The Research and Design of Asynchronous Communication Mode in Mobile Service Platform

Yonghua Qiao, Yuhui Tian, Shouning Qu and Tao Du

Abstract—**Mobile service platform (MSP) moves the intelligent computation service to the authorized client for computing service, mainly including the calculation control process such as service authorization, service downloading, service activation, service monitoring, service recovery and service extinction. This article will introduce MSP and propose the asynchronous communication mechanism in the platform using the related techniques. The platform uses highly effective asynchronous message transmission mechanism, realizes to monitor the service running process and running status and ensures service to reliable running computation.**

Index Terms—**Asynchronous communication, Intelligent computation, Mobile service platform, Messages transmission**

I. INTRODUCTION

With the development of information society, the enterprises have accumulated the massive process historical data in the production process, which imply a large number of unknown knowledge. How to use historical data and find relevant useful knowledge for enterprises to improve production efficiency and reduce production costs, which has become a modern enterprise's an important task. With the development of intelligent computation technology, the technologies have become increasingly mature such as modeling algorithms, Internal rules discovery, optimization of production processes, but it has difficulty in developing these technologies, but also they may require only a limited times in practical applications and they have no value after getting correct results [1, 2]. Moreover, the characteristics have also hindered the enterprise to adopt the intelligent computation to raise the development of enterprise's production efficiency, which not only include enterprise has a lot of production data and requests the highly speed of the

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network transmission, but also include enterprise needs to make use of the massive resources and the enterprise's data is safe. In order to adapt enterprise's service demand, we design a remote service platform, which provides enterprises with knowledge discovery based on intelligent computation services. The computation process and the massive enterprise's data will fuse and guarantee that the enterprise's data the independence and the security through the remote service, which will be great significance for providing the reliable service for the enterprise [3]. Therefore, we propose the mobile service platform (MSP) for enterprise users with mobile computation service.

MSP is based on the mobile computation service, through the way that the whole service including intelligent computation, security, recovery, interface and control move to the client, which can satisfy mobility, security, recoverability and usability to application platform. MSP can face that the enterprise has the weak computing power and the enterprise whose computation demand is quite big but the ability of developing is not strong. MSP can use asynchronous communication mechanism to meet the mobility that user-centered whole services, user requests and process recovery point. This article proposes the MSP's asynchronous communication mechanism, through uses highly effective asynchronous message transmission mechanism, realizes to monitor the service running process and running status and ensures service to reliable running computation.

II. MOBILE SERVICE PLATFORM

A. Architecture of MSP

Mobile service platform moves the service to the authorized client for computing service, mainly including the calculation control process such as service authorization, service downloading, service activation, service monitoring, service recovery and service extinction. Service authorization will permit legitimate customer to apply service; Service downloading is that intelligent computation services have downloaded to the client; Service activation is that using the activation rules will activate intelligent computation service downloaded to the client; Service monitoring carries on monitoring to service running process and running status; Service recovery is when service breaks off, the use of the backup service can restore services to be implemented; Service extinction is when the service

execution finished, the service will die out automatically and guarantee service security.

