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# Energy Efficient Minimum Broadcast Routing in ASN

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***Abstract*—** Routing in a symmetric sensor network brings many challenges in wireless sensor network. As wireless sensor network works in infrastructure less environment. In asymmetric network it is a challenging to choose path at runtime to send packet from source to destination. In literature we discussed that most of the work is done in symmetric network only and routing in asymmetric network and related challenges are left uncovered.

In our proposed work we have proposed a shortest path energy efficient routing in a asymmetric network. We extended the work to incorporate the energy with the shortest path routing. We simulated the performance of the proposed protocol in terms of PDR, PLR, Overhead and number of hops used. We compared the proposed system with Egyhet, Layhet and Prohet routing protocol and proved to be more efficient.

***Keywords-*** *Asymmetric Wireless sensor network, RP, Layhet, Egyhet.)*

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## I. INTRODUCTION

The process of route discovery in asymmetric networks is different from that in symmetric networks [2]. Routing packet in asymmetric network may not use the same path in both back and forth direction [2]. When any node has a packet to send to the destination then it broadcast packet to all its neighbor. Upon receiving packet from a node, other starts rebroadcasting packet to all their neighboring nodes until it reaches to the destination. When destination node receives packet it replies with preferred path.

In this paper we addressed the basic problem in wireless network where the two nodes from the network may not use the same path to communicate with each other [1]. The network where such conditions or problem arrive are known as asymmetric wireless sensor network [1]. Asymmetry in the network arises mainly due to noise sources near a device, energy conserving by shutting down a node etc [2].

Most of the existing routing protocols are designed for symmetric communication networks where two nodes uses same path to communicate back and forth [1]. Few authors who discussed the heterogeneous network assume that the link between nodes is symmetric [2]. Mosse et. al. provided the framework solution for asymmetric networks, but not addressed the issue of performance guarantee
.
In our work our focus is on designing a shortest path minimum broadcast energy conserving protocol for asymmetric wireless sensor network [2]. Our proposed algorithm performs the selective broadcast in order to perform routing and improves the energy conservation. Our algorithm improve upon RP, Layhet, prohet from the state of the art and achieve better delivery rate consuming minimum energy and slow sinking. Our protocol uses the less energy for routing packet from source to destination in asymmetric environment.

## II. RELATED WORK

Most of the research on design on routing protocol assumes that the links are symmetric in nature [4]. Asymmetric nature of links leads to the more overhead and less throughput. Traditional design on routing protocol in wireless network must consider the asymmetric nature of links [1]. BRA protocol is build considering the asymmetric nature of links with building reverse path for asymmetric links. Chen et al. proposed reverse path protocol using source based routing[14].

Pro-het routing protocol is a reverse path protocol which better suits for large and dynamic networks. A Proactive Link State protocol such as OLSR [10] having complete view of network at nodes but implement with partial view is capable of handling the asymmetric links [2]. DSDV [11] a proactive routing protocol is better than [10] but assume that links are bidirectional and fail in asymmetric links.

Reactive protocols uses route request and route reply packets for path discovery such as AODV and DSR. As we know in asymmetric networks, RREPs cannot be sent along the original path [2]. AODV avoids asymmetric links in its path and DSR allow RREPs to go along separate links, which needs additional route discovery packets [2].

Unidirectional Link Routing (UDLR) proposes a protocol [11] which invokes tunneling and encapsulation to send multi-hop acknowledgments at the link layer.

Nesargi et. al. proposed a similar tunneling-based protocol where control packets sent through tunnel in multi-hop reverse routes to the upstream nodes of unidirectional links [20].

In [14], [16] the cross-layer integration and design techniques result in significant improvement in terms of energy efficiency in WSNs. Paper [15] introduces a novel concept, i.e., *initiative determination* and illustrates how certain traditional networking functionalities can be jointly designed based on this concept to implement a cross-layer operation of medium access [2], distributed routing, local congestion control functionalities.

## III. PROBLEM STATEMENT

Achieving routing performance in asymmetric network is a challenging task. Most of studies reveal properties of routing protocol performance evaluation with the links being symmetric. State of art methods for routing performance considered asymmetric links with unidirectional reverse route mechanism to tackle asymmetric links.

In our work we propose a novel approach for routing in asymmetric sensor network with shortest path and energy efficient way. We also propose to evaluate our proposal against various performance metrics such as PDR, PLR, Throughput, overhead etc.

