

## Use of Mobile Agent for smooth function of Web Services

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### Abstract

A Mobile Agent is an independent form of code that has mobility and autonomy behavior. One of the main advantages of using Mobile Agent in a network is that it reduces network traffic load. The Mobile Agent technology invented to overcome the complexity resulting due to the increasing size of network components raises new network management schemes. Many applications providing Mobile Agent capability have been proposed for being used in network management. E-commerce and information retrieval are some of them. The target behind the agent mobility is that, it has some limitations faced by centralized client-server architecture, which are mainly, minimizing bandwidth consumption, supporting network load balancing, enhancing scalability as well as flexibility, increase fault tolerance and solve problems caused by unreliable network connections. In this paper it proposed a model for applying web services with the help of mobile agent.

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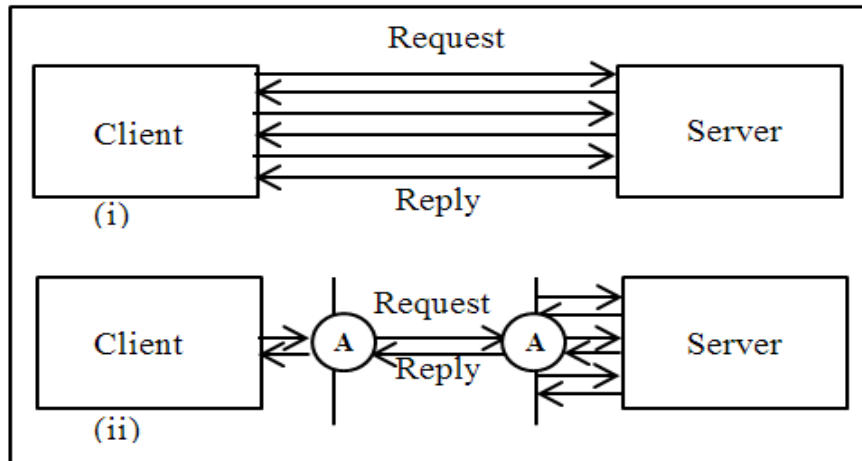
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### I. INTRODUCTION

A Mobile Agent, then, is a computer program that is capable of migrating autonomously from node to node, across a heterogeneous network, to perform some computation on behalf of the user. Applications can inject Mobile Agents into a network, allowing them to roam the network, either on the predetermined path or one that the agents themselves determine based on dynamically gathered information. Having accomplished their goals, the agents can return to their home site to report their results to the user. In managing networks it can achieve more benefits from the use of Mobile Agents due to the fact that, the approach is based on a decentralized computation. The comparison between Mobile Agent performances with traditional centralized approach based on Common Network Management Protocol (CNMP) show that CNMP does not scale well when the size and complexity of the network increases. Today Service Oriented Architecture is a fast emerging successor of the Object Oriented and Distributed Object Oriented paradigms. Web Services Technology is an implementation of the Service Oriented Architecture Model.

### Mobile Agent

A mobile agent is a type of software agent characterized by autonomy, social ability, learning, and mobility. It combines computer software and data with the ability to autonomously migrate from one computer to another within a network. A mobile agent can migrate from one host to another autonomously to resume its execution. Here autonomy means to take decision and to execute an action without direct user or human interaction. One of the main advantages of using mobile agent is – it reduces network traffic load noticeably as it does not require any continuous connection or communication between the server and the client. Besides, use of mobile agent makes access of remote resource more efficient and flexible



## II. AGENT CHARACTERISTICS

Mobile Agents may possess several or all of the characteristics summarized below in Table. Every agent satisfies the first four properties (i.e. reactive, autonomous, goal oriented, and temporary continuous). Other properties are defined on adding hierarchical classification.

Characteristics of Mobile Agent

Autonomy	Exercise control over its own actions
Temporary continuous	It is a continually running process
Reactivity	Respond in a timely fashion to changes in the environment
Goal oriented	Does not simply act in response to the environment
Proactively	Able to change event and make things happen
Social ability	Can communicate and collaborate
Mobility	Able to transport itself from one machine to another
Cognitive	Able to learn and adapt environment
Flexibility	Characterized by capability to adapt changing environment

### Problems with Mobile Agent

Here it is Several Mobile Agent systems have been proposed. However, the technology is still not yet widely accepted, due to the fact that there are still several issues to be solved. Major problems associated with Mobile Agent include:

