Performance Comparison of B.A.T.M.A.Nd and B.A.T.M.A.N-adv

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Abstract-The B.A.T.M.A.N routing algorithm is a routing solution for *ad hoc* wireless networks. Two of these branches, Batmand and Batman-adv are the most commonly used as the default routing protocols on the Mesh Potatos (MP). The MPs are devices that use VoIP to communicate over the air with each other. These devices are the most common use of the Batman routing protocols and there are no performance tests conducted on the devices. Furthermore, there are no performance tests that can conclusively tell us which of the two braches is the better one and should serve as the first choice on the MPs. This paper highlights the differences between the protocols theoretically and describes a testbed in order to measure performances of the routing protocols.

Index Terms—B.A.T.M.A.N, *ad hoc* wireless networks.

I. INTRODUCTION

The B.A.T.M.A.N routing algorithm is a routing solution for *ad hoc* wireless networks. This algorithm gave rise to three recognized branches that stem from the original description of the algorithm described in [1]. These branches are Batmand (batman daemon), BatMan-eXperimental (BMX) and Batman-advanced (Batman-adv) [2]. We investigate Batman-adv, the most recent branch, and Batmand because these are the most commonly used. Furthermore, we have not found evidence of any performance testing that explicitly tests and compares the two protocols. We aim to fill this void by comparing the performance of these two Batman protocols. These tests would give us valuable insight into the real-world performance of these two protocols and their relative performance.

The Batman protocol is the protocol of choice for the wireless communication device called Mesh Potato (MP) [3]. The MPs use Voice over IP (VoIP) over a wireless medium to communicate with connected nodes on the *ad hoc* wireless network. This device can benefit communities, institutions and businesses wishing to connect everyone in the group. Therefore performance tests done to test the Batman protocols should be done on these devices.

Some performance testing between the two protocols have been done [4] however the results from the experiments were inconclusive. Furthermore the bulk of the performance testing only focuses on the Batmand protocol and almost nothing on Batman-adv [5] [6] [7] . The performed were not conducted on the MP devices.

In the next sections we present a practical insight into a real-world performance comparison of the Batmand and the Batman-adv wireless routing protocols. We also describe a testbed used in order to measure performances of the routing protocols and highlight the differences between the protocols theoretically.

II. RELATED WORK

The Batmand and the Batman-adv implementation branches differ in the way in which the protocol was implemented. Batmand was implemented as a layer three (OSI stack) while Batman-adv as a layer two protocol. However, both are both based on the Batman III algorithm described next.

A. B.A.T.M.A.N

Batman [8], does not maintain the full route to the destination, each node along the route only maintains the information about the next link through which the node can find the best route [9]. The objective is to maximize the probability of delivering a message. Batman does not attempt to check the quality of each the link, it just checks its existence and chooses a link based on the number of messages received on that link. The protocol does these checks by having every node periodically broadcast hello packets to all its neighbours, these packets are known as originator messages (OGM) and each have a unique sequence number.

The links are compared in terms of the number of originator messages that have been received within the current sliding window on a specific link this value is called the transmission quality (TQ) value and is the routing metric used by Batman. TQ is just a name given to metric it does not imply actual link quality checks. The sliding window is a fixed value that defines a range of the unique sequence numbers afforded to each OGM packet sent by a node.

B. Batmand versus Batman-adv

- The main difference between the two protocols:
- Batman-adv works at layer two of the OSI protocol stack.
- Batmand works at layer three of the OSI protocol stack.
- Batman-adv needs only the Mac address to work
- Batmand needs IP to work.

- Batman-adv emulates an ethernet bridge, so that all nodes appear to be connected by a direct link, so all protocols above layer two are not aware of multi hops.
- Batmand all protocols are aware of the multihop nature of the underlying network.

Batman's routing technique incurs low processing and traffic cost [8]. This makes it an attractive option for use on devices that have limited processing power such as the MP.

C. *Mesh Potato*

The village telco group [10] describe the MP as a wireless System on Chip (SoC) – the processor and all wireless functionality is combined in a single chip. MP uses the *ad hoc* profile which is a mode wireless cards can operate in. The *ad hoc* profile allows any wireless node to connect to any other node within range which forms the wireless blanket or cloud and with the use of batman as a routing protocol creates a communication network. The MP was primarily developed for Voice over IP (VoIP) using plain old telephones (POTs). The MP can also be used for data networks.

III. Experimental Set Up

Our approach is to set up a testbed and have the actual MPs be the nodes in the testbed. In order to generate and collect data we shall have two Unix machines. These machines will be passive nodes, meaning that they will not perform any routing, so as not to influence the results. We have planned to use the entire third floor of the Computer Science Department at the University of Cape Town.

Currently we have 14 MPs and the challenge will be to see how many of these we can have in our testbed. The limitations of this are the size of the space available and the range of each wireless card in the MPs. We shall force as many hops as possible to occur in the network and add this as a variable in our experiments.

We use packets of size 73 bytes and 1500 bytes, each representing voice packet or standard Ethernet packets respectively and here understood as the *load*. In doing this we hoped to compare the performance of the network when dealing with voice and data packets sizes. We shall also collect data and observe the following metrics: Bandwidth (B), Throughput (Tp), Jitter (J), Packet Loss Ratio (PLR) and Delay (D).

A. *Scenarios*

The experiments will be broken down into scenarios as shown in figures 1 and 2.. Each scenario will be repented by the number of hops travelled by the data from source to destination. Each of the hops scenarios shall be composed of the two Unix machines, one generating and one receiving the traffic, and also at least one MP routing the data.

In each of the scenarios we shall conduct the same experiments. In these experiments we shall vary the load. Each load will have an *iteration* of 60 times in which 1000 packets are sent.

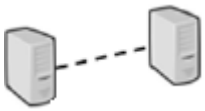

Figure 1 shows the one hop scenario with two Unix machines only

Figure 2 shows the two hops scenarios with MPs

IV. Conclusion and Future Work

In this work we plan to investigate the real-world performance comparison of the Batmand and the Batman-adv wireless routing protocols. We shall conduct this investigation through experiments conducted on a MP indoor testbed. The use of the MP devices will give us an in-sight into the performance of the protocols on devices that have limited processing power.

Edmundo Chissungo received his undergraduate degree in 2008 from the University of Cape Town and is presently studying towards his Master of Computer Science degree at the same institution. His research interests include Batman routing protocol, wireless mesh networks and ICT4D.

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