RPAR: Pharaonis approach based Reserve Path Adaptive Routing Topology for handling QoS constraints in Mobile Ad hoc Networks

Shaik Jaffar[1], Dr.M.V Subramanyam[2]

[1]Associate professor, Madina Engineering college, kadapa, A. P, India, email: sj3j@rediffmail.com

[2]Principal, Santhi ram Engineering College, Nandyal, Kurnool Dist, A.P, India email: mvsraj@yahoo.com

Abstract:

Specially structured and independent nodes are the special the of Ad hoc. To exchange data, Nodes always use a medium which is wireless due to that, message or data can be transferred only when both are in broadcast range. The difficult behavior which needs no efforts is the result of biologically motivated pharaonis method. In spite of having limited knowledge and by following basic rules that were understood from surroundings, universally accepted activities like finding shortest route can be seen when individuals work as groups. With respect to this, our earlier proposal was the pharaonis approach called swarm intelligence based conditional broadcasting (SIBCAST) in mobile ad hoc networks. As per the motivation gained from our earlier work SIBCAST, here we propose another paper on Pharaonis approach based Reserve Path Adaptive Routing (RPAR) topology. The basic objective of this work is to handling the QoS constraints. We are using the earlier proposal algorithm that was inspired by biologically inspired pharaonis approach to obtain these characteristics, with the help of different analysis tests we will prove that this is the best choice when there are different situations.

Keywords: *Mobile ad hoc Networks, Pharaonis intelligence, swarm optimization, proactive and reactive routing, SIBCast, Reserve Path routing.*

1. Introduction

By using different paths in place of routing entire information through single path, Multipath routing topologies have differentiated with respect to performance and process when compared with single-path routing. Load management and minimizing failure were the major concerns eith respect to conventional multipath routing. Load management eliminates the problem of capability restrictions of a single route. This was possible as it transfers date through different routes. The multipath strategies application in mobile ad hoc networks are very natural, it controls the role of defective wireless links, minimizing any delay and achieve load management. Along with that as per the power and bandwidth restrictions, a fair distribution among the mobile hot is mandatory. But the existing routing topologies in this situation are single-path topologies which are not focusing on load management issue. An uneven transmission of data will not only result in delay in data processing but also consume excess energy. An on-demand multipath routing scheme was projected by Nasipuri et al [3] which will use different routes, whenever there is a problem with the main one. Multipath routing's performance with respect to load management is not exploited to the maximum extent. Only a Split Multipath Routing (SMR) was proposed by S.J. Lee et al, which was focused on the process of identify and use multiple paths that are available to use.

The primary concern of the multipath routing in ad hoc networks is considering the combinations of different routs while selecting the route. The importance of route combinations on Alternate Path Routing (APR) with respect to mobile ad hoc networks was examined by M. R. Pearlman et al [5]. The basic qualities of the channel like rout combination and the topology of the network will effect the advantages that can be enjoyed by the APR tactics. While transforming the data if the routs are placed physically very close to interfere with one another Route combination can be observed physically. As a result, multiple paths' nodes continuously struggle to enter in to the medium they distribute; in turn this will result in poor performance when compared with single route topology. That's why node-disjoint routes will not be a appropriate in-order to enhance the results in this context.

required path is being used , path restoration will take place among pn_i *and* pn_{i+2} as any congestion is identified at pn_{i+1} and couldn't be controlled.

B. RPAR topology

i. $rreq$ will be prepared by n_s and will be broadcasted it to the neighbor leap level nodes
ii. After getting $rreq_i$ a leap level node n_i verifies that $rreq_i$ is broadcasted by it or not.
iii. If found that the $rreq_i$ broadcasted earlier, then $rreq_i$ will be discarded by n_i , otherwise from the transport layer n_i will collect information about neighbor leap nodes and includes its details and identity of leap nodes to '$rreq_i$', then broadcasts $rreq_i$. This process is iterative at each node that receives $rreq$ until it reaches the targeted node n_d .
iv. Upon receiving $rreq_i$ the targeted node n_d initiates the transmission of a packet $rrep_i$, which indicates the route response packet that will have the information about the nodes traversed by $rreq_i$ to reach n_d and about their all leap nodes. The route followed by route request $rreq_i$ is used in backward manner by $rrep_i$ to reach source node n_s .
v. In the routing path the details about antecedent node an_{i-1} , successor node an_{i+1} and overhearing nodes of present relay node an_i will be collected in every in between node an_i of the path that utilized route response packet $rrep_i$.
vi. With the information gathered in the earlier stage relay node $an_i\infty$ will update its outing table.
vii. Till response packet reaches the source node n_s , the process mentioned in steps 6 and 7 will be recurrent.
viii. Required path that contains optimal nodes will be identified by Source node n_s .
ix. "n_s" transmits $ack(an)_i$ for $i = 1..n$ in the selected path for all relay nodes 1 to 'n'.
x. After getting $ack(an)_i$, pn_i will instantiate to identify different available paths between an_{i+2} and an_i , so that the other path must be using only overhearing nodes of the 'an_{i+1}' and 'an_i'.
xi. Then at routing cache substitute path flanked by an_i *and* an_{i+2} will be stored by an_i .

