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MEASURES FOR FAULT EVALUATION IN MOBILE AGENT SYSTEMS

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ABSTRACT

Mobile agent is intelligent, autonomous, ragged, interactive, coordinative, cooperative and proactive agents. There arise many problems while moving the data, so to resolve such hindrances, mobile agent moves itself instead of moving the data. They are aspired to act smart and efficiently as they are acting on someone's behalf. Metrics measures have proven itself as great boon to judge a system's complexity, reliability and efficiency. Main objective of this paper is to configure out the intelligence property of mobile agent by introducing three metrics to measure defects and their effects. The paper also analyses and evaluates mobile agent measures.

KEYWORDS: Mobile Agent, Measures, Quality Factor, Fault Evaluation.

INTRODUCTION

Mobile agents are programs which start their journey or directed by a source computer and move among a set of networked servers until they are able to accomplish their task. They can migrate from one server to server and roam on uncertain network. This new paradigm of distributed systems has the unique property of making it possible for partial execution of agent's code on more than one platform. This extension of code distribution that was not present in the traditional distributed systems makes the mobile systems very useful [1]. Mobile agent is a free to air kind of agent that's why it should be smart enough that no one tries to misuse, corrupt or divert it from its original behaviour. During the life cycle, a lot of unpredictable situations may happen, may be on servers or during network communication. The main hurdles in wireless type of communications are the heterogeneity, frequent disconnection and constant changes in the environment parameters [3][2]. These agents are extension of client /server computing but here client sends a portion of itself to server for execution. The longer the path of the agent, the higher the possibility that it gets some troubles thus it is important to make a mobile agent fault –tolerant that means errors can be detected and recovered.

Agents can fail if host fails or agent might not reach the desired host. These failures may lead to a partial or complete loss of the agent. So the fault tolerant mobile agent systems should be created [4]. Incoming faults effects on integrity and security of agents. These agent face problems because of their mobility, portability and wireless communications, where mobility problems means how do these systems incorporate the address, process and object migration from host to host, portability problem is that the mobile code must be able to do its job with the use of limited resources without any loss of efficiency. Many techniques may be adopted to save mobile agent like dummy code insertion, authentication mechanisms and log maintenance.

In this paper we concentrate on intelligence of mobile agent as it is its main characteristics and makes a mobile agent more reliable and secure. We try to configure out the intelligence property of mobile agent by introducing defect evaluation measures..While designing these measures we kept mobile agent intelligent characteristic in our mind. Our paper suggests some ideas that would help to analyze the attacks done on mobile agents and the attacks done by mobile agent.

The paper is structured as follows. The section 2 discussed about some security and failure issues of mobile agent. Section 3 defines mobile agent defect evaluation measures. At Last section 4 includes some concluding remarks and discusses future work.

MOBILE AGENT FAILURES AND SECURITY ISSUES

Mobile agents are programmed to perform certain tasks and in the process of performing the task the agent may traverse numerous hosts. The host provides an execution environment and dispatcher of the agent is considered the home platform. But their autonomous and mobile nature introduces new security and failure issues.

Security issues:-

- A malicious agent may attack the host and access sensitive information that can cause Denial of service attack.
- Dispatcher or host platform should provide a safe environment for the agent to execute
- If an agent is carrying sensitive information like Debit card detail ,it must not reveal information inappropriately.
- Any other entity in the network may manipulate or eavesdrop on agent communication.
- A malicious host can also attack the agent by stealing or manipulating its data or code.

Failures:-

The following failures may occur in a mobile agent system that effect on reliability of mobile agents.

- **Server failure:** it may be called as node failure. If a server fails all the agent placed are failed. It may be a temporary failure of server but working of mobile agent effect.

Figure1: shows Server failure where dispatcher is home agent platform of mobile agent.

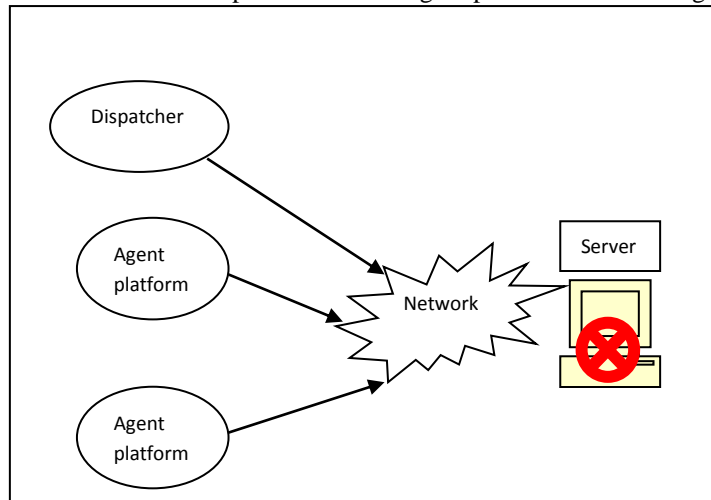


Figure1: Server failure

- **Agent failure:** if the computing scheme offered is faulty then this failure may occur.
- **Communication failure:** this arises due to single link failure of entire link failure.figure2 shows this type failure.

