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Collaboration System using Agent based on MRA in Cloud

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Abstract

This paper proposes a collaborative system using a mobile agent based on hybrid concept consisting of MRA (Metadata Registry Access) based mobile agent. The system aims to ensure that data is accessed and validated for interoperability in a database environment that independently operated locally-based. It is also a platform to support interoperability of local systems in existing cloud environment. It consists of mobile agent manager of hybrid concept for data virtual community formation and MRA - based agent system which provides environment for independently executing interoperable services required for data access. The MRA-based agent system provides the service environment of the mobile agent on the cloud. The MRA-based mobile agent consists of a static agent on the local system and a dynamic agent that performs the service by migrating to the agent system that forms the cloud community.

Keywords: MRA, Hybrid Agent, Cloud, Interoperability System, MetaData

INTRODUCTION

This paper is a study on cloud collaboration system for buffering and interoperating metadata schema collision of system to support collaboration of existing local systems. In this study, we propose a collaborative system using a hybrid agent consisting of a single agent based on a large number of MRA (Metadata Registry Access) [1]. The proposed system aims at effective interoperability through data access in a database environment operated locally. In addition, the proposed system is a platform to support interoperability of local systems in existing cloud environment [2, 3]. It is an environment that can freely perform functions for accessing collaborative data and mobile agent manager of hybrid concept for virtual community formation. MRA-based agent system. MRA-based mobile agent manager checks system status of agent systems and manages XMDR (eXtended Metadata Registry) [4] for data interoperability support [5]. The MRA-based agent system supports the configuration of the cloud environment of the local systems and provides the execution environment of the mobile-based agent. The MRA-based mobile agent consists of a static agent that is located in the agent system and a dynamic agent that performs the service by migrating to the agent system that forms the virtual community. In addition, we propose extended MRA construction method and query conversion method for data interoperability provided by hybrid mobile agent system and support coherent processing module for integrity. The composition of this paper is as follows. Chapter 2 describes related research. Section 3 describes the proposed system design and techniques. Section 4 describes the proposed system. Section 5 describes conclusions and future research.

RELATED WORK

XMDR (eXtended Metadata Registry) is a technique to solve metadata schema, structure, and semantic conflict due to data access using XMDR (eXtended Metadata Registry), which is a concept extended from MDR (Metadata Registry) is a technology to store and manage [5, 6].

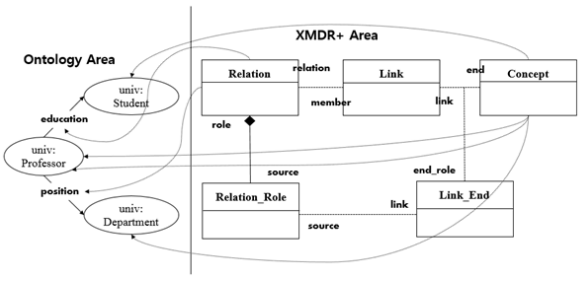


Figure 1. Concept of the XMDR

In other words, it combines MDR and ontology to solve the conflict between the schema structure of the data on the cloud and the instance. The collaborative system using XMDR provides data integration service for interoperability between local systems using a single viewer app. In this paper, we design the MRA and apply it to the specification of data access for interoperation in the process of mobile agents.

MRA-BASED COLLABORATIVE SYSTEM IN THE CLOUD

Proposed System

In this paper, we propose a collaborative system using hybrid agent based on MRA in the cloud. The proposed system is a technology for efficiently using data through mutual access of data in a cloud environment. The system needs a platform to configure and support virtual communities for collaboration. The middleware in this paper is a system built using a Java based hybrid agent and located on the local system. Fig. 2 is based on the MRA-based collaborative system using the proposed hybrid agent. Data virtual communities are nodes that are configured for common tasks. This community is a common task for cloud computing, data access, information retrieval, etc., and performs collaborative work according to the usage characteristics. And nodes that are virtual communities formed in data interoperability are for collaborative work of local systems and have a system for forming cloud.

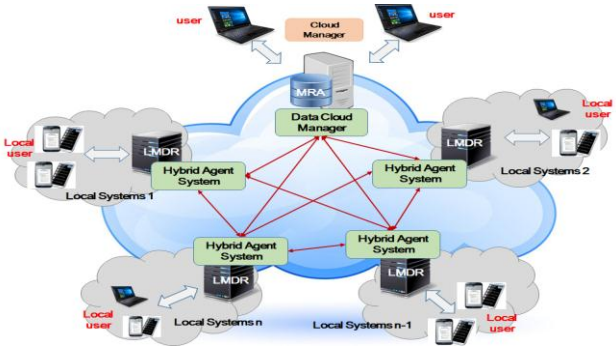


Figure 2. The Proposed System

On the other hand, by installing the mobile-based hybrid agent system proposed in this paper in the MRA-based collaborative system, a new configuration of the data virtual community is not necessary. It consists of two types of agents for MRA - based collaborative services: static type agents located on the system and dynamic type agents moving to other nodes and performing services. In the app that utilizes the MRA-based collaborative service, the service request requests the node through the collaborative system in the cloud as shown in Fig. 2. The node requesting the initial task requests the task execution using static and dynamic type agents. First, the task of delivering status information or monitoring information of nodes to a cloud manager requests work from a static type agent. After this, work through migrating to other nodes, such as data access and collection services, requests work from dynamic type agents.

