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Adaptive link Repair Algorithm for Mobile Adhoc Networks

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Abstract: Ad hoc network is the method that directly communicates with each other without involving central access point. Wireless networks typically work by one of the configuration, network topology either Adhoc or infrastructure network. Ad hoc wireless network is a collection of node (or router) mobile wireless that dynamically existence without use of existing network infrastructure or centralized administration. Ad hoc wireless network can also be regarded as more decentralized wireless network. It is a form a wireless communication network are the simplest performance metrics. The existing protocols are suffering with high density nodes and speed of the node. To enhance the performance of the network, this paper presents Adaptive link repair algorithm, Packet Delivery Ratio and Throughput Average End to End delay with respects to node speed and node density, and compare ENAODV, AODV and DSDV for same parameter metrics. Simulation tool is NS2.3

Keywords: MANET, End to End Delay, ENAODV, AODV, DSDV, ZRP, NS 2.3.

1. INTRODUCTION

In the Ad Hoc network, the router can freely perform network organization that resulting topology will change quickly and are difficult to predict. With this feature, the Ad-Hoc network experienced several challenges, among others, Multihop Mobility The combination of large networks with a range of different tools Bandwidth Limitations of battery consumption

Ad Hoc network [1] also requires a routing protocol because each node requires data exchange. In contrast to the infrastructure network, ad-hoc networks do not require a wireless LAN to connect each computer and network topology is a mesh network formed.

Here are some of the advantages of a wireless ad-hoc network: Ad-Hoc wireless network is very simple in its setup. Plug the wireless adapter into the laptop / computer, configure the software, and you also are able to do communication between laptop Ad-Hoc network is cheap because you do not need a wireless access point. Ad-Hoc network is fast. Throughput rates between the adapters twice faster a wireless access point in the infrastructure topology. Concept of infrastructure network where it is necessary to establish a wireless LAN network as a centralized network. Wireless LANs have the SSID (Service Set Identifier) as the name of the wireless network, with wireless LAN SSID then it can be recognized. At the time several computers connected to the same SSID, then formed a network infrastructure. It appears that some computers connected by a wireless LAN, here network topology formed is a star topology. With an infrastructure network topology allows you to: Connected to the wired LAN. A wireless access point lets you extend your LAN network with the ability to connect wirelessly. Computers on a wired network and a computer with a wireless connection can communicate with each other. This had been the main strength of the infrastructure wireless topology. Extending the range of your wireless. By putting a wireless access point between the two wireless adapters extend the range to be doubled.

Ad Hoc Network (MANET) indicates a wireless network of mobile nodes that have no fixed routers. The nodes in this network also serve as routers that are responsible for finding and dealing with the route to every node in the network. Some characteristics of MANET [2][9] are: dynamic network configuration, limited bandwidth power constraints for each operation, low overheads, and an adaptive system able to handle packet loss. The MANET network layer has two parts, namely the network layer and the transport layer. In the network layer of MANET is the IP (Internet protocol) and the ad hoc routing layer uses the AODV protocol (ad hoc on demand distance vector)

2. RELATED WORK

Surrender sing , BS Dhaliwal et al performance evolution and comparison of AODV[4],DSR and hybrid routing protocols in mobile Adhoc networks. this paper presents compared the performance of AODV,DSR [14][15] and Hybrid routing Protocols [5][10] on the basis of packet delivery ratio, Throughput ,End to End delay [6], routing over head and Energy consumption in mobile ADHOC network using MATLAB.

A.A.Chavan; Prof. D.S.Kurule et al, performance Analysis of AODV,DSDV Routing protocol in MANET and modification in AODV again Block hole Attack this paper presents AODV,DSDV protocols are analyzed in terms of routing overhead ,Packet delivery ratio Throughput [8] ad End to End Delay. the performance of AODV is Better than

DSDVin terms of routing overhead ,Packet delivery ratio Throughput ad End to End Delay. This paper gives the modification in AODV which helps to improve the performance of AODV in presence of Black hole attack.

