

Employing "Mobile Agents (MAs)" In the Internet services

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Abstract

In this paper, it is obvious show how current technological trends may lead to present the employing of mobile agents in Internet services because of Use of the Internet has exploded in recent years with the appearance of the World-Wide Web, and also It seems likely that, within a few years, nearly all major will be capable of hosting and willing to host some form of mobile code or mobile agents and it is also contributes towards such an evaluation and implements an Internet services using mobile agents.

This paper also summarizes the advantages and disadvantages that arise in using these technological trends and discussed some of the trend deployment of mobile agent systems in internet services. It is also discuss other experiences on integrating components internet sites and applications, enabling them to receive and send agents with critical evolutionary and requirements of team work. However other experiences approach involves wrapping the components inside a Java that can be included in any internet services enables the servers to receive and send agents that can query of information. We discuss several technical and non-technical hurdles along the path to that eventuality. A few years, nearly all major Internet sites will be capable of hosting and willing to host some form of mobile code or mobile agents.

Keywords: *mobile agents, internet services, Advantage of employing (MAs).*

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1. Introduction :

Using internet which resulted in new business has created a need for new ways of structuring, to provide cost-effective. It is expected to increase The number of people whom used and performing transactions on the Internet , However the majority process which should be automated Applications are still largely non-automated so , human is still in the loop in all stages of the process, which adds to the transaction costs and still responsible for collecting and interpreting information on products, making decisions and all other information . Which more easily accessible and orders and payments can be dealt with electronically.

(MAs) which has being define as programs that can migrate from host to host in a network, at times and to places of their own choosing. [7]Or it is a software agent that is able to move between locations. And dispatched to perform an analysis of the component locally thus avoiding the delays involved in data transfer, have for some time been seen as a promising paradigm for the design and implementation of distributed applications.

It is a program that can autonomously migrate between various nodes of a network and perform computations on behalf of a user. (MAs) are defined also as objects that have behavior, state, and location [5]. Its tasks are determined by the agent application, and can range from online shopping to real-time device control to distributed scientific computing. Applications can inject mobile agents into a network, allowing them to roam the network either on a predetermined path, or one that the agents themselves determine based on dynamically gathered information. Having accomplished their goals, the agents may return to their ``home site" in order to report their results to the user. Some of the benefits provided by MAs for creating distributed applications include reduction in network load, overcoming network latency, faster interaction and disconnected operations [10].so we can say that mobile agents help people with tedious repetitive job and time consuming activities.

Actually, We share other believes that the effective use of mobile agents can dramatically reduce transaction cost involved in all Internet services , in general, and in business-to-consumer transaction, in particular. Mobile agents represent a good approach to overcome the limitations of networks with centralized management system, by distributing the management operations and move the "management intelligence" as close as possible to the managed resources. [5]

2. Paper goal

Our paper contributes in such a direction by presenting minimal requirements that mobile Agents should support for correctly enabling employing in internet services.

3. Why mobile agents?

Mobile Agents are agents that can physically travel across a network, and perform tasks on machines that provide agent hosting capability. This allows processes to migrate from computer to computer, for processes to split into multiple instances that execute on different machines, and to return to their point of origin. . In other words, mobile code gives providers the time and flexibility to provide their users with more useful applications, each with more useful features.

The definition outlined previously lead to the conclusion that mobile code, and mobile agents, will be a critical near-term part of the Internet Not because mobile code makes new applications possible, nor because it leads to dramatically better performance than (combinations of) traditional techniques, but rather because it provides a single, general framework in which distributed, information-oriented applications can be implemented efficiently and easily, with the programming burden spread evenly across information, middleware, and client providers .Web sites and other Internet services will not be able to efficiently provide the full range of customization desired by their clients, and clients will want to use the same information-filtering and -organizing tools across many sites.

The technology behind mobile agents is examined, and an analysis of its uses and implications is offered .Mobile agents are in the process of graduating from being limited to research systems to being a practical technology in network computing in many practical systems for many research technologies.[29]

