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IMPLEMENTATION AND PERFORMANCE ANALYSIS EVALUATION OF A NEW MANET ROUTING PROTOCOL IN NS-2

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Abstract- Mobile ad hoc networks (MANETs) can be defined as a collection of large number of mobile nodes that form temporary network without aid of any existing network infrastructure or central access point. The Efficient routing protocols can provide significant benefits to mobile ad hoc networks, in terms of both performance and reliability. Many routing protocols for such networks have been proposed so far. The main method for evaluating the performance of MANETs is simulation. The Network Simulator is a discrete event driven simulator. The goal of ns-2 is to support networking, research, and education. In this paper we create a new Routing Protocol called MyRouter step by step in Ns-2. Then we evaluate its performance based on several parameters such as Packet Delivery Ratio, End to End Delay etc and compare it with MANET routing protocol OLSR.

Keywords: MANET, Network Simulator, Throughput, End to End Delay, OLSR

I. INTRODUCTION

MANET provides a possibility of creating a network in situations where creating the infrastructure would be impossible or prohibitively expensive. An ad hoc network is self-organizing and adaptive. Networks are formed on-the-fly, devices can leave and join the network during its lifetime, devices can be mobile within the network, the network as a whole may be mobile. Wireless devices communicate directly with devices inside their radio range in a peer-to-peer nature. If they wish to communicate with a device outside their range, they can use an intermediate device or devices within their radio range to relay or forward communications. Each mobile node acts as a host when requesting/providing information from/to other nodes in the network, and acts as router when discovering and maintaining routes for other nodes in the network.

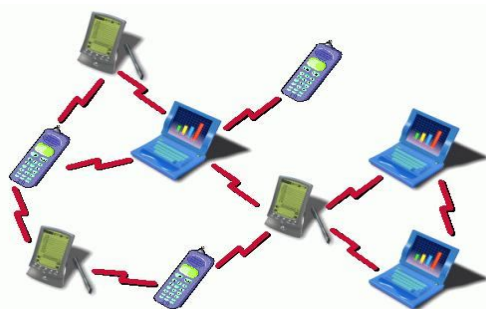


Figure 1.1 Mobile Adhoc Network

MANETs have several salient characteristics: 1) Dynamic topologies 2) Bandwidth-constrained links 3) Energy constrained operation 4) limited physical security.

Routing in mobile ad hoc networks faces additional problems and challenges when compared to routing

in traditional wired networks with fixed infrastructure. The routing protocols for ad hoc networks are Proactive routing protocol and Reactive routing protocol. The proactive routing protocols are Table driven. The reactive routing protocols are on demand routing protocols. The routes are propagated only on demand. AODV, DSR are on demand routing protocol and DSDV, OLSR are table driven routing protocols. These are the commonly used protocols in MANETs.

In this paper first we implement a new Manet routing protocol MyRouter and then focus its performance comparison with the OLSR routing protocol.

II. OPTIMIZED LINK STATE ROUTING

The Optimized Link State Routing (OLSR) protocol is a proactive link state routing protocol based on the Open Shortest Path First (OSPF) protocol. OLSR has been specifically developed to support mobile ad hoc networks and the constraints they impose on routing. The OLSR protocol can be conceptually divided into three different operations, namely neighbor sensing, distribution of signaling traffic and distribution of topological information [2]. Neighbor sensing in OLSR is accomplished by transmitting periodic hello messages that contain the generating node's address identifier, a list of its neighboring nodes and the type of the link it has with each neighbor (e.g.: symmetric or asymmetric). For the distribution of signaling traffic OLSR adopts a flooding mechanism where every node forwards a flooded message that it has not forwarded previously. Finally, the distribution of topological information function is realized with the use of periodic topology control messages that result in each node knowing a partial topology graph of the

network which is then used for the computation of optimal routes.

III. STEPS TO IMPLEMENT NEW ROUTING PROTOCOL

Network Simulator -2 is an object oriented open source simulator written in OTcl and C++ . Because it is open source ,new functions and new algorithms can be added by modifying the source files [1][6]. We implement the new routing protocol by modifying codes from DSDV or OLSR source code in ns-2. The class Agent has an implementation partly in OTcl and partly in C++. The C++ implementation is contained in `~ns/agent.cc` and `~ns/agent.h`, and the OTcl support is in `~ns/tcl/lib/ns-agent.tcl`.

We take the following steps as reference to allocate our code. We will firstly create a new directory called MyRouter inside our NS2 base directory. Here we include two files : `MyRouter_agent.cc` and `MyRouter_agent.h`. These files are same as those for OLSR . We have changed all classes, functions, structs, variables and constants names and included MyRouter implementation in the files. There are some changes we need to do in order to integrate our code inside simulator.

