UML MODEL FOR MIS OF BRIDGE BASED ON B/S ARCHITECTURE

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ABSTRACT

Developing with computer and Internet technology, the Urban Bridge Management System (UBMS) designers mainly chose B/S architecture for the system. Because of the complexity of the B/S architecture, the analyses and design of the system before coding became very important. This paper discusses modeling by means of UML and the expanded mechanism of it, and uses object-Oriented technology to analyze, design, and realize the system.

Keywords: Urban Bridge Management System; B/S architecture; UML; Object-oriented technology

1. INTRODUCTION

The UBMS is the Multi-disciplinary integration system including bridge engineering, information engineering, management engineering and system engineering. With the development of the Internet technology and information servers based on the web, more and more people begin to study and apply the MIS based on web environment. The benefit of the Browser/Server architecture is sharing date in the different environment of the network, reaching the synchronism of the data of the greater degree in the bigger range to solve so-called "Information Island" problem, and expanding the function of the MIS of the bridge. The MIS based on web not only realize sharing of the data in the different environment of the network and issuing the real-time information on the Internet, but also provide the functions such as real-time and historical inquiry information for bridge, bridge control, bridge daily management and bridge accident record and analyses for the designers, the constructors, the administrative department.

Because of the relative complexity of the web application based on the B/S architecture, if the developer ignored the whole process of the system, the result was losing effective management and control of the whole system in the final and making it difficult to maintenance and upgrade for the system. Furthermore, considering with the view of the software engineering, the system analysis and design of the earlier stage, namely Systematic modeling, was the decisive factor for the success of the system. Setting up good systematic model in the state of analysis and design was the guarantee of the quality of the software. We must understand to the system thoroughly before the coding. So it is especially important to set up modeling for the system during the development of the MIS based on the web.

2. B/S ARCHITECTURE

B/S architecture is a kind of application of C/S architecture in the web, which is a three-level B/S architecture made up of browser, server and database. In this structure, application program for customer set is separated from code of operation logic and figuring data by introducing a group of operation objects. Thus customer set is only responsible for showing the final data, having nothing to do with all other complexity hidden behind operation objects. And then traditional "fat customer"

becomes “slim customer” and real application system of distribution. B/S architecture is shown in Fig. 1.