Hybrid agent system based on mobile

The proposed mobile-based hybrid agent system consists of four layers as shown in Fig. 3: network, system, service, and data. The network layer constitutes and manages the network for building the data cloud. The system layer manages the information service for configuring in the local system. The service layer manages the services in the data cloud, and the data layer manages the local MDR (LMDR), which is built for interoperability with the data autonomously operated on the local system.

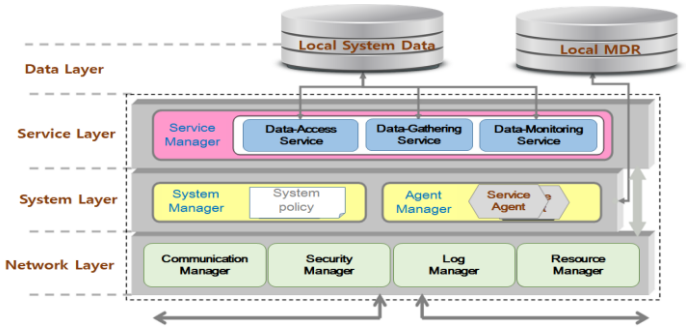


Figure 3. Hybrid Agent System Composition

**** Network layer***

This layer is the layer for network configuration for the data cloud. It handles asynchronous connection requests and service connection requests of these systems, and determines whether the requested system is a node on the cloud. It is also a layer that collects all event processing and resource information.

- Communication Manager: Responsible for processing connection requests of data cloud systems. It configures the communication protocol in the standby state for the connection of the systems, and plays the role of sending and receiving the service. When sending a service, check the system and ask the mobile agent manager. And transmits the signal to the requesting mobile agent after completion of service execution.

- Security administrator: Security on the data cloud that supports the migration of service agents is important. This is necessary for countermeasures against malicious service creation and distribution, but the security problem is solved by applying the Java security model. In order to process the authentication process of the service agent, only the registered service is processed using the secure manager supported by Java. The service agent supported by the data cloud identifies the node of the local system participating in the virtual community as a regular service, and processes the authentication of the service agent for the node.

- Log Manager: It is a module that stores and manages all events occurring in the mobile-based hybrid agent system.

- Resource manager: A resource in a local system where a mobile-based hybrid agent system is located is a module that manages only resources for service execution.

**** System layer***

This layer module manages the information of the nodes to participate in the data cloud community and manages the mobile agent for service execution. The information of the nodes establishes and manages the hybrid agent system. In addition, it manages the agents that classify and perform agents provided by the data cloud.

- System administrator: It is a module that manages information of nodes to participate in data cloud community.

And sets host information for data cloud administrator information configuration and network protocol configuration through a method for managing system information. Sets data information to process information for accessing data, and manages the MRA configured for data interoperability.

- Agent manager: This is a module that manages the service agent. The service agent manager classifies the service and requests the service manager of the service layer to migrate. Service execution is performed by static type agent and dynamic type agent, and agent manager manages each type of agent. The static type agent transmits the state information and monitoring information of the node to the cloud manager. A dynamic type agent executes data access and collection services and performs user requests. The data access and collection service is a regular service of the data cloud.

**** Service layer***

This layer is responsible for the management of the provided services. The regular service supported by this system is a node status monitoring service, a data change monitoring service, a data access and collection service, and provides a service by user request with an irregular service.

- Service manager: The service provided by the data cloud system is divided into a static type service and a migration type service. The static type service is a service that delivers node state information and monitoring information to the data cloud manager. In addition, the migration type service is a data access and collection service located in the local node, and provides a user requested service other than the regular service. - Service support module: It is a basic module to support data related service. It is applied to query conversion based on MRA configured for data interoperability provided by data cloud system. Includes locally relevant query translation functionality for XML (JSON) and incoming XML (JSON) to be sent to the data cloud system.

**** Data layer***

This layer manages data access and query execution that are operated on the local system, and manages the MRA configured for data interoperability. In the mobile-based hybrid agent system, MRA is constructed based on the standard specification of ISO / IEC-11179 for data interoperability and local MRA is managed.