4.4 Routing Route maintenance

The end to end delay for data packet dp_i will be measured after verifying the time $t(dp_i)$ taken by dp_i to travel from source node s to destination node d by the destination node d after getting a packet dp_i . a swarm agent $RCSA$ will be initiated when the delay of dp_i is more than the delay threshold τ , then it starts and transfers towards source node that prefers the route used by data packet dp_i . The process of updating pheromone indicator value g_{ni} at each hop level relay node in the route will be performed by '$RCSA$'. This process is discussed previously in equations (a), (b) and (c).

4.5 Handling link failures

in fixed time gap to every neighbor relay leap node a swarm agents $RCSA$ will be initiated by the targeted node d . Due to that there will fixed time interval ς will for updating the emission table with the pheromone indicator values.

If time since last update of g_{ni} is more than time interval ς in emission table of any node i the pheromone indicator value of any neighbor relay hop ni is not valid . This represents the failure of the link between node i and targeted node d .

5. EXPERIMENTAL RESULTS

By prototype model that build using NS2[20] the discussed Pharaonis approach based Reserve Path Adaptive Routing (RPAR) topology for QoS constraints (due to congestion) management is examined. In this work process, 2 Mbps value is set to the channel capacity of mobile hosts. DCF (Distributed Coordination Function) of IEEE 802.11 represented MAC layer protocol in this simulation model. Link failure in routing process will be identified by this DCF.

Within the range of 30 to 110 are being used to perform simulations. In every set of simulation we increased the number nodes by 10. 1100 meter X 1100 meter network area is considered in simulations where as simulation time is only for 60 seconds. The deviation of node mobility direction is not being considered because this simulation model is using Random Way Point mobility model. 200 meters among every two hop level nodes is the maximum communication coverage range. 10 to 50 m/s is range of the node mobility. Constant Bit Rate (CBR) is the traffic simulated. The parameters summary used in simulation model detailed in table 1.

Table 1: Simulation parameters

No. of Nodes	30 to 110, with increment of 10 nodes for each sequence
Area	1100 X 1100
MAC	DCF of 802.11
Radio range	200 mtrs
Simulation time	60000 milli seconds
Traffic source	CBR
Rate	0.25 kb/ms
Packet size	512 B
Mobility model	Random way point
Speed	10 to 50 m/s
Pause time	5000 milli seconds

5.1 Performance Analysis

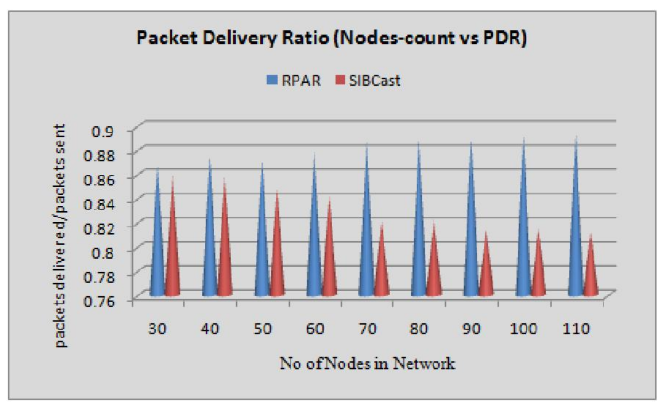
With the proposed RPAR protocol we have compared the Swarm Adaptive Hybrid Routing Topology [15]. As per the following conditions we have examined the performance of the RPAR.

Control overhead: Overall number of routing control packets normalization through the overall set of received data packets.

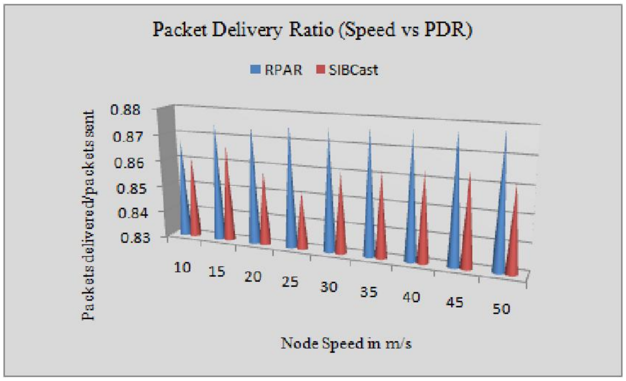
Average Packet Delivery Ratio: The number of packets routed and total number of packets delivered ratio. The observations of the simulation are as follows.

