Design of Labour Agency Platform Based on Agent Technology of JADE

Xiaobin Qiu, Nan Zhou, Xin Wang

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Network Center，China Agriculture University，Beijing 100083，P. R. China

Abstract. Ordinary labour agency system provides services for clients with a data center which comprises single or multi servers according to the scale. And each server provides service of regular function. Therefore problems in security, load balance and extendibility may be involved. In this paper, a labour agency platform using an agent technology called JADE was designed, which effectively solved the problem of normal systems.

Key words: labour agency; multi-agent; JADE

1、Introduction

With the rapid development of network, labour agency system gradually becomes the main approach to gaining the labour information for both employers and employees, and gives departments in charge prop for formulating policies. Ordinary labor agency system mainly provides information. Employers and employees obtain their required information by key word query, etc. The matching accuracy is in mass shortage. In order to solve problems of the Information Island, systems are generally composed of one or more servers to constitute a large system center platform to provide customer service. As the system volume turns larger, some disadvantages emerge in the structure, such as security and robustness. Due to the unitary center, once the system is attacked or broken down, the whole system will collapse. In addition, database load is also a bottleneck of the whole system.

This paper adopts JADE (Java Agent Development Environment, referred to JADE) for labour agency system based on multi-agent framework design, which effectively solves the above problems through multi-agent technology.

2、Agent and JADE

Agent refers to an entity which stays in specific environment with independent behavior and can interact with other agent at high-level. Agent technology supports analyzing, modeling, structuring and deploying the system by abstract concept and design concept of agent. As it provides high-level abstractions and natural modeling method to simplify the system development and control complexity, and especially because software agent can effectively adapt to dynamic open environment, in recent years research in this area acquires widespread attention among many mainstream computer information research fields.

JADE is a software architecture which is fully parsed by Java. It is also an agent platform architecture which completely follows the standard of FIPA(Foundation for Intelligent Physical Agent). Its platform architecture as shown in Fig. 1, includes AMS(Agent Management System), DF(Directory Facilitator) and MTS(Message Transport System).
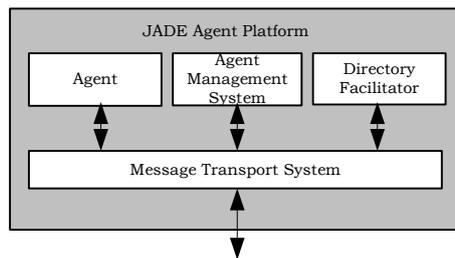

Fig. 1 Agent platform architecture

Each agent in JADE is a self-governing entity, which has the cooperation ability and the communication ability. External cannot obtain the quote, namely, agent attributes cannot be accessed directly by external, and agent's behavior cannot be designated directly by external too. The specific task of creating agent is completed only by the container. The returned results are encapsulated agents. A container is a Java virtual machine. Same containers can accommodate multiple agents, and each container must register to a main container. JADE platform, when activated, will immediately creates the AMS Agent and the DF Agent, meanwhile it will set MTS module to allow communication between each other.

3、System Framework

Ordinary labour agency system usually includes a recruitment management subsystem, a job management subsystem and an information release subsystem. All functions which every labour service agency uses are completely the same. When using agent, each system can provide personalized functions in the main function consistent circumstance according to the agent requirements. For instance several labor agency systems can be deployed in a platform, namely, system 1, system 2, etc. All these systems may have the same functions or some personalized functions, but all interfaces must be completely consistent in order to provide a uniform service. These systems are equal between statuses. A system can work with other systems, or work alone while not suffered from any other system's influence. Platform structure is shown as Fig. 2.
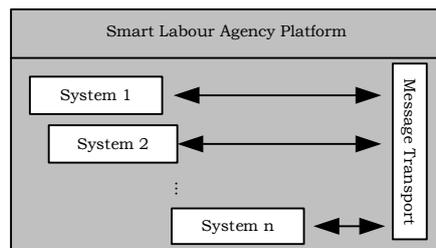

Fig. 2 Labour agency platform architecture

The function of each system platform is complete. All systems unite each other by agency communication channels. For users, it appears like one system. Consequently, not only every system on the platform has complete function, but also there is not any coupling between systems. Safety and extendibility of platform can be improved effectively.

In the design of labour agency platform, each system mainly includes a system management agent, a recruitment agent, a job agent, a recruitment broker agent and a job broker agent. System function structure is shown as Fig. 3.
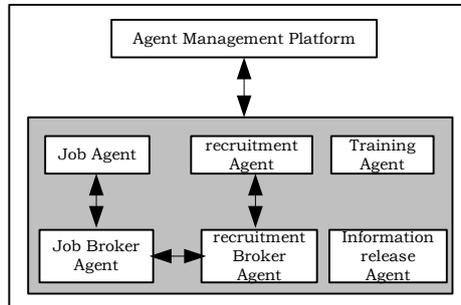
Fig. 3 functions of the system platform

System management agent is responsible for managing the entire system agents. When a job seeker arrives, system management agent will start the job agent and the job broker agent to serve it. Job agent manages the basic information of job seeker. Job broker agent is primarily responsible for job seekers offering the right candidates. In the same way, when an interviewer comes, system management agent will start the recruitment agent and the recruitment broker agent to serve it. Job broker agent and recruitment broker agent is in the many-to-many relationships. When a job broker agent inquires a recruitment position, multiple recruitment broker agents can provide recruitment posts for it. And it chooses the most suitable one for its recruitment broker agent.

