Use of mobile agent in E-commerce

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Abstract— **In today's world, more and more stress in given to information and its access. And with this more emphasis is given to the mobility of information. This trend has led to evolution of electronic commerce which is acting as a promising way the business is conducted. Computer systems have evolved from centralized system to client server paradigm then to mobile agent paradigm. Mobile agent systems consist of agent and hosts which provide working environment to the agents. Mobile agent consists of program code and execution state and when agent is dispatched to some other host both are transferred. They travel to different trading sites and locate the most befitting deal, negotiate the deal and even finalize them on behalf of their owners. This paper reviews the working of mobile agents in field of ecommerce.**

  Keywords— *Mobile agents , electronic commerce, B2B, B2C, C2C, C2B.*

I.   Introduction to Ecommerce

Traditional shopping activities require a large effort from a human buyer collecting and interpreting information on merchants, products and services, making an optimal purchase decisions and finally entering appropriate purchase and payment information. With development in technology and change in lifestyle of consumer more and more emphasis is given to online shopping which is done through electronic commerce. Electronic commerce is sharing business information, maintaining business relationships, and conducting business transactions by means of communication networks. [1] There are four categories of E-commerce shown as follows:

- Business to Business (B2B): B2B is an acronym for business-to-business, a type of E-commerce involving a transaction from one business to another via the internet. In this case the volume of business is quiet more.
- Business to Consumer (B2C): B2C is similar to traditional retailing by a business to a consumer. The novelty is that the retailing is now done on the Internet rather than at a brick and mortar store location.

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- Customer to Business (C2B): This is buying and selling where the consumer takes the initiative to contact the business establishment. The business has become reactive rather than the traditional proactive approach. Consumer to Business is a growing arena where the consumer requests a specific service from the business.

- Customer to Customer (C2C): The consumer initiates the selling to another consumer using business as an intermediary. These sites are usually some form of an auction site. The consumer lists items for sale with a commercial auction site. Other consumers access the site and place bids on the items. The site then provides a connection between the seller and buyer to complete the transaction. The site provider usually charges a transaction cost.[2]

In case of traditional online shopping, to search for a product, a consumer can:
  - Visit specific vendors' sites that one is aware of or use standard search engines and keyword retrieval to identify potential vendors and products
  - In each site visited the consumer can search for a product, its price, specification and other attributes.

But there may be hundreds of vendors selling the same or similar products so checking vendors requires time. Returned results through standard search technology may be biased. And if more than one product is required there may be no single site that caters for all. (Case of B2B shopping). Due to these factors mobile agents are introduced in this area. [4]

II.   Introduction to Mobile Agent System

These are the computer programs that run on behalf of user which have code, data and a particular execution state at any time. It travels from one system to other doing some task example collecting some information in any heterogeneous network. Mobile agents are an emerging technology that makes it very much easier to design, implement, and maintain distributed systems. A mobile agent is not bound to the system in which it begins execution. It has the unique ability to transport itself from one system in a network to another. This ability to travel allows a mobile agent to move to a system that contains an object with which the agent wants to interact, and then to take advantage of being in the same host or network as that object. [7]
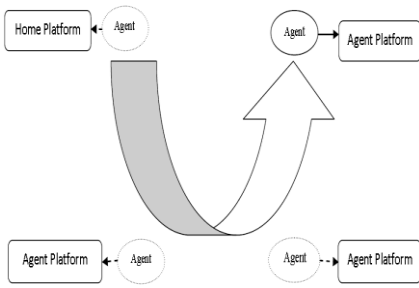
Mobile agent is the core of the most emerging application of today- ecommerce but due to issues of security it has not been exploited to its full extend. It must have following properties:

- Communicative: i.e. they should communicate with Other Agents, Systems, and People.
- Autonomy: i.e. decide the sequence of actions to be performed. An agent is able to act without the direct intervention of humans (or other agents), and that it has control over its own actions and internal state.[6]
- Adaptability: should learn about the user's behavior and adapt them to suit the user.

