An Investigation of the Adequacy of Agent Platforms for Rural e-Service Provisioning

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Abstract-This research serves to investigate the adequacy and suitability of agent platforms for rural e-Service provisioning. The adoption of new and innovative forms of service provision such as the use of Agent architecture may help improve service provision in rural areas. A basic network monitoring application will be deployed on Jade and Aglets mobile agent platforms as a basis for comparing these two platforms in terms of the robustness and fault-tolerance, mobility, intelligence, and suitability for rurality context.

Key words—Aglets, Jade, Mobile Agents, Network Monitoring System

INTRODUCTION

Agent technology has in the past few years grown in popularity and has therefore been adopted by computer scientists as a new and exciting platform for application development. "Software that thinks" is what some articles termed mobile agent technologies because the technology simulates human cognitive processes [1]. The fact that mobile agents can move from one host to another on a network to perform a given task and still come back to their host of origin is a cause for their fast growing popularity and use in several applications. In this research this technology will be used as a way to solve a problem faced by those who stay in marginalized areas, who constantly suffer from network failures. An in-depth study will be taken on the above mentioned platforms in order to do a comparison which will bring solid results to affirm the suitability of these platforms for rural areas. Some other services can also be tested on these platforms. For instance there are projects being run at Siyakhula Living Lab in Dwesa a rural area which are web-based applications which can after the findings of this investigation be tested on mobile agent platforms. The result of the comparison will lead to one of these platforms being used to deploy the services.

I. OVERVIEW OF JADE AND AGLETS AGENT PLATFORMS

A. Jade

Jade is a software development Framework that facilitates the development of multi-agent systems implemented in Java programming Language [2]. It has the following features: a runtime environment where Jade Agents can live and that must be active on a particular host before one more agents, a library of classes to use directly or by specializing them to develop their agents and a set of graphical tools for managing and monitoring running agents [2]. Each running instance of the Jade runtime environment is called a Container as it can contain several agents and the set of active containers is called a Platform and a single Main Container must always be active in a platform and all other containers register with it as soon as they start [2]. The structure of the Jade platform is shown in Figure 1:

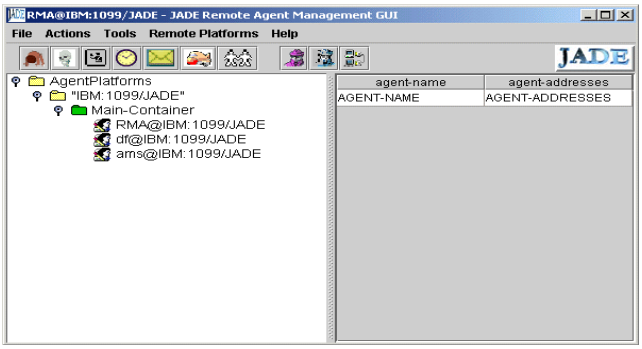

Figure 1: Jade Platform GUI

B. Aglets

Aglets is a Java Library for the development of mobile agents, it follows an applet like developing paradigm [3]. Unlike an applet's short limited time for execution, an aglet can exist and execute tasks for longer. One of the main differences between an aglet and ordinary Java mobile code of applets is the itinerary that is carried along with the aglet. Aglets are goal oriented and can travel from place to place over the internet [4]. It decides where to go and when to come back. An aglet can be dispatched to any remote host that supports the Java Virtual Machine. This requires the remote host to have a pre-installed Tahiti server (Figure 2), a server provided by the aglet framework. A running Tahiti server listens on the host's ports for incoming aglets, captures them and provides an environment for execution where aglets can communicate with each other.