3. METHODOLOGY

In figure 1 let the path established between source S to destination D, the n_j node not able to transfer the data due to node having low power, affected by attacks and internal and external problem. If any node away from the routing path that has sent existing path information to neighboring nodes. The neighboring nodes are accept RRQ and sent RRP, the node which is away from existing path that node choose nearest neighboring node among them. In this process n_j node gave total path information to neighboring node that node is shown in figure 2 then it act like n_j node without loss of information. here n_j node transfer buffer and total information about routing path and in this buffer having address of source, intermediate nodes and destination. by this algorithm we can avoid the whole new path establishment between source to destination.

Simulation environment is created for transmitting data from one place to another with 1000*1000 dimensions. Maximum nodes are taken 100, Number of nodes have being given as input assuming nodes are moving. Process of data transmission, first identify the source and destination nodes and find the intermediate nodes between source and destination. Check whether they are in the same cluster or not, this can be founded by different path finding algorithms. If it is not in same cluster, from the source via intermediate nodes it sends route request (RREQ) to neighboring cluster node. This paper presents, Enhanced AODV[16][17] protocol is to calculate the parameter metrics are Packet delivery ratio, throughput, End to End Delay.

4. MATHEMATICAL EXPRESSIONS:

Interpolation equation:

The three received signal strengths are P_1, P_2, P_3 and the packet arrived time t_1, t_2, t_3.

P_r is the threshold signal streangth

Tp is predicted time

$$f(x) = f(x_0) + (x - x_0) + \cdots + \prod_{i=0}^{n-1}(x - x_i)\, f(x_0, x_{1,\ldots,} x_n) \quad (1)$$

$$P_r = P_1 + (t_p - t_1)\Delta + (t_p - t_1)\,(t_p - t_2)\Delta^2 \quad (2)$$

$$p_r = p_1 + \frac{(t_p - t_1)\,(p_2 - p_1)}{(t_2 - t_1)} + (t_p - t_1)(t_p - t_2)\left(\frac{(p_3 - p_2)}{(t_3 - t_2)} - \frac{(P2 - P1)}{(t2 - t1)}\right)/(t3 - t1) \quad (3)$$

Let A $= \frac{(P2 - P1)}{(t2 - t1)}$,

$$B = \left(\frac{(P3 - P2)}{(t3 - t2)} - \frac{(P2 - P1)}{(t2 - t1)}\right)/(t_3 - t_1).$$

The above equation becomes

$$P_r = P_1 + (t_p - t_1)A + (t_p - t_1)\,(t_p - t_2)B \quad (4)$$

Rearranging above equation

$$Bt_p^2 + (A - Bt_1 - Bt_2)t_p + (P_1 - P_r - At_1 + t_1t_2B) = 0 \quad (5)$$

This is the form

$at_p^2 + bt_p + c = 0$,

Where

$a = B$,

$b = (A - Bt_1 - Bt_2)$,

$c = (P_1 - P_r - At_1 + t_1t_2B)$.

Therefore, the predicted time t_p at which link will fail is

$$t_p = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$P_r = P_tG_tG_r\left[\frac{\lambda}{4\Pi d_{ij}}\right]^2$$

3.1 Proposed Algorithm:

1. For each neighbour,
2. On receipt of packet,
3. Update record for last three packets
4. If (($P_1 > P_2$) and $P_2 > P_3$)) then repair (),
5. Repair ()
6. {
7. Estimate and update the tp and update ts, when node enters into critical state.
8. Prior to link break
9. }
10. If ((current time >= ts)
11. {
12. Sent warning message to upstream node ,
13. Wait for fixed duration
14. }
15. On receipt repair message
16. Set the route and line stats

```
Local route repair()
{
At link breaking node
Let link break nj node,
Before  it's breaking, search neighbouring nodes,
If (tp>=ts) link break
If found neighbour nodes, near the has to broken node
{
Transfer all information of route between source to destination
Establish path same as previous but different node,
Else
Search again()
Until get node with in region,
Select nearest node,
}
End
```

