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Performance Analysis of various Routing Protocols in Mobile Ad-hoc Networks

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Abstract

Mobile Ad-hoc Networks are encouraged in future technological activates to link various objects. Routing in MANET become a challenging task. In the past decade many routing protocols are proposed, still there is a vacuum for research. Hence in this paper the performance of five most used routing protocol are compared. The routing protocols consider in this comparative analysis are Dynamic Source Routing (DSR), Destination Sequenced Distance Vector (DSDV), On-demand Distance Vector (AODV), Zone Routing Protocol (ZRP), and Temporally Ordered Routing Algorithm (TORA). In order to analysis the performance of these protocol, which are implemented with same configuration and performed for same a common objective. Then the performance such as sent packets, received packets, packet delivery ratio, throughput, average end to end delay, packets dropped, sending jitter and receiving jitter are analyzed.

Keywords: On-demand Distance Vector (AODV) , Dynamic Source Routing (DSR), Destination Sequenced Distance Vector (DSDV), Zone Routing Protocol (ZRP), Temporally Ordered Routing Algorithm (TORA).

INTRODUCTION

Wireless Ad-hoc Networks (WANET) are used to in any application, and it is a most used decentralized wireless network [1]. In this kind of networking configured without physical connection between its nodes. In centralized systems, there is a permanent base station and the nodes may be mobile. These nodes are mostly communicating with base station, while it is in its range. In a De-centralized network, all the nodes are connected are dynamically and arbitrarily. In these type of networks, every node can act as a router. This type of wireless networks also referred as mobile Ad-hoc network [2].

A. Table-Driven Routing Protocols

In this type of routing protocol, the network nodes maintain a table to record routing information. Nodes update the table whenever there is a change in the network. In routing tables are kept at each node and are occasionally updated. The routing of data is done on the origin of these tables.

Advantages:

i) Since the paths are existing between all the destination nodes in the network, so the delay to set up the path is low.

ii) The adapted wireless ad-hoc network, employed an incremental update method to number the existing wired network protocols. So all the existing wired protocols can easily implement in wireless networks.

Disadvantage:

i) Due to huge reply packets while answering caused the control overhead, it become a noticeable drawback in this type of protocol [7].

B. On-Demand Based Routing Protocols

The on-demand routing protocols, as a particular type of routing strategy. In with the routs are initiated based on its needs. In an ideal condition, the nodes in the network never maintain the routing data. The route enabled till its need, and it is a slow technique in routing. In this type of routing, the route is discovered after receiving route request packets [9] [11].

Advantages of AODV:

i) The routing load can be reduced, because the paths are created only when it required.

ii) Delay to setup connection is low.

Disadvantages of AODV:

i) While network change, it needs to start a new sequence number.

ii) Bandwidth problem may arise due to the frequent update of its routing table.

iii) It has the massive volume of control messages. [5]

C. Hybrid Routing Protocols

The advantages in the reactive and proactive routing is combined in this type of protocols. The initial routs are established from the proactively prospected routes. Then the service is provided based on the demand of activated nodes and via the reactive flooding.

Advantages:

i) Required to flood network with messages of updates of tables periodically is eliminated.

ii) This protocol is one of the best suitable technique for the densely packed arrays of nodes.

Disadvantages:

i) Each node in the network should require a structure. The structure describes the height of node and link status.

ii) Occurs routing loops due to the network topology change.

iii) All the nodes in the network should keep on concentrating the adjacent node to detect topology change.

