic than its concept. We focus on sharing CALS standard data file instead of several databases. In real business fields, the major part of the exchanged data types between enterprises are included in CALS standard data such as STEP and SGML. In general, STEP data represents product information like image, description, and so on, and besides SGML is used for the whole standard documentation[2,3,4,5,6,7].

In this paper, the software server system for sharing data between the contracted enterprises will be presented, which especially deals with CALS standard data file like STEP, SGML. As one already knows, a great number of data types including ordinary flat file, relational database, and object-oriented database exists in CALS environment. However, CALS has many standard data formats and these data should be shared at first. We specially focus on STEP and SGML because these data are remarkably used in a business field. Besides the server, Engineering Change Management (ECM) application that can be used during the design phase of the product-manufacturing life cycle between the contractors will be shown to prove the usefulness of the server.

2. CALS Sharing Environment for Virtual Enterprise : CSEVE

CSEVE is the sharing server of CALS standard data and is the software package that consists of schema designer, server monitoring GUI program,

meta-data registration GUI program, and several CORBA servants. In this section, the method of constructing data model, which describes the shared data as a meta-data in CSEVE, will be discussed. After then, each CORBA servant in CSEVE will be represented[8,9].

CALS has the goal of a virtual enterprise, in which each contractor can exchange and share its data during product-manufacturing cycle like design, manufacture, logistics, sales, and so forth. In order for an enterprise to exchange and share with others, there should exist a common data storage prescription. On relational data base system, that prescription is represented as a schema set. In CSEVE, ORACLE™ is adopted as a main storage, and it will has the whole meta-data about the exchangeable data. As already described, each contrac-tor in a virtual enterprise has its own data that is intended to share with others. CSEVE does not store the whole shareable data, but does store the meta-data about those data. Thus, in CSEVE, the autonomous of the data will be kept, and also the distributed specialty will be.

CSEVE has its own E-R model designing tool. The tool can design and store E-R model of the storage structure of the meta-data, also it can extract and update the E-R model from CSEVE database. This design tool is included in the CSEVE package, because the structure and the content of the adopted meta-data can be changed according to the type of a virtual enterprise environment, for example Vehicle-related or Ship-related. Fig. 1 shows the designing tool, in which the meta-data schema is extracted from the CSEVE database.

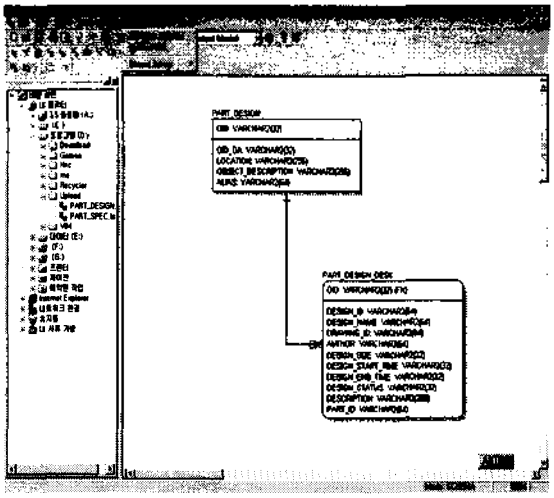

Figure 1 CSEVE E-R Model Designing Tool

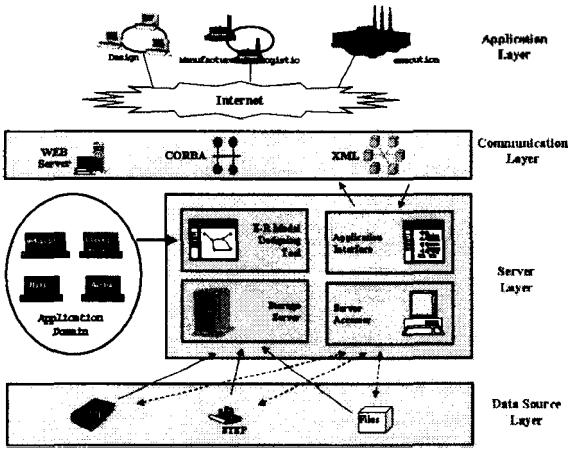

Figure 2 CSEVE Operating environment

Fig. 2 is the operating environment of CSEVE that is 4-layer structure. The most bottom layer represents the HAD data source level, and the data source are divided into three types like STEP-type, SGML-type, and other flat file. Especially, STEP and SGML should be distinguished, because their can be searched in a content-level. There exists each data-adapter CORBA servant which handles the request from server layer. The above layer of data source consists of CSEVE's CORBA servants and E-R model designing tool. Three servants are the core parts in CSEVE, which together operate as a