4、System Implementation

The system is implemented by mature technology and extensive JADE. JADE manages agents by containers. Containers can be in one computer or in multiple computer hosts, but a JADE platform has only one main container. Any other containers are agent containers. Every container includes all kinds of agent of the system. There are four objects in the labour agency system, which are JobSeekerAgent, JobSeekerBrokerAgent, JobInforAgent and JobInforBrokerAgent. All these objects are inherited from jade.core.Agent. So they have all basic methods of the superclass, including setup(), addBehaviour(Behaviour b), removeBehaviour(Behaviour b), send(ACLMessage msg) and receive(). System realization model is shown as Fig. 4.
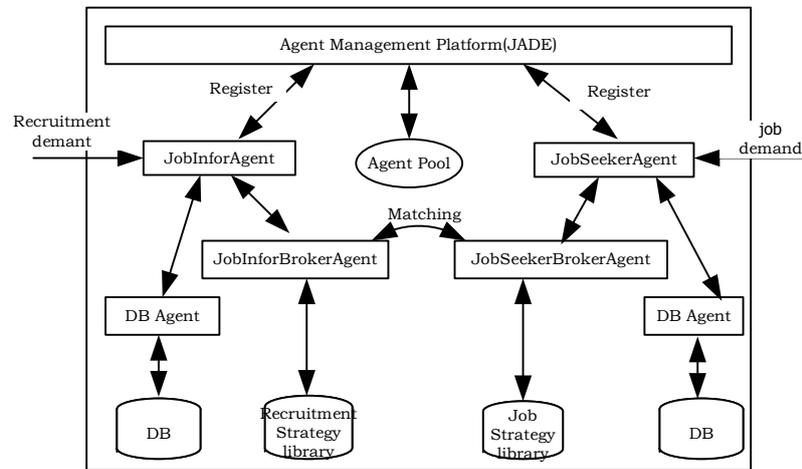
Fig. 4 system realization model

Agent management platform is responsible for creating agent and managing the agent pool. JobInfoAgent and JobSeekerAgent are responsible for receiving the needs of users and paying the broker agent. Broker agent performs match and returns results according to the strategy library. To demonstrate the working process of the system implementation, an example of seeking a job launched by a job seeker is given below. The recruitment process is similar.

When JobSeekerAgent obtains demand, it sends messages to all actived.recruitment agents, with the message type CFP.The content is job intension including salary requirement, site requirement, position requirement, etc. The purpose is to let recruitment agent send their recruitment information. Recruitment agent detects CFP message, inquires, starts recruitment broker agent and sends PROPOSE message to recruitment agent, if there is information matching the requirements. The content of message is recruitment information. When job agent detects PROPOSE message, job agent will start the job broker agent, create a list of job agents and send the list as a parameter to the job broker agent. Job broker agent performs matching with recruitment broker agents according to related conditions. If matched, job broker agent will send an ACCEPT message to the recruitment broker agent, or send a REJECT message to it. The agent which detects the ACCEPT message is the recruitment agent selected by job broker agent. The recruitment agent sends an OK message whose content is the information of matching successfully. Job agent detects

the OK message, confirms the success of the employment and notifies users. If match fails, the process will start again.

5、Conclusions

Labour agency system is implemented by multi-agent with JADE. It can effectively improve the platform for safety and expansibility, and can implement load balance better than other systems. Not only can JADE implement multi-agent in one machine, but also in multi machines and can be deployed distributedly. Currently the implementation is in only two machines due to the actual platform situation. The improvement of the system can mainly be in the efficiency of system strategy and the further promotion in the future.

References

1. Ye, Ronghua,Yang, Xiafen. Multi-agent web services aggregation driven by requirement in JADE[J]. Proceedings - 1st International Symposium on Computer Network and Multimedia Technology, CNMT 2009

2. Bellifemine, F. JADE a FIPA2000 compliant agent development environment[J]. Proceedings of the International Conference on Autonomous Agents 2001

3. Chmiel, Krzysztof. Efficiency of JADE agent platform[J]. Scientific Programming 2005

4. Mundle, Siddharth. JADE based Multi Agent System for mobile computing for Cellular networks[J]. Proceedings of the International Conference on Advances in Computing, Communication and Control, ICAC3'09

5. X. Vila, A. Schuster, A. Riera.Security for a Multi-Agent System based on JADE.computers & security26(2007)391-400

6. Chuan-Jun Su, Chia-Ying Wu.JADE implemented mobile multi-agent based, distributed information platform for pervasive health care monitoring [J]. Applied Soft Computing 11 (2011) 315–325

7. Fabio Bellifemine, Giovanni Caire, Agostino Poggi, Giovanni Rimassa. JADE: A software framework for developing multi-agent applications [J]. Information and Software Technology 50 (2008) 10–21