There are some advantages of mobile agent technologies are applied on network:

I.   They reduce the network load: The interactions in a distributed system are often achieved using communication protocols. These protocols involve transfer of large volumes of data stored at remote hosts over the network to a central processing site resulting in high network traffic.
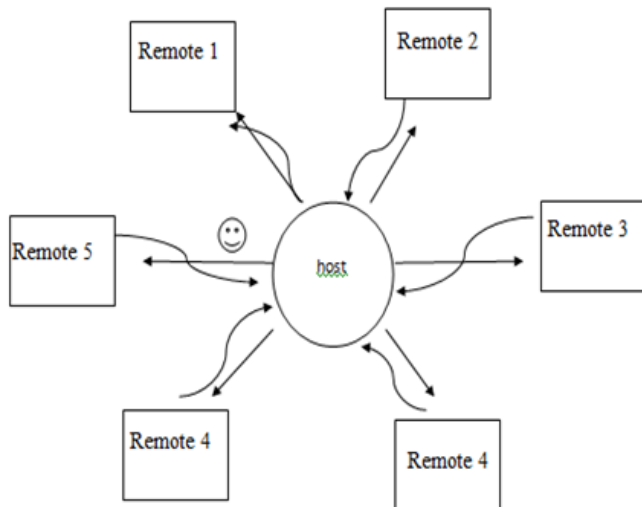

An alternative to using communication protocols is the use of mobile agents. Mobile agents are dispatched to the remote hosts containing the data. The agents perform the computations at the remote hosts and return back with the results. Since computations are moved to the data storage location instead of moving data to the computing location, network load is reduced. [9]
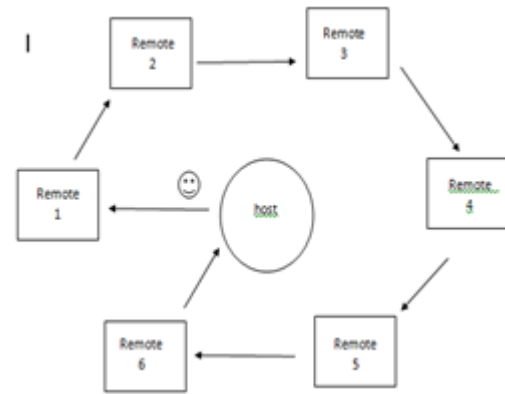
II. They overcome network latency: Consider a manufacturing plant in which many critical real time systems are controlled through a network. Controlling any systems through a network involves significant delays, which are not acceptable for critical real time systems. To overcome this problem, mobile agents can be directly dispatched from the central controller in the manufacturing plant to the real time systems. The agents act locally and directly execute the controller's directions.[9]

III. They execute asynchronously and autonomously: Mobile agents operate asynchronously. Once a mobile agent is dispatched from the home machine, the home machine can disconnect from the network. The mobile agent executes autonomously without the intervention of the home machine. The home machine can reconnect at a later time and collect the agent.[8]
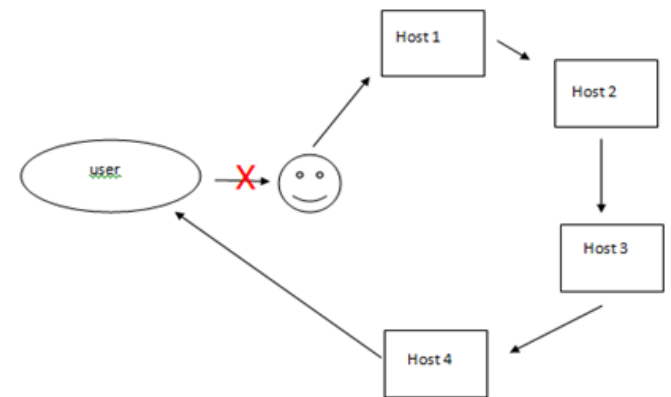
IV. Conserve bandwidth: Mobile agents conserve the amount of bandwidth needed by an application. For instance, an agent may be sent out to find the best price for an item. Instead of having to return each price found for the item to the client, an agent can go from host to host gathering prices and then return best price. [8]
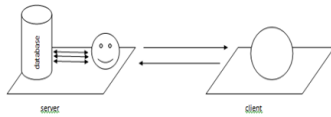
III. Use of Mobile Agents in Ecommerce

As described above, agent is code at home machine. Then it is dispatched to remote computer. The remote computer provides a suitable execution environment to agent. The agent uses resources of the host to perform its task.

In order to gain a clearer understanding of what agents do and what they are good for in electronic commerce, we chose to focus on three primary dimensions in which agents can add value:

I. Personalization: user creates its customized agent with all its specification like cost, quantity and quality etc and sends it to network.