- **Coordination:** One of the fundamental activities in Mobile Agent application is coordination between agents and entities they encounter during execution. The mobility of an agent raises problems. Multiple agents are likely to visit the same site at the same time. It is forbidden several agents attempting to have access to the same resource at the same time, as this might lead to deadlock. For the agent-based application to be successful, coordination between agent and network components is an issue that needs to be well addressed.
- **Resource management:** Since agents are autonomous congestion during resource access is inevitable. Resource allocation of agents must be governed in order to avoid congestion or system breakdown.
- **Security:** The introduction of mobile code in a network raises several security issues. In open network such as Internet, servers run the risks of system penetration by malicious agents, as these can cause undesirable consumption of resources. On the other hand parts of the agent states might be sensitive and might need to be kept secret when they travel on the network. Security breach could result in the modification of the agent's code as it traverses the network. Researches admit that protecting the agent against hostile hosts and vice versa are still a difficult issue further points out that security is the major obstacle preventing the wide spread acceptance

of the Mobile Agent paradigm. In Section it proposes noble mechanisms for protecting the agent's code and their hosting sites of execution.

### **III. Security Issues with Mobile Agent**

Security of mobile agent is essential in any mobile agent based application. Besides security of agent platform is also important. To discuss the security aspects of a mobile agent system it has considered the following security services: Confidentiality, Integrity, Authentication, Authorization and Non-Repudiation.

- **Confidentiality:**

Confidentiality ensures that, data and code carried by an agent is not accessible by unauthorized parties (unauthorized agent or unauthorized agent server).

- **Integrity:**

Integrity guarantees that agent's code and baggage cannot be altered or modified.

- **Authentication:**

Authentication enables a mobile agent to verify its identity to an agent server as well as an agent server to a mobile agent. Without authenticity an attacker could masquerade an agents identity and could gain access to resources and sensitive information.

- **Authorization:**

Authorization ensures that an agent can access the resource or information only those are allowed for it to access.

- **Non-Repudiation:**

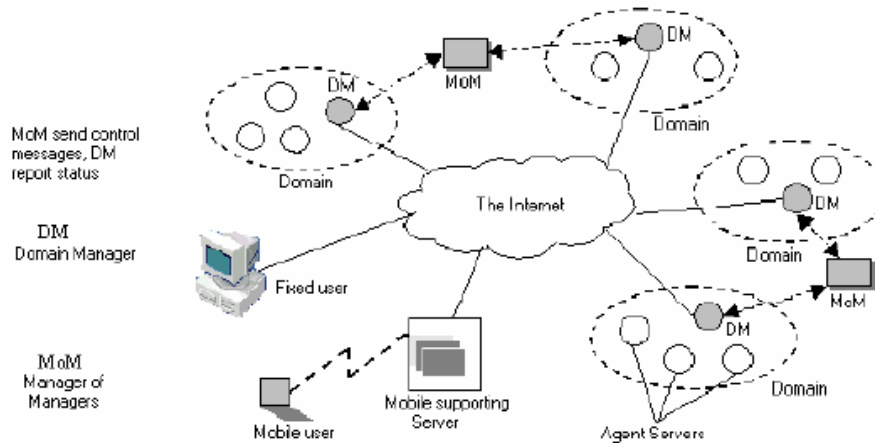
Non-repudiation assures that the agent-server or the mobile agent cannot repudiate the actions it has performed.

### **PROPOSED MOBILE AGENT MANAGEMENT SYSTEM:**

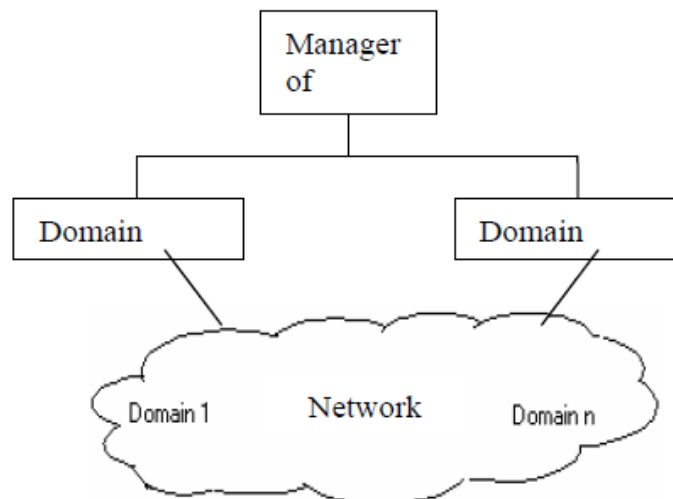
It is propose a system that provides framework for network management functionality and code mobility. The architecture emphasizes autonomy and mobility of agents. The entire network is viewed as being made up of small and easily manageable groups of nodes called Domains. Based on this vision the infrastructure is equipped with two major entity categories namely, management entities and managed entities. The management entities include Domain Managers and Manager of Managers, all performing the management roles in a hierarchical level. The Domain Managers have control over the nodes within a domain, and Manager of Managers directly exercise power on their immediate subordinates Domain Managers, who's in turn exercise the powers delegated to them, to the managed entities. The managed entities include Agent Servers, Directory servers, Service/Resource agents and Mobile Supporting Server, each performing specific function. To ease the management, domains consist of serves not more than a certain number. Likewise the Manager of Managers is bound to serve not more than certain maximum number of Domain Managers. The grouping will largely depend on the geographical layout of the networks and the average load on the entire network. The registration of a node in a group may be done at the time anode is being installed, and a node can be shifted to another domain later as the network administrator may prefer. The mobile supporting server is used to enable the participation of the mobile user in communicating with the network components.