server. Storage-Server servant stores the meta-data about the shareable data source, and handles the request from Server-Accessor that deals with the retrieval of the data from the data source layer. Application-Interface is the API (Application Programming Interface) and offers CORBA IDL to many clients of the application layer. In the application layer, various types of the clients can be implemented according to the business processes of a virtual enterprise. In the next section, the client example will be presented which manages the Engineering-Change in design phase. In the communi-cation layer, CORBA is used as a network backbone, and upon it, JAVA/Servlet is used to support Internet/WEB. Also XML technology is adopted to pack or unpack the data into or from one document.

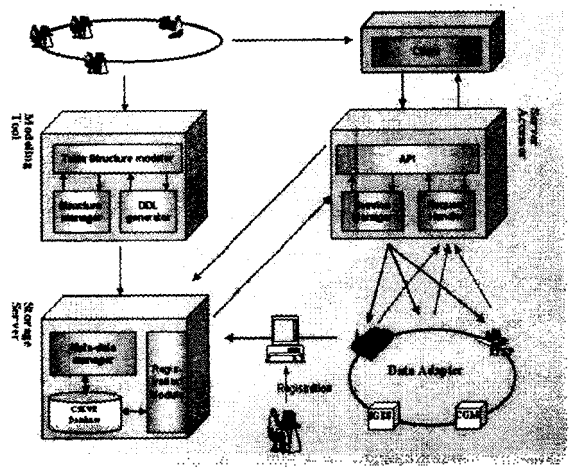

Figure 3 CSEVE server layer servant structure

Fig. 3 shows the structure of the Fig. 2 server layer, and Fig. 4 shows the software architecture of CSEVE.

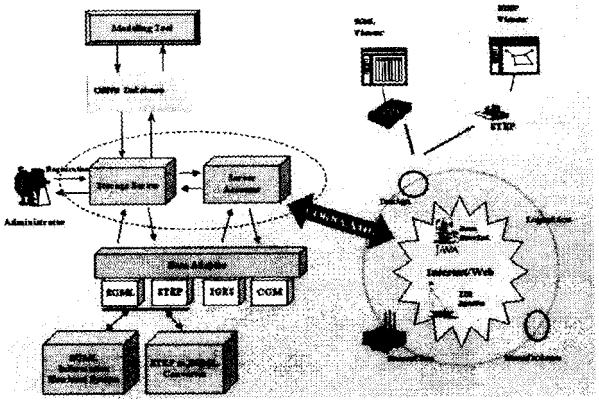

Figure 4 CSEVE server layer software structure

3. Engineering Change Management

CSEVE can be used to exchange and share the various technical engineering data during design, manufacture, logistics, execution between the participating enterprises. In these engineering operations, Engineering-Change Management (ECM) is frequently occurred during the design phase between the participating contractors in a common project. ECM client is implemented as an application to show the usefulness of the CSEVE server.

Engineering-Change process between several enterprises has not defined, but in private has been prescribed only between the participating contractors. In order to implement ECM client, we have developed the scenario that is shown in Fig. 5.

ECM client mainly consists of four modules, that are part drawing-information management, part specification management, drawing engineering-change management, and document management.

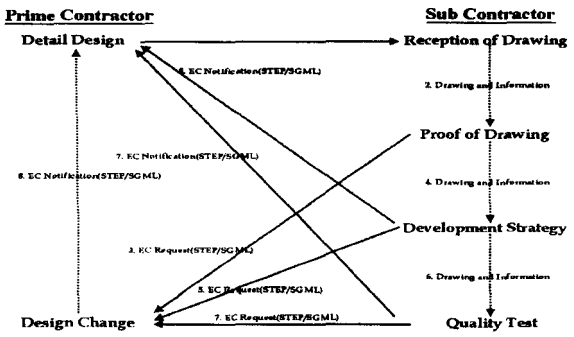

Figure 5 ECM Scenario

The part drawing or the specification is registered with CSEVE storage server, and if a user want to find the detail information, he can use part drawing-information management module or part specification management module. Fig. 6 shows the WEB page for the ECM client. When a user logins in ECM, a user can manage the drawing information from ECM management modules like Fig. 7 and Fig. 8.