The ratio of packets delivered against to the number of packets sent is a key parameter to indicate the performance of any routing strategy. This is exemplified for SIBCAST [15] and RPAR (see figure 1). By contemplating this output it is adequate to confirm that RPAR deals with utmost inability of achieving PDR by SIBCAST. Quite appropriate catastrophe amount of PDR that is restored by the RPAR than SIBCAST is 1.5%. This is stable volume amongst the pause intervals. The minimal PDR hike inspected is 0.12% and the maximal is 3.04%.

RPAR is having minimal routing overhead than that SIBCAST as observed in Figure 2. This gain of the RPAR is due to the usage of of efficacious routing procedure with multiple substitute routes. The routing overhead ascertained in SIBCAST is almost 5.3% larger than routing overhead revealed in RPAR. The slightest and uppermost routing overhead in SIBCAST than RPAR anticipated as 4.59% and 8.97% correspondingly.

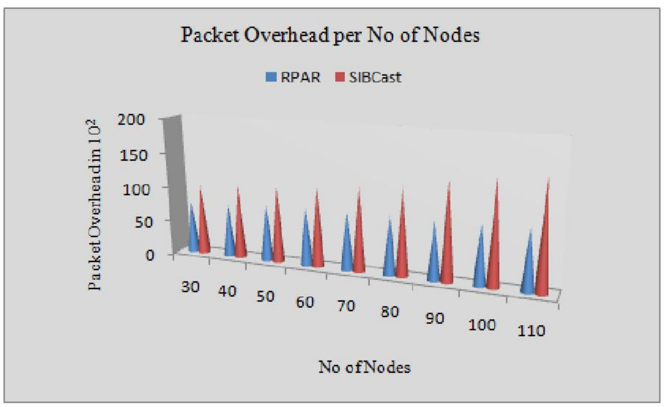


1(a) The Packet Delivery ratio observed against divergent number of nodes involved in routing

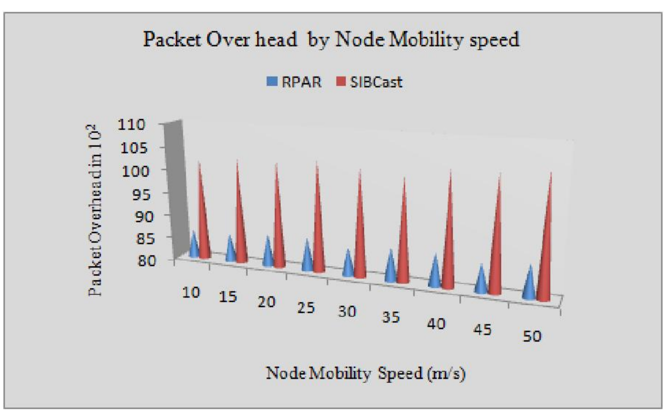


1(b) Packet Delivery Ratio Observed against divergent node mobility speed

Figure 1: Packet Delivery Ratio comparison between SIBCAST[15] and RPAR



2(a): Packet Overhead Observed against number of nodes involved in routing



2(b): Packet Overhead Observed due to Node Mobility Speed

Figure 2: Overhead comparison of RPAR with SIBCAST

6. CONCLUSION

Herewith in this paper for QoS obstacles arose because of congestion in Mobile Ad Hoc Networks we initiated Pharaonis approach based Reserve Path Adaptive Routing (RPAR) Topology. Previous work that we have exhibited is a routing topology SIBCAST [15] developed for establishment of core level process of route after proper search. To coordinate the endurance congestion with respect to the load at the time of route maintenance process, we initiated a novel routing with substitute routes model, and that yield very good results. After deciding the route based on the MAC Layer congestion and load indications the data packets will be routed through different paths. In order to highlight the congestion the load managing technique is executed in the system. As per the results we got in testing the proposed protocol is yielding better results than the SIBCAST core level protocol. It is producing the better results in stipulations of PDR by control overhead and low delay when there is an increase in the speed of the mobile and network size.

References:

[1] Sajal K. Das, A. Mukherjee, Somprakash Bandyopadhyay, Krishna Paul, D. Saha, “Improving Quality-of-Service in Ad hoc Wireless Networks with Adaptive Multi-path Routing, Proc. Of the GLOBECOM 2000, San Francisco, California, Nov. 27-Dec 1, 2000.

[2] Aristotelis Tsirigos Zygmunt J. Haas, Siamak S. Tabrizi , Multi-path Routing in mobile ad hoc networks or how to route in the presence of frequent topology changes , MILCOM 2001.

