Chapter 9
Universities Teaching Resources Based on Semantic Grid Portal Construction

Changlong Hu, Wei Liu and Jidong Zhang

Abstract This paper discusses the college teaching resources based on semantic grid portal construction, which starts from the system architecture and explains how to construct a grid portal application that can support learning service in the area of semantic retrieving of teaching resources on the basis of description of the teaching resources based on semantic and use of grid technology in service-oriented architecture (SOA) to improve the structure of teaching grid portal system.

Keywords Semantic description • Grid portal • Teaching resources

9.1 Introduction

The use of grid technology in Web-based instruction has become a research hotspot; some scientific research departments, institutions of higher learning, commercial corporations and even higher education institutes have invested a lot of man power and material resources for research and development [1]. For example, European proposes a "European teaching grid framework (ELeGI)," and China has put forward building "China education scientific research grid (ChinaGrid)" and "the national basic teaching grid." After building a basic teaching grid framework, the high-level application of teaching grid becomes cutting-edge research; this research will combine the research result of traditional network teaching, and it will improve the network teaching research to a new stage [2, 3].

The university teaching resources grid portal model expounded in this paper is based on the above idea to research [4]. On the one hand, this paper has realized the generalization of university teaching resources object described by standard ontology language RDF and OWL. On the other hand, it has improved on the basis of the former and proposed the ontology molecular concept which is suitable for the description of

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college teaching resources and the inherent knowledge in the body of resources and relative knowledge and realized fusion of the changeable college teaching resources and grid portal on the basis of semantic, which makes a beneficial exploration in the university teaching resource for user's better transferring and interacting.

9.2 Universities Teaching Resources Portal on the Basic of Semantic

9.2.1 System Architecture

Nowadays, the research on teaching grid is in the beginning stage. The key point of research is on the study of teaching grid architecture. For example, the literature gives the teaching grid architecture and proposes imagination of special middleware for teaching grid; the literature is developing LMS on the foundation of grid and composing teaching grid structural framing. The literature proposes imagination of teaching grid portal.

We settle teaching grid structural framing and portal of teaching grid on founding of these researches. Course evaluations and education resources will be constructed through the semantic ontology and then the resources are integrated through the semantic grid portal and are offered to users. It aims to break the restrictions of time and space, support resources sharing and learning collaboration and provide personalized and adaptive learning environment. The current network technology can only support the lower levels of learning resources sharing and learning activities' simple collaboration, and it still has many unsolved problems, including how to realize sharing resources and cooperation study in a distributed, autonomous, heterogeneous network environment, how to make semantics tap its potential in system, how to construct the essential components portal of a grid environment and how to regulate and simplify the environment of development. Therefore, this paper proposes a platform system structure on the basic of grid semantic.

9.2.2 The Grid Portal Based on Service-Oriented Architecture

Analyzing the teaching grid system, on the basis of the characteristics of the network teaching and the structure of the network teaching system, makes as much use of the service-oriented architecture (SOA) in using the grid technology and gives a more reasonable teaching grid portal system structure. SOA makes the loose coupling between learning partners possible and provides higher abstraction in the form of open interface. Semantic grid technology can promote learning resources sharing and interconnected interoperability of all kinds of learning support system in higher level, to make it easy to use the existing resources and services and to