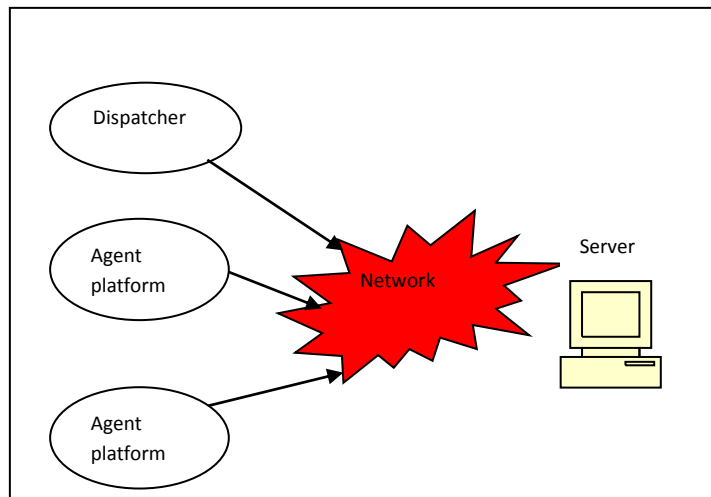


Figure2: Network failure

- Message Loss: this may occur in case if the network fails.
- Malicious agent: failure of mobile agent through any other malicious agent.

DEFECT EVALUATION MEASURES OF MOBILE AGENTS

These measures help in testing a mobile agent system so that we can track its progress as well as its quality.

- **Number of defects occurred (NDO) :-** This metric presents the total number of defects arise during lifetime of mobile agent. This measure helps a programmer in improving the design of mobile agent. we can add a timer for mobile agent that hold the maximum estimated time required for execution of Mobile agent and counter that count the number of defects occurred during life time. This measure can be calculated with the help of below steps.

a) When mobile agent start its journey start a counter variable and initialized it to zero

b) If (node!=responding)Then
 server failure
 count++
 elseif computing scheme== faulty
 agent failure
 count++
 elseif link!=responding
 comm.failure
 count++
 elseif network==false
 network failure
 count++
 elseif time==max_timer_value
 mobile agent failure because of any reason
 count++
 else
 count=0

c) NDO=count

- **Number of defects detected (NDD):-**it is the total number of defects recognized by mobile agent. there may be some errors that could not be detected by mobile agent but in facts they were meant to be happen in the course of its life time.

Using value of count variable of above steps we can measure total number of defects detected.

If count==0 then

$$\sum_{i=0}^n NDD = 0$$

Else

$$\sum_{i=0}^n NDD = count$$

If variable count=0 it means no defects occurred so the NDD is also equal to zero.

- **Number of defects resolved (NODR):-** it can be evaluated by subtracting above two measures. If the value of this measure raises then it depicts that the mobile agent is much efficient and intelligent.

$$\begin{aligned} &\text{If } NDD=0 \text{ then} \\ &NODR = \sum_{i=0}^n NDO \\ &\text{Else} \\ &NODR = \sum_{i=0}^n NDO - \sum_{i=0}^n NDD \end{aligned}$$

Where

NDO=total number of defect occurred
NDD=total number of defect detected
NODR=total number of defect resolved

CONCLUSION

Mobile agents are special agent and the use of these agents makes agent oriented technology more attractive and advantageous. To improve their performance we must check them on various quality factors before use and to check these quality factors metrics are required. This paper proposes three measures of mobile agent and the way to calculate them. In future we will try to calculate these measures on some case study to check and analyze their full potential. As compared to another fields it is hard to analyze behavior of mobile agent. But we tried our best while designing these measures, for this purpose working of mobile agent could be thoroughly analyzed. In future we will also try to work on some techniques that can also help in auditing the defects like storing the log of mobile agent travel, cryptography to maintain code and data privacy and using dummy data items.

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