1. Packet type declaration : We add the new packet type constant " PT_MyRTR" to `~ns2source/common/packet.h`
2. Then we provide a textual name for our packet type under `p_ifo()` as `name_[PT_MyRTR] = "MyRouter"`.
3. We define protocol name MyRouter to use in tcl file. This is done by writing it under "for each prot" function present in `~ns-allinone/ns-2.29/tcl/lib/ns-packet.tcl`.
4. Next we modify `tcl/lib/ns-lib.tcl`. We need to add procedures for creating a node. This step, is intended to set the routing agent for a node. We need to hack this procedure to create an instance of our MyRouter. For this we include code for MyRouter under "switch -exact \$routingAgent_" similar as defined for other routing protocols .
5. The same file is further modified so that when a user configures the mobile node to have a new routing agent using `$ns_ nodeconfig -adhocRouting MyRouter <...other node parameters>`, the OTcl interpreter calls the `create-MyRouter` function. This function instantiates the MyRouter and signals to start functioning .
6. Now we add trace function to `~ns2source/trace/cmu-trace.cc` , so that NS2 trace our

simulation and write it to a tr file and trace routines present in `cmu-trace.cc` are able to identify the packet of type PT_MyRTR.

7. To add trace function we add code to `~ns2source/trace/cmu-trace.h` .

8. Now everything is implemented and we only need to compile it by editing `makefile.in` and defining # Define all our .cc files as .o files under OBJ_CC = \ here to be compiled into ns2.

IV. SIMULATION & RESULTS

All extensive simulations are performed in NS-2 .NS-2 is simply an event driven simulation tool that is useful for studying the dynamic nature of communication networks. The new implementation is created in Ns2.29 . To test the simulation .The simulated network consisted of 15, 45 and 80 MANET nodes in radio range 60 , 125 and 150 respectively .

A. Performance Metrics

Some important performance metrics can be evaluated :-

Average End-to-End delay (seconds): This metric is calculated by subtracting "time at which first packet was transmitted by source" from "time at which first data packet arrived to destination". This includes all possible delays caused by buffering during route discovery latency, queuing at the interface queue, retransmission delays at the MAC, propagation and transfer times.

Packet Delivery Ratio: This is the number of packets sent from the source to the number of received at the destination.

Routing Overhead : Defined as the average amount of routing protocol control packets in the network.

Hop count : It is equal to the number of intermediate links in a path, and is therefore equivalent to the length of a path when each link has a uniform weight of one.

B. Results & Discussions

Packet Delivery Ratio: The Optimized Link State Routing protocol OLSR performed particularly well On the other hand MyRouter depicts satisfactory results for PDR as it gives better performance than OLSR.

End-to-End delay (seconds): The average end to end delay of packet delivery was higher in OLSR as compared to MyRouter as shown in Fig 1.3. Our implementation MyRouter gives less E2E delay than OLSR. This observation is made while varying the nodes.

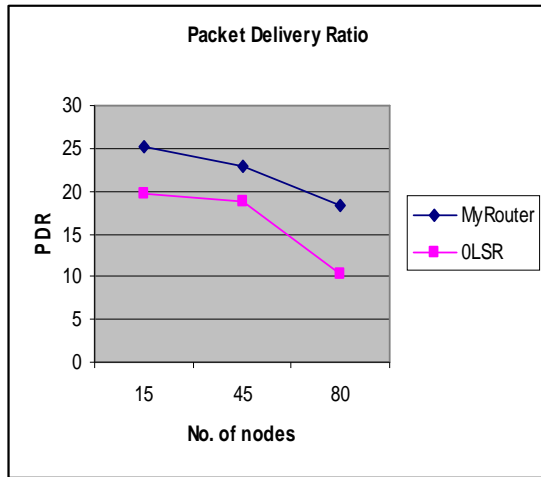


Figure 1.2 Packet Delivery Ratio

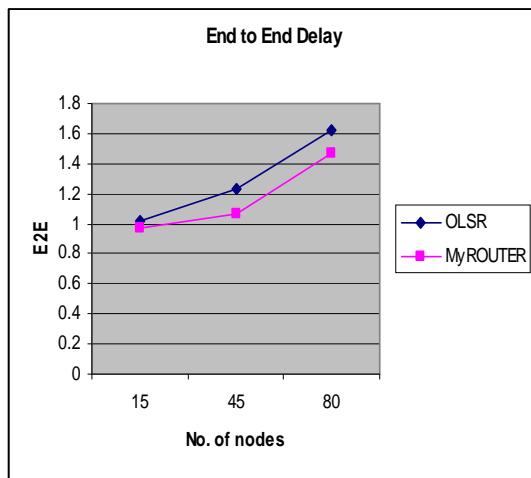


Figure 1.3 End to End Delay

Hop Count: The hop count increases with number of nodes for all OLSR and MyRouter . MyRouter shows better performance than OLSR in terms of hop count for 15 , 45 and 80 nodes (fig 1.4).