### **IV. System Implementation**

In the proposed infrastructure, the managing entities provide an interface to the user to specify policies for Mobile Agent and dispatch the Mobile Agent. They also have the capability to create the Mobile Agent based on the information provided by the user. The travel action plan and security of the management information are specified at the Domain Manager before launching the Mobile Agent. When the Mobile Agent returns with the collected information, the Domain Manager processes the information and presents it to the user in a Graphical User Interface. In addition, a Domain Manager keeps track of the Mobile Agent, and it is ready at any time to service any special request from any of the managing entities.



Once the Mobile Agent is launched, the DM is available for other actions such as processing the received results, launching the new agent etc. The user at the user interface defines the policies before dispatching the Mobile Agent. It adopted, with slight modifications, the traveling plan proposed by it consists of a list of nodes to be visited, potentially in a specified order. However, the order given at the launching entity is not mandatory; the intelligence of a Mobile Agent still enables it to make decisions based on the situations at any Agent Server. Intelligence can also be used in making decisions such as finding the next destination thus optimizing the travel plan. It can also be used to detect abnormal situations as the agent travel around the network. The security feature provides the way to protect the agent, the information collected at the entity, as well as from other agent hosts or entities. The Agent server is designed to receive and execute mobile code. It thus provides execution environment, and it is responsible for receiving a Mobile Agent, authenticating the Mobile Agent and executing under local environment. It must also provide mechanism by which the local resources can be accessed. The Agent Server program specifies the policies that govern the Mobile Agent interaction with the local resources. At the same time the Agent Server has the authority to deny any service to the Mobile Agent that violates contract. The Domain Manager strictly specifies interactions between the local environments of the agent server. In order to effectively distribute processing load and control of management station, the hierarchical management approach has been adopted. To keep system manageable, the infrastructure provides only two level hierarchies as illustrated shown figure.



**Agent Server Implementation**

The agent server provides the resources, execution environment, as well as communication support for Mobile Agents. Every node in a Mobile Agent system must, therefore, be equipped with the Agent Server. The execution environment consists of Java interpreter called Java Virtual Machine, (JVM), which is a stand-alone platform. When the Mobile Agent arrives in the execution environment with the request to execute the server first performs security operations upon the agent to ensure its safety and regality; it is then instantiated and starts execution. After execution, the server provides storage support for the intermediate results. An Agent Server supports the transport mechanism with the help of Aglet Transfer Protocol (ATP). Aglets is a Java system

developed by IBM, it enables the agents to move from one server to another by invoking special methods which execute automatically when the agent finishes execution and serving the context in a current host. In the proposed architecture, when the Mobile Agent wants to move first the Agent server packs it along with the context and encrypt the code for transit protection. When this is done the method go to execute automatically, and thus enables the agent's code to move to the next destination.