II. Brokering: information gathering and retrieval. Agents may also serve to obtain desired information, often from a variety of sources, and supply it back to the user. In the context of electronic commerce this activity brings information from the buyer and seller together and presents it to either the buyer or the seller or to both.

III. Negotiation: dynamic and flexible execution of transactions. Negotiating agents may be empowered to execute transactions on behalf their users.[6]

The mobile agents travel securely from agent platform to platform. It collects information from one site then move to other site and so on in order to get better result. It then comes back to user and decides which deal is better and then does negotiation and place the order and payment.

For e.g. Here in the diagram, agent who is designed to buy airline ticket migrates from platform P0 which is acting like its home platform to platform P1 and collect the price of tickets. It then moves from P1 to P2 and compare the price from P1 platform to P2 platform. After moving all the available platforms it comes back to the host with the result of best tickets available.
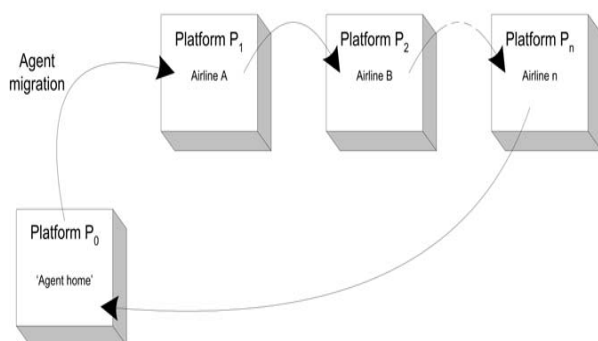
A. Threats

Agents are executed on other computers than that of the user, namely those of the merchants, the execution of the agent may be tampered with to bias the output of the agent in favor of the merchant. An agent may want to hide certain information from the merchant, like its maximum price it is willing to pay for an item and which other merchants it will ask for a bid, in order to give as little information away as possible. Ecommerce deals with money transactions so it becomes quiet important for us to study security issues to agent code or platform on which agent arrives. [12] These are as follows:

- Modification of other offers: A malicious host could try to modify or delete offers from other hosts so that its offer would become the best one.
- Denial of an offer: A malicious host could try to make a very good offer (e.g., make an offer with a very low price) such that its offer would certainly become the best offer and afterwards try to deny that it has made that offer.[3]
- A malicious platform can modify an agent's code, state, or data.

B. Security Measures

Both prevention mechanisms and recognition mechanisms are used for protecting mobile agents. Prevention mechanisms refer to protection of mobile agents while recognition mechanisms use for exploring possible security violation. [4]

- Safe programming (code obfuscation): by this we can make our agent secure so that no other platform can invade its code or do any harm to it. Code obfuscation applies transformations to the code to make their analysis very hard and thus safer from being reverse-engineered. They do not change the functionality of the program though.[4]
- Encryption using cryptography: it can be done by following steps:
  - place checksums on agent code/data
  - encrypt checksums on agent code/data
  - employ anti-replay mechanisms
  - employ anti-copy mechanisms
  - control copying

If a mobile agent wants to send results from the target system back to the initiator in a private way, the agent could encrypt the data using the initiator's public key. Since anything encrypted with a public key can only be decrypted using the corresponding private key, which only the initiator knows, the

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message will remain private until the initiator decrypts it. This approach implies that the mobile agent knows the initiator's public key. This is not a problem, since the public key is published. [5]

C. *Tips to choose a Good Agent:*

Check the agent's time of establishment. Longer the website is established the more professional the agent will be. If the agent has more than three years experience in serving customers, you can trust them in packing and delivering your parcels

- Service fee is always an important part of online shopping. Some agents charge 8% of items cost and domestic delivering fee, such as Taobaoring.com. Some charge 10%, like youbuy.com. So one must go with least fee.

- Choose those agents who offer online help, such as MSN, but pay attention to their office hour. Online help is much more efficient and easier than offline help.

- Choose agents who can accept the payment of Paypal which is the safest payment for purchasing. Other are just remember that finance safety should always come first. [13]

Conclusion

Ecommerce has given customer immense facility to doing business while sitting in home. And invention of mobile agent they can do this work with lesser time and more ease. Both the concepts of ecommerce and mobile agents are new and their combined utilization is very fruitful but due to some issues discussed in this paper this field is not fully exploited. Thus there is lot of scope in research in this field.

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