INTERNET INTELLIGENT PLATFORM- AGRIP

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Abstract: In information age, both governments and enterprises need intelligent platform to provide dynamic, real-time intelligent information processing service. This paper describes an **A**gent **Gr**id based **I**ntelligent **P**latform AGrIP to support service layer information processing. AGrIP integrates a comprehensive set of tools to compose a whole platform that will enable straightforward management of large-scale information from Internet and then apply data mining, case base reasoning and expert system to aid practical enterprise applications.

Key words: Intelligent Platform, Agent, Grid

1. INTRODUCTION

The "Grid" is an emerging infrastructure that connects multiple regional and national grids to create a universal source of computing power—the work "Grid" was chosen by analog with the electric power grid, which provides pervasive access to power. The resource management is central to the operation of a grid. Agent technology is one of the ways to meet these requirements in such grid environment. In the past decade, attempts to apply intelligent agents in realizing the Grid vision have been made by academic researchers during the past few years. The most interesting work in the literature might be the Agent Grid concept proposed under the DARPA ISO's Control of Agent-Based Systems (CoABS) program. The agent grid is a specific construct or mechanism within that layer for making services and resources available. Hence we can view the Grid as a number of interacting agents. In terms of the idea we have built a system of agent-based grid

intelligent platform (AGrIP). It is based on the multiagent platform MAGE and integrated various middleware for intelligent information processing.

The rest paper is organized as follows. Section 2 will discuss the architecture and main characteristics of intelligent platform. Section 3 describes the multiagent environment MAGE [1]. Section3 introduce the middleware of the platform. And section 4 summarized the paper and gives a conclusion.

2. ARCHITECTURE

In this section, we introduce the architecture of AGrIP. As the figure 1 shows, AGrIP, from bottom to up, consists of three layers: MAGE integrated platform layer, middleware layer and application layer. At bottom, MAGE is a multiagent environment, which applies the wrap techniques to provide integration support. In the middle layer, the functional software is wrapped by agents and can cooperate with other to together complete complex applications. The functional software mainly includes the intelligent search engine GHunt, multi-strategy data mining tool MSMiner, case base reasoning tool CBR, multimedia retrieval tool MIRES and expert system OKPS etc. To summarize, it has the following characteristics.

Open. As a platform, not a toolbox, it should support HTML, XML, WML files etc, in order to support the mobile devices and low-band applications. Moreover, the platform should provide integration patterns for business intelligence and outer applications seamlessly. Likewise, it is a service engine based on web, not a client/server tool driven by end-users.

Distributing It can integrate heterogeneous data sources and deal with different file formats, granularities, dimensions and distributed documents stored in the business or decision-support systems.

Scalable. It should integrate external application systems and run on the high performance SMP machines, supporting the cluster technologies such as load-balance, fail-over, the connection pools, in order to support a great deal of transaction processes.

Self-adaptive. It can adapt to the front users according to the specified preferences, which only show the relevant functionalities when the authorized users use it.

Timely. It can provide the needed efficient and timely data to the users and business applications considering its distributing abilities and rich ontology or metadata.

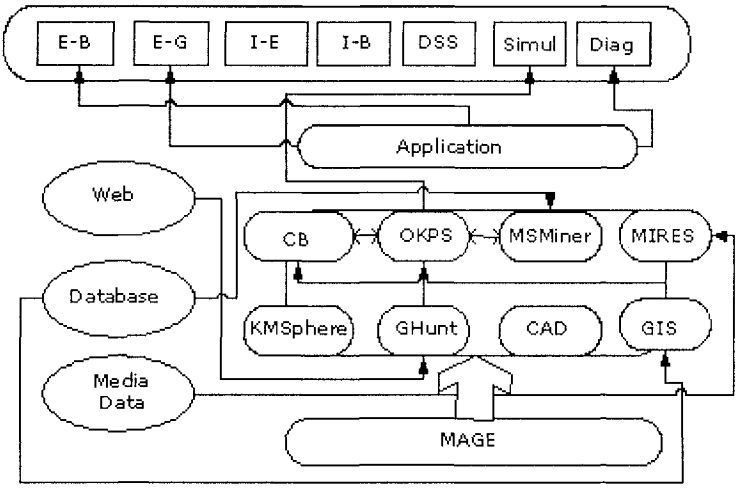

Figure1 The architecture of AGrIP

3. MULTIAGENT ENVIRONMENT-MAGE

MAGE is a multiagent environment with a collection of tools supporting the entire process of agent-oriented software engineering and programming. It is designed to facilitate the rapid design and development of new multiagent applications by abstracting into a toolkit the common principles and components underlying many multiagent systems. The idea was to create a relatively general purpose and customizable toolkit that could be used by software users with only basic competence in agent technology to analyze, design, implement and deploy multiagent systems.