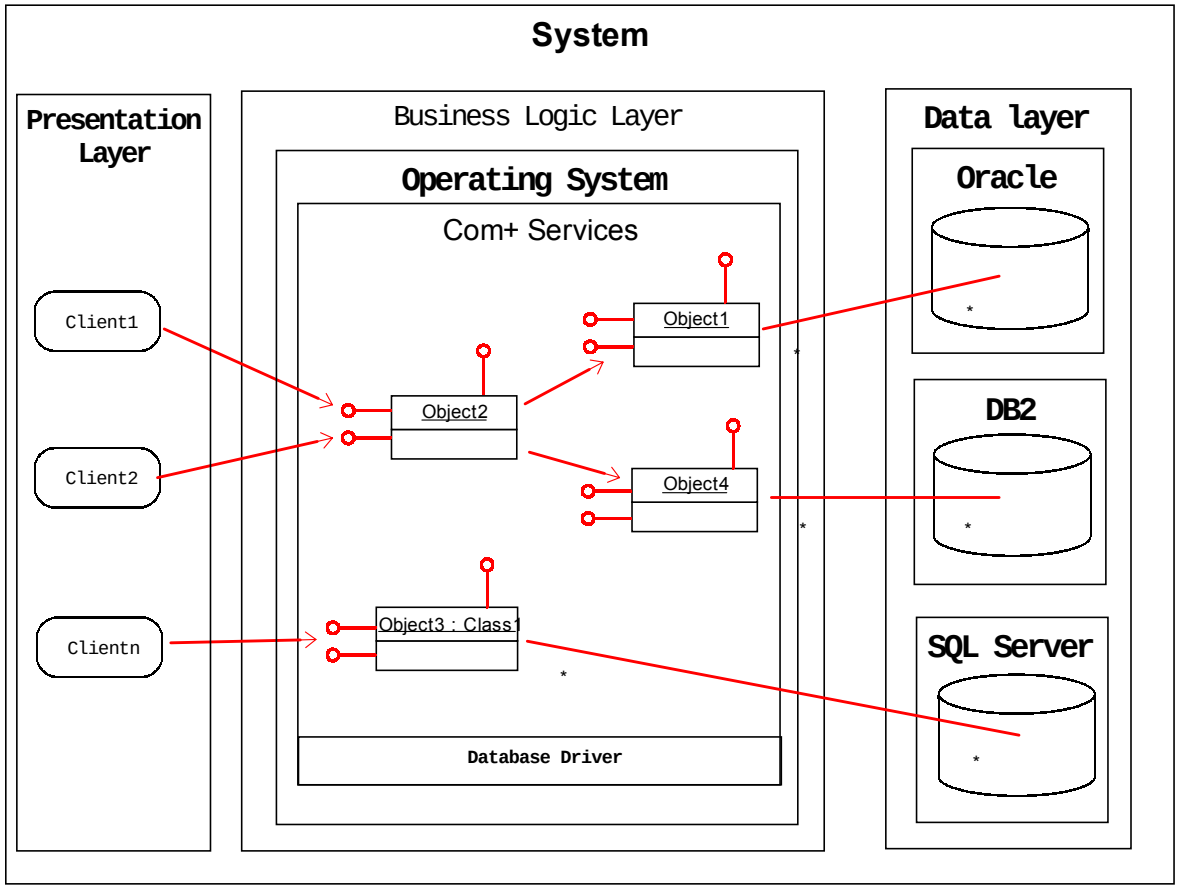

Figure 1. Three-level B/S Structure.

B/S architecture is of the following advantages:

- Machine deployments of lower customer set require compliance with application program of more convenience. Code for user surface is separated from operation logic and code for figuring data and customer set is only responsible for showing the data, which make re-use of operation logic and figuring data easier in the application program of many customer sets and furthermore change operation logic and database without recreate and re-announce application program for customer sets.
- Strengthen total handling capacity and flexibility of system. Every customer set can share certain resources such as line programs, EMS memory and connection to database, which can easily improve handling capacity and flexibility of system.
- Easily figuring out data from a number of databases. In this large-scale integrated system like bridge management system, sometimes some key operation data are spread in many different systems, and in B/S architecture, this kind of diversity of data resources is transparent to customer sets. And therefore, there exists more flexibility of design and deployment of the whole system.
- Share resources to a larger extent. All data from customer set centralize in the data level, and thus strengthen real-time capability of control over the whole system.

It is seen from all the above merits that B/S architecture is of apparent advantage in all the respects such as software capability, system integration, upgrading for maintenance and investment compared with two-level C/S architecture.

3. ESTABLISHMENT OF MODEL FOR BRIDGE MANAGEMENT SYSTEM BASED ON UML

3.1 Brief Introduction to UML

UML is a kind of language for establishing models to describe establishment and documentation firstly addressed by famous object-oriented technical experts, Grady Booch, Jim Rumbaugh and Ivar Jacobson and developed on OMT method (technology for establishment of model for object) and OOSE (object-oriented software project). UML language is a kind of language for establishing models and a kind of manifestation of standard, not a kind of method, the final use of which is to provide communication standard for the people from all walks of life.

The development of bridge management system is accomplished by experts in the field of bridge, system analysts, developers and users, while difficulties in communication between them become obstacle to system development. However, no matter personnel in charge of design, analysis and development adopt any kind of progress and methods, the results held by them are described by UML, which can help to promote mutual communication and understanding.

UML:

1. Requiring analysis. Through establishment of model by the use of legend, establish models for external objects and system function they need.
2. Analysis. Describe by UML logic perspective and dynamic perspective including type drawings, components drawings, listing drawings, situation drawings and activity drawings. The basic objective is to provide developers a system of understanding and communication.
3. Design. The results from analysis are broadened into technical solution plan. And the results in the design stage are concrete specification statement on the stage of establishment.
4. Establishment. The results on the stage of design are converted into language code for object-oriented program design.
5. Testing. The task of different testing group is based on different UML drawings: in unit testing, use type drawings and type specification statement; in integrated testing, use component drawings and coordination drawings; in system testing, use legend to affirm whether the action of system complies with corresponding definitions.

3.2 Establishment of Models Based on UUC for the Bridge Management System

Establishment progress based on UML in the respects of description and analysis of needs of bridge management system is as follows:

3.2.1 Description of Needs

The general function of this system is to give full display to advance computer technologies and advanced research results to satisfy the needs of users.