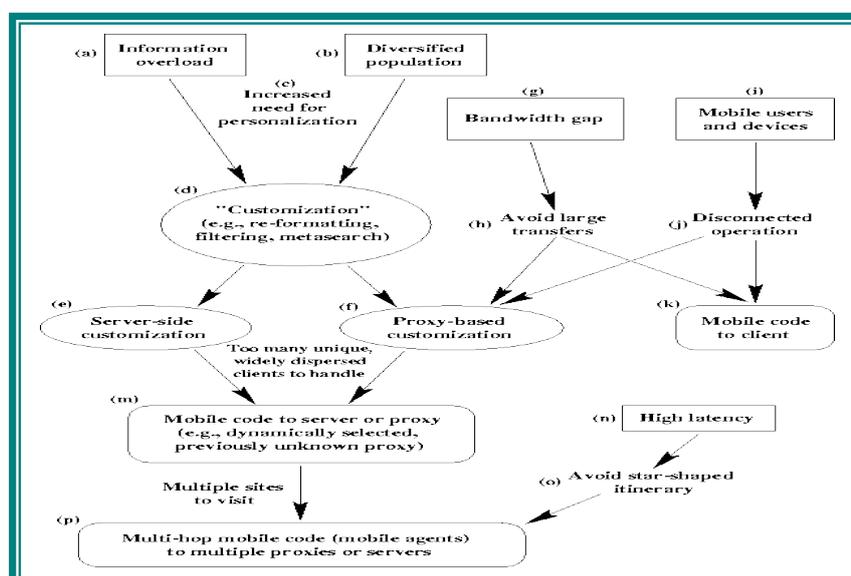


Fig.(1) why Mobile Agents ? [29]

4. Advantage of employing (MAs) in Internet services:

Some of the benefits of mobile agents in Internet are:

*4.1 **Reduction in network traffic**: MA's code is very often smaller than data that it processes, so the transfer of mobile agents to the sources of data creates less traffic than transferring the data.*

*4.2 **Asynchronous autonomous interaction**: (MAs) can be delegated to perform certain tasks even if the delegating entity does not remain active. This makes it an attractive for mobile application and disconnected operations.*

*4.3 **Interaction with real-time systems**: Installing a mobile agent close to a real-time system may prevent delays caused by network congestion.*

*4.4 **Efficiency savings**: CPU consumption is limited, because a mobile agent execute only on one node at a time. Other nodes do not run an agent until needed.*

*4.5 **Space savings**: Resource consumption is limited, because a (MAs) resides only on one node at a time. In contrast, static multiple servers require duplication of functionality at every location. (MAs) carry the functionality with them, so it does not have to be duplicated.*

*4.6 **Support for heterogeneous environments**: (MAs) are separated from the hosts by the mobility framework. If the framework is in place, agents can target any system. The costs of running a Java Virtual Machine (JVM) on a device are decreasing. Java chips will probably dominate in the future, but the underlying technology is also evolving in the direction of ever-smaller footprints .*

*4.7 **Online extensibility of services**: Mobile agents can be used to extend capabilities of applications, for example, providing services. This allows for building systems that are extremely flexible.*

*4.8 **Convenient development paradigm**: Creating distributed systems based on mobile Agents is relatively easy. The difficult part is the mobility framework, but when it is in place, then creating applications is facilitated.*

*4.9 **Easy software upgrades**: A mobile agent can be exchanged virtually at will. In contrast, swapping functionality of servers is complicated; especially, if we want to maintain the appropriate level of quality of service (QoS).*

5. Disadvantages of employing (MAs) in Internet services:

5.1 Cost of installing and maintaining: already mentioned cost of installing and maintaining the agent support infrastructure is also a very sensitive argument for the NM community, which wants manageable management systems.

5.2 Security risks: are other relevant reasons why mobile agents have not yet gained wide acceptance in the Internet services field.

5.3 Proper support & standards: lack of proper support for fault tolerance and lack of standards.

6. Directions in Internet services:

There are many trends in Internet technology and activity that encourage the use of mobile agents on the Internet. [5] Which described below :

6.1 Bandwidth : Internet access is broadening to the point where people will have a reasonable-speed access to the Internet. Backbone of it has an enormous amount of bandwidth available; however the average user will not have this at his disposal. Although Internet traffic is growing exponentially, the bandwidth soon to be available on the Internet backbone, as well as to many offices and neighborhoods, is immense. Nonetheless, bandwidth to many end users will remain limited by several technical factors. Many users will still connect via modem, or at best, ADSL over the old copper loop. Many other users will connect via low-bandwidth wireless networks. [13], [14].

6.2 Mobile devices : Internet users are mobile and therefore they need their Internet access to come with them by using portable computing devices. Everything from laptops or palmtops to car telephones to pagers can access the Internet. These devices usually connect using a telephone or wireless network. One of the hottest areas of growth in the computer industry is portable computing devices. Everything from laptops to palmtops to electronic books, from cars to telephones to pagers, will access Internet services to accomplish user tasks, even if users have no idea that such access is taking place. Typically, these devices will have unreliable, low-bandwidth, high-latency telephone or wireless network connections.

