

Developing a Cloud Energy-saving and Data-Mining Information Agent

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Abstract

The paper focus on developing a cloud energy-saving and data mining information agent with Web service techniques. It could explore related technologies to establish a Web service platform, and study how to construct cloud interactive diagrams to employ Web service techniques for extensively and seamlessly integrating an energy-saving and data-mining information agent in the Internet. In the networking era, many Web services resulted from developing the interface of traditional program providers with cloud computing techniques.

Web services principally provide services for application programs on Web and enable the usage of programs in other machines, which are provided with powerful inter-communication and extensibility. It can easily integrate application programs and related programs on the Web and achieve some complicated information service processes through interactive programs. When program scales need addition or modification, they can immediately be achieved through Web services.

Keywords

Data Mining Agent, Case-Based Reasoning Agent, Web-Service-Based Information Agent System, energy-saving

I Introduction

In the networking era, many Web services resulted from developing the interface of traditional program providers with cloud computing techniques. Web services principally provide services for application programs on Web and enable the usage of programs in other machines, which are provided with powerful inter-communication and extensibility. It can easily integrate application programs and related programs on the Web and achieve some complicated information service processes through interactive programs.

It is ready to go through networks, transmit necessary service interfaces to needed programs, and even proposes formats of communication standards. When program scales need addition or modification, they can immediately be achieved through Web services.

In regard to cloud computing environments, this paper developed an intelligent energy-saving and data mining information agent on the basis of Web service techniques, which can easily achieve the application goal of ubiquitously accessing information.

II Conceptual Architecture of an energy saving information

The conceptual architecture of an energy-saving information system Fig. 1 illustrates The left-hand side was constructed with a wireless sensor network to detect and collect the running parameters of all electrical devices; the related data would then be sent to a cloud server for handling related energy-saving information processing and corresponding decision support.

The cloud server is a multi-agent system, including: Interface Agent, Data Mining Agent, Case-Based Reasoning Agent (CBR Agent) and Web-Service- Based Information Agent System (WIAS), as shown in Fig. 2 The Interface Agent is responsible for providing energy-saving and information monitoring access and intelligent decision making.

The latter aims at providing corresponding control decisions to the monitored information, including whether prediction solutions exist, as judged by the Data Mining Agent; whether CBR solutions exist, as judged by the CBR Agent; and whether predefined solutions exist, as judged by the Interface Agent in accordance with predefined rules within WIAS; this is called three-stage intelligent decision processing.

WIAS employs the concept of SQL IC to be responsible for providing various Web services of energy saving information from the abovementioned agent systems,

which can achieve the investigation on fast accessing system information in clouds via the Internet. The server system is a multi-agent system, including: Interface Agent, Data Mining Agent, Case-Based Reasoning Agent- CBR Agent, and Web-Service-Based Information Agent System- WIAS, as shown in Fig. 2. The Interface Agent is responsible for providing energy-saving monitoring of information access and intelligent decision making.

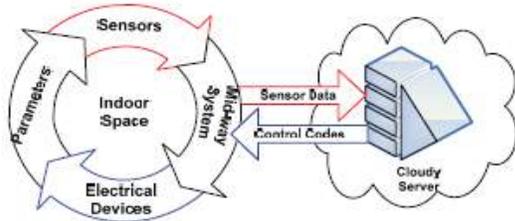


Figure1. Conceptual architecture of an energy saving information System.

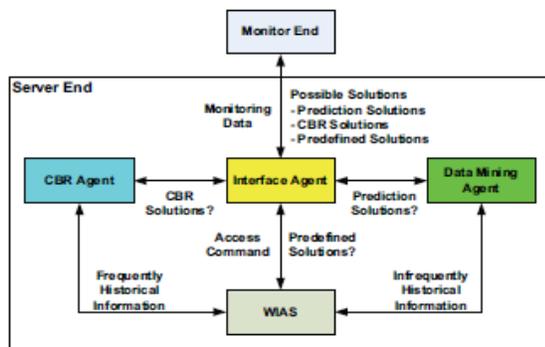


Figure2. System structure of backend multi-agent system

The latter is aimed at providing corresponding control decisions to monitor information, including whether prediction solutions exist, as judged by the Data Mining Agent; whether CBR solutions exist, as judged by the CBR Agent; and whether predefined solutions exist, as judged by the Interface Agent in accordance with predefined rules within WIAS; this is called three-stage intelligent decision processing. WIAS employs the concept of SQL IC to be responsible for providing various Web services of energy-saving information from the abovementioned agent systems, which can achieve the investigation on fast accessing system information in clouds via the Internet.

III WIAS:-Web service based information agent system

Fig. 3 presents the structure of the WIAS. If the query information is an access command, WIAS goes directly through Web-Service-Based Interface to employ the SQL IC Constructor to trigger the corresponding SQL access templates. After binding related access parameters, WIAS retrieves the corresponding access results from the Raw Data Base.

Finally, it goes through the Web-Service-Based Interface to return those results to the Interface Agent.