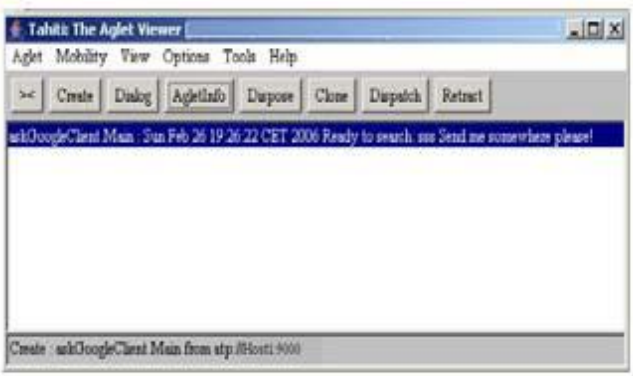

Figure 2: Aglets Tahiti server

II. MOTIVATION FOR MOBILE AGENT SYSTEMS

A number of technologies are being used presently which are able to conceive similar results to mobile agents like KQML (Knowledge Query Manipulation Language). KQML allows agents to communicate using a rich set of messages called performatives, and is capable of communicating attitudes about information, rather than just data and facts [5]. Despite the existence of such technologies the use of mobile agents has several advantages such as, reducing the network load by allowing conversations to happen locally rather than across network [6][7] and also due to the fact that they are dynamic, robust and fault tolerant. Mobile agents are able to relocate to improve performance or fault tolerance

III. Network Monitoring System

A. Proposed Service on Jade

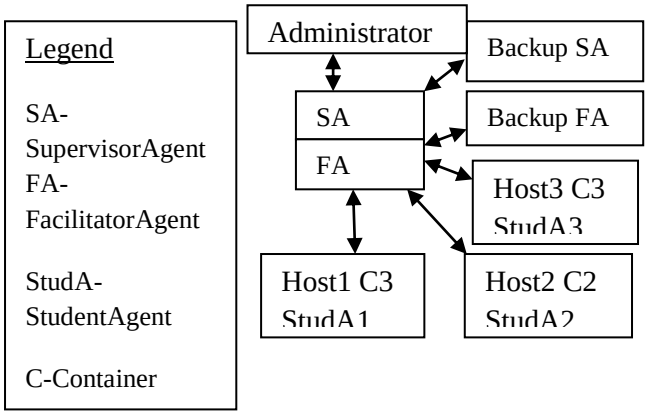

Figure 3: Jade platform

The system above is a representation of a network monitoring system on the Jade platform which is constituted by the set of active containers located at different hosts. On the main host which has the main container reside two Agents called FA and SA. SA is the overseer of the whole system, FA works as first handyman of SA who communicates what is going on around the network. These two again have backups residing on other host in case any one of them goes down. StudA1, StudA2 and StudA3 are the monitoring agents residing on the different hosts they are monitoring. These are constantly communicating with FA as represented by the arrows showing flow of messages to and from each other. If any one of the monitoring agents goes down the information is directed to the SA responsible also for notifying the system administrator.

B. Aglets System Architecture

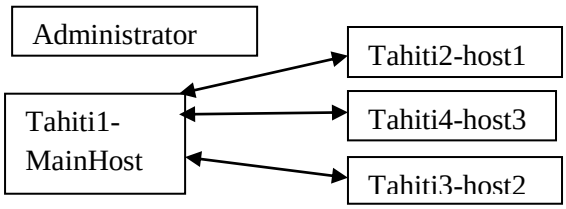

Figure 4: Aglets monitoring system

In this case the monitoring starts when Tahiti's are launched on different hosts specified on ports to reside on and aglets are dispatched from the local main host to remote hosts. To move an aglet from one machine to other, the aglet contacts the aglets server from the target machine, in a predetermined TCP port, and identifies itself [4]. The contact, the identification, the stream transfer, the control switching, all these are controlled with aid of the ATP protocol (Aglet Transfer Protocol) [4]. Failure to retract back that aglet that has been sent to a particular host will then mean the network at that host is down.

IV. Future Work and Conclusion

The above applications are to be thoroughly designed and run to make sure they have full functionality and they produce desired effects. Comparison based on observations during development of the system as well as performance will then give conclusion to which mobile agent system is most desirable for deploying the service and the overall general adequacy of Agents for service provisioning in rural areas.

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Biography

Octavia Chidyiwa is currently pursuing her Honours Degree in Computer Science at the University Of Fort Hare. Her research interests are mainly in the area of Network Traffic Management, Multi Agent Systems and ICT's for development in rural areas.