6.3 Mobile users : Internet users have shown that they like to have access to everything from anywhere through the popularity of things like web-mail. Web terminals are becoming more popular, Internet cafes are the latest in public place Internet access. Web-based email services I make it clear that users value the ability to access their email from

any computer and become commonplace in public spaces, such as cafes, airports, and hotels and full access to all of users files and applications from any terminal .

6.4 Intranets : Organizations are increasingly using Internet protocols, particularly HTTP, to build internal ``intranets" for their own distributed-information needs. Internal or private and smaller versions of the Internet are being used for information sharing within companies and corporations. Usually managed by a single organization and can make use of new technologies quickly since security. Little coordination is needed with outside organizations, and security is of less concern.

6.5 Information overload : Internet users are already overwhelmed by the sheer volume of available information, and the problem will get worse as the Internet grows. Filtering technology, while still quite limited, can help reduce the stream of information to a given user to a tolerable level. Search engines , portals, collaborative filtering, and email filtering are existing technologies that allow the user to reduce the torrent to a manageable stream, but these technologies are still quite limited.

6.6 Customization : Site customization for individual users is possible through the Internet and can be provided on either the client or server side .Unlike broadcast media, the Internet makes it possible to customize access for each user. Current technologies allow customization at both the client (browser) and the server.

6.7 Proxies : Third party proxies can provide site wide customization for one or more Internet services. They can be used to reduce information overload and customize service access. Such proxy sites, which today are most often Web sites such as the various shop bots, interpose between a user and one or more other Internet services. As a means to both reduce information overload and customize service access, in portable devices become more prevalent, highly specialized proxy sites will be provided to meet the special needs of mobile users. Java has no built in support for agent communication. In Aglets, each Java agent has a proxy object. Communication from one agent to another happens through the proxy. This is to protect the agent objects from being directly modified. The proxy object provides a set of methods for communicating to the represented object. These include requests for aglets to take actions, such as migration, cloning, destroying and suspending. There are also two methods for sending synchronous and asynchronous messages to the aglets. [15]

7. Critical Evolutionary of Mobile agents Technical

*There are several technical that must be cleared before mobile agents can be widely used, which can be divided into **hurdles** and **un hurdles** Technical. Hurdles technical Performance and scalability it can be cleared when mobile-agent systems save network latency and bandwidth at the expense of higher loads on the service machines, since agents are often written in a (relatively) slow interpreted language for portability and security reasons, and since the agents must be injected into an appropriate execution environment upon arrival. [16][17] Security on the other hand , possible now to deploy a protects a machine against malicious agents[18] . Numerous challenges remain, however protecting the machines without artificially limiting agent access rights; and groups of machines that are not under single administrative control. [19]*

However Non-technical hurdles deter the widespread adoption of mobile-agent technology. Internet sites must have a strong motivation to overcome inertia, justify the cost of upgrading their systems, and adopt the technology. Once a clear quantitative argument is made, It is unlikely that any Internet service will be willing to jump directly from existing client-server systems to full mobile-agent systems. Researchers must provide a clear evolutionary path from current systems to mobile-agent systems. In particular. It is appear first in the relatively safe intranet environment, particularly intranets that are built on high-latency networks such as a WAN or a wireless network for mobile computers.

A final important hurdle is Revenue and images the problem of revenue flow and commercial image. Although it is not yet clear whether advertising is a viable economic foundation for Web sites, many Web sites earn money solely from advertisements. If these sites allow mobile agents to easily access the content of the site, the number of human visits to the Web pages will presumably decrease, and the advertisements will not be seen. Similarly, when users are accessing a service with a front-end backed by mobile agents, the distinction between the service and the front-end agents starts to blur. Since the agents will likely be provided by middleware developers, the Internet service will no longer have complete control over its image. A poorly implemented agent may lead to a negative view of the service, even though the service is blameless. However, it can be deployed in the near-term in many applications where the existing services do not rely on advertising; in the long-term, both the Internet and mobile-agent communities will need to explore different revenue models.

8. Team work Requirements:

- 8.1. **The first team:** in order to developed a MA infrastructure specifically tuned for internet sites and applications Like other known MA implementations, the idea was to have a set of platforms providing an execution environment for mobile agents, controlling their migration and lifecycle. These platforms are seen as an extension of the host's operating system (typically one platform per host) where mobile agents from different applications coexist. Following this platform-centered design we focused on issues like performance [2] we focused on issues like performance [5], robustness, and integration with legacy management technologies [6], infrastructure manageability [8], agent coordination and security.
- 8.2. **The second team:** another team work used this platform to develop management applications. Four prototypes were produced and evaluated, and two of them were selected for integration into commercial products.