MRA Design based on Cloud

The MRA used in the data cloud system is a metadata repository extended to the data integration standard proposed to solve the metadata conflict for data interoperability in the cloud. In order to design MRA, it is necessary to design MDR that can solve data structure and syntax heterogeneity and XMDR which is extended to solve semantic heterogeneity. The MRA in Figure 4 is based on the metadata schema of the database located in each local system, which is intended to share database, table, and column attribute information included in the collaboration. It is the foundation of the MRA design that will be used to transform queries between local data and service request XML (JSON) messages on the local system. This is used for query translation with service request XML (JSON) messages from virtual communities because the database metadata schemas in the local system are all different.

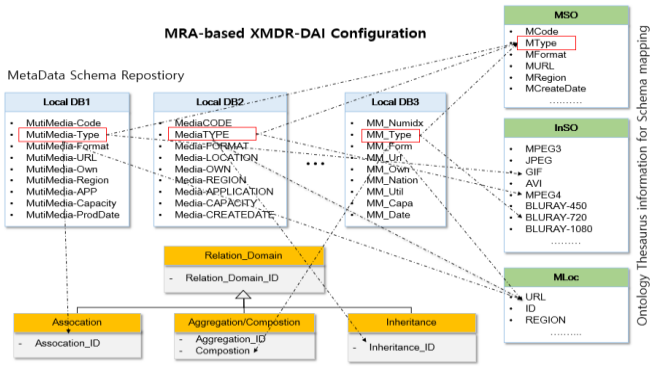


Figure 4. MRA Design of Cloud Data.

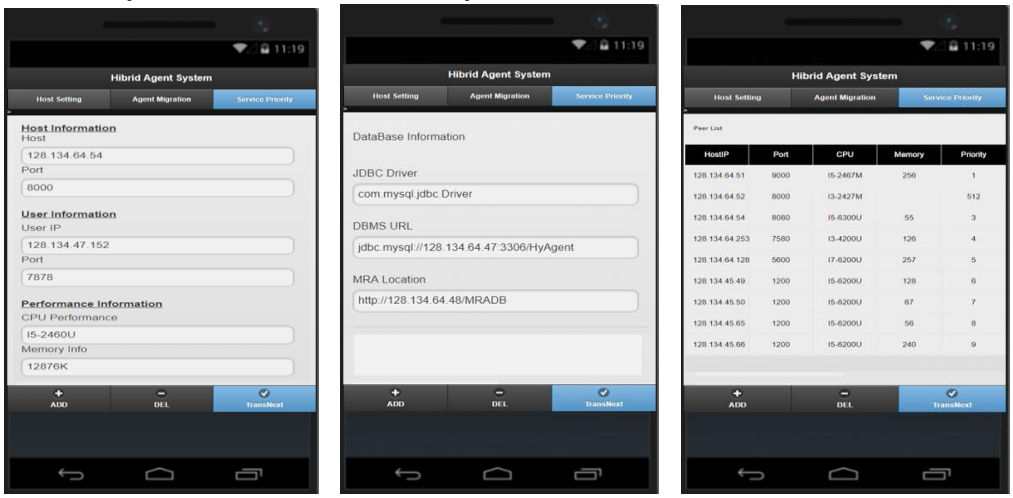
Design according to data attribute specification for collaboration of local systems as shown in <Fig 4>. Classification according to data collaboration of local systems is classified according to each local database and table. The classification of the data to be collaborated is the same as the Local DB in <Fig 4>. MRA constructs metadata standardization and extension process step by step based on local database for collaborative support. First, we collect the metadata schema of the local databases to collaborate and construct the MDR. Reconstruct according to the domain content based on the standard MDR. In order to include the semantic association information of the data, the domain

expert constructs the extended MDR, including the MDR, on the constructed ontology. According to the MRA design, XML (JSON) work is performed to utilize in the data cloud system. The MRA document as shown in <Figure 5> is for data interoperability with heterogeneous systems constituting local system and virtual community, and is applied when each local query is converted according to the request. When making a request for data access and collection in the local system, it is converted into an XML (JSON) message so that it can be applied to a database of other local systems participating in the data virtual community. The requested local systems then translate the XML (JSON) message into a query suitable for the database in which they operate. Conversion of XML (JSON) message and query is done through mapping using MRA information.

APPLICATION EXAMPLES

The data cloud system using the mobile-based hybrid agent proposed in this paper is a system that makes it possible to construct and utilize existing local systems as data cloud nodes. The proposed system implements a module for constructing a data cloud and a module for providing a migration of a mobile - based hybrid agent. Especially, the security for handling the authentication of the mobile agent is implemented by the module using Java secure method. For experimentation, the resource manager implements functions of the processor and memory information of the system, and does not include overall resource management. In the proposed system, the data cloud for collaboration of local systems sets the information of the participating systems and the information that is operated locally. Configure the network protocol and set the necessary information and the necessary policies for the service request.