[3] Nasipuri and S.R. Das, "On-Demand Multi-path Routing for Mobile Ad Hoc Networks," Proceedings of IEEE ICCCN'99, Boston, MA, Oct. 1999.

[4] Johnson and D. A. Maltz, "Dynamic Source Routing in Ad Hoc Wireless Networks," T. Imielinski and H. Korth, editors, Mobile Computing, Kluwer, 1996.

[5] M. R. Pearlman, Z. J. Haas, P. Sholander, and S. S. Tabrizi, On the Impact of Alternate Path Routing for Load Balancing in Mobile Ad Hoc Networks, MobiHOC 2000, p. 150, 3- 10.

[6] S.J. Lee and M. Gerla, Split Multi-path Routing with Maximally Disjoint Paths in Ad Hoc Networks, ICC 2001.

[7] Siuli Roy, Dola Saha, S. Bandyopadhyay, T. Ueda, S. Tanaka. A Network-Aware MAC and Routing Protocol for Effective Load Balancing in Ad Hoc Wireless Networks with Directional Antenna; ACM MobiHoc,2003, Maryland, USA, 1-3 June 2003

[8] Sung-Ju Lee, Mario Gerla, Split multipath routing with maximally disjoint paths in ad hoc networks, IEEE International Conference on Communications, 2001, 3201-3205

[9] Ducksoo Shin, Jonghyup Lee, Jaesung Kim, Jooseok, A2OMDV: An adaptive ad hoc on-demand multipath distance vector routing protocol using dynamic route switching, Journal of Engineering Science and Technology, Vol. 4, No. 2, 2009, 171-183

[10] N. Jaisankar, R. Saravanan, An extended AODV protocol for multipath routing in MANETs IACSIT, International Journal of Engineering and Technology, Vol. 2, No. 4, August 2010

[11] Bo Xue, Pinyi Ren, Shuangcheng Yan, Link optimization ad-hoc on-demand multipath distance vector routing for mobile ad-hoc networks, 5th International Conference on Wireless Communications, Networking and Mobile Computing, 2009, WiCom'09

[12] Juan J. G´alvez, Pedro M. Ruiz, Antonio F. G. Skarmeta, Spatially disjoint multipath routing protocol without location information, 33rd IEEE Conference on Local Computer Networks, 2008

[13] Ash Mohammad Abbas, Bijendra Nath Jain, Path diminution in node-disjoint multipath routing for mobile ad hoc networks is unavoidable with single route discovery, International Journal of Ad Hoc and Ubiquitous Computing, Volume 5, Issue 1, December 2010

[14] Kun-Ming Yu, Chang-Wu Yu, Shi-Feng Yan, An ad hoc routing protocol with multiple backup routes, Journal Wireless Personal Communications, Volume 57, Issue 4, April 2011, 533-551

[15] Shaik Jaffar, Dr. M.V. Subramanyam; "SIBCast: Pharaonis approach based broadcasting for Mobile Ad hoc Networks "; International Journal of Scientific & Engineering Research, Volume 4, Issue 11, November-2013 1180, ISSN 2229-5518, IJSER © 2013, http://www.ijser.org..

[16] A. Misra and S. Banerjee, "MRPC: Maximizing Network Lifetime for Reliable Routing in Wireless Environments", WCNC'02, Mar. 2002

[17] J. Zhu, C. Qiao and X. Wang, "A Comprehensive Minimal energy routing Topology for Wireless Ad Hoc Networks", INFOCOM'04 , Mar. 2004

[18] R. Schoonderwoerd, O. Holland, J. Bruten, and L. Rothkrantz. Ant-based load balancing in telecommunications networks; Adaptive Behavior, 5(2):169– 207, 1996

[19] M. Heissenbttel and T. Braun, "Ants-Based Routing in Large Scale Mobile Ad-Hoc Networks," University of Bern, Tech. Rep., 2003

[20] Network Simulator, http://www.isi.edu/nsnam/ns

S.JAFFAR M.Tech, M.I.E, M.I.S.T.E (Ph.D) Currently working as Associate Professor Head of ECE Department at MADINA ENGINEERING COLLEGE KADAPA YSR DISTRICT KADAPA , A.P

Dr.M.V.Subramanyam received his B.E degree in 1989, M. Tech degree in 1997 and PhD degree in 2007. Presently he is working as a 'Principal' and 'Professor' of 'Electronics and Communication Engineering' department of Santhi Ram Engineering College, Nandyal, Kurnool district, Andhra pradesh, India. He is having more than 23 years of teaching experience. His areas of interest are Adhoc Networks, Computer Networks, Advanced Communications, Signal Processing, Image processing, Embedded Systems and Microcontrollers. He has published more than 40 papers in national and international, conferences and international journals. He is a life member of ISTE, IEEE, IETE, IEI and KDTFM.