The general functions:

- This system is of Internet function. So, in this system, many users can share the database at the same time and cooperate with each other.
- This system has an interface platform of GIS system, which makes inquiries for bridge information more direct, apparent and dimensional.
- This system is a large-scale bridge information database design, construction, maintenance, checking, testing and assessment, providing all kinds of functions of inquiry for statistics and data management.
- This system has management function of circuit level that saves the files of historical checking of bridges and maintenance, scientifically assesses them, maintains decisions and automatically gives an alarm.
- This system is of management function of bridge project level formed by combination with checking, monitoring and calculation based on destruction and degradation of components.

Generally, use UML model of legend to describe the needs of system. Model of legend is made up of internal function of UML system (legend), external environment (object) and the relationship between the two (legend). Legend of bridge management system is shown in Fig.2.

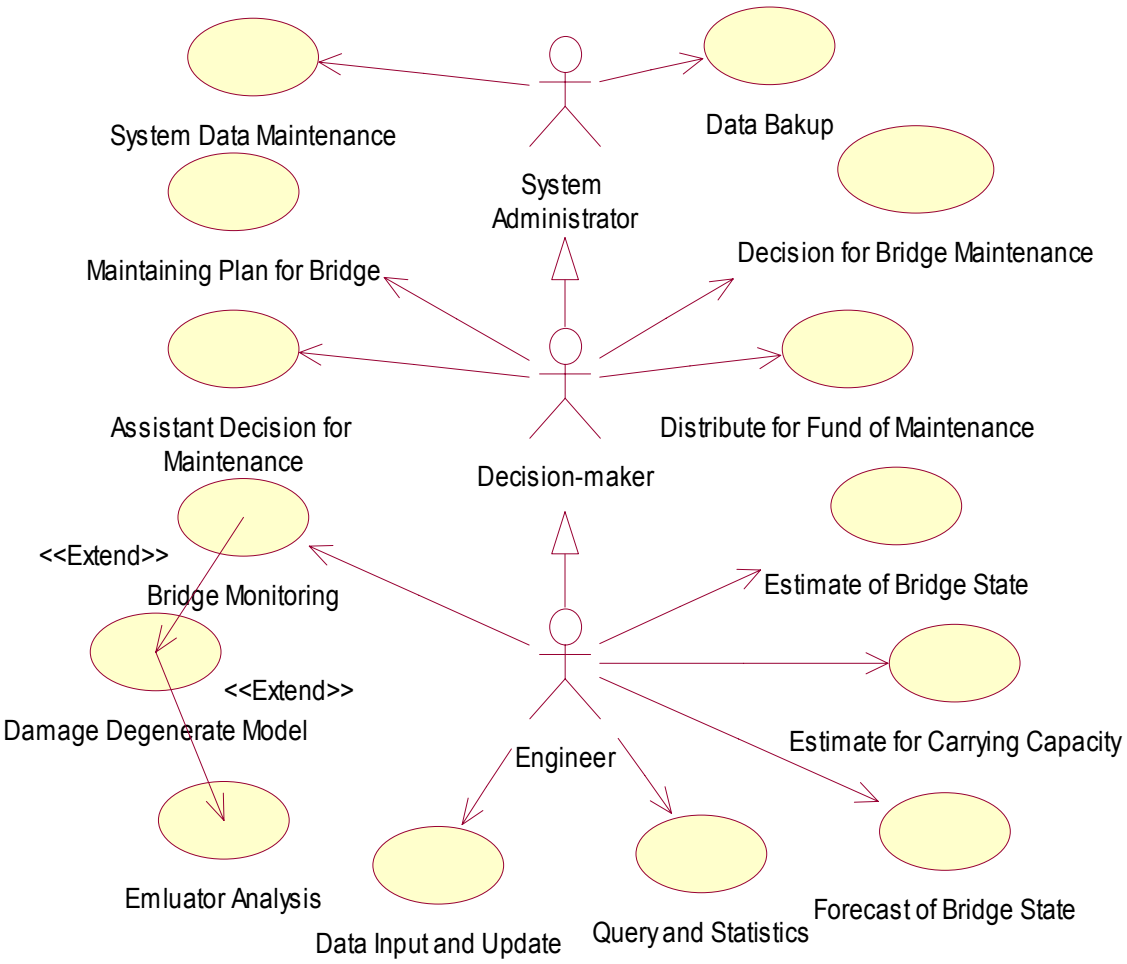

Figure 2. Structure platform.