MSP need to meet the mobility, security, recoverability and usability, so the research of the platform is mainly including four aspects: mobile service control, platform security, service module backup and recovery and interface specification, and mobile service control is the core of mobile service platform. We design mobile service control module of MSP combined with asynchronous message transmission mechanism In the MSP. When MSP provides services to the client, it need to monitor the service running process and running status, transfers a lot of asynchronous messages and achieves service reliable running. The architecture of MSP is as Fig. 1.
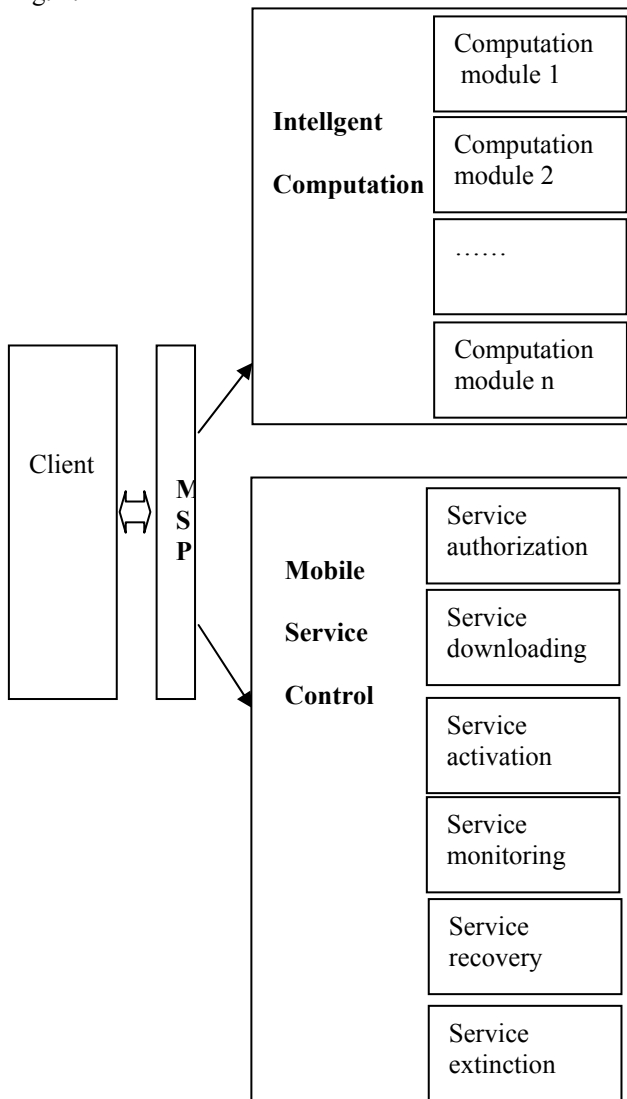
directory, then matches the services that user want to apply, and send service requests to MSP by unified and standardized interface; MSP will check validity of client, downloading the service module to the client, and then activate the service module; Service module should downloading to the client and service module will run calculations combining the client's local data; Simultaneously MSP will monitor the running status of the service module, including the service module's status information and running processes, as well as whether the service interrupts. After the service module interrupts running, the service module can be utilized service backup to service recovery in the client. Once the service module finished running, MSP withdraws running permissions of the service module and makes the service module of client losing effectiveness. The process of MSP is as Fig. 2.
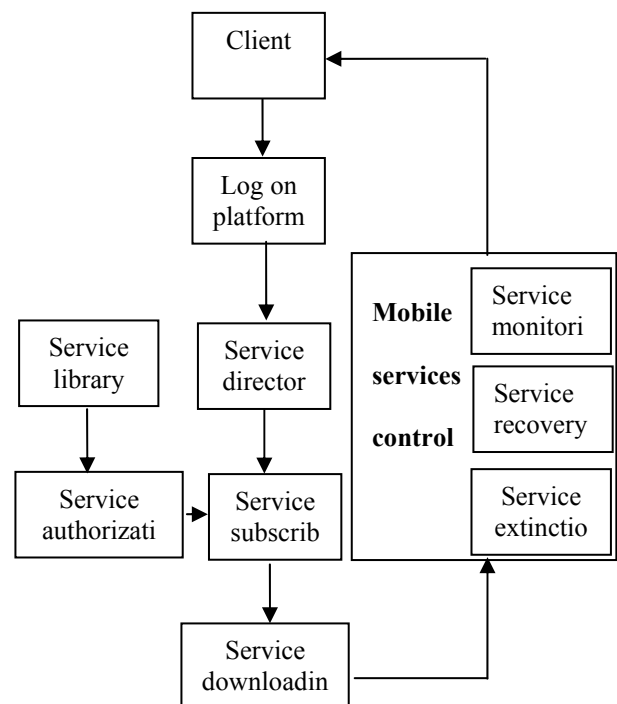

