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Reactive Routing Protocols in MANETs: A Relative Analysis on delay and throughput

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Abstract- Mobile Ad-hoc network (MANET) provides a new dimension in the field of wireless networks. There is an absence of any sort of centralized support. No fixed infrastructure is present to provide specific paths to the mobile nodes. Mobility of the nodes and the instability of the links are the core issues that need to be addressed. Ergo, to put up with such environment, a robust routing protocol is required. The paper addresses the comparison between three reactive routing protocols, Ad-hoc On-Demand Distance Vector Routing, Temporally Ordered Routing Algorithm and Dynamic Source Routing. Their performance is judged on the basis of two parameters: node density and node mobility using OPNET 14.5 modeler. The results show that AODV proves to be the best candidate.

Keywords: reactive protocols, routing, delay, throughput

1. Introduction

Wireless networks have gained popularity since many years. Basically, there are two types of wireless networks, infrastructured networks and infrastructureless networks. Ad-hoc network is an infrastructureless network.

An infrastructured network [1], [2], [14] contains mobile nodes, that are obviously wireless, and one or more base station controllers (BSCs), connecting the wired network to the wireless one. A mobile node is in a constant search for the closest BSC that has the maximum signal strength and make connection with it for communication. A process, known as handover, comes into picture, when a mobile node is out of range of its home BSC during its mobility. However, it automatically connects seamlessly with the BSC of the new area in which it is in now.

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Contrariwise, there is no central administration and fixed routers in an Ad-hoc network [1], [2], [14]. There is a random movement of all nodes in the network, which behave as routers to each other and participate in finding and maintenance of routes.

2. Classification of routing protocols

There are two broad classifications of protocols: proactive routing protocols and reactive routing protocols.

2.1. Proactive Protocols

These are table-driven protocols. They store the routing data in one or more table and maintain consistent information between each other. In order to sustain the network consistency, the nodes in this protocol keep on propagating any update throughout the entire network.

2.2. Reactive Protocols

These are on-demand routing protocols. There are no routes present here. The routes are formed only when they are asked for by the source node. Route discovery mechanisms are invoked by the source node if it wishes to send some data to the destination node due to which the path is created. Once all possible routes to a particular desired destination node are found, the process completes.

This work mainly focuses on the performance comparison of 3 routing protocols, namely AODV, TORA and DSR.

3. Results and discussions

OPNET 14.5 modeler is used to model and evaluate all scenarios. Following are the metrics selected for evaluation of their performance:

(a) Average end-to-end delay

(b) Throughput

Table 1 illustrates the main characteristics:

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Table 1. Scenario’s characteristics

Parameter	**Value**
Scenario dimension	1000 m x 1000 m
Node mobility (m/s)	10, 30
Number of Nodes	10, 100
Node Movement Model	Random Waypoint Model
Traffic Type	FTP
Transmitted Power (W)	0.005
Duration of simulation	3 mins

3.1 Average end-to-end delay

3.1.1 Constant mobility (10 m/s) and varying number of mobile nodes (10 and 100):

Figure 1 presents the involved delay for all the protocols when there are 10 nodes. AODV and DSR have more delay at the start due to beacon broadcast and involvement in cache table addressing, respectively. Out of all, TORA outshines and has less delay that is stable due to its nature of recovering a route quickly.

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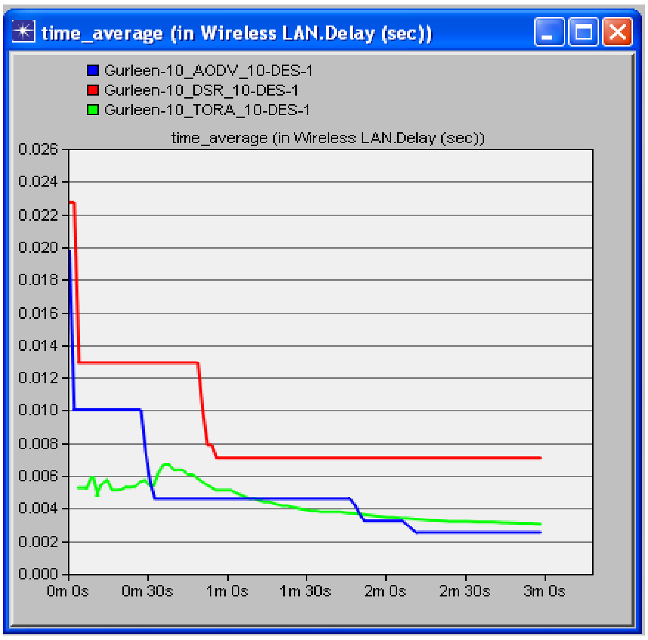

Figure 1 Delay for 10 nodes with mobility of 10 m/s

On increasing the number of nodes ten times, i.e. to 100, drastic changes occur as shown in Figure 2. AODV's delay is reduced to zero whereas that of DSR and TORA increases due to network congestion.