This system is aimed at different users and operated in different ways. For instance, engineer can assess the situation of bridge, calculate and analyse in emulation and assess capability of bearing the weight and so on. Decision-maker can use and maintain distribution capital, plan maintenance of bridge and maintenance of bridge. The relationship between every users is one of succession mainly between rights.

3.2.2 Establishment of Models Based on Analysis

It is the chief task of systematical analysis to UML that establish systematical analysis model, which can adopt corresponding drawing of establishing models to describe system according to the needs of reality. It can be shown by type drawings, sequence drawings and activity drawings.

- Type drawing

Type drawing is the key drawing of UML, describing the relationship between type and type in this system, which is the base of other drawings. Because of the complexity of bridge management system, emphasis is laid on discussion about design data for bridge. It is shown in Fig. 3.

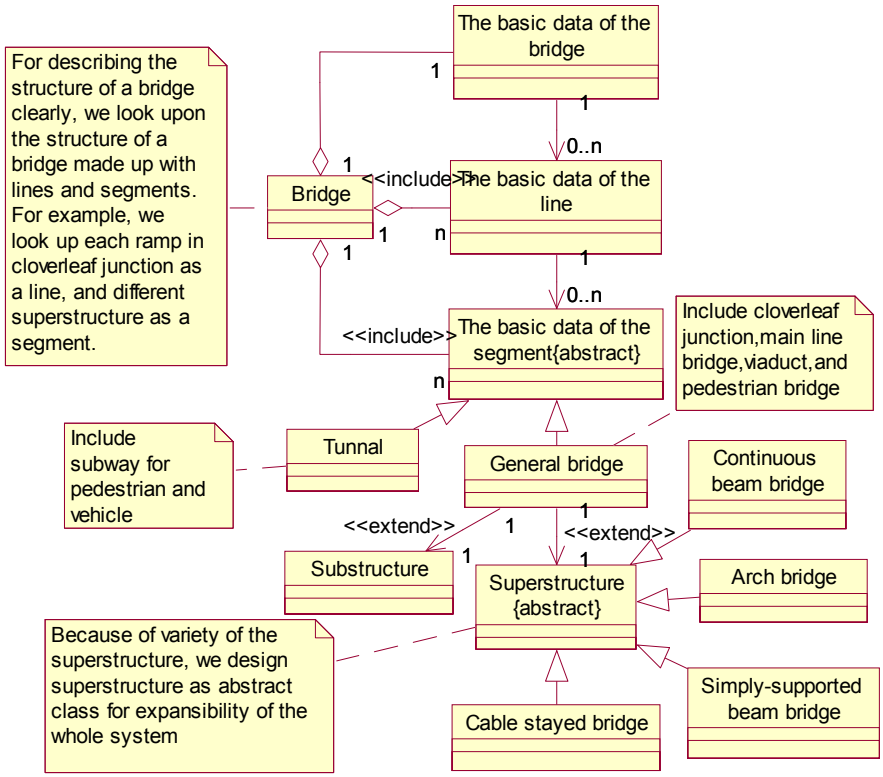

Figure 3. Bridge design data class diagraph.

- Sequence drawing

Sequence drawing describes dynamic mutual relationship between objects, showing time sequence of communication of information between objects and embodying alternative relationship between different objects in their sequence and at the same time, it shows different alternates between different objects in concrete level. There are discussions about sequence drawing through inquiry into bridge information, which are shown in Fig. 4.