## IV. PROPOSED WORK:

Our proposed approach works in four different stages.

- Initialization of network
- Asymmetric Route Discovery
- Data Routing
- Metric measure for performance

***Methodology***

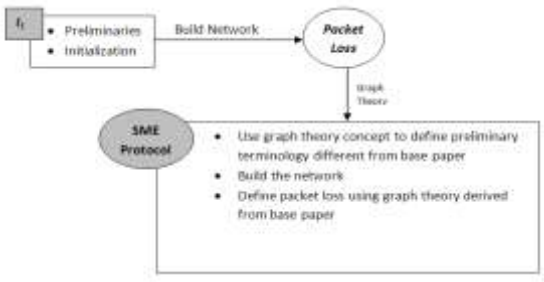


Figure 2: Initialization of Network

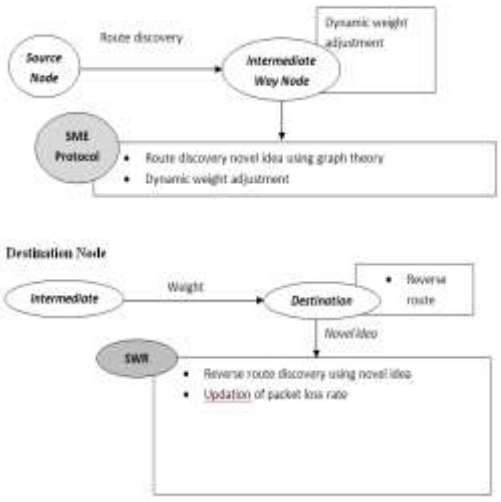


Figure 3: Route Discovery

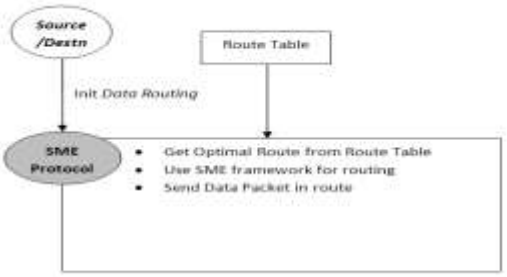


Figure 4: Data Routing Mechanism

We propose a reactive routing algorithm instead of proactive algorithm for routing packet from source node to destination node. Proposed work present destination based routing scheme instead of using source based scheme. In destination based routing approach the destination takes the responsibility to receive the packet coming it. Destination based approach increases the efficiency of the protocol.

In our proposed work we implement the selective broadcast for sending packet from one node to another node over a path. Our selective broadcast approach reduces the routing overheads to the greater extent.

## V. RESULT AND DISCUSSION:

We created a network of 150 nodes and simulated the existing routing schemes Prohet, egyhet along with proposed routing protocol. Scenario is as shown below.

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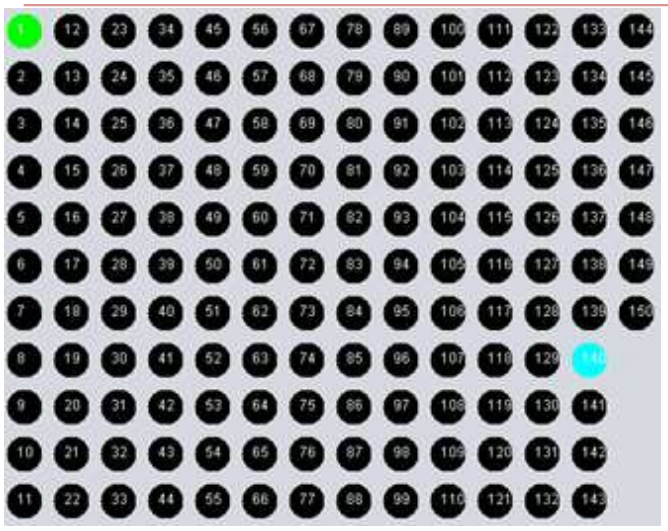
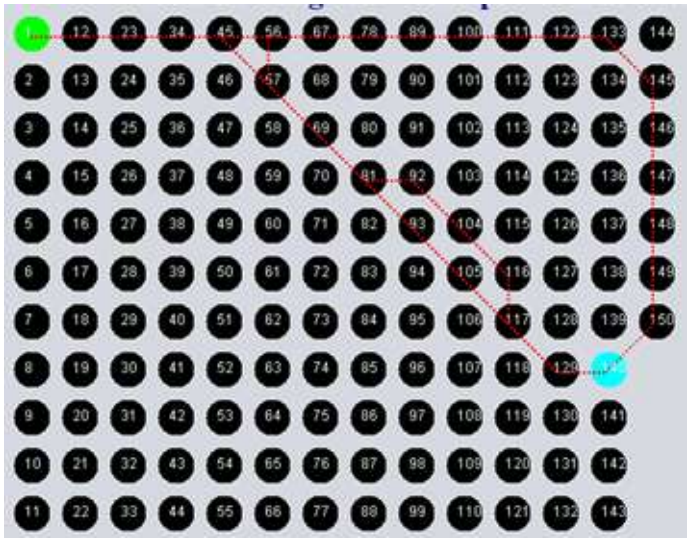