Fig. 5(a) sets the host information and the local system information of the cloud manager managing the data cloud system in the mobile device environment. It also acquires local state information and sends it to the cloud manager. When the state of the system changes, information on this is always sent to the cloud administrator. Fig. 5(b) inputs data related information operated locally in mobile device environment. The mobile-based hybrid agent system that constitutes the data cloud is implemented in Java-based Android, and the data-related information inputs the JDBC driver and connection setup information. Also, after constructing the MRA for the metadata of the localities, the LMDR information is set for the mapping with each local area. Fig. 5(c) is an interface for confirming the priority for performing the service based on the mobile agent. This service execution priority information is configured based on the information registered in the cloud manager and the mobile-based hybrid agent systems constituting the virtual community on the cloud. In addition, the prioritization of service execution should include the policy through the cloud manager and information determined locally by the user. This is to support the performance of the service based on the mobile agent effectively by reflecting the request of the user. When running a locally mobile hybrid agent system that forms a data cloud, it sends the information of the node system to the cloud manager. The cloud manager determines the priority according to the information allocated to the agent system and the time allocated by the time spent in the virtual community. This is done by transferring the priority information of the execution to each mobile-based hybrid agent system to determine the order of requests and to prevent collision between node systems.



(a) (b) (c)

(a) Cloud Management Host Information and Data Cloud System Information Configuration

(b) Data related Information Configuration (c) Service Execution Priority Information

Figure 5. Cloud Management Host Information and Data Cloud System Information Configuration

CONCLUSION

In this paper, we propose a data cloud system using a mobile - based hybrid agent to facilitate node system heterogeneity and data collision for collaboration of local systems. In this paper, we propose a mobile - based hybrid agent system based on a lightweight platform. The collaborative work of this mobile-based hybrid agent enabled us to construct an effective data cloud and used MRA, a standard for data access, to solve the inherent syntax, structure, and semantic heterogeneity in data. We could support interoperability of data by using static type service and migration type service provided in data cloud system proposed in the paper. Also, it is possible to provide services based on user requests other than regular services provided by the present system. This considers the scalability of the agent so that it can provide irregular services. The system uses MRA to overcome various heterogeneity and conflicts in data access in the cloud. It is also suitable for configuring the environment for local collaboration support. It is a system that attaches to information delivery and business process support in real-time enterprise environment. Future research needs to be done to provide various information services in mobile cloud system. It also needs to be able to extend the service coverage to Big Data for flexibility of service delivery.

REFERENCES

[1] Y. Park, J. Kim, “Metadata registry and management system based on ISO 11179 for cancer clinical trials information system,” Proc. of the AMIA Annual Symposium Proceedings, Vol.2006, pp.1056, 2006.

[2] Gracia-Tinedo, Raúl, et al. "Giving wings to your data: A first experience of Personal Cloud interoperability." Future Generation Computer Systems (2017).

[3] Maqueira-Marín, Juan Manuel, et al. "Environment determinants in business adoption of Cloud Computing." Industrial Management & Data Systems 117.1 (2017): 228-246.

[4] R. K. Pon, D. J. Buttler, “Metadata Registry, ISO/IEC 11179,” Encyclopedia of Database Systems, pp.1724-1727, 2009

[5] Hu, Wenfeng, Lu Liu, and Gang Feng. "Output Consensus of Heterogeneous Linear Multi-Agent Systems by Distributed Event-Triggered/Self-Triggered Strategy." IEEE transactions on cybernetics (2017).

[6] Moon, SeokJae, GyeDong Jung, and YoungKeun Choi. "A Study on Cooperation System design for Business Process based on XMDR in Grid." *International Journal of Grid and Distributed Computing* 3.3 (2010): 1-12.

[7] Mylvaganam, Thulasi, Mario Sassano, and Alessandro Astolfi. "A differential game approach to multi-agent collision avoidance." IEEE Transactions on Automatic Control (2017).

[8] Wang, Yong, and Ying Wang. "A Collaborative Work System of Urban Management Based on Multi-Agent." Transactions on Edutainment XIII. Springer Berlin Heidelberg, 2017. 194-203.

[9] Byrski, Aleksander, and Marek Kisiel-Dorohinicki. "Towards the Implementation of Agent-Based Computing Systems." Evolutionary Multi-Agent Systems. Springer International Publishing, 2017. 123-138.

[10] Khan, Gitosree, Sabnam Sengupta, and Anirban Sarkar. "Modeling and Analysis of Enterprise Cloud Bus Using a Petri Net Based Approach." Advanced Computing and Systems for Security. Springer Singapore, 2017. 17-36.

[11] Chunlin, Li, Yan Xin, and Li LaYuan. "Agents collaboration‐based service provisioning strategy for large enterprise business in hybrid cloud." Transactions on Emerging Telecommunications Technologies 28.3 (2017).