Semantic Browser: An Intelligent Client for Dart-Grid

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Abstract. In this paper, we propose a generic architecture of Semantic Browser for Dart-Grid, which is an intelligent Grid client and provides users with a series of Semantic functions. Extensible plug-in mechanism enables Semantic Browser to extend its functions dynamically; Semantic Browser converts various format of semantic information into uniform semantic graph with Semantic Graph Language (SGL); a semantic graph is composed of operational vector-graphic components. An application of Semantic Browser on Traditional Chinese Medicine (TCM) is also described.

1 Introduction

The evolution of the Web has resulted in a great deal of distributed database and knowledge base (KB) [1] resources. In such an environment, sharing and utilizing large-scale information resources has become a central issue to be addressed. Traditional architecture of Web browser is quite insufficient for these requirements. So some novel browser should be brought forth and developed. Semantic Browser is just such a new type of browser, aimed at sharing and managing information from distributed KBs and databases for Dart-Grid [2], which is an OGSA [3] -based system developed by Grid Computing Lab of Zhejiang University and intends to support information resource management in the open, dynamic wide-area environment. This paper discusses the architecture of Semantic Browser based on Grid [4] and Semantic Web [5] and introduces the key technologies of implementation, as well as an application on TCM.

2 Overview

We indicate the architecture of Semantic Browser for Dart-Grid in the frame with dotted line border in figure 1. Semantic Browser views distributed information at semantic layer and acts as an intelligent client to Dart-Grid. It provides richer interaction to end-users of Dart-Grid for querying and managing information.

Fig. 1. The architecture of Semantic Browser

Fig. 2. The screen shot of Semantic Browser

A Customizable User Interface. The information view is intuitive and users can customize the interface to fit their specific needs as shown in figure 2.

Semantic Browser Plug-ins. Semantic Browser accesses Grid services through Grid interface by semantic plug-ins, which usually contain some specific stubs [3] and gain access to a Grid service instance through GSH and GSR.

An Intelligent Controller. Intelligent Controller coordinates and schedules plug-ins, enabling proper plug-ins to access proper services.

An SGL-parser and an SG-factory. Semantic Browser needs an SGL-parser to parse and process SGL data stream. An SG-Factory will produce uniform semantic graph based on SGL, despite formats of semantic information.

3 Implementation and Key Technologies

According to the generic architecture of Semantic Browser, we implement a prototype of Semantic Browser based on SkyEyes [6] Browser.

Extensible Plug-in Mechanism. As the scale of information increases or users' requirements vary, services of Dart-Grid may be dynamically updated and delivered. The extensible plug-in mechanism allows Semantic Browser to extend its functions by adding new plug-ins, without the basic code and structure being modified.

Operational Vectographic Components. A vectographic component is used as a proxy or view for semantic information. In a semantic graph, each vectographic component provides not only a view of semantic information but also a series of intelligent functions to end-users.

Semantic Graph Language. SGL takes semantics in and treat semantics as part of graph elements. We can convert various Semantic Web languages like RDF(S) [7] into SGL and use SGL to describe both the semantics and the appearance of a semantic graph. SGL is an XML-based language and here is a small part of SGL BNF definition.

SGL ::= '<SGL>' namespaceList, graph* '</SGL>'

graph ::= '<graph>' idAttr depthAttr '>' subgraph* '</graph>'

subgraph ::= '<subgraph>' idAttr typeAttr '>' root, (edge, node | subgraph)* '</subgraph>'

node ::= '<node>' idAttr ((resourceAttr localnameAttr labelAttr) | (literalAttr operatorAttr inputAttr)) angleAttr? spaceAttr? DisplayAttr? '>' '</node>'

resourceAttr ::= 'resource=' 'resourceURI' '/* the URI of a Resource */'

Fig. 3. A use case of Semantic Browser

4 Application on Traditional Chinese Medicine

In collaboration with the China Academy of Traditional Chinese Medicine, we have finished the development of TCM Information sharing platform based on Dart-Grid,

which involves tens of large databases from 17 institutes. Users can use Semantic Browser to acquire useful TCM information. For example, if a doctor is not sure about the use of a new medicine, he can take Semantic Browsing, Semantic Querying and reasoning in Semantic Browser to get useful information about the new medicine quickly and effectively, as shown in figure 3.

5 Summary

Semantic Browser differs itself from traditional Web browsers as an intelligent client for Dart-Grid. It's based on dynamical and open Grid environment and accesses Grid services to solve more complex problems. Browsing and Querying with semantic links can get information more exactly and effectively. Vectographic components provide users with excellent semantic information view and interactive functions. Extensible plug-in mechanism enables extending functions dynamically according to the change of Grid services. Heterogeneous information is converted into uniform semantic graphs based on SGL. Our future work is to improve the functions of Semantic Browser further, especially on reasoning services and knowledge services.

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References

1. Wu Zhaohui, Chen Huajun, Xu Jiefeng. Knowledge Base Grid: A Generic Grid Architecture for Semantic Web. JCST Vol.18, No.4, July, 2003.
2. Wu Zhaohui, Chen Huajun, Huang Lican et al. Dart-InfoGrid: Towards an Information Grid Supporting Knowledge-based Information Sharing and Scalable Process Coordination. CNCC, 2003.
3. I. Foster et al. The Physiology of the Grid: An Open Grid Services Architecture for Distributed Systems Integration. Tech. report, Glous Project.
4. I. Foster, C. Kesselman, S. Tuecke. The Anatomy of the Grid: Enabling Scalable Virtual Organizations. Int'l J. High-Performance Computing Applications, 2001.
5. Berners-Lee, T., Hendler, J., Lassila, O. The Semantic Web. Scientific American, 2001.
6. Resource Description Framework (RDF) Model and Syntax Specification.
<http://www.w3.org/TR/1999/REC-rdf-syntax-19990222/>.
7. Mao Yuxin, Wu Zhaohui, Chen Huajun. SkyEyes: A Semantic Browser for the KB-Grid. GCC, 2003.