Fig. 1 The architecture of MSP

Fig. 2 The process of MSP

III. RELATED CONCEPTS AND TECHNOLOGIES

A. JMS summarize

Message Middleware is a kind of message transmission mechanism or mode of message queue middleware technology, which exchange of data between all kinds of platform by using efficient and reliable message transmission mechanism. JMS (Java Message Service) is the current middleware technology [5].JMS is designed by Sun as a message-oriented middleware technology, which defines a set of loosely coupled message communication mechanism with the ability to handle asynchronous message, which provides a range of standard java interfaces for message-oriented middleware.

JMS architecture is composed by the JMS provider, JMS client (the message sender and message receiver), management tools, and message components. Managed object is made up of the connection factory and destination.

B. Process of MSP

Mobile service platform using service-oriented architecture can provide the services to client, achieve secure service between platform and client, monitor the service running and protect the service the copyright and valid [4]. At the same time it has a good level of service to realize the reuse of services and updates.

Mobile service process: When the client will register and log on to the MSP that can access service through the service

JMS has two communication modes: point to point (PTP) mode and publish / subscribe (Pub / Sub) mode [6].The point-to-point mode is based on the queue. Message sender can send the messages to the specified message queue; Message receiver can receive messages from the specified message queue. The message sending and receiving are asynchronous and sending and receiving are one-to-one. Publish/ subscribe mode is based on the theme. The message sender can send the message to a theme; The message receiver can subscribe a or many messages from some themes. Theme makes publishers and subscribers independent each other and ensures the reliability of the message sending.

B. Communication mode component

Communication mode of MSP is made up of sending module, receiving module, message listener, the message client and message life cycle.

Sending module: It is running on the JMS server and will send XML format messages to the appropriate message queue which seals message sender, queue of receiving message, message type and message text; Receiving module: it is running on a JMS server's client. Each client corresponds to a message queue. Message receiver module listens for messages on message queue using MDB; After receiving module receives the messages, it will transfer XML format messages in the transmitting process; Message listener: MDB as a message listener in the message queue is used to monitor the arrival of the message and make quick response to notify that the receiver receives the message; Message client: message client includes message client of client and MSP; client and MSP also contains both the message sender and message receiver; Message life cycle: the message is marked as persistent so that it must be sent to the message queue and message receiver will receive and deal with the message.

C. Message transmission format

MSP need to carry on the communication with service module of the client. In order to realize to delivery processing between MSP and client, we need to be a unified message format specification. XML (Extensible Markup Language) has defined a series of standard of data exchange, which is the extensible markup language. We could consider it as the information transmission, which realizes to sealing of message and provides a unified sealing format [7].

According to the need for message transmission and content in the MSP, we define XML's message format is: Message ID, Message sender, Message queue, Message type and Message text.

Message ID: Each service establishes a message queue in the MSP and message ID is the uniquely marking of message queue.

Message sender: Each client of subscribing service from MSP is a sender. In a message queue the message sender is only two: the MSP and the client.

Message queue: MSP can create a message queue for downloading to client's service module and it will repeal message queue after service module withers away.

Message type: There are three main types of messages: Service running status messages, service running process messages and service backup messages. The service running status messages mainly include the service authorization, service downloading, service activation and service extinction; Service running process messages include service beginning time, interruption time, estimate closure time, abnormal situation and so on; The service backup messages is backup information of each stage.

Message text: It will send the contents of each message.

IV. PLATFORM ASYNCHRONOUS COMMUNICATION DESIGN

Mobile service platform is running a virtual machine environment system, which provides intelligent computation services, message control service and reliability of the security services based on the authentication mechanism [8]. While the client can apply to intelligent computation services from MSP not until the service automatic withering away, The MSP and client have a lot of message exchange and service running state information transmission. This paper made use of relevant technology and proposed the asynchronous communication module of platform.