3.1.2 Constant number of mobile nodes (10) and varying mobility (10 m/s and 30 m/s):

Figure 3 displays the end-to-end delay when mobility is increased to 30 m/s. It is observed that there is not much difference in the characteristics of AODV and DSR as compare with Figure 1. However, TORA now has even better response in having a very minimal delay.

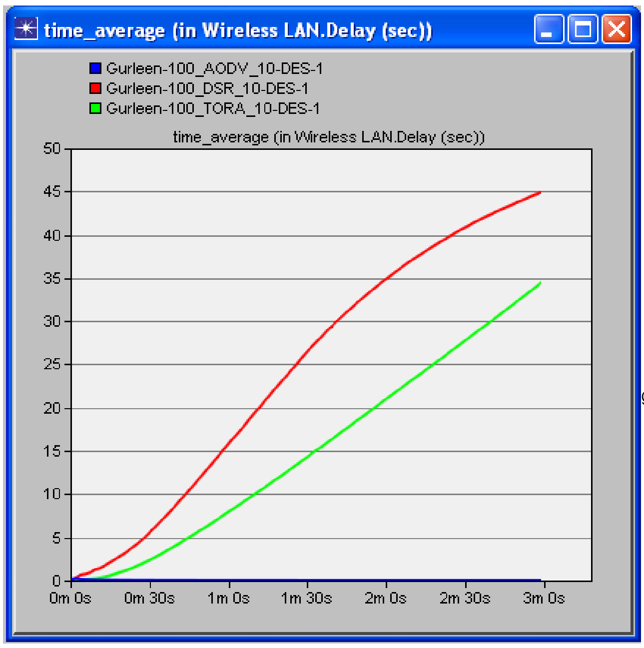

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Figure 2 Delay for 100 nodes with mobility of 10 m/s

3.2 Throughput

3.2.1 Constant mobility (10 m/s) and varying number of mobile nodes (10 and 100):

Figure 4 shows the throughput performance of the aforementioned reactive protocols. AODV and DSR have a very high throughput at the initiation of the simulation but decreases with time. But TORA shows a constant low value, exhibiting a poor throughput performance.

Figure 5 shows the effect of increasing the number of mobile nodes on throughput. AODV proves to be the best candidate by having the maximum value out of the three protocols. Its peak value comes out to be 16 x 10^6 bits/sec. Throughput of DSR is very high just at the start of simulation but reduces drastically within 10 seconds. However, TORA is classified as the worst candidate in this scenario.

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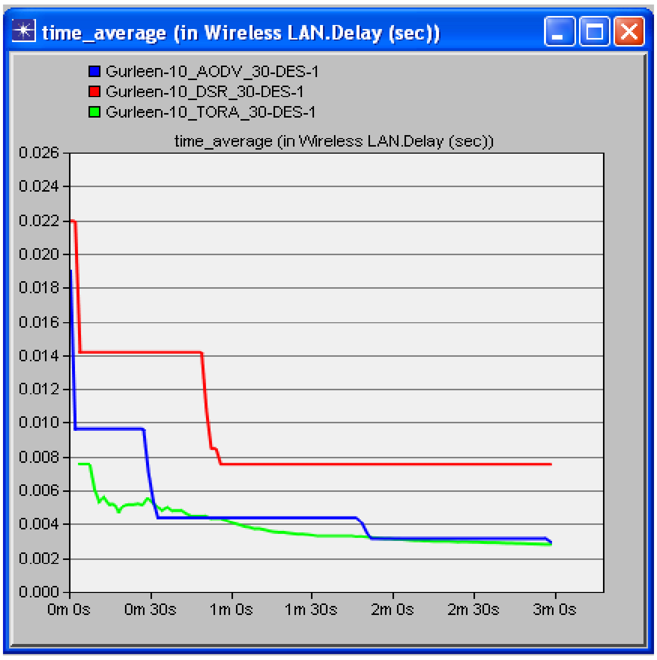