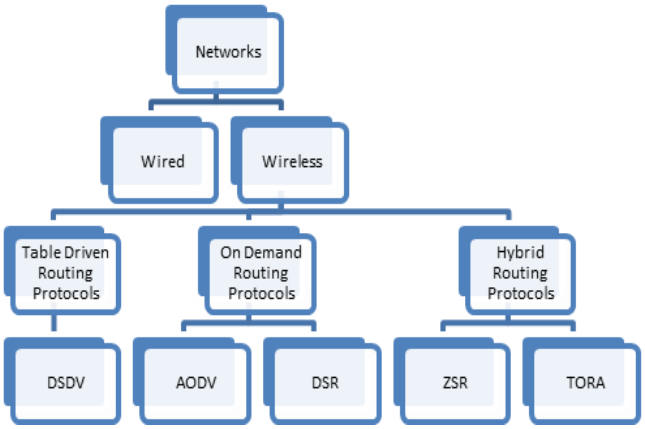


Figure 1. Classification of various routing protocols

RELATED WORK

C. Siva Ram Murthy and B.S. Manoj [2] provides the fundamentals of Wireless Communications. It discusses the cellular and Ad-hoc networks in depth and also provides insights to their applications.

Fasee Ullah, Muhammad Amin and Hamidul Ghaffar [3] simulated AODV as well as DSDV for sensor networks. The sensor network was created to monitor the environmental and physical conditions and pass the data to the sink. Here the nodes were kept static. The system is implemented using ns2, and the performance of the AODV and AMODV protocol were compared.

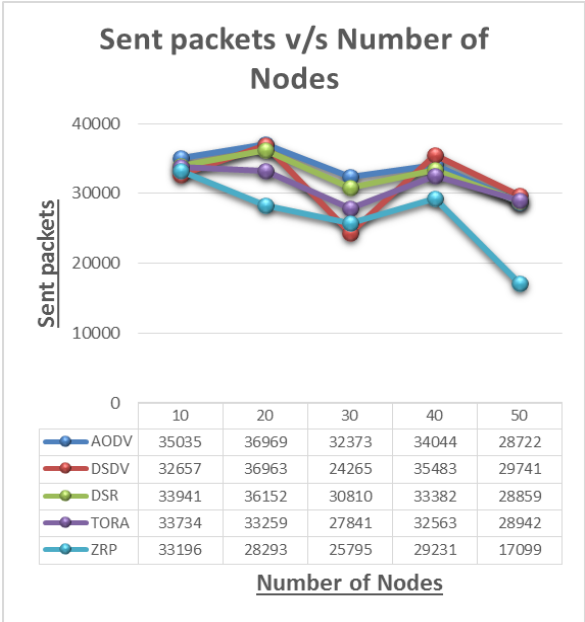
Echchaachoui, Adel, et al. [4] discussed mobile Ad-hoc Networks (MANET). They implemented AODV and AMODV for a MANET scenario over the range of fifty to two hundred number of nodes. A comparison was conducted by Gayatree Rana et al. [5] where they analyzed five protocols, namely PAAODV, AOMDV, DSDV, DSR, and AODV in MANET and number of nodes ranging from ten to fifty. The comparison has been made to analysis the performance of the above protocols when different parameters in a simulation are varied.

S. Vanthana and Dr V.Sinthu Janita Prakash [6] compares reactive, proactive and hybrid protocols in this paper. They discuss different types of Ad-hoc networks namely Vehicular Adhoc Network (VANET), Smart Phone Ad-hoc Networks (SPAN) and Mobile Ad- hoc Network (MANET). Here, more than one routing tables are maintained to recoded the overall topology of the network using the proactive routing protocol. Reactive routing protocols follow a route determination procedure.