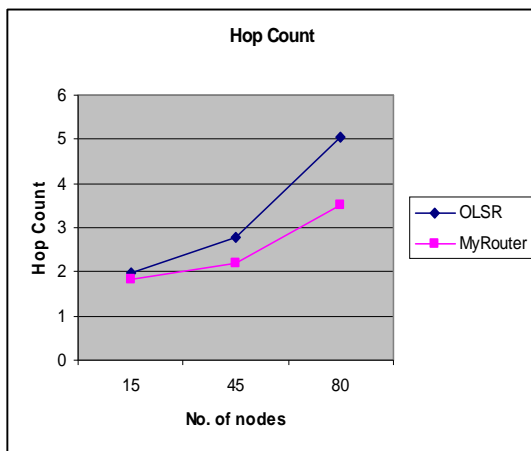


Figure 1.4 Hop Count

Routing Overhead : The Routing Overhead increases with number of nodes . OLSR produces more routing overhead than AODV. Our Implementation

MyRouter gives lesser overhead than OLSR for 15,45 and 80 nodes(Fig 1.5) .

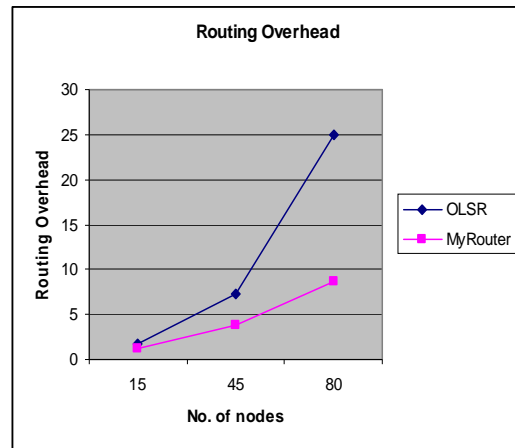


Figure 1.5 Routing Overhead

V. CONCLUSION AND FUTURE WORK

The Network Simulator is a discrete event driven simulator. Because it is open source ,new functions and new algorithms can be added by modifying the source files. In this paper we implement a New MANET Routing Protocol in Ns-2 . We present a performance evaluation by comparing it with OLSR routing protocols .As the final words, it is not an easy and also is not possible to say “X” protocol is the best one. In the various simulations that we have explained, there were many parameters changing usually, and depending on number of nodes. MyRouter gives satisfactory results .The MyRouter gives more PDR, less E2E Delay than OLSR and lesser overhead.

In the future, extensive complex simulations could be carried out using other existing performance metrics by increasing no. of nodes in order to gain a more in-depth performance analysis of the ad hoc routing protocols .We can compare it with other routing protocols as well.

REFERENCES

- [1] NS-2, The ns Manual (formally known as NS Documentation) available at <http://www.isi.edu/nsnam/ns/doc>.
- [2] T. Clausen and P. Jacquet (2003), “Optimized Link State Routing Protocol (OLSR)”, *RFC 3262, IETF Network Working Group*, October 2003.
- [3] Aleksandr Huhtonen,□ Comparing AODV and OLSR, Routing Protocols□, Seminar on Internetworking, HUT T-110.551, Helsinki University of Technology, Sjökuulla ,2004.
- [4] P. Misra., “Routing Protocols for Ad Hoc MobileWirelessNetworks”http://www.cse.wustl.edu/~jain/cis788-99/adhoc_routing/index.html, 14 May 2006.

- [5] Thammakit Sriporamanont and gu Liming, Wireless Sensor Network Simulator, Technical report, IDE0602, January 2006
- [6] J. Chung and M. Claypool, "NS by Example". Available at <http://nile.wpi.edu/NS/>.
- [7] Thammakit Sriporamanont and gu Liming, Wireless Sensor Network Simulator, Technical report, IDE0602, January 2006.
- [8] Hilal Karatoy , wordpress.com Available at <http://hilalkaratoy.wordpress.com/ns-2/add-new-protocol-to-the-ns-2/> August 2009
- [9] Routing Protocols to Enhance Security in MANETS Rakesh Vanaparthiα, Pragati.G Global Journal of Computer Science and Technology Volume 11 Issue 13 Version 1.0 August 2011