If the query information is whether predefined solutions exist, WIAS also goes through the Web-Service-Based Interface to ask the Predefined Rule Base to return the corresponding predefined solutions to the Interface Agent. Furthermore, the Raw Data Base also provides all of the frequent historical information to the CBR Agent as information material for the production of cases, and supplies all infrequent historical information into the Data Mining Agent as information material to trigger the production of prediction solutions.

As for the construction of Predefined Rules, it is determined by domain experts through the Rule Maker. The WIAS architecture realizes on-line interfaces of Web services with cloud computing and information transmission techniques on the Internet. It enables individual agents to access the common function library.

IV Structure of the Data Mining Agent

Fig. 4 illustrates the structure of the Data Mining Agent. First, it goes through the Case Base constructed by the CBR Agent to get Case Information. Then the Rule Maker employs algorithms of Information Entropy in accordance with the information to calculate and obtain related Object-Action Pairs for constructing suitable Prediction Rules

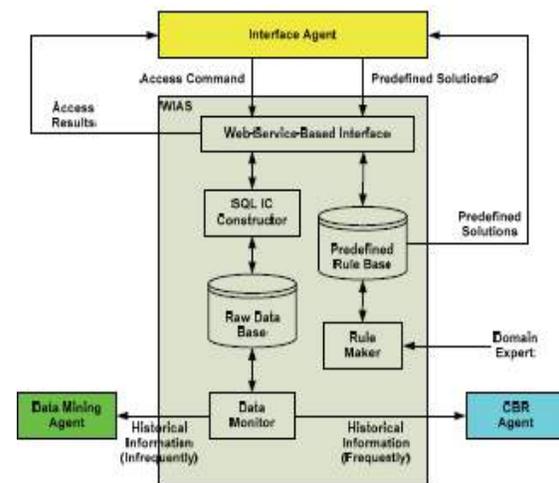


Figure 3. Structure of WIAS.

If the query information is whether prediction solutions exist, it is usually abnormal energy saving information, i.e., Infrequent Historical Information from WIAS mentioned above. The Prediction monitor produces corresponding prediction solutions into the Solutions Pool in accordance with the Prediction Rules.

The system then sends suitable prediction solutions back to the Interface Agent in accordance with the system threshold. When the prediction solution is successful, it will become learning material of the CBR Agent. Its learning efficiency is gradually incorporated into the Case Base within the CBR Agent, and then the CBR Agent provides corresponding Case Information into Data Mining Agent; finally, the Rule Maker revises the Prediction Rules and correspondingly enhances its prediction robustness. The main function of the Rule Maker is producing Prediction Rules. It can make the backend multi-agent system have the processing kernel of the on-line knowledge to deal with abnormal monitor information. The rule construction has periodically been produced by the off-line schedule of the system. The source materials of the rules come from the cases produced by the CBR Agent through the help of Frequent Historical Information periodically generated by Data Monitor in WIAS, and then the Data Mining Agent is triggered to employ the Web service.

agent systems. The Prediction Monitor is responsible for on-line monitoring of those triggering data, and then employs the Web service: DM_ Solutions provided by WIAS to proceed with the corresponding energy-saving monitoring process.

V Conclusion and future Scope

Thus the proposed architecture is the first multi-agent structure of energy-saving system. In practical environment the presented three-stage intelligent decision processing strategy is the first appearance in intelligently energy-saving systems. In this cloud energy-saving and data-mining information agent with Web service technique. It could explore related technologies to establish a Web service platform, and study how to construct cloud interactive diagrams to employ Web service techniques for extensively and seamlessly integrating an energy-saving and data-mining information agent on the Internet.

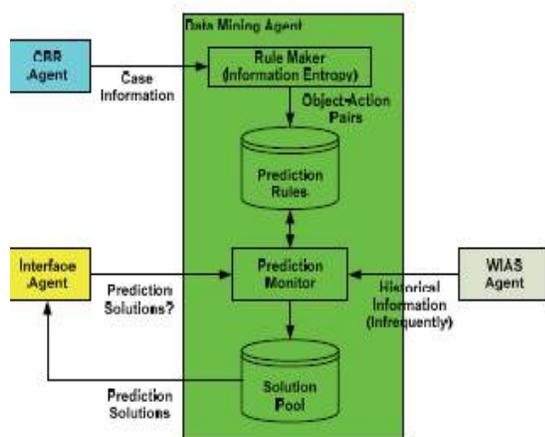


Figure 4. Structure of Data Mining Agent.

When the proposed system on-line operates, the stream of monitoring information was uninterruptedly and orderly delivered by the Interface Agent. The Interface Agent sequentially and rotationally asks related agent systems to get the feedback control process of energy-saving monitoring data in accordance with the three-stage intelligent decision processing mentioned above. Each data record from the Interface Agent contains five parameters: DT (Date), ATN (Area_Type_Name), ASN (Area_Size_Name), MTN (Mac_Type_Name) and Value. Those parameters can be triggering bases of related