An Analytical Study of Integration of Mobile Agent System and Web Services with Incorporating Locations

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Abstract

Web services are widely used in the current web-based business applications, and form the basis of emerging frameworks in Grid computing. Current mobile agent systems implement similar (often proprietary) mechanisms for the service description, invocation and discovery. Furthermore, the mobile agents provide very specific advantages with respect to dynamic and concurrent service composition resp. execution, as well as the extension of the server-sided services with the client-side intelligence and functionality.Web services and the mobile agent technologies have different problems that limit their functionality when applied separately. It is widely recognized that integrating these two technologies in a joint environment can overcome all of their problems while strengthening their advantages.

I. INTRODUCTION

Web services, software agents can encapsulate business or application logic. Rather, the software agents can dynamically discover, combine and execute theseprocesses and further offer the multiple services or behaviors that can be processed concurrently [1]. In this order to move from one system to another or even to communicate with each other, mobile agents currently need a common platform on which they operate. Thus, they are very useful for the business partners only if these actually share a common platform.

Web service and the mobile agent technology have the various attack scenarios and thus ask for various solutions. The main concern in web service security it is to prohibit unauthorized access to resources from clients. As we talk of mobile agent based web services, i.e. program code is transported to another host and executed locally within a foreign environment; we must not neglect the corresponding security aspects. Within the mobile agent community there have been elaborate discussions about security concerns in the past.

The web services and mobile agents it has to be assured that the new mean of service interaction does not bypass or override existing security mechanisms of the agent system. In the mobile agent system, the mobile agent could not take any password or private key with them for security reasons while roaming in the networks. This has been a big challenge for mobile agent security research community. In this security architecture and we do not need Certification Authority based public key infrastructure. Instead, we adopt the ID-based authentication scheme so that the mobile agent is not required to carry a password for authentication. Furthermore, the server only needs one key to encrypt one service that can be available to a group of users.

II. INTEGRATION OF MOBILE AGENT SYSTEM AND WEB SERVICES

The integration of Mobile agent and Web services can be applied to many applications. This may be widely used in E-commerce, E-Government, military, hospital and remote education systems etc. [2].Web service message is encrypted with that encryption key, and only student users who registered to this subject Web service can decrypt it.Web service resource platform, agent interacts with the host to get the subject Web service, the host verifies the identification using the authentication protocol, and then provides the service such as lecture notes, assignment etc. The Web services host encrypts the result with session key and transfer it to mobile agent. At same time, the host encrypts the session key with the subject Web service encryption key and signs it, and sends it to the user's email.

When the mobile agent moves to second and third subject Web service platforms, the same process will repeat. When the student user receives his/her mobile agent, s/he gets the encrypted Web service data from the resources. Then, the receives the encrypted session keys from the email and decrypts these session keys with his private key, and then use it to decrypt the encrypted Web service data. At the same time, s/he also may verify that it is from the service provider by using the authentication protocol.

A mobile agent can select a host to migrate to so that it can use enough resources for its task or achieve load balancing. It is often achieved with dynamic resource management and the allocation methods. It facilitates the concurrent local access to multiple services. This is also facilitates reduction in migration cost by dispatching a clone with only required data, instead of migrating itself with accumulated data [3].

The mobile agents are very well suited for enacting ad-hoc workflow applications across loosely-coupled web-based services [4]. The critical aspect it makes mobile agents suitable for this kind of the workflow is their ability to move ad-hoc to local services. Without mobile agents, and such web-based services will have to be integrated and designed as distributed cooperative services that are able to communicate with a remote workflow engine. Mobile agents can communicate with each other, clone, merge, and coordinate their computations. Mobile agents are autonomous agents in the sense that they control their relocation behavior in pursuit of the goals with which they are being tasked. These properties are additional reasons that make the mobile agents a good candidate to be used in a loosely coupled network environment.
The Web service provider can encrypt the Web services data with a session key, and encrypt the session key with corresponding Web service key, then email it to the user. Only legitimate users can get the session key by decryption.The mobile agent may interact with the user on the mobile device and achieve other tasks on other more stable hosts. This decreases dependence on the moving user's device with less resources and unstable connections, while maintaining fast responses during interaction with the user. The user have to connect only when it is required, e.g. when launching and receiving the agent.