RESULT ANALYSIS

A. *Sent Packets*

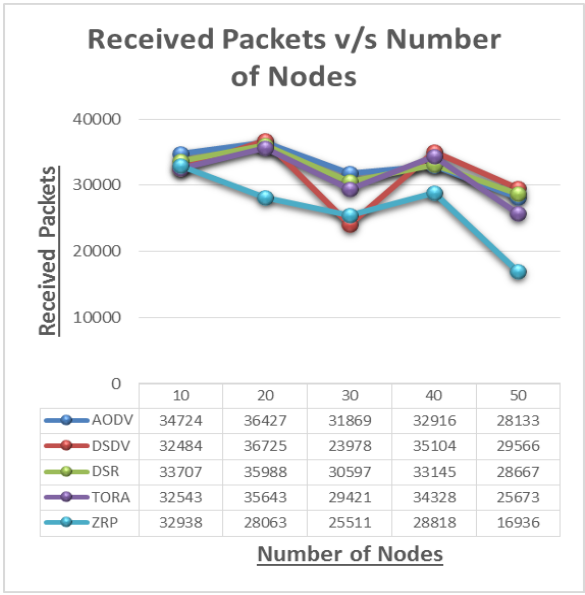
The performance of the five most used routing protocol based on its sent packets is compared. The number of nodes in the network varied from 10 to 50. At a lower number of the node, the DSDV sent the least packets, and while increasing the number of nodes, the ZRP sent the lowest packets. Thus the ZRP become the lowest performing protocol than the other four protocol. The performance chat based on the sent packet is given in fig. 2.



	10	20	30	40	50
AODV	35035	36969	32373	34044	28722
DSDV	32657	36963	24265	35483	29741
DSR	33941	36152	30810	33382	28859
TORA	33734	33259	27841	32563	28942
ZRP	33196	28293	25795	29231	17099

Figure 2. Graph - Sent packets v/s Number of Nodes

B. *Received Packets*

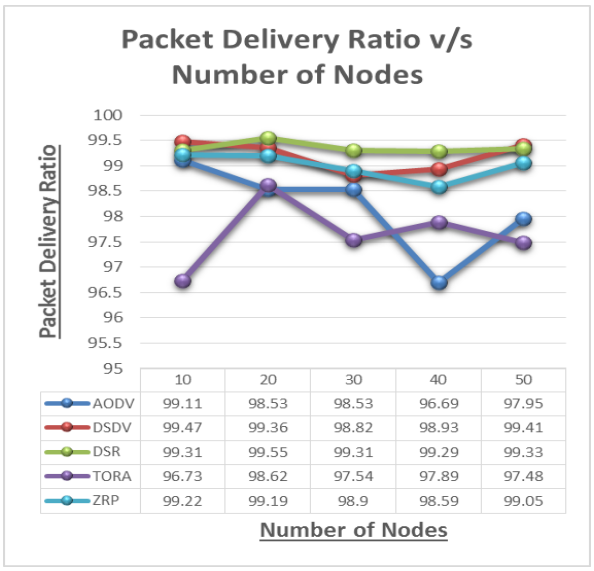


	10	20	30	40	50
AODV	34724	36427	31869	32916	28133
DSDV	32484	36725	23978	35104	29566
DSR	33707	35988	30597	33145	28667
TORA	32543	35643	29421	34328	25673
ZRP	32938	28063	25511	28818	16936

Figure 3. Packets received by each protocol and number of nodes

The performance chart based on the received packet is shown in fig 3. The overall performance based on a received packet of AODV is better than the other techniques, and the ZRP gives the lower performance.