MAGE has the following features:

(1) It utilizes standardized technology and standardized specification wherever feasible, for examples our MAGE is FIPA compliant, and agent interaction is based on FIPA-ACL.

(3) It provides friendly and easy-to-use human-computer interface by the visual programming paradigm and the pick-and-choose principle.

(4) It supports an open and flexible design so that it is easily to extend, thus users can easily add to the library different kind of components.

(5) It supports the entire development process of agent-based software engineering and programming: AUMP [4] (Agent Unified Modeling Platform) for system analysis and design, VAStudio (Visual Agent

Studio) for implementation, and MAGE deplorers for deployment and management.

3.1 MAGE platform architecture

MAGE is designed to be compliant with FIPA, and MAGE framework in which MAGE agents exist and operate is comply with FIPA Agent Management Specification. Figure 2 is the architecture of MAGE framework. It is a logical reference model for the creation, registration, location, communication, migration and retirement of agents. From Figure 2 we can see that MAGE platform consists of the following components, each representing a capability set.

Agent Management System (AMS) is a mandatory component of MAGE. The AMS exerts supervisory control over access to and use of MAGE platform. Only one AMS exists in MAGE. The AMS maintains a directory of AIDs (agent identifiers) which contain transport addresses (amongst other things) for agents registered in MAGE. The AMS offers white pages services to other agents. Each agent must register with an AMS in order to get a valid AID.

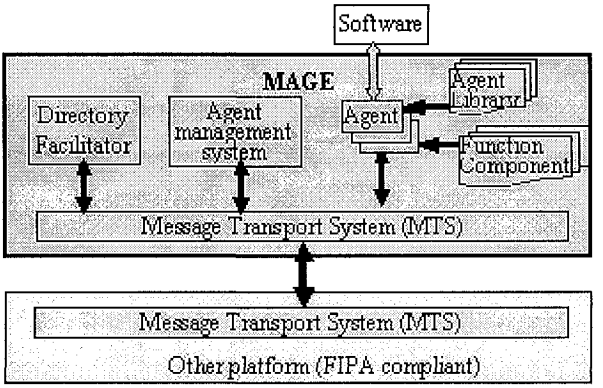

Figure 2. MAGE platform architecture

Directory Facilitator (DF) is a mandatory component of MAGE. The DF provides yellow pages services to other agents. Agents may register their services with the DF or query the DF to find out what services are offered by other agents. Multiple DFs may exist within MAGE and may be federated.

Message Transport Service (MTS) is the default communication method between agents on different agent platforms.

Agent is the fundamental actor in MAGE, which combines one or more service capabilities into a unified and integrated execution model that may

include access to external software, human users and communications facilities. An agent may have certain resource brokering capabilities for accessing software.

Software describes all non-agent, executable collections of instructions accessible through an agent. Agents may access software, for example, to add new services, acquire new communications protocols, acquire new security protocols/algorithms, acquire new negotiation protocols, access tools that support migration, etc.

4. MIDDLEWARE MODULES

The section will describe two main middleware modules, intelligent search engine Ghunt and multi-strategy data mining tool MSMiner. They are seamlessly integrated in the AGrIP system.

4.1 Intelligent Search Engine-GHunt

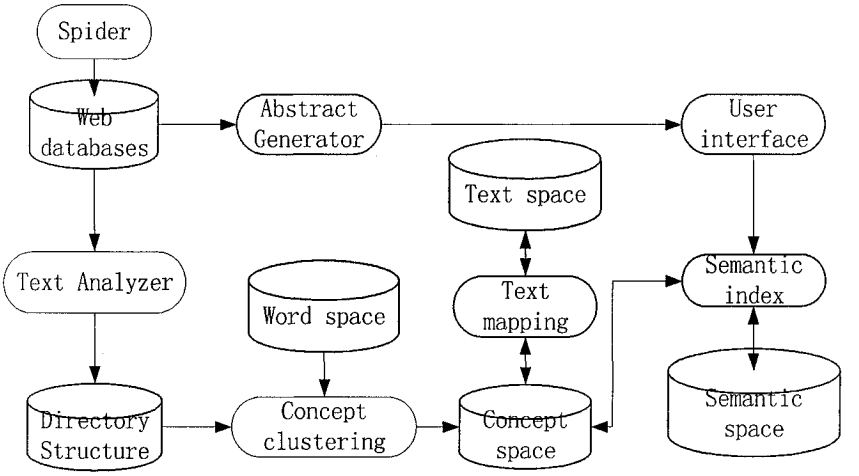

Figure 3 GHunt processing

In this section, we describe the intelligent search engine GHunt [3]. At first, GHunt is an independent tool for information retrieval, which is not integrated in the AGrIP platform. From the function aspect, it is an all-sided solution for information retrieval on the Internet. When it runs on the internet, a parallel, distributed and configurable Spider is used for information gather; a multi-hierarchy document classification approach combining the information gain initially processes gathered web documents;

a swarm intelligence based document clustering method is used for information organization; a concept-based retrieval interface is applied for user interactive retrieval. Since huge original information is crucial in a decision support system, it was integrated as a module of the AGrIP platform, which provides a powerful information collection function.

