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Connection Management Scheme using Mobile Agent System

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Abstract

The mobile agent paradigm can be exploited in a variety of ways, ranging from low-level system administration tasks to middle ware to user-level applications. Mobile agents can be useful in building middle-ware services such as active mail systems, distributed collaboration systems, etc. An active mail message is a program that interacts with its recipient using a multimedia interface, and adapts the interaction session based on the recipient's responses. The mobile agent paradigm is well suitable to this type of application, since it can carry a sender-defined session protocol along with the multimedia message. Mobile agent communication is possible via method invocation on virtual references. Agents can make synchronous, one-way, or future-reply type invocations. Multicasting is possible, since agents can be aggregated hierarchically into groups. A simple check-pointing facility has also been implemented. Another proposed solution is to use multi agent computer systems to access, filter, evaluate, and integrate this information. We will present the overall architectural framework, our agent design commitments, and agent architecture to enable the above characteristics. Besides, the each information needed a mobile agent system such as text, graphic, image, audio and video etc, constructed a great capacity multimedia database system. However, they have problems in establishing connections over multiple sub-networks, such as no end-to-end connections, transmission delay due to ATM address resolution, no QoS protocols. We propose a new connection management scheme in the thesis to improve the connection management involved of mobile agent systems.

Keywords: Mobile Agent, ATM, QoS, Middle-Ware Services, Multicasting

1. Introduction

One of the reasonable and economically suitable solutions of those cases is mobile agent system. The mobile agent paradigm can be exploited in a variety of ways, ranging from low-level system administration tasks to middle ware to user-level applications. An example of a system-level application is in real-time control. If the application uses remote procedure calls to control a device, it may be difficult (if not impossible) to guarantee that it will meet the real-time deadlines associated with the device. This is because communication delays are usually neither bounded nor accurately predictable, unless the underlying network provides quality of service guarantees. Instead, the application can send an agent to the device and control the device locally, resulting in better predictability. Other examples of system-level applications include network maintenance, testing and fault diagnosis, installing and upgrading software on remote machines, etc.

Advanced technologies on super high-speed communication nets by ATM[1][2] and microprocessor make it possible to provide multimedia services which perform the transmission of multimedia data to video information user through communication nets. Among the related works on multimedia[3] services, multimedia servers and communication technologies are very important parts.

Despite of the super high-speed processing capability of server, it is more important to us to communication[4] resources effectively since multimedia data should be delivered to video information user.

In mobile agent[5] systems, communication is the basis for interactions and remote control.

Without communication, the agent is merely an isolated individual, desk and dump to other agents, closed into its perception- deliberation- action loop.

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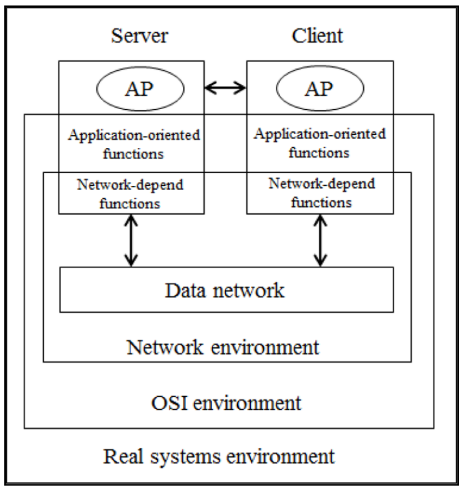

Fig. 1. The composition of remote control system.

Communication is expressed as a form of interaction in which the dynamic relationship between agents[6] is expressed through the intermediary of mediators, signals, which, once interpreted, will affect these agents.

We have implemented this system framework and are developing collaborating agents in diverse complex remote control agent model design[7].

There is a close relation between QoS(Quality of Service) and system resources in distributer multimedia communication. Resources manage reports the system resource information periodically or when resources are in the overload state, or on demand by the QoS manager. By using this information, this QoS manager can predict QoS degradation and perform CAC(call Admission Control). If QoS degradation has happened, QoS manager could maintain the contracted QoS level by means of fine grained resources tuning strategies.

A system composition at Fig. 1 constructs composition of remote control system in ATM communication nets concatenation distributed system.

This paper improves transmission search and analysis function in real time multimedia data in ATM communication nets.

The rest of this paper is organized as follows. In the next section, we describe research and implementation environment about mobile agent system. Section 3 presents the mobile agent control system by using both RDBMS and ATM API. The mobile agent system embodiment are shown in Section 4. Section 5 states this paper's conclusions.

2. Research and Implementation Environment about Mobile Agent System

The use of the internet has accelerated with an unprecedented pace.

However, effective use of the internet by humans or decision support mobile agent system has been hampered by some dominant characteristics of the info sphere.

First, information available from the net is unorganized mobile agent. Second, the number and variety of data sources and services is dramatically increasing every day.

Furthermore, the availability, type and reliability of information services are constantly changing. Third, the same piece of information can be accessible from a variety of different information sources. Fourth, information is ambiguous and possibly erroneous due to the dynamic nature of the information sources and potential information updating and maintenance problems.