Figure 3 Delay for 10 nodes with mobility of 30 m/s

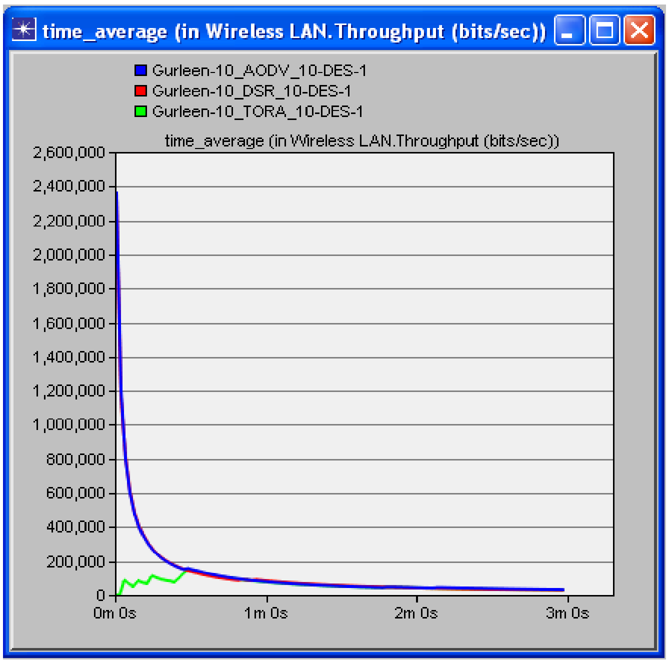

Figure 4 Throughput for 10 Nodes with mobility of 10 m/s

3.2.2 Constant number of mobile nodes (10) and varying mobility (10 m/s and 30 m/s):

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Increasing the node mobility significantly affects the throughput. For AODV, the peak value increases to 24 x 10^6 bits/sec. On the contrary, the value of DSR peak falls from 20 x 10^6 bits/sec to 18 x 10^6 bits/sec. Worst result is shown by TORA. Ergo, AODV outweighs the other two.

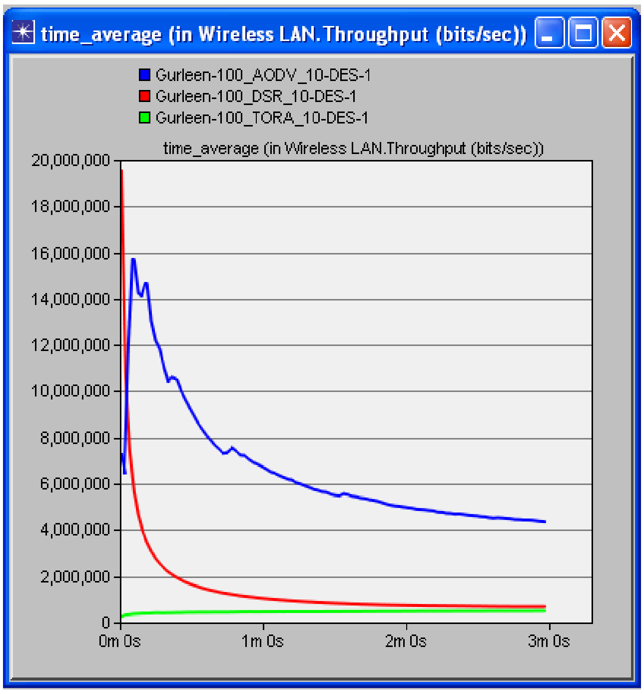

Figure 5 Throughput for 100 Nodes with mobility of 10 m/s

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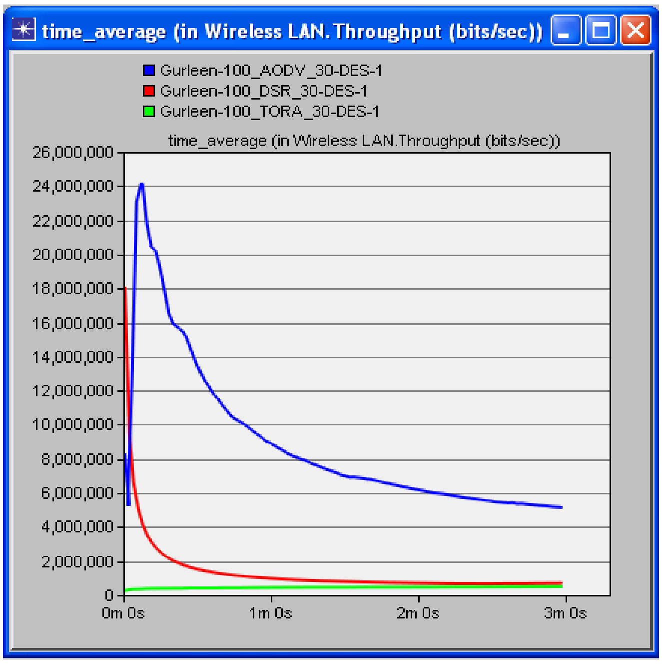

