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SPECIFICATION AND EVALUATION OF A HETEROGENEOUS MANET ROUTING PROTOCOL

UNDERGRADUATE THESIS PROPOSAL

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1. Present Context

In present days, mobile communication has increased in usage and popularity. Tasks earlier handled by wired communication can now be performed using wireless devices offering different styles of technologies (such as IEEE 802.11 [1], IEEE 802.16 [2], Bluetooth [3] and so on) that also provide for the user the advantage of the mobility.

For some tasks, such as the ones involved during emergency network scenarios, the use of wireless devices is mandatory. Some relevant scenarios include coalition military operation, disaster relief efforts, and on-the-fly team formation for a common mission, such as search and rescue. In these situations, multiple groups and organizations may need to establish a way to communicate and collaborate to achieve a goal. For example, in a disaster relief effort, a military force may need to coordinate its activities with fire fighters, medical team, police force and other entities by sharing information without being concerned with the particular networking technologies that each group uses.

Such tasks call for the development of an approach that enables end-to-end communications over those mobile wireless networks (networks containing wireless devices). The fundament of mobile ad-hoc networking is to support efficient operation in mobile wireless networks by incorporating routing functionality into mobile nodes, and any device (router or host) that implements the IP [4].

A mobile ad-hoc network (MANET) is a multi-hop ad-hoc wireless network where nodes can move in an arbitrary manner in the topology. Therefore, the network may experience rapid and unpredictable topology changes. Such networks have no given infrastructure; can be set up quickly in any environment and generally are likely composed of nodes with constrained capabilities (power level, processing capacity, and so forth). Moreover, this kind of network could be linked to other infrastructure networks constituting a mesh network.

Several MANET routing protocol have been specified by the IETF MANET WG and other entities to achieve an easy deployment of these networks. Those protocols are based on different design philosophies and proposed to cope with certain requirements from different domains. An important scenario yet not fully explored is the deployment of a MANET with heterogeneous technologies with an efficient warranty for the communication of its nodes.

2. Objectives

The overall objective of this work is part of a process involved during the development of a new routing protocol used in mobile ad-hoc context and aims to provide a specification of this protocol, an implementation and its evaluation.

In this work, we provide a communication infrastructure within the context of emergency applications in a heterogeneous environment. More specifically, we provide a routing infrastructure able to handle different operators of a team equipped with different mobile devices using heterogeneous communications technologies.

The new routing protocol may support the use of different technologies. For this work, only the use of IEEE 802.11 [1] and Bluetooth [3] will be explored. Moreover, the new protocol may use some mechanism to support auto configuration and the communication of nodes contained in this network. This protocol may be suitable for emergency scenario seen as a priority requirement.

It is important to be said that the intension of the author is to provide a functional protocol that cope with the requirements presented, however the author could not provide any warranty of the full elaboration of the final version protocol due to complexity of the problem approached and time limit imposed. In the case that some part of the protocol is missing, the author may convey some recommendations of extensions, future work, to fulfill this work.

This research is part of a project that has already made some contributions. Due to the complexity of the problem, this work is going to suggest new important extensions such as the evaluation of quality of service for the proposed routing protocol.

This work is divided in three main parts. Initially, a specification of this new protocol must be obtained. During the second part of this work, an implementation of the protocol specified would be developed providing a functional prototype that will be used during the last step. Finally, the protocol elaborated during this work is evaluated using a real scenario, containing real wireless devices, to validate the functional prototype that was implemented. For the implementation, the Python programming language [5] will be used.

There are three different ways to evaluate and compare the performance of MANET protocols [6]. The first one is based on analysis [7] and uses parameters such as time complexity, communication complexity for performance evaluation. In the second method, routing performance is compared based to simulation results [8] [9] using some simulator (e.g. Network Simulator [10], GloMoSim [11] and OPNET [12], and so on). The last method is based on the implementation of the routing protocols and analyzes their performance using data from real-world implementations. [6] warns that the last method is not suitable for comparison of large sets of protocol, however the author of this work chose the last methodology,

namely measurement, as more suitable for this work due the fact that only one protocol will be evaluated.

3. Work plan

Considering the objectives described before, a work plan is presented below containing each task required and a estimation of the time necessary for each task be concluded.

TASK	AUGUST				SEPTEMBER				OCTOBER				NOVEMBER			
Initial bibliography selection																
Specification of the proposed protocol																
Implementation of the proposed protocol																
Evaluation of the proposed protocol																
Report elaboration																
Presentation elaboration																

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5. Possible examiners

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6. Signatures

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