

# **Resource Management in Wireless Systems Using Multiagent Technology**

Eranga Harshana Tennakoon



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Faculty of Information Technology  
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Dissertation submitted to the Faculty of Information Technology, University of  
Moratuwa, Sri Lanka for the partial fulfillment of the requirements of the Degree of  
MSc in Artificial Intelligence

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## Declaration

I declare that this dissertation does not incorporate, without acknowledgment, any material previously submitted for a Degree or a Diploma in any University and to the best of my knowledge and belief, it does not contain any material previously published or written by another person or myself except where due reference is made in the text. I also hereby give consent for my dissertation, if accepted, to be made available for photocopying and for interlibrary loans, and for the title and summary to be made available to outside organization.

E. H. Tennakoon

Name of Student

Signature of Student

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Supervised by

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Prof. Asoka S. Karunananda

Name of Supervisor

Signature of Supervisor

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# Dedication

To my Wife and Parents



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## Acknowledgment

The realization of this work was only possible due to several people's collaboration, to which I desire to express my gratefulness.

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## Abstract

Increasing uses of portable devices and the development of wireless systems require a further special attention on performance of the access points. The performances of these access points are mainly determined by various parameters such as end to end delay, bandwidth, packet loss or throughput, which occur mainly due to the topology changes of the network.

According to the multi-agent system definition, agents attend to solve the problem through proper coordination through the messages passing. Each access point of the wireless system is attached with an agent prior to initiate the routing tasks. Through the cooperation, collaboration and negotiation capabilities of all the agents in the system the best performance availabilities on each access point is measured, later the agents are allowed to initiate relevant routing tasks based on the result. In view of the above, the proposed message oriented middleware solution will increase the overall efficiency of wireless systems.

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Taking the advantage of existing wireless communication protocols, an agent of the access point operates in between the physical layer and the link layer. Agent in access point handles the incoming requests from the physical layer and validates against the performance parameters, such as end to end delay, bandwidth that and the packet lost. Once the agent identifies that the available resources of the attached access point is capable of maintaining proper information routing tasks against all the other access points, the connection request is handed over to the link layer, and then disappear. Link layer is not aware about the agents' interference and it simply handed over the response to the application layer which follows the standard communication model.

The proposed system is evaluated with the comparing of conventional wireless system and with exactly the same instrumentation. Each system gone through the two evaluation phases, namely the device connectivity and the file management over the network. Results in each step recorded and evaluated at the end. It shows that the proposed solution draws 43% of average bandwidth usage over the conventional wireless systems. Hence the data transfer also reduces by 35% comparing to the conventional wireless systems. That is mainly due to the fact that the proposed

solution not required all the information of the network at the time of initiating, but the conventional wireless system does. In file management, simultaneous upload, it shows 17% of average bandwidth usage over the conventional wireless system. However, more importantly the noise of the bandwidth is quite lower than the conventional system. The results of the proposed solution are discussed later in this dissertation.

The presented solution, message oriented middleware is independent of a particular choice of a wireless technology or a specific protocol implementations. So it is possible to integrate with a bridge device based wireless communication system as well as Bluetooth wireless system. However, in situations as in terms of throughput and delays, the choice of performance parameter measuring algorithms will have an impact on the system performance.



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