C. *Packet Delivery Ratio*

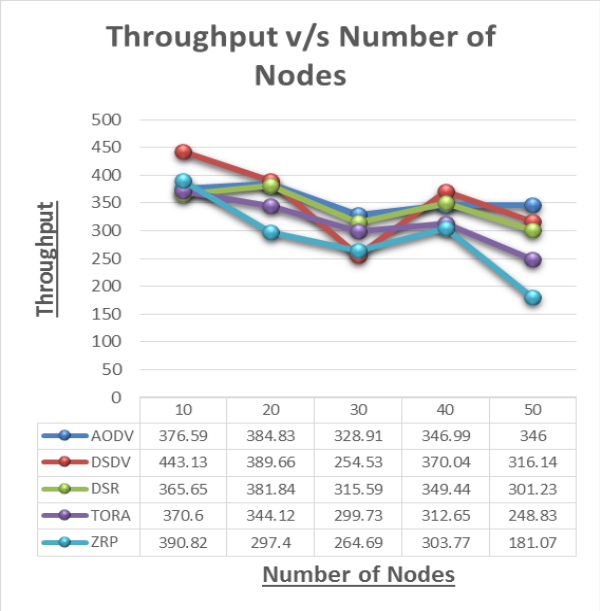


	10	20	30	40	50
AODV	99.11	98.53	98.53	96.69	97.95
DSDV	99.47	99.36	98.82	98.93	99.41
DSR	99.31	99.55	99.31	99.29	99.33
TORA	96.73	98.62	97.54	97.89	97.48
ZRP	99.22	99.19	98.9	98.59	99.05

Figure 4. Graph – Packet Delivery Ratio v/s Number of Nodes

The packet delivery ratio of the four routing protocol of MANET is given in fig 4. The figure shows that the performance of DSDV is varied based on the number of nodes in the network. Moreover, the DSR provided a stable delivery ratio, comparing to the other four routing protocols.

D. *Throughput*

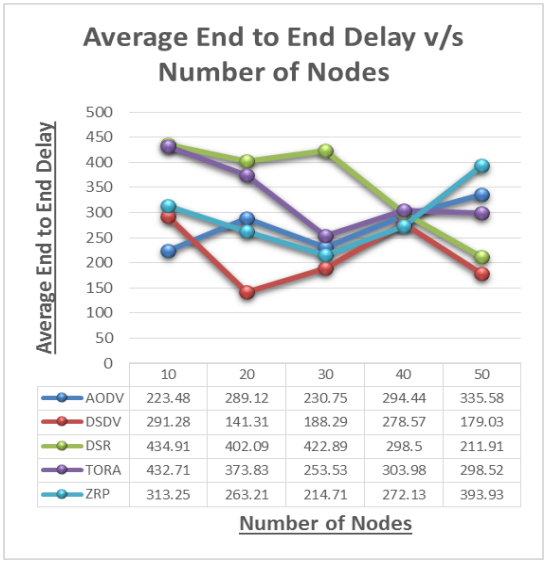


	10	20	30	40	50
AODV	376.59	384.83	328.91	346.99	346
DSDV	443.13	389.66	254.53	370.04	316.14
DSR	365.65	381.84	315.59	349.44	301.23
TORA	370.6	344.12	299.73	312.65	248.83
ZRP	390.82	297.4	264.69	303.77	181.07

Figure 5. Graph – Throughput v/s Number of Nodes

The throughput of the four routing protocol is evaluated and is plotted in fig 5. The throughput of DSDV is maximum at the total number of nodes considered in the network is 10, and it gets reduced while increasing the number of nodes in the network. The overall performance of AODV is better based on it throughput comparing to the other techniques.

E. *End to End delay*

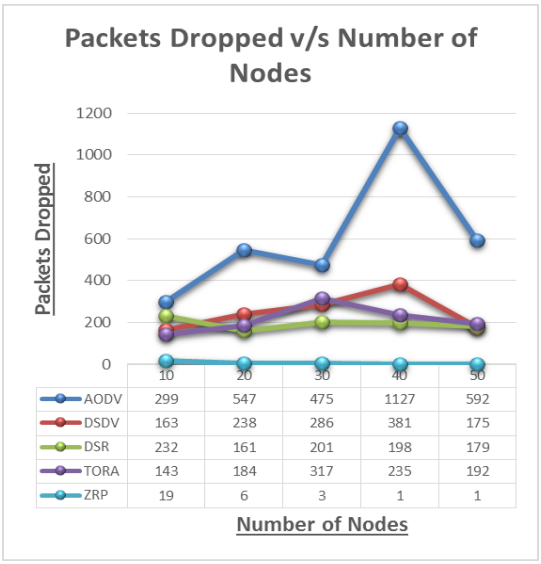


	10	20	30	40	50
AODV	223.48	289.12	230.75	294.44	335.58
DSDV	291.28	141.31	188.29	278.57	179.03
DSR	434.91	402.09	422.89	298.5	211.91
TORA	432.71	373.83	253.53	303.98	298.52
ZRP	313.25	263.21	214.71	272.13	393.93

Figure 6. Graph – Average End to End Delay v/s Number of Nodes

The end to end delay observed from the various routing techniques is plotted in fig. 6. The DSDV technique provided better performance than the other techniques based on its average end to end delay.