III. INCORPORATING LOCATIONS WEB SERVICES INTO MOBILE AGENT SYSTEM

Web Services offer an evolution of the internet-standards based distributed computing model, an evolution in the way of architecting, designing, implementing, and deploying e-business and integration solution. Web Services fosteratrend from the tightly coupled, rigid, and static solutions that focus on implementation technologies, to loosely coupled, flexible and dynamic solutions focus on system interoperability, dynamic business models, enabling dynamic integration for both new and existing applications. Often, mobility is ad-hoc; it is, and the mobile agents move autonomously and asynchronously, without following a predefined route.

Figure 1 Web Services Stack

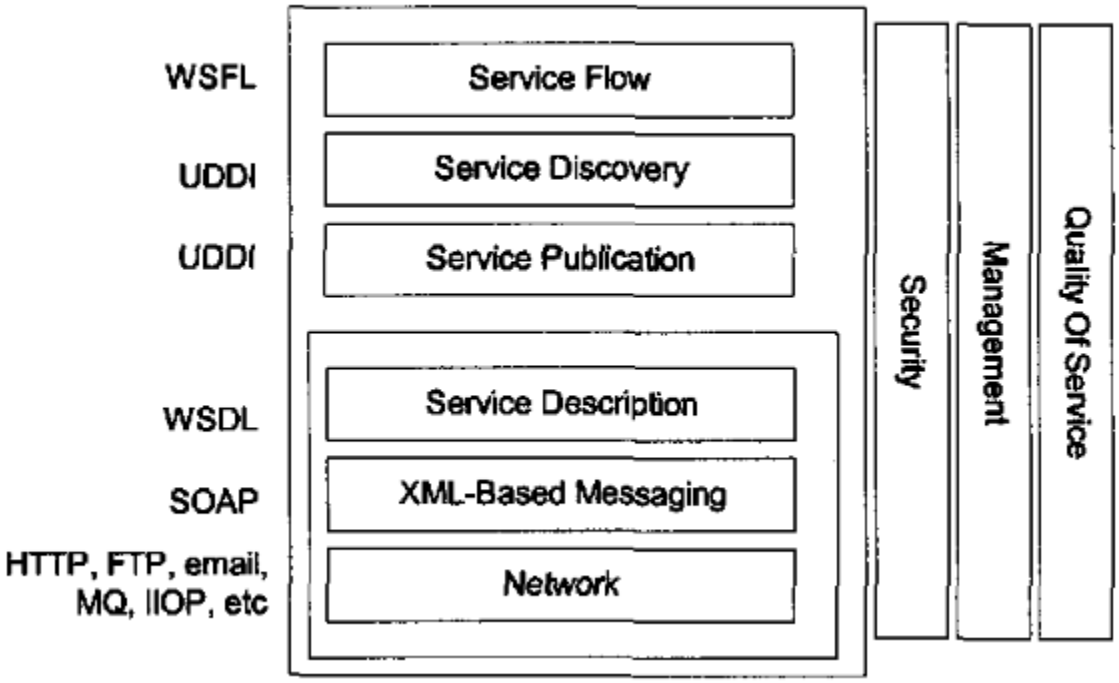


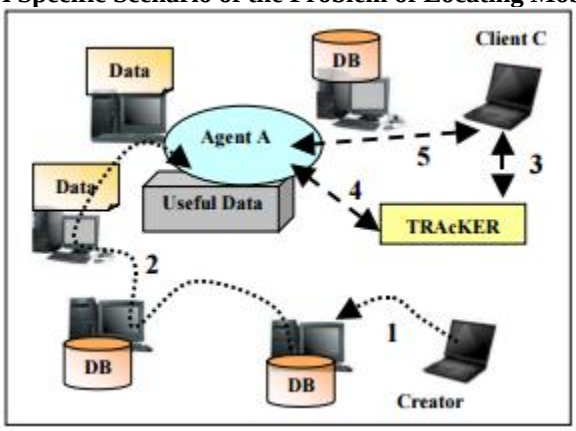
Figure 1 depicts the Web Service architectural layers and the technologies used to build respective layer. Like network architectural protocol stack, Web Services could be presented as stack that embraces standards at each level. The upper layers build up on the cap abilities which is provided by the lower layers. The vertical towers represent requirements that must be addressed at every level of the layer. The text at the left represents the standard technologies that apply at that layer [5].