Fig. wireless network

Below figure shows the network with node 1 as source node and node 140 as destination node. Red dotted line show the different paths taken by the prohet, Egyhet , layhet and proposed protocol. Our proposed protocol takes the shortest path than the other protocol in the network. Amongst all protocol the Prohet routing takes the longer path than all other and uses large number of hops to deliver packet to the destination.



**End to end delay:**

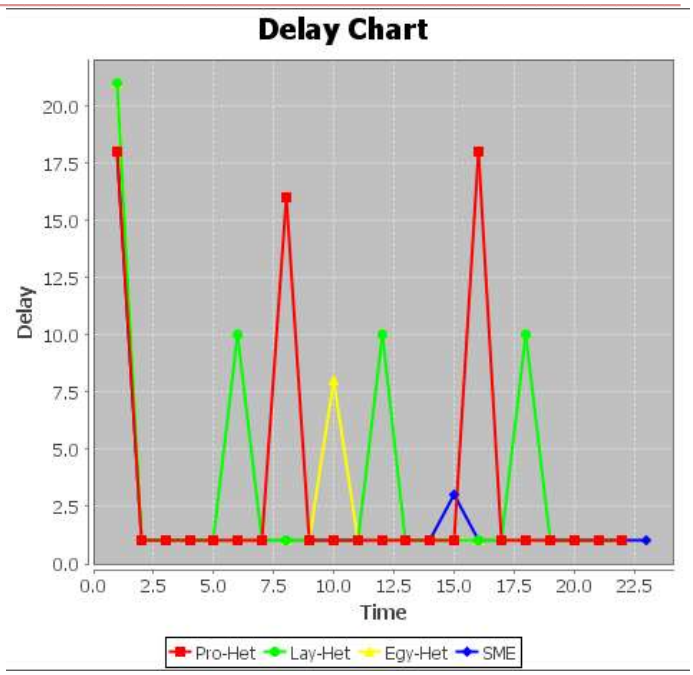



Fig. End to end delay

Above fig show the delay taken by the protocols to deliver the packet. Prohet protocol has large delay than other. Our proposed protocol takes the minimum delay than all other protocol.

**Throughput:**

Throughput of the protocol is good as compared to the prohet routing protocol but it can be improved than the other two.