F. *Packets dropped*



	10	20	30	40	50
AODV	299	547	475	1127	592
DSDV	163	238	286	381	175
DSR	232	161	201	198	179
TORA	143	184	317	235	192
ZRP	19	6	3	1	1

Figure 7. Graph – Packets Dropped v/s Number of Nodes

The total number of packets dropped is given in fig 7. The total packets dropped by the ZRP in routing is lower than the other technique. Thus this technique can be a suitable option for the routing in MANET at lowest packet loss.

G. Jitter Sending

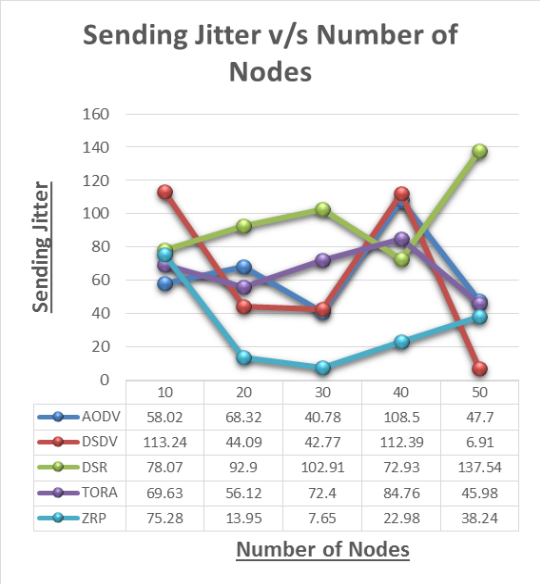


Figure 8. Graph – Sending Jitter v/s Number of Nodes

The sending jitter value of various routing techniques for MANET is graphically illustrated in the fig. 8. The DSDV has a high jitter at low nodes, but least jitter at more number of nodes. Hence, if there are an unusually high number of nodes, DSDV can be used, but for constant low jitter, ZRP should be preferred.

H. Jitter Receiving

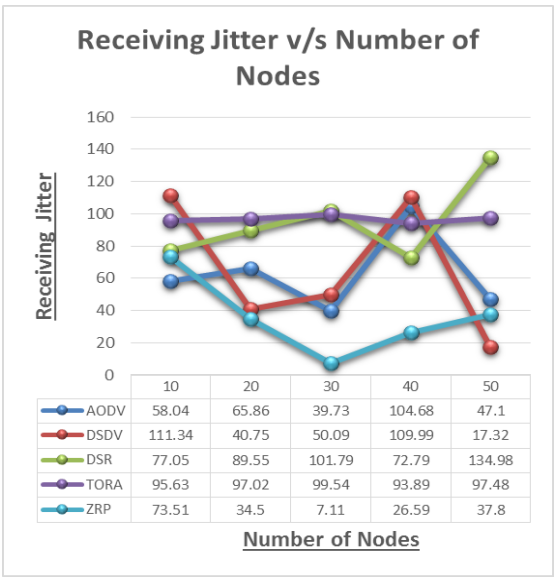


Figure 9. Graph – Receiving Jitter v/s Number of Nodes

When the number of nodes is 10, AODV has the lowest jitter as compared with the rest of the protocols. But while increasing the number of nodes, the jitter of DSDV also increases. The jitter of ZRP is high when the number of nodes is less, but as the number of nodes increases the jitter of ZRP decreases gradually. DSDV has a high jitter at low nodes, but least jitter at more number of nodes. Hence, if there are an unusually high number of nodes, DSDV can be used, but for constant low jitter, ZRP should be preferred.