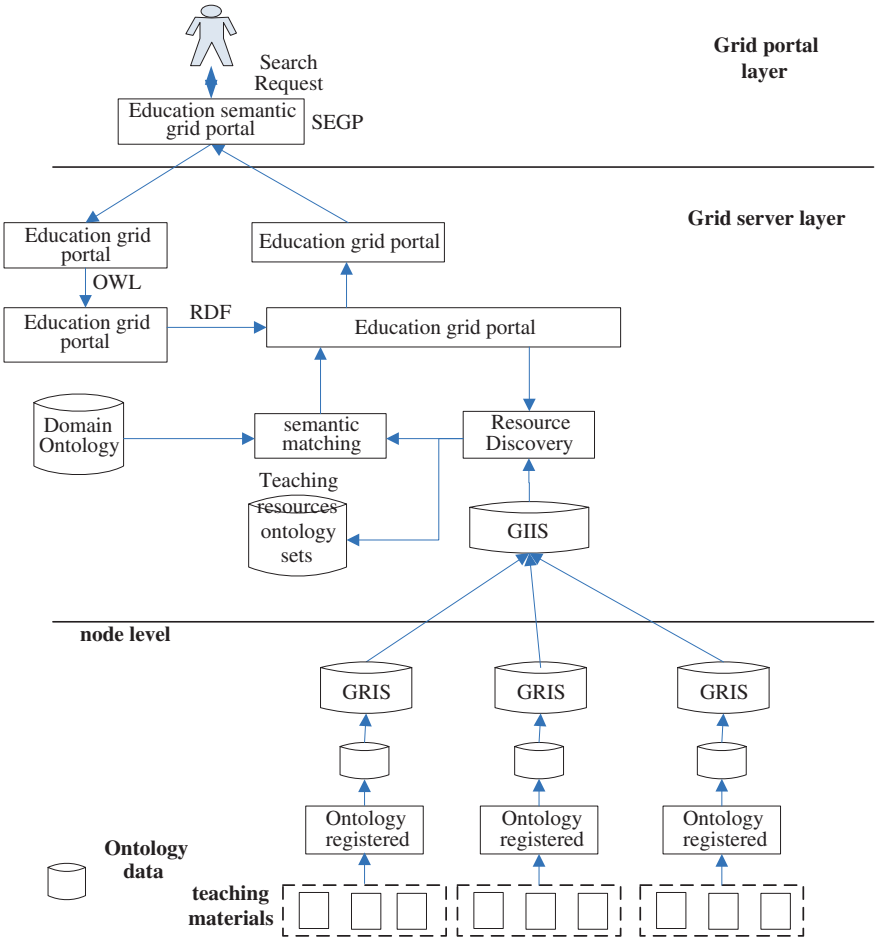

Fig. 9.1 The grid portal based on SOA

construct a new service dynamically and transparent, which gathers and coordinates resources in a flexible way. Dynamic grid computing environment is autonomous entity, heterogeneous and distribution, and this is a kind of environment that cannot be agreed beforehand; consequently, cooperation relations must be able to be selected, negotiated, established and monitored dynamically. In order to gather grid components and resources effectively, we not only need SOA model, but also require the relative functional, available information and the information of different components interface information to have consistent interpretation which can be understood and dealt by the machine. As shown in Fig. 9.1.

Through the identity authentication and other security technology to prevent illegal users through Internet use or get any resources of the grid we can, guarantee the security of data. Meanwhile, by using the technology of access control and data

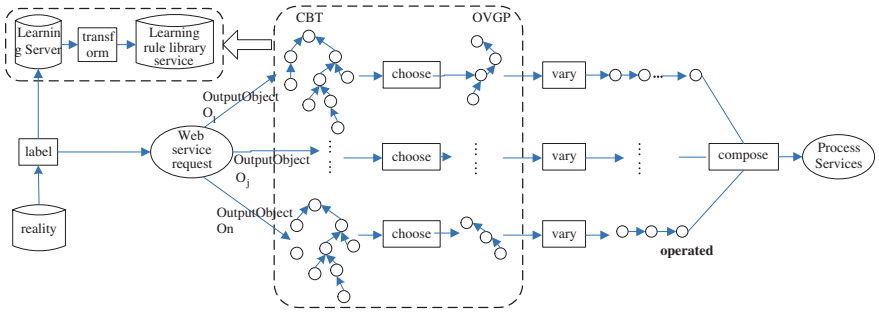

Fig. 9.2 Teaching resources description on the basic of semantic

hiding, users can only get the allowable information and knowledge and cannot steal unauthorized information. The grid security needs to realize security functions as follows: the user authentication, access control, billing, confidentiality, integrity, certainty and non-repudiation. The grid security also needs to realize the network flow control, load balance and congestion control, monitoring the grid resources, tasks and the state of application, providing performance evaluation and fault-tolerant processing.

9.2.3 Teaching Resources Description on the Basic of Semantic

Based on the semantic teaching resources description and Instructional Resources Management to classify and improve the existing teaching resources, we can get better formal description, and build semantic description model of teaching resources. Based on the grid monitoring and discovery system (trMDS) to establish a model for teaching resources register in the teaching grid, we can use this model to design teaching resources information server and implement registration, sharing and reuse of teaching resources in the grid. As shown in Fig. 9.2.