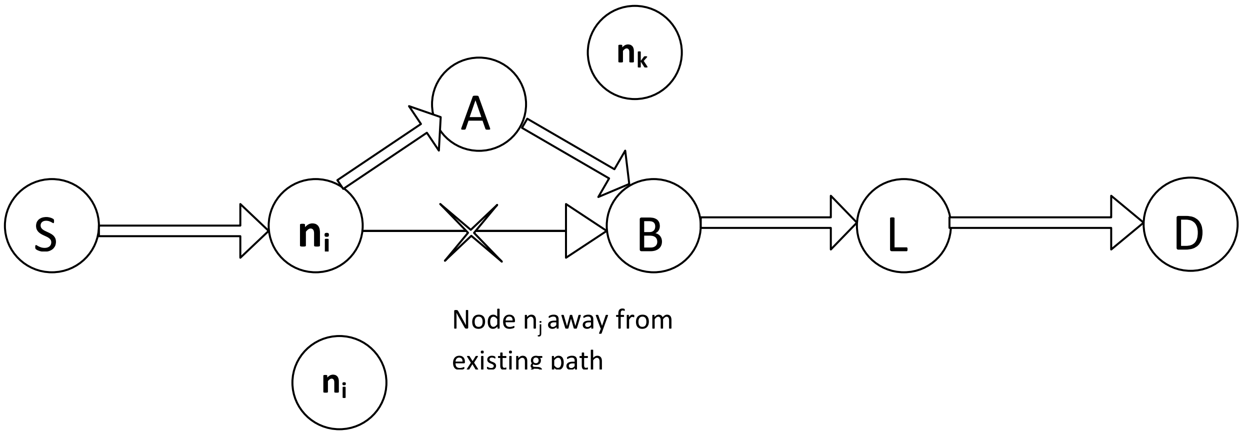

Figure 1: Path breaking between source node to destination node

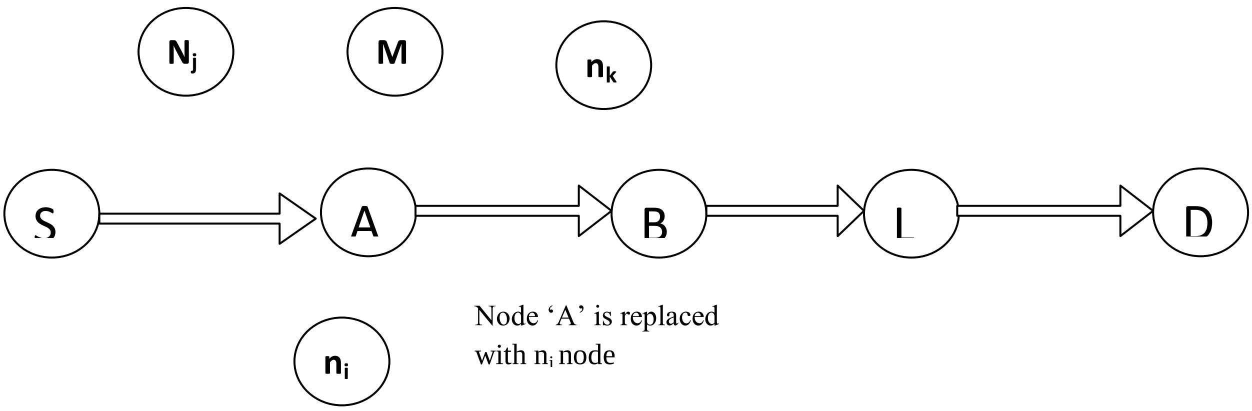

Figure 2: Nearest node is arrives in place of 'n_j'node and established new path

No. of nodes in given region

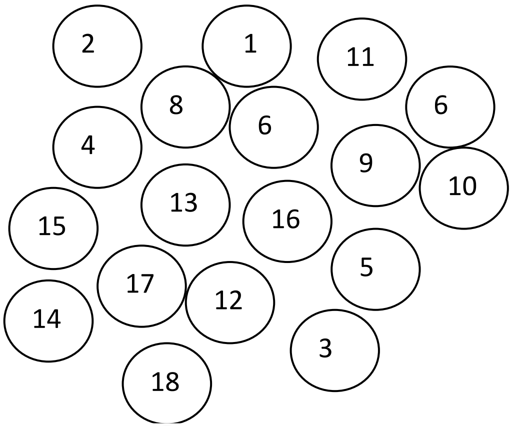

Figure 3.Mobile node density

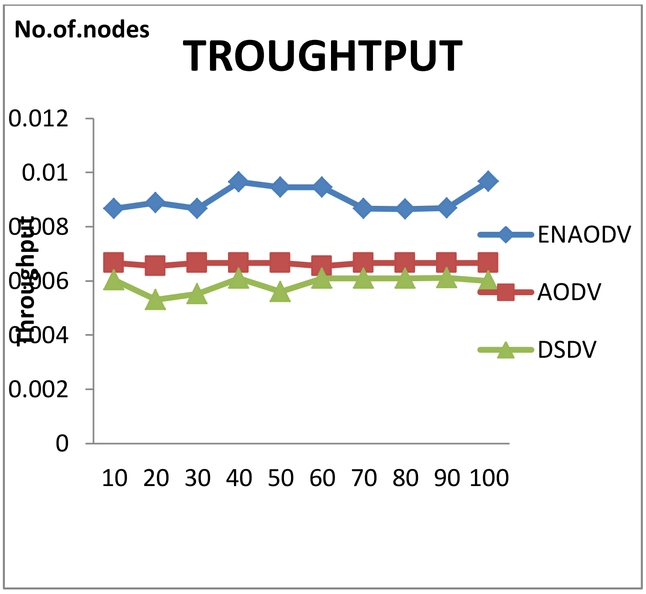

Figure 4 Experiment results of throughput vs No.of.nodes

5. RESULTS AND DISCUSSIONS:

The simulations were performed using Network Simulator 2 (NS-2.33). The source destination pairs are spread randomly over the network. We have summarized the model parameters that have been used for our experiments.

Parameter	**Value**
Network area (size)m^3	1000x1000
Wireless nodes	100
Node speed (m/s)	[0,10],[10’25],[25,50],[50,100]
MAC layer protocol	PHY IEEE 802.11g
Channel setting	Auto assigned
Buffer size	25600=32k
Transmission power (watt)	0.005