4.2 Data mining tool-MSMiner

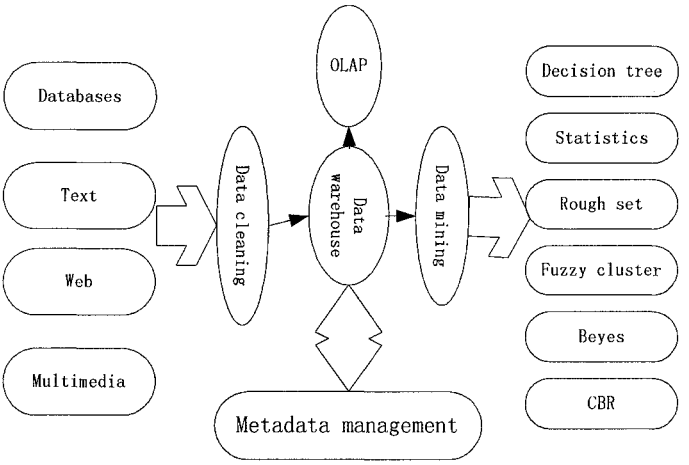

Figure 4. MSMiner

MSMiner [2] is a generic multi-strategy data-mining tool. The functions of the system include database access, data modeling, data preprocessing, data mining, and data visualization. In addition to this, emphasis has been put on the extensibility characteristics of the system. As multi-strategy data mining software, MSMiner not only provides convenient tools to develop new data mining algorithms, but also includes many build-in algorithms such as SOM and C4.5. MSMiner has an open interface for adding data preprocessing function and can access a variety of databases such as SQL Server, Oracle, and Informix. It can collect information from web, text, database and multimedia database. After data cleaning, they are stored in the data warehouse for data mining. Since it is a multi-strategy data mining tools, we integrated machine learning, rough set, CBR and Statistics techniques in

the algorithms library which provides a strong data mining for decision support.

5 APPLICATIONS

AGrIP is now as the foundation platform for city emergency inter-act system. The process is as follows. Firstly, it searches the information through the Ghunt from the Internet and stores them in the database. And then, we use the MSMiner in the platform for data mining and acquire rules. These rules are applied for reasoning about the future cases. After getting decisions about the emergency, we apply the MAGE as the integrated platform to distributed the decision information to concrete department for actions.

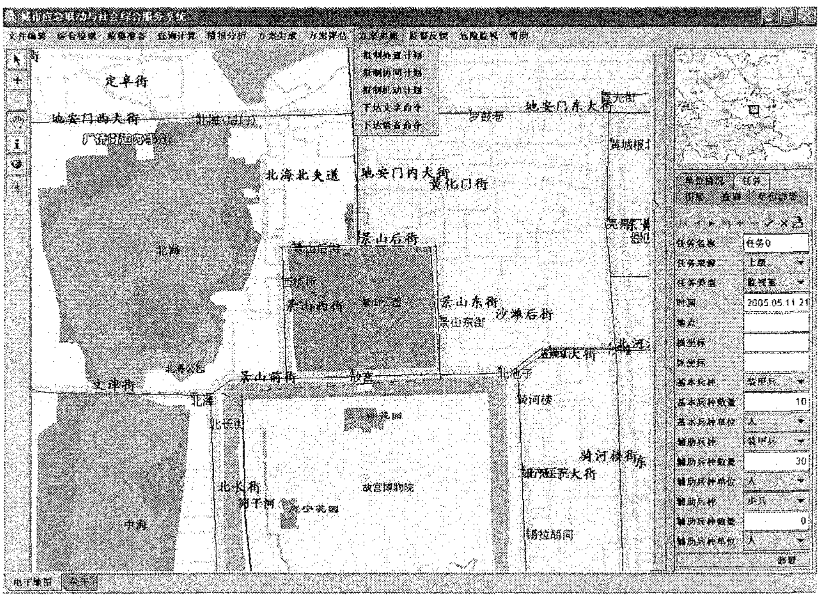

Figure 5 Grid-Based Emergency Inter-Act System

5. CONCLUSIONS

Establishing grids is an important undertaking in developing scalable infrastructures. In this paper we have proposed a model for agent-based grid computing from the implement point of view. Based on the model AGrIP has been constructed using MAGE, which is a multiagent environment platform.

Due to the very generic nature of the grid computing, we can involve the research on it from different level, such as operating system layer, information layer, knowledge layer, and service-oriented layer. Agent-based grid intelligent platform AGrIP focuses on service-oriented layer in terms of current exist running environment. AGrIP will be a useful platform for research on agent-based grid computing.

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