Figure 6 Throughput for 100 Nodes with mobility of 30 m/s

Conclusions

In this study, a comparison is provided between three reactive routing protocols. It is analysed that no single protocol can be declared the best in all the scenarios. They outweigh each other in different scenarios. However, among all, AODV comes out as the strongest contestant in having lowest end-to-end delay and maximum throughput.

References

[1] Theodore S. Rappaport, “Wireless Communications: Principles and Practice”. New Jersey, Prentice Hall. ISBN 0-13-375536-3.

[2] Mobile Ad-hoc Networks (MANET). URL:http://www.ietf.org/html.charters/manet-charter.html

[3] D. Johnson, D. Maltz and Y.-C. Hu, “The Dynamic Source Routing Protocol for Mobile Ad-hoc Networks,” Internet Draft, draft-ietf-manet-dsr- 10.txt, work in progress, July 2004

[4] S. Murthy and J.J. Garcia-Luna-Aceves, "An Efficient Routing Protocol for Wireless Networks", ACM Mobile Networks and App. J., Special Issue on Routing in Mobile Communication Networks, pp. 183-97, Oct. 1996.

ISSN:0971-1260
Vol-22-Issue-37-December -2019

[5] S. Nesargi, and R. Prakash, “A Tunneling Approach to Routing with Unidirectional Links in Mobile Ad-hoc Networks,” Proceedings of the IEEE International Conference on Computer Communications and Networks (ICCCN), pp. 522-527, 2000.

[6] V. D. Park and M. S. Corson, “Temporally-Ordered Routing Algorithm (TORA) Version 1: Functional Specification”, Internet draft, draft-ietf-manet-tora- spec-04.txt, July 2001.

[7] Temporally Ordered Routing Algorithm. Available at http://en.wikipedia.org/wiki/Temporallyordered_routing_algorithm.

[8] J. Broch, D. A. Maltz, D. B. Johnson, Y. C. Hu and J. Jetcheva, “A Performance Comparison of Multi-Hop Wireless Ad-hoc Network Routing Protocols,” in Proceedings of the 4th Annual ACM/IEEE International Conference on Mobile Computing and Networking (MOBICOM’98), pp. 85–97, October 1998.

[9] Information Sciences Institute, “ns-2 network simulator,” Software Package, 2003. [Online]. Available: http://www.isi.edu/nsnam/ns/

[10] “The VINT Project,” USC/ISI, Xerox PARC, LBNL and UC Berkeley, 1997. [Online]. Available: http://www.isi.edu/nsnam/vint/

[11] J.-C. Cano and P. Manzoni, “A Performance Comparison of Energy Consumption for Mobile Ad-hoc Network Routing Protocols”, IEEE Transactions, 2000.

[12] H. Ehsan and Z. A. Uzmi, “Performance Comparison of Ad-hoc Wireless Network Routing Protocols”, IEEE Transactions, 2004.

[13] N. Karthikeyan, V. Palanisamy And K. Duraiswamy, “A Performance Evaluation Of Proactive And Reactive Protocols Using ns-2 Simulation”, International J. of Engg. Research & Indu. Appls, vol. 2, pp. 309-326, 2009.

[14] D. O. Jorg, “Performance Comparison of MANET Routing Protocols in Different Network Sizes”, Computer Science Project, 2003.

[15] E. M. Royer and C. -K. Toh, "A Review of Current Routing Protocols for Ad-hoc Mobile Wireless Networks", IEEE Personal Communications, vol. 6, pp. 46-55, April 1999.

[16] S. Barakovi and J. Barakovi, “Comparative Performance Evaluation of Mobile Ad-hoc Routing Protocols”, MIPRO 2010, Opatija, Croatia, May 24-28, 2010.