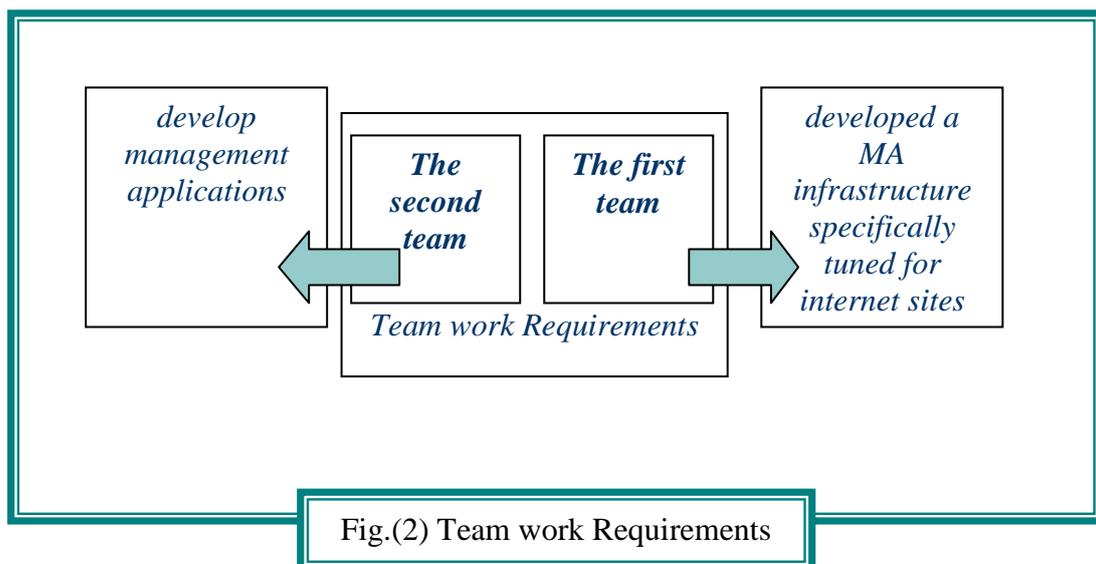


Fig.(2) Team work Requirements

9. Characteristics of Languages for Mobile Agents:

a mobile agent language must be able to support agent migration it should be possible to suspend an agent's execution at any point, save the state, including the heap, the stack and even the registers, move the agent to another computer, and restart execution, with the agents execution state exactly restored. Agents may move to any location with the go statement. Upon the execution of this command, the agent is transported to the target site, where it continues execution from the line after the go statement. All the agents properties and the program execution state, including those of local variables in methods and the program counter, are restored exactly. [20] [15]. A site can make its execution engine available for threads at other sites to use. A procedure can be executed at a remote site, by passing the name of the procedure as a parameter to the execution engine. [22]

Communication between agents, request a meeting with another agent at the same place, that is the same execution environment when an agent receives an invitation to hold a meeting, that method contains the agents negotiating strategies, which may include rejecting holding a meeting under certain conditions or with certain types of agents. [20] [24] The fundamental purpose is to get the program closer the source of the information must provide an easy way to access the resources on the host machine. There are Two major techniques which used to protect the host computer, Executing agents in an isolated environment , Authenticating the source of mobile agents, and granting execution privileges to agents on the basis of how trusted their source is. For Example Java programs each run in their own environments. This security mechanism built into the Java Virtual Machine instruction set to prevent programs from accessing outside of their environment. [21] Type-safe reference casting, Structured memory access, Automatic garbage collection , Array bound checking and Checking references for null are these thinks . The effects of these mechanisms is that Java programs run in limited environment allocated to them by the Java Virtual Machine, and the Java byte code instruction set disallows them from directly accessing anything outside of this environment. The Security Manager may grant special privileges to all classes from the same author, or to just some classes. [25] In the safe interpreters commands that access outside resources are hidden. The security policy is user-defined by the administrator of the server. The authority is a class that defines the individual or organization in the physical world that the agent or place represents. Agents and places must reveal their authority to another agent of place on request. They may not falsify or withhold their authority. The network of places is divided into regions under the same authority. When an agent tries to move from one region to

another, the source region must prove the authority of the agent to the destination region. [20] The common way for the host to authenticate incoming mobile agents is through digital signing. Most Java mobile agent systems and I use this method. When an agent is transported, the message containing it is signed by the sender agent server. [22]