The application involves large amounts of data and computing resources and usually needs to cross the organizational boundaries to share security resources. In order to reduce the complexity of application development, general grid services layer can shield the heterogeneity of the network resources (physical resources and logic resources) and support the unity of management of the network resources, distribution scheduling and safety control and provide a platform that is convenient to use, similar to a unified operating system for the upper applied to.

Distribution resources are coupled with service. The goal of the grid is organizing all the resources and working together, by using the distribution resources coupled service can submit the resource to the top of the grid applications in the form of service.

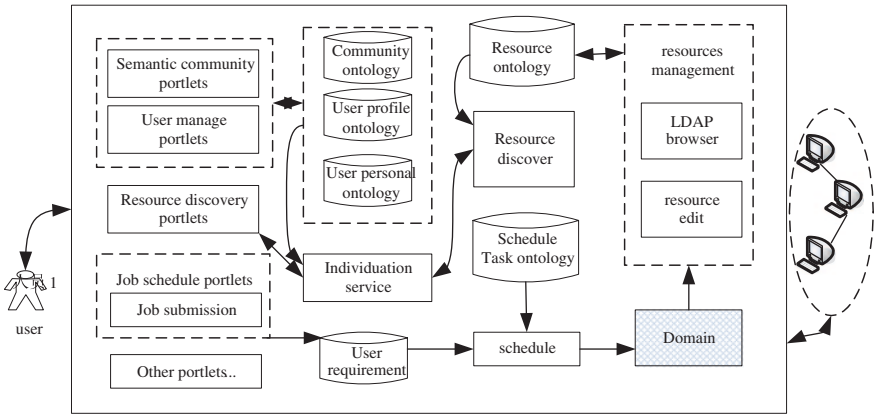

Fig. 9.3 Semantic retrieval of teaching resources

9.2.4 The Student Model Based on Ontology

The research of student model based on ontology uses ontology framework to integrate student model and establish the domain ontology and mapping that covers the ontology, studies mapping algorithm, builds cognitive ontology, and integrates the cognitive characteristics, cognitive style and cognitive abilities into the other common cognitive student model. And then based on these models, active teaching resources recommended mechanism was proposed. As shown in Fig. 9.3.

9.2.5 Semantic Retrieval of Teaching Resources

Semantic retrieval of teaching resources makes the traditional semantic retrieval expand to the teaching grid, to realize the distributed, heterogeneous semantic retrieval of teaching resources and realize the description, registration, discovery, searching, distribution, migration, reservation and recovery work of resource. Grid resource has the following characteristics: the geographic distribution of resources is very wide; resources and resources, resources and customer, customers and customers always connect each other by WAN; the quantity and type of resource are huge and required a certain degree of collaborative work resources that is dynamically changed, including resource attribute changes and copy and transfer in the grid, etc.; resources work in heterogeneous platforms and are controlled by different management strategy. In such an environment, a kind of resource discovery mechanism is needed, which does not depend on the centralized control, distributed, can be expanded, can adapt to the dynamic change of resources and has good positioning performance. Unlike the traditional distributed system which is using URI for positioning resources such as the Web, grid resource discovery

mechanism should not only consider the position information of resources, but also should consider the attributes of resources and the other semantic information.

9.3 Summary

This paper expounds the basis and requirements of university teaching resources grid portal construction based on semantic analysis of users' demand and experience. With semantic ontology knowledge, we make creatively try and research on the teaching resources description based on semantic and its application to teaching resources management.

Meanwhile, this paper describes the complete process of universities teaching resources grid portal system based on semantic, from requirements analysis, design to the system modeling and finally realize. In practical projects, the process and considerations of the grid portal system modeling are tried and recorded, a reference of using the semantic in university teaching resources management field is provided, and finally a unified and standard modeling approach that provides reference is formed.

Ontology knowledge in the process of teaching is a new promising field of research. It still has not appeared as a complete ontology model and the framework. How to analyze dominant and recessive knowledge in teaching process better? How to select right ontological form of the different types of knowledge? The research with a combination of universities' teaching resources which is based on the semantic and grid portal still has a lot of the unknown waiting for people to explore. With the development of research, believing that the expression of semantic study will become more and more mature, grid portal that is based on the semantic will also be better serviced in the spread of human knowledge, sharing and creating.

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