Manet routing protocol	ENAODV,AODV,DSDV,ZRP
Simulation time(ms)	80
Addressing mode	Ipv6
Simulation	NS2.33

Table.1: Simulation setup

No.of. nodes	**ENAODV**	**AODV**	**DSDV**
10	0.008679	0.006668	0.006034
20	0.008886	0.006536	0.005311
30	0.008678	0.006668	0.005512
40	0.009664	0.006667	0.006099
50	0.009456	0.006665	0.005607
60	0.009451	0.006536	0.006092
70	0.008665	0.006668	0.006095
80	0.008644	0.006668	0.006101
90	0.008684	0.006668	0.006118
100	0.009683	0.006664	0.006001

Table.2 Throughput and No.of.nodes

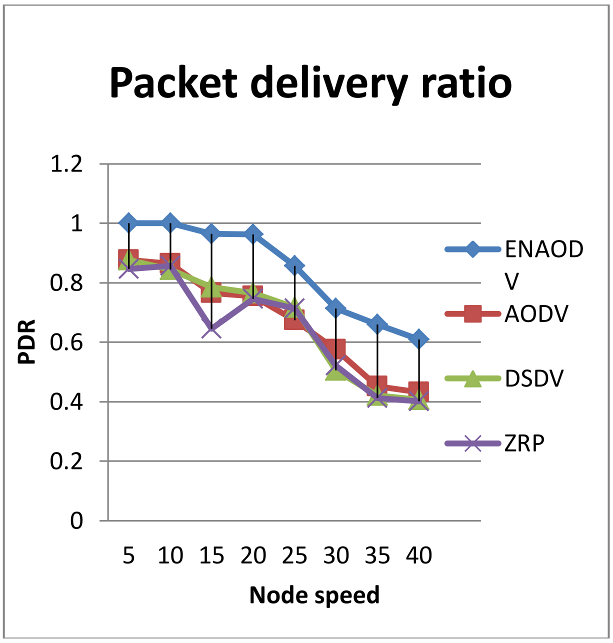

Figure 5: Experiment results of Packet delivery ratio vs. Node speed

Node Speed	ENAODV	AODV	DSDV	ZRP
5	1	0.8769	0.87632	0.84596
10	1	0.86453	0.84342	0.85647
15	0.96423	0.76541	0.78433	0.64549
20	0.96322	0.75498	0.76458	0.74568
25	0.85676	0.67452	0.71732	0.71254
30	0.71286	0.57452	0.50524	0.52147
35	0.65976	0.45231	0.42147	0.41257
40	0.61001	0.43265	0.40641	0.40081