Therefore, information is becoming increasingly more difficult for a person or machine system to collect, filter, evaluate, and use in problem solving.

As a result, the problem of locating information sources, accessing, filtering, and integrating information in support of decision making, as well as coordinating information retrieval and problem solving efforts of information sources and decision-making systems has become a very critical task.

The crucial factors influencing the determination of the type of an agent are: first, its functional and informational scope, second, predominant types of agent interactions, and third, constituent reusable agent architecture components.

It is required RDBMS to construct a great database that supports the data of various shapes that is no depre-

Table 1. Server/Client construction environment

Division	Server Environment	Client Environment
Operation Structure	Windows NT	Windows 95 over
Memory	128M over	64M over
DBMS	SQL Support possibility	
Protocol	NetBEUI/TCP/IP	TCP/IP
Development Tool	Visual Basic	
Communication Nets	ATM	

ciation situation due to the data increase of mobile agent system, and that can search real-time[8,9] data used super high-speed communication nets.

This paper embodies the environment of mobile agent system by using server system and client system that is much using RDBMS these days and presents the construction method not be exclusive system to support the service of mobile agent system. Table 1 should be Server/Client Construction Environment.

3. The Mobile Agent System by using both RDBMS and ATM API

We embody mobile agent system using API providing common RDBMS to receive more fast transmissible ability, and ATM service of varied quality in ATM communication due to providing ATM API in order to use pure ATM service without passing protocols like TCP/IP[10,11], SPX/IPX to be used in established LAN environment.

Hereafter, it brings on a viewpoint that same RDBMS must be used in each system and that TCP/IP's[12] specific properties must be used in great-capacity data transmission unless the API supports ATM communication nets in replacement of RDBMS. In order to solve these problems, it is required the mobile agent service realization of the independent structure of RDBMS.

This study designs independent continuance of RDBMS that provides API like Fig. 2 and mobile agent to accept the ATM communication net. Also, this study designs protocols connected in data transmission and connection setup between Control Agent and Service Agent in order to use in ATM communication nets that the remote control is so included in a hierarchical agent to be functioned in IPC (Inter Process Communication).

Remote Control Agent consists of Control Agent and Service Agent[13], divides Service Agent structure to take the transference of data and Control Agent to execute the initial connection setup as well as the management function.

Database query class is designed able to correspond to a plenty of RDBMS only to replace query class not to modify a remote control service program in order to manage independence to the RDBMS. Also, it is able to provide Multiplexing service due to a connection aim oriented-changeable bit service transmission section used AAL5 to provide C class and D class for ATM communication nets service.

4. The Embodiment of Remote Control Agent System

As Fig. 3 embodies Control Agent and Service Agent structure, Remote Control Agent is designed types not including Query class because of not executing a direct access to Database. Coordinator class to the Query confirms to be able to use or not to use services after searching an empty slot of CCD (Connection Control Data) Class when there is demand of a Remote Control Service program by ATM. If a slot empties Coordinator class recognizes so possible in services that it executes the connection setup process. If a empty sol doesn't exist it informs to the remote control service program that services is impossible.

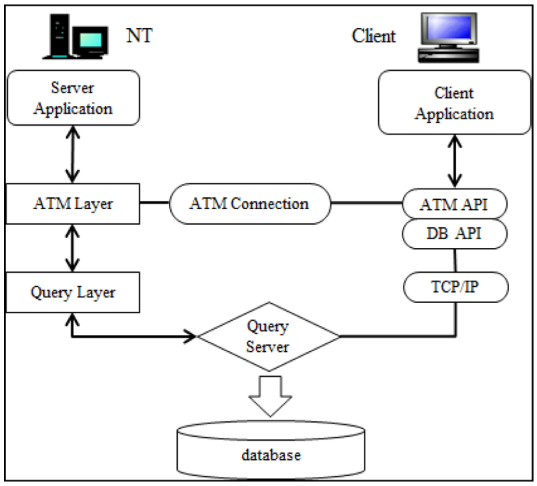

Fig. 2. Remote agent search function.

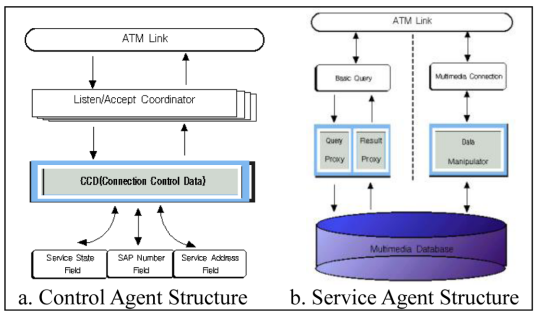

Fig. 3. Control agent & service agent structure.

