Chapter 52
Improvement of JXTA–Overlay P2P Platform:
Evaluation for Medical Application and Reliability

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ABSTRACT

JXTA-Overlay is a middleware built on top of the JXTA specification, which defines a set of protocols that standardize how different devices may communicate and collaborate among them. JXTA-Overlay provides a set of basic functionalities, primitives, intended to be as complete as possible to satisfy the needs of most JXTA-based applications. In this paper, the authors improve the reliability of our JXTA-Overlay P2P platform by implementing a new fuzzy-based Peer Reliability (PR) system. In the system, the authors considered three input parameters: Local Score (LS), Security (S) and Number of Interactions (NI). They evaluate JXTA-Overlay platform for medical applications and reliability. The experimental results show that by using JXTA-Overlay is possible to decide the situation of the patients. The simulation results have shown that the proposed system has a good performance and can choose reliable peers to connect in JXTA-Overlay platform.

INTRODUCTION

The Internet is growing every day and the performance of computers is increased exponentially. However, the Internet architecture is based on Client/Server (C/S) topology, therefore cannot use efficiently the client's features. Also, with appearance of new technologies such as ad-hoc networks, sensor networks, body networks, home networking, new network devices and applications will appear. Therefore, it is

very important to monitor, control and optimize these network devices via communication channels. However, in large-scale networks such as Internet, it is very difficult to control the network devices, because of the security problems.

In order to make the networks secure many security devices are used. The firewalls are used for checking the information between private and public networks. The information is transmitted according to some decided rules and it is very difficult to change the network security policy. Also, there are many small networks and Intranets that do not allow the information coming from other networks. Therefore, recently many researchers are working on Peer-to-Peer (P2P) networks, which are able to overcome the firewalls, NATs and other security devices without changing the network policy. Thus, P2P architectures will be very important for future distributed systems and applications. In such systems, the computational burden of the system can be distributed to peer nodes of the system. Therefore, in decentralized systems users become themselves actors by sharing, contributing and controlling the resources of the system. This characteristic makes P2P systems very interesting for the development of decentralized applications (Xhafa, Fernandez, Daradoumis, Barolli & Caballe, 2007; Barolli, Xhafa, Durresi & De Marco, 2006).

In (Xhafa, Fernandez, Daradoumis, Barolli & Caballe, 2007), it is proposed a JXTA-based P2P system. JXTA-Overlay is a middleware built on top of the JXTA specification, which defines a set of protocols that standardize how different devices may communicate and collaborate among them. It abstracts a new layer on the top of JXTA through a set of primitive operations and services that are commonly used in JXTA-based applications and provides a set of primitives that can be used by other applications, which will be built on top of the overlay, with complete independence. JXTA-Overlay provides a set of basic functionalities, primitives, intended to be as complete as possible to satisfy the needs of most JXTA-based applications.

In P2P systems, each peer has to obtain information of other peers and propagate the information to other peers through neighboring peers. Thus, it is important for each peer to have some number of neighbor peers. Moreover, it is more significant to discuss if each peer has reliable neighbor peers. In reality, each peer might be faulty or might send obsolete, even incorrect information to the other peers. If a peer is faulty, other peers which receive incorrect information on the faulty peer might reach a wrong decision. Therefore, it is critical to discuss how a peer can trust each of its neighbor peers (Aikebaier, Enokido & Takizawa, 2010; Watanabe, Nakajima, Enokido & Takizawa, 2007).

The reliability of peers is very important for safe communication in P2P system. The reliability of a peer can be evaluated based on the reputation and interactions with other peers to provide services. However, in order to decide the peer reliability are needed many parameters, which make the problem NP-hard.

Fuzzy Logic (FL) is the logic underlying modes of reasoning which are approximate rather than exact. The importance of FL derives from the fact that most modes of human reasoning and especially common sense reasoning are approximate in nature. FL uses linguistic variables to describe the control parameters. By using relatively simple linguistic expressions it is possible to describe and grasp very complex problems. A very important property of the linguistic variables is the capability of describing imprecise parameters.

The concept of a fuzzy set deals with the representation of classes whose boundaries are not determined. It uses a characteristic function, taking values usually in the interval [0, 1]. The fuzzy sets are used for representing linguistic labels. This can be viewed as expressing an uncertainty about the clear-cut meaning of the label. But important point is that the valuation set is supposed to be common to the various linguistic labels that are involved in the given problem.

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