### **PROPOSED MODEL FOR APPLYING WEB SERVICES WITH MOBILE AGENT**

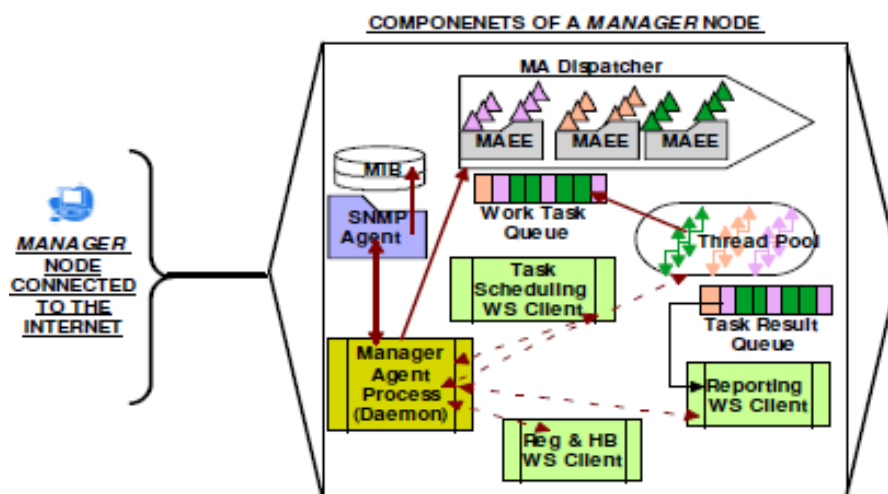
The network Throughput is watched and prospective congestion segments are tracked and reported by overseeing the Packet Discard Rate at the NIC. As shown in Figure below, the framework broadly consists of three components namely:

- i) The Manager Node.
- ii) The Enterprise.
- iii) The Managed Node.

#### **The Manager Node :**

As shown in Figure, the Manager Node has a plethora of components working together. They are:

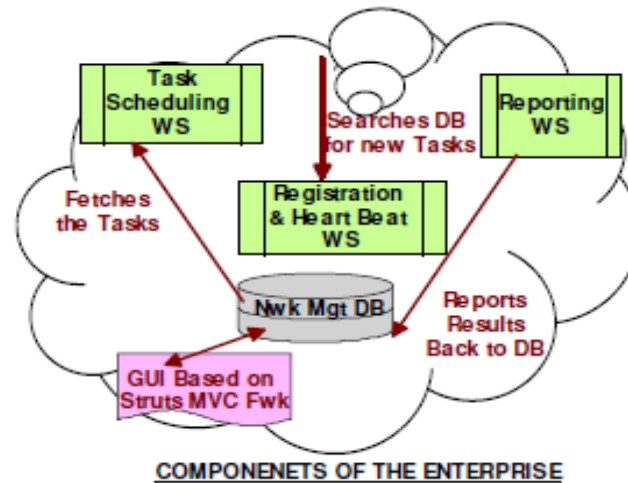
- A Daemon Process: It brings up the Agent.
- MAEE (Mobile Agent Execution Environment)
- SNMP Agent
- MIB (Management Information Base): Maintains state of network parameters of itself.
- Three SOAP Based WS Clients: Vital for Enterprise-Agent SOAP message exchange.
- A Pool of Threads: Made ready to execute the scheduled NM tasks, simultaneously.
- Result Queue: Maintains the task execution results until fetched by the Reporting Web Services.
- Set of library files developed by us to ease manager & managed node communication.



#### **The Enterprise**

The Web Services deployed on the Internet, thus enabling pervasive monitoring and management of the computer network. As depicted in Figure, the framework has three Web Services, namely

- a) Registration and Licensing Web Service
- b) Task Scheduling Web Service
- c) Result Reporting Web Service



## PROPOSED SECURITY MODEL

As it know that in an ad hoc network it is not possible to use a central server or a single point of trust, so trust should be distributed here among the available nodes. Distribution of trust in our proposed model is attained by using Threshold Cryptography. According to Threshold Cryptography to sign a certificate (for a service or server) there is a Master public/Private key pair which is called the key pair of the Key Management Service. The master public key is known by all the Agent Servers and all nodes in the network trust any certificate signed by the master private key.

## V. CONCLUSION

In proposed work, a Mobile Agent-based management system has been discussed. The framework differs from most other Mobile Agent frameworks in that, it proposes a hierarchical level of management, which provides, to network components, smooth coordination and fault tolerance mechanism. It also provides an efficient way of locating the agent. This is achieved by having the agent creating a registration path as it passes through the servers. The approach enables the message being sent to trace the agent, easily follow the path and go directly to the agent. The spotlight of our work was to demonstrate the research outcomes of using an approach for Network Management combining two distributed computing paradigms, namely, Web Services and Mobile Agents. But, it did not want to bring in a totally new approach, replacing the tried and tested CNMP, a stable, sturdy, simple Network Management Protocol prevalent for more than two decades. Therefore, it employed a convergence of three techniques for Network Management, namely, CNMP, Mobile Agents as well as Web Services. This paper provides a solution for securing mobile agent in an ad hoc network. It have used Threshold Cryptography in our model, because it provides solution to the problem of central certificate authority and trusted third party by distributing trust among several network nodes.

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