A. The general framework of communication mode

The client will subscribe the service from the platform in the mobile service platform and MSP will realize service authorization, service downloading, service activation and service extinction. MSP and client are going to exchange messages. Simultaneously MSP not only need to monitor service running process and service process backup, but also need to transmit messages between MSP and client; Asynchronous communication is a very important link between MSP and client [9]. For the heterogeneous distributed object environment, JMS and XML technologies provide a good solution for finishing information exchange and message processing. The paper designs message transmission mode of MSP's asynchronous communication based on JMS and the XML technologies.

Message transmission can adopt to asynchronous communication module between MSP and client using JMS technology and MDB (Message driven bean) technology to realize and message format uses XML format. The communication mode of MSP is as Fig. 3.
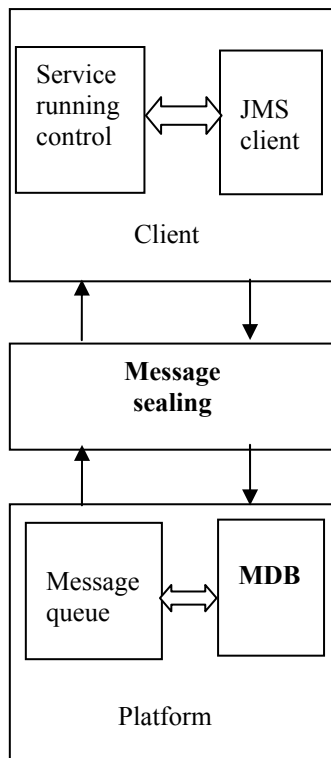
Fig. 3 The communication mode of MSP

(1) MSP uses point to point model. In the JMS server creating message queue used to store transmission information between MSP and client, and using a FIFO message queue mechanism will ensure that the message will be handled and can only be processed one time.

(2) XML has the good expansion performance and the characteristic which has nothing to do the platform. The message format uses the XML sealing format. It carries on transmitting XML as the text information in the JMS transmission process; There are going to seal message, transfer message, deliver message and monitor XML message in the course of communications; The sender must transfer and seal message and the receiver must transfer and analyze message.

(3) MDB monitor listened server. According to the related property of message, we use the FIFO mechanism to deal with the message of the queue [10].

B. Service control module design

The MSP need to carry on the transmitting messages with the client in the MSP. The MSP should transmit service running status information to the client which include service authorization, service downloading, service activation and service extinction, and the client should transmit service running status messages and service running process information to the MSP. Meanwhile the client must send backup message of service module to the MSP, which makes MSP monitor the intelligent computation service and should guarantee service correct execution.

(1) Service authorization: The client register and log on the MSP, then applies for their own needed services and send out request of ordering service to MSP. The MSP will confirm the client valid using JMS communication mechanism [11]; If the client is legitimate, it will prepare to downloading service to the client.

(2) Service downloading: MSP is based on the client's service application and verify that client is legitimate and has the running service capabilities, and the platform should downloading intelligent computation service module to the client. But intelligent computation service module has not been activated and can't run.

(3) Service Activation: When the client satisfies operating condition of computing services to meet the intelligent computation module, the MSP use the related activation rule to activate intelligent computation service by downloading to the client. Once intelligent computation service of the client is activated, the activate rule would expire and prevent the service activating again.

(4) Service monitoring: MSP should monitor intelligence computation service running for downloading to the client from service authorization to service extinction. The MSP mainly uses the MDB technology to realize intelligent computation service monitoring. In order to obtain computing service running status and running process information, MSP is based on different running process characteristics of intelligence computation service and sends out the request for message reply to the client using the JMS communication. After the client receives messages request for reply of the platform, and it will send intelligence computation service running status and the running process message to JMS receiver by JMS sender. Then MDB will listens to messages of JMS receiving in the MSP. Once the messages arrival, it will call the MDB instance to handle the message and verify the correctness of replying messages; Moreover if the client does not receive the message or messages received is incorrect, MSP will make intelligent computation service lose effectiveness and let service automatic withering away so that services can not continue to carry out and guarantee the security of services [12, 13].