Table 3: Packet delivery Ratio and Node Speed

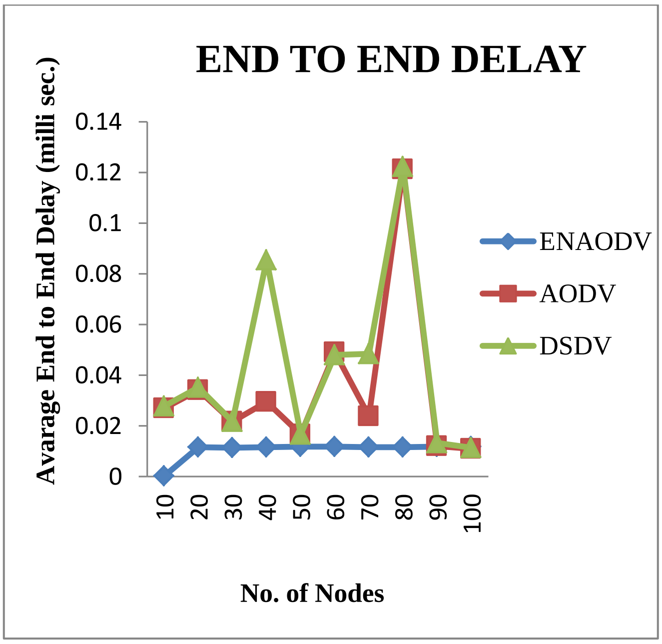

Figure 6: Experiment results of Average end to end delay vs No.of.nodes

No.of Nodes	ENAODV	AODV	DSDV
10	0.000158	0.026915	0.027796
20	0.011554	0.034076	0.035171
30	0.011446	0.021631	0.021741
40	0.011671	0.029415	0.08556
50	0.011799	0.016638	0.016646
60	0.011778	0.048988	0.048111
70	0.011688	0.023801	0.048348
80	0.011575	0.121123	0.122241
90	0.011781	0.012113	0.013312
100	0.011778	0.011011	0.011499

Table 4: Average end to end delay and No. of Nodes

We used to different mobility models to investigate whether there is impact on the performance due to different mobility patterns: random way point and gauss Markov.

We use following metrics to measure and compare the performance of the protocols:

4.1 Packet delivery Ratio: It is the percentage of successfully received data packets and is computed by dividing the total number of received data packets by the total number of sent data packets.

4.2 Average End-to-End delay: The average time it takes a data packet to reach the destination. This includes all possible delays caused by buffering during route discovery latency, queuing at the interface queue. 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.

4.3 Throughput: The rate of successfully transmitted data per second in the network during the simulation.

In figure 4 blue graph shows throughput of ENAODV performance is better when node density was increases compare to AODV and DSDV. This is achieved by selecting neighbouring node before link break occurred in source to destination path.

In figure 5 blue graph indicates Packet delivery ratio of ENAODV, it's performance is little bit slow when node speed is higher but it is far better than AODV, DSDV and ZRP. It could achieve by adaptive link repair algorithm.

In figure 6 the blue graph indicates average End to End delay of ENAODV. Average End to End delay of ENAODV is almost constant with small variations compare to AODV and DSDV,this evaluated reducing buffer size at each node and eliminate false nodes**.**

6. CONCLUSION:

MANET is collection of mobile nodes, the performance of MANET depends on routing algorithm and path management. The proposed adaptive link repair algorithm for mobile adhoc networks give better performance as compared to conventional algorithms in terms of parameter metrics throughput, Average end to end delay, Packet delivery ratio, routing overhead and energy consumption etc. according to above simulation results the throughput of ENAODV is more compare to AODV and DSDV, this is achieved by adaptive link Repair algorithm the second parameter average end to end delay of Enhanced AODV is almost constant and small change when node speed increases. Packet delivery ratio of ENAODV is gives better performance compared to AODV, DSDV. In future we can improve bandwidth, reduce bottle neck problem.

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