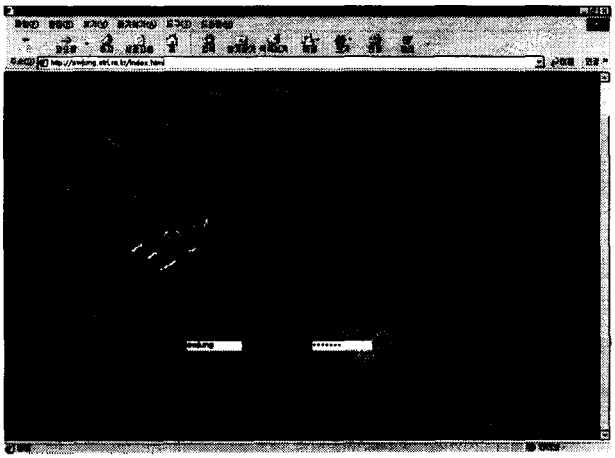

Figure 6 ECM Homepage

Every management module is implemented in JAVA and Servlet technology, and Servlet are interconnected with CSEVE server modules through CSEVE's applica-tion interface that is CORBA IDL definition.

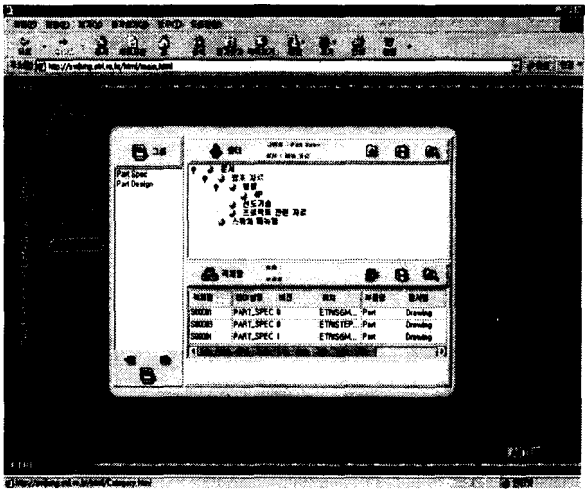

Figure 7 Document management module in ECM

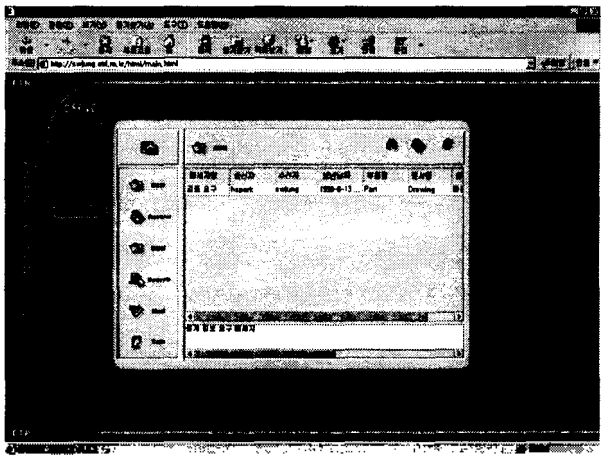

Figure 8 Part Drawing-information management module

4. Conclusion & Future Work

In this paper, we described the sharing server of CALS standard data such as SGML and STEP. In order to support the adaptation for the various types of contracts in a virtual enterprise, we developed E-R model designing tool and CORBA/JAVA servants. And ECM Web application was implemented to show

the usefulness of the server, CSEVE. By using JAVA, CORBA, and Servlet, we could achieve fast response, reliable server.

CSEVE will be extended to cover the standard method for constructing the meta-data such as IRDS. Also, besides ECM, other client will be developed to support the real engineering collaboration between several enterprises. JAVA agent technology will be adopted in order to support the intelligent gathering of engineering information.

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