(5) Service recovery: Intelligent computation services will break off in the client, MSP adopt services recovery to achieve the service running again. When the intelligence computation service module embedded MSP, it will establish interruption recovery point in the different running stages of service according to the different intelligence computation service's running process characteristic. When the service execute to service interruption recovery point, it will save the running process data and running parameters to the client and realizes the intelligence computation service automatic backup. At the same time it will send automatic backup and recovery messages to the MSP. The MSP can gradually carry on the service monitoring using the JMS communication. When the intelligent computation service break off because of the client, the platform will test that the client can continue to run the service. Once interruption is clear, the platform will check interrupt recovery point the occurrence of interruption and reuse the activation rule to activate service. Intelligent computation service will be resumed from the interruption point and combined with backup process data and process parameters that the client saved automatically, which make intelligent computation service run again.

(6) Service extinction: After the service has ended, service will stop running. When intelligent computation service of the client have finished running, intelligent computation service will send out the service expiration messages to the

MSP. The MSP has received messages that intelligent computation service have sent and then make service activation failed in order to prevent the service running again and even self-delete to ensure the safety of intelligent computation service. The service will be voluntarily the deletion and confirm to intelligent computation service security.

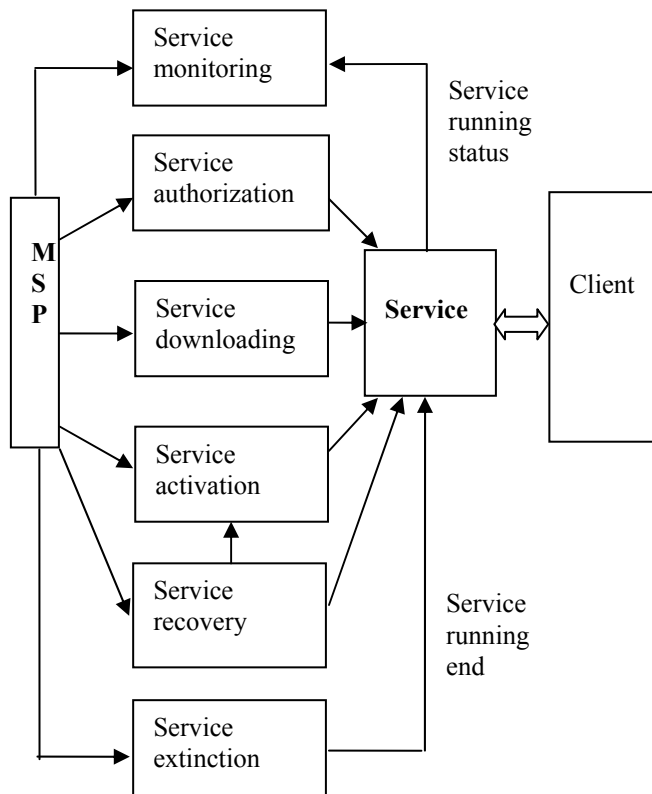The service control module design is as Fig. 4.

Fig. 4 The service control module design

V. FUTURE WORK

This paper uses JMS technology and XML technology to design asynchronous communication mode of mobile service platform. Our next work is to use Mobile agent technology to design the structure for mobile service; We will make use of Rbac (role based access control) technology to design and implementation of controlling mobile service, and improve the MSP security. Using these techniques, we develop finally and design a mobile service platform by Java language.

VI. CONCLUSION

Mobile service platform should provide services to enterprises and guarantee the service safe reliable running by downloading intelligent computation services to the client. This article describes architecture and service process of MSP. It designs asynchronous communication module between MSP and client using JMS and XML technology and proposes communication module of asynchronous message transmission. Based on this communication mechanism, we can be achieved asynchronous message transmission and service monitoring between the platform and client, which will build a solid foundation for designing a safe and efficient mobile service platform.

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