However Efficiency for MAs needs to be executed reasonably efficiently. For agents with a high mobility rate, the bottleneck to performance is likely to be the network rather than their execution speed. Execution speed is also not critical for agents that spend most of their time idle waiting for events to happen, Java was designed to be high performance interpreted language. Java programs are compiled to Java byte code, instructions for the Java virtual machine. [26] Java's performance will be improved again with the implementation of Just-In-Time compilers. This is a technology that numerous companies are currently working on. Java byte code is compiled to native binaries just prior to program execution, giving an execution speeds almost as fast as optimized native [23] The compilation however causes an overhead at the application start up. Whether Just-In-Time compilers will be useful for mobile agents depends on the application. The compilation penalty will only payoff for mobile agents that stay at one site for a relatively long time. [27] However, this speed may be adequate for many mobile agent applications. While Cross platform in most cases it is desirable for a mobile agent to be able to migrate across a heterogeneous network. Certainly, for a mobile agent to be used on the Internet this is a requirement. For this to be possible, the agent must be written in a language that is supported on all its potential host computers. This is one of the reasons why nearly all mobile agent systems use interpreted languages. All the languages looked at are interpreted. The language that the program is written in should suit the task. There are two views as to what is required of the task for mobile agents. The language should be compatible with agent-oriented programming. The other object-oriented principles, inheritance and polymorphism are also compatible with agent programming. Object oriented languages are well suited to representing agents. [28] The advantage of system languages are execution speed and flexibility. For writing agents to customize the services provided on network servers, For lower level tasks and performance critical applications, a system language like Java is well suited. As mobile agents become widespread it will be interesting to see which applications dominate. Declarative languages may also be useful for writing mobile agents. Declarative languages are well suited to knowledge representation and reasoning. Hence they would seem suitable for writing intelligent mobile agents. It is interesting that there have been no prominent mobile agent implementations using a declarative language.

10. Agents integrating components:

Three dimensions from the other experiences on integrating components internet services, enabling them to receive and send agents in query of information:

10.1. The Programmer:

From the point of view of the programmer, mobile agent technology should not be an exclusive of agent-based software design. It should be available, as well, to traditional object-oriented software developers. Systems force the development to be centered on the agents, many times requiring the applications themselves to be coded as a special type of agents – stationary agents. Constructing an application that uses mobile agents is a difficult process. When this does not happen, special interface agents have to be setup between the application and the incoming agents. These agents must know how to speak with the mobile agents and with the application. The complicated interface between the agents and the applications must be written. The programmers want to develop their applications as they currently do.

10.2. The User

From the viewpoint of the user, if use of mobile agents first of all install an agent platform and second security permissions given to the incoming agents configured and proper hooks necessary to allow the communication between the agents and the application must also be setup. The user is much more concerned with the applications than with the middleware they are using in the background. In the currently available mobile agent systems, the agents are central and widely visible. They are not the background middleware but the foreground applications . In many cases, using mobile agents does not pose an increased security threat, especially if proper authentication and authorization mechanisms are in place. Because the current agent platforms do not shield the user from the middleware, the risk associated with this technology is perceived as being higher, which causes users to back away from applications that make use of mobile agents.

10.3. The Application Field

Actually mobile agent model is not complete without defining a set of events that are of interest to the agent during its lifetime. The set of events varies a bit from model to model, which be Creation, Disposal, Dispatch Arrival $\square\square$.

11. Conclusions

1. *It have been learned that MA-technology, when appropriately used, provides significant competitive*
2. *MA, technology is still not appropriate to take those advantages to mainstream application development.*
3. *There is a strong case for the use of mobile agents in many Internet services. Once several technical challenges have been met, and a few pioneering sites install mobile-agent technology, use of mobile agents will expand rapidly.*
4. *There are main points, basic independence from central servers; proper persistence storage and reactivation mechanisms; and transparency in terms of the programming model given to developers.*
5. *The main advantage of mobile agents is that they can bring a program closer to the information resources. The client uses the services provided by the server by dispatching a program that is a mobile agent, to the server. The mobile agent makes use of the server's basic services, in the way that its owner intends. The fundamental advantage is they provide a layer of abstraction, between the services provided by the server and the way they are used.[7]*
6. *Mobile agent languages are able to support the agent migration, communication, interaction with local resources, security mechanisms, suitable execution efficiency, language implementation across multiple platforms, and ease of programming of the tasks mobile agents perform.*

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