CONCLUSION

The routing in MANET become a challenging task. Hence many techniques were proposed in the literature. However, the performance obtained by the existing techniques are not up to the mask. Hence there is a research gap to propose a novel routing strategy for MANET. However, before proposing a new technique, it is essential to understand the complete knowledge about the operation and performance of the well-known existing techniques. Hence in this paper five most used routing strategies such as ZRP, TORA, DSR, DSDV, and AODV are described, and its performance is analyzed. The performance of these techniques depends on the number of nodes in the network. However, ZRP, DSDV and AODV are the suggested techniques to modify or enhance in the future study.

REFERENCES

[1] Chai Keong Toh Ad Hoc Mobile Wireless Networks, Prentice Hall Publishers, 2002. ISBN 978-0-13-007817-9

[2] C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks: Architectures and Protocols, Prentice Hall PTR, May 2004. ISBN 978-0-13-300706-0

[3] Fasee Ullah, Muhammad Amin and Hamid ul Ghaffar,"Simulating AODV and DSDV For Adynamic Wireless Sensor Networks" IJCSNS International Journal of Computer Science and Network Security, Vol.10, No.7,July 2010.

[4] Echchaachoui, Adel, et al. "Comparative Performance Analysis of AODV and AOMDV in Networked Systems", Springer Berlin Heidelberg, 2013.

[5] Gayatree Rana, Bikram Ballav, Dr. Binod Kumar Pattanayak," Performance Analysis Of Routing Protocols In Mobile Ad-hoc Networks", 2015 International Conference on Information Technology (ICIT) .

[6] S. Vanthana and Dr. V.Sinthu Janita Prakash, "Comparative Study of Proactive and Reac-tive Adhoc routing Protocols Using NS2", IEEE –World Congress On Computing and Com-munication Technologies, 2014.

[7] Perkins, C.; Belding-Royer, E.; Das, S. (July 2003).

Ad hoc On-Demand Distance Vec-tor (AODV) Routing IETF. RFC 3561. Retrieved 2010-06-18.

[8] Manveen Singh Chadha and Rambir Joon Sandeep, "Simulation and Comparison of AODV, DSR and AOMDV Routing Protocols in MANETs", International Journals of Soft Computing and Engineering (IJSCE), Vol.2,July 2012.

[9] D. Sivakumar and B. Suseela, "A Survey of Routing Algorithms For MANET ", IEEE-International Conference On Advances in Engineering, Science, Management (ICAESM-2012).

[10] Asma Tuteja , Rajneesh Gujrl and Sunil Thalia,"Comparative Performance Analysis of DSDV, AODV and DSR Routing Protocols in MANET using NS2",International Conference on Advances in Computer Engineering, 2010.

[11] Perkins and Bhagwat, "Highly Destination Source Routing (DSR) for Mobile Comput-ers", ACM SIGCOMM '94 Conference,1994.

[12] David B. Johnson, Davis A. Maltz, "The Dynamic Source Routing Protocol for Mobile Ad Hoc Networks" October 1999 IETF Draft, 49 pages.

[13] Chai-Keong Toh, "A novel distributed routing protocol to support Ad hoc mobile compu-ting" Proc. 1996 IEEE 15th Annual Int'l. Phoenix Conf. Comp. and Commun., Mar. 1996, pp. 480-86.http://www.ics.uci.edu/~atm/adhoc/paper-collection/toh-distributed-routing-ipccc96.pdf

[14] Zone Routing Protocol by Nicklas Beijar, Networking laboratory, Helsinki University Of technology, Finland.Licentiate course on Telecommunications Technology, 2002 .

[15] Z.J. Haas, "The Relaying Capability of the Reconfigurable Wireless Networks", VTC'97, 1997-May-4-7.