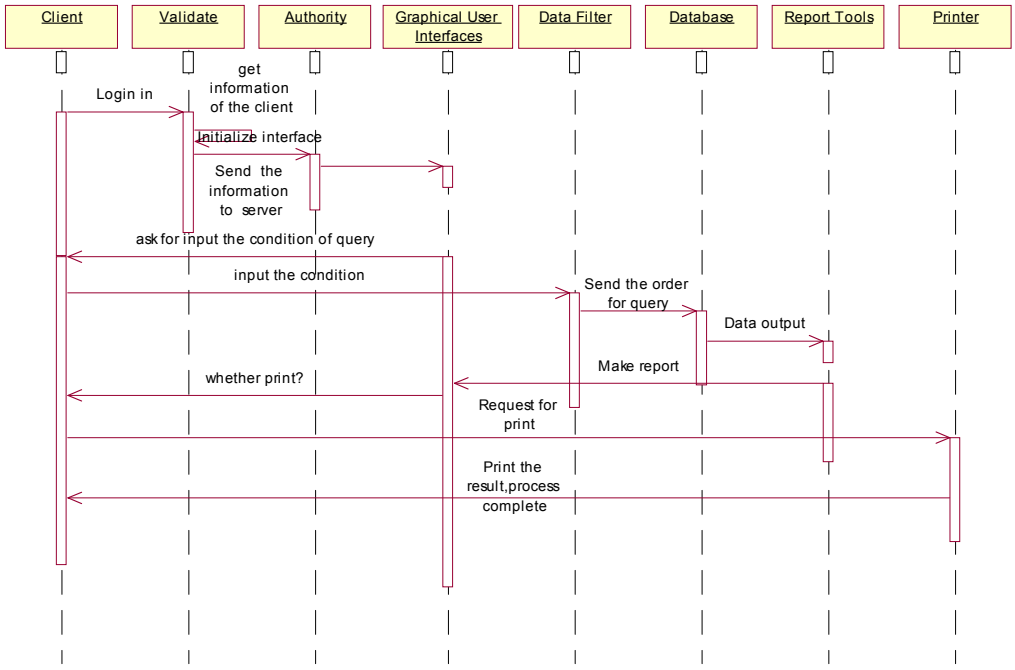

Figure 4. Sequence drawing of inquiry.

- Activity drawing

It is an assistant in model, helping select objects. It shows control flow of progress between two or more objects. It is used to establish model for more advanced operation progress at the level of operation unit or establish model for internal operation of internal part at low level. It is shown in the following activity drawing which shows that decision-maker makes decisions.

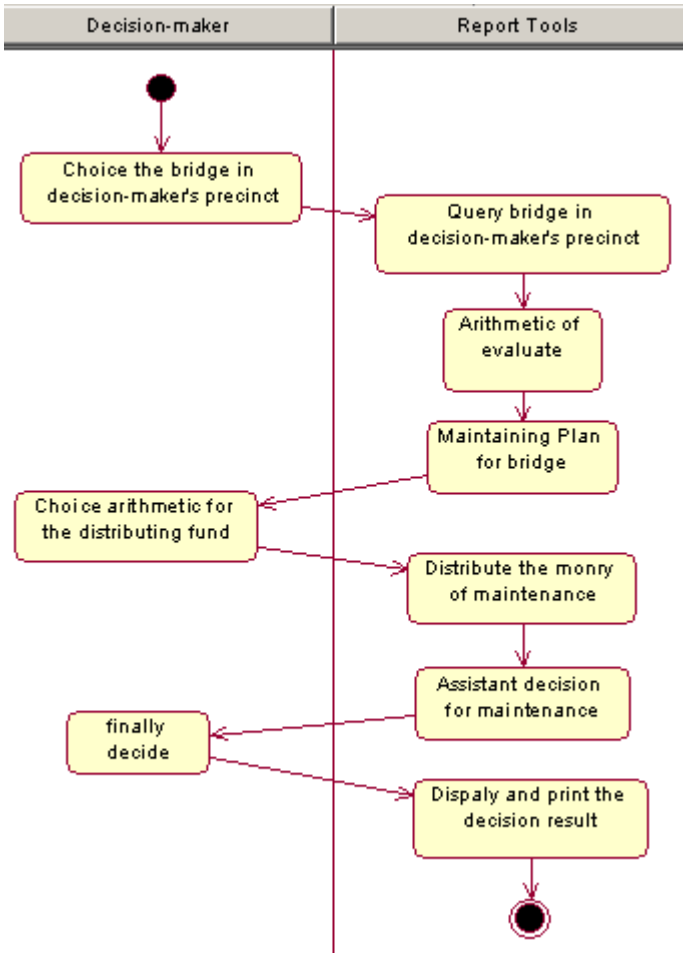

Figure 5. Diagraph-6 decision-making drawing.

4. CONCLUSION

As a whole, it is seen from the analysis through establishment of model for bridge management system that UML is a kind of object-oriented apparent language of establishment of models of strong function, extensively applied in all kinds of fields, especially in system adopting B/S structure. Through UML establishment of model, analysis and design are made on bridge management system, identifying the functions of this system and helping developers understand, modify and maintain system.

In this paper, an introduction is made to static and dynamic model by some examples such as legend drawings, type drawings, sequence drawings and activity drawings. A exquisite design plays a critical role in development of system, late maintenance and expansibility. The developer should bear in mind 00 design essence “high cohesion, low connection and improving the function of re-use, earnestly express results of establishment of models of system by UML, which has a favorable influence on the development of the whole system.

5. REFERENCES

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