Mobile Agent needs to provide an environment for accepting incoming agent, installing and registering the agent and provide an execution environment where the incoming can continue its execution [6].Also, upon there questoras will of the agent, it packs the state of agent along with the code together; send it over the network to the destination where the agent supposes to go. The agent typically uses some communication transport mechanisms such as Remote Procedure Call(RPC), messaging with some high level languages like ACL to achieve that. The RPC could be one of forms of CORBA, DCOM, and RMI.

The creator of an agent, to needs to keep track of the agent's current location, and in order to contact the agent and get access to its data and resources. Furthermore, other agents, called client agents, and may be need to contact the agent. In this situation information retrieval is approx impossible, even if the agent follows the predefined route. These location problems become even more difficult when agents need to locate and cooperate with agents in other execution environments. Thus there is a need for the web service with the ability to locate any type of mobile agent at anytime from anywhere.

Such a mechanism (i.e., Tracker) must be generic, flexible, and to independent of the agent platform and able to dynamically accommodate location algorithms to support various moving and invocation patterns.

Figure: 2 A Specific Scenario of the Problem of Locating Mobile Agents



1. The creator submits mobile agent A to perform some task.
2. That mobile agent moves to different machines and environments.
3. Client C needs to communicate with mobile agent. This client is unaware of the agent's location therefore that contacts Tracker.
4. Tracker knows the agent's location and to communicates with it in order to inform the client.

Without Tracker, and the client will not know the agent's location, so contacting it would be impossible, unless the agent returned back to the client or the creator [7]. The Tracker must be capable to assist the communication between the client and moving agent even if the agent has moved in amid the client's request and the Tracker's response and independently of the speed of the movement.

Two things are mainly needed to the effectively attack such a problem: (a) to study and evaluate the current location technology supported by the exiting mobile agent platforms, and (b) to understand the specific requirements and peculiarities in having mobile agents or moving objects roam around the internet.

It has been examined that the most popular mobile agents platforms (i.e., Aglets, Concordia, Grasshopper and Voyager) giving special emphasis on the way these systems provide agent location management support. This advantages and disadvantages of the current methodologies are identified and to studied. The positive features are the effectively adopted while the negative ones are in some sense to eliminate. The agent issue, however, exists problems in communication and discovery aspects; this study aims to incorporate collaborative concepts to implement service sharing on mobile devices; incorporating agent technology enables to increase system flexibility, such as in the system configuration, service deployment, service discovery, and so on;

agents are capable of solving the unstable service accesses problems in mobile devices owing to the highly mobile nature.

While many positioning methods and the technologies do exist, e.g. Round-Trip Time, Angle of Arrival, and the Reference Node Based Positioning, 3GPP has standardized three methods for the Location Services (LCS) functionality in 3G mobile networks. They are Cell ID based positioning, and the Observed Time Difference of Arrival (OTDOA) positioning (which is based on Time Difference of Arrival positioning), and Assisted GPS positioning (which essentially is GPS positioning) [8].

OTDOA works well indoors and to provide reasonable accuracy when more than two neighboring base stations are used in the determining the user's location. GPS is the most accurate but requires LOS between user and three or the more satellites to perform well [9]. Cell ID based positioning is the least accurate and that accuracy is inversely proportionate to the size of cell that the user is in. It may be easily deduced that the accuracy of the user's location is a major factor when provisioning the location-aware services.

Inaccurate location positioning of the user could result in providing the user with services it he/she does not want or need, thus decreasing user satisfaction and service reputability [10]. The importance of that factor increases when different location-aware services are aggregated together. Although all aggregated services would suffer to some extent from positioning inaccuracy, a CnL1 aggregated service would be more likely to be affected than a C1Ln or a CnLn aggregated service as this entire service locality is smaller than that of the other two (assuming that the area of each composite service locality is equal and exclusive) – a small inaccuracy would constitute a greater percentage of error over a small area than a large area.

IV. CONCLUSION

Mobile agents are useful for the applications it need to respond in real time to changes in their environment, because they can be dispatched from a central controller to carry out operations directly at the remote point of interest. In addition to detecting and diagnosing potential network intrusions and an IDS needs to provide an appropriate response in order to protect and defend the network from the malicious behavior. Mobile agent allows an adaptation of a fully-fledged implementation on a powerful device to a restricted implementation on a resource-limited device. Incorporating the web services into mobile agent system may be very much useful in the future system in many norms such as m-commerce, m-banking etc.

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