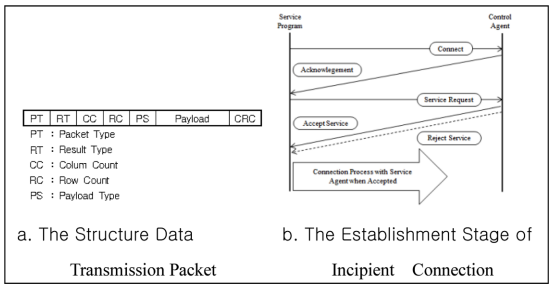

Fig. 4. Incipient connection establishment stage and data transmission packet structure.

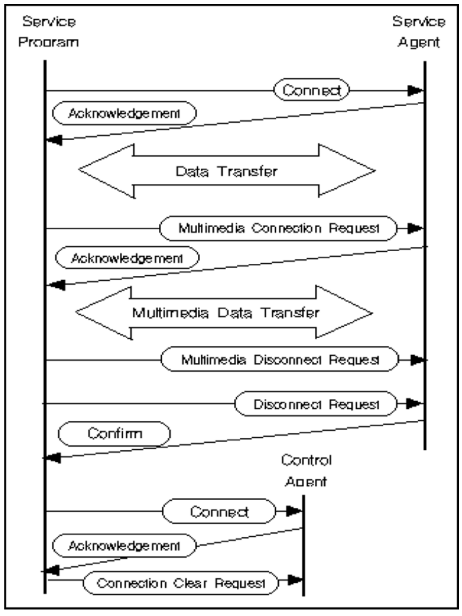

Fig. 5. Service agent protocol structure.

CCD (Connection Control Data) class that is data structure storing the necessary information in the connection management consists of the service state field to confirm whether services are able to do or not to do, the SAP number field to keep the Service Access Point number of the Service Agent and the Service address field to keep ATM address of a computer where the Remote Control System operates. The PT indicate a sequential data in the data packet structure of Fig. 4 if a data length is more bulky, the RT field indicates whether a transferred data is a result or the information to the error.

Each RC and CC records the number of a column and a row of the searched data record.

The PS field records a recorded data size in payload. The CRC has a function detecting a 32 bit error to execute the error search in the application field for the confidence degree of the transmission information.

The connection setup process divides into the BQC(Basic Query Connection) and the multimedia data channel composition like Fig. 5. The Remote Search Service must be removed for a reuse of a assigned slot through the connection removal process and the Control Agent from the point of time when a job is finished.

5. Conclusions

With one rather narrow exception, there is nothing that can be done with mobile agents that cannot also be done with other means. The exception is remote real-time control when the network latency prevents real-time constraints being met by remote command sequences.

The individual advantages of mobile agents therefore rest on relative technical and commercial factors compared to alternative methods. The technical advantages of mobile agents identified in this assessment are:

a. High bandwidth remote interaction
b. Support for disconnected operation
c. Support for weak clients
d. Ease of distributing individual service clients
e. Semantic routing
f. Scalability
g. Lower overhead for secure transactions
h. Robust remote interaction

While none of the individual advantages of mobile agents given above is overwhelmingly strong, we believe that the aggregate advantage of mobile agents is overwhelmingly strong, because:

a. They can provide a pervasive, open, generalized framework for the development and personalization of network services.

b. While alternatives to mobile agents can be advanced for each of the individual advantages, there is no single alternative to all of the functionality supported by a mobile agent framework.

c. In addition to providing an efficient support for existing services, a mobile agent framework also enables new, derivative network services and hence new businesses.

d. Mobile agents are expected to appeal strongly to

the Internet community, since they can provide an effective means for dealing with the problems of finding services and information and since they empower the individual user.

The individual technical disadvantages of mobile agents identified in this assessment are:

a. Need for highly secure agent execution environments.

b. Performance and functional limitations resulting from security.

c. Virus scanning and epidemic control mechanisms.

d. Transmission efficiency, for example a courier agent compared to a simple SMTP mail object.

The security and virus problems in particular require very close study and consider-able technical innovation.

Commercial issues raised by mobile agents include:

a. Difficulty of propagating agent execution environments onto large numbers of third-party servers.

b. Balance to be struck between open and closed electronic commerce.

c. Trust on the part of third-party server providers in the face of security concerns.

d. Willingness of the third-party server providers to permit users the ability to customize server behavior.

e. Willingness of the third-party server providers to support the computational load of mobile agents.

f. Perceived value among users.

g. Enthusiasm for this approach among the Internet community.

This assessment suggests further studies:

a. What degree of expressiveness can be safely accepted in an agent scripting language? Is it possible to devise languages that permit the expression of useful, quasi-general procedures, but which permit the non-existence of viruses to be proven?

b. How strong are the qualitative arguments for performance advantages? We could compare existing services with hypothetical mobile agent-based services?

c. Alternatively, what could be done to enable RPC-based client-server interactions to match the advantages of mobile agents.

The mobile agent approach continues to intrigue and shows signs of offering important qualitative advantages for network services. Assuming that solutions to the security problems can be found - and efforts are underway the signs are sufficiently positive that we cannot rule out the possibility that mobile agents will be a successful new method of client-server interaction in network services. We are now engaged in developing plans to prudently explore this opportunity.

Acknowledgments

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