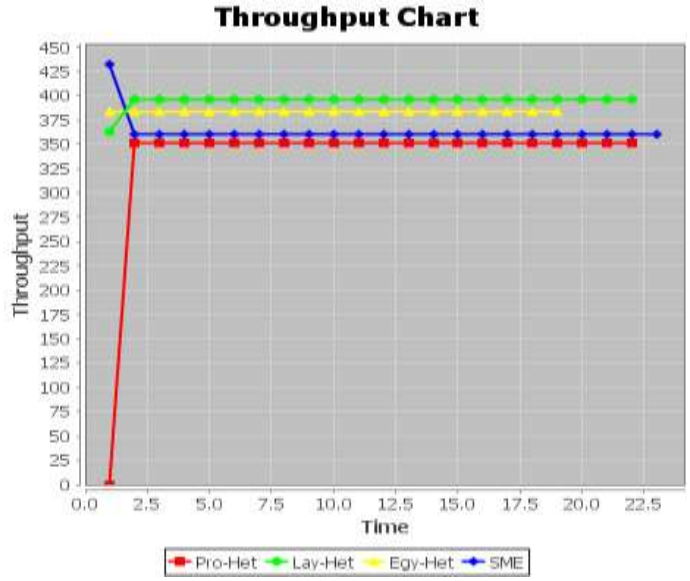



Fig throughput

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**Packet Delivery Ratio:**

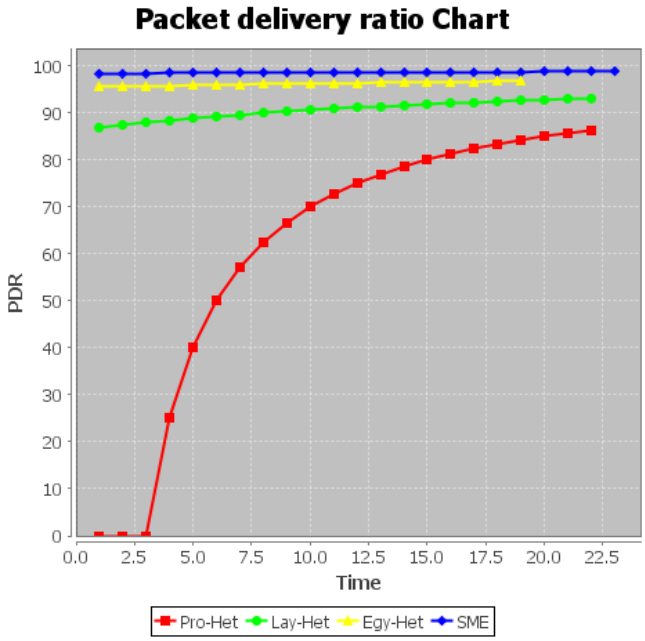


Fig PDR

Packet delivery ratio of the proposed protocol is more efficient than the all other routing protocol. prohet protocol has the lowest pdr amongst all other.

**Packet Loss Ratio:**

Fig shows the lowest packet loss ratio for the proposed energy efficient routing protocol.

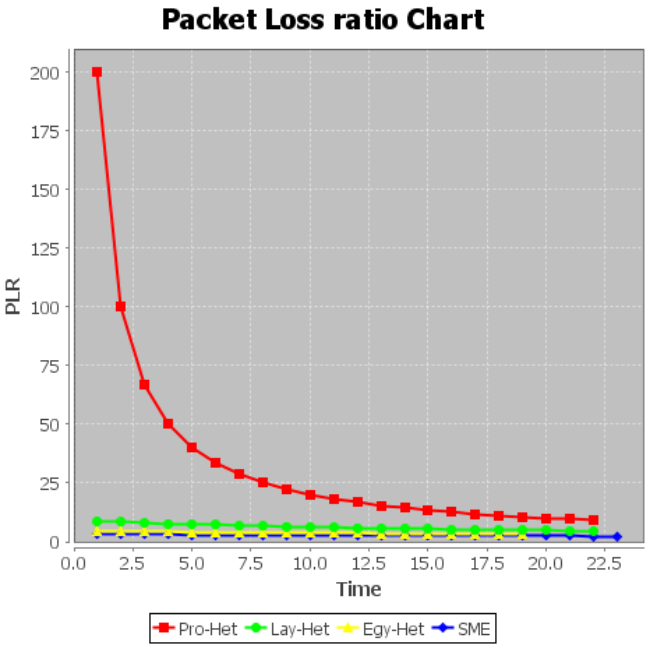


Fig PLR

**Overhead:**

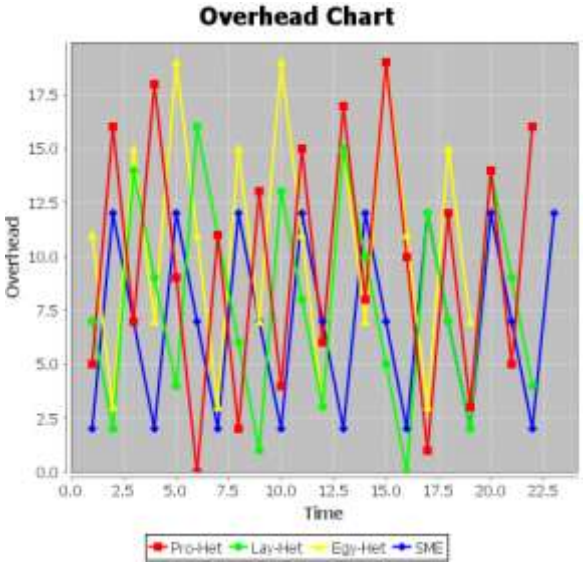


Fig. Overhead

Overhead possessed by the proposed routing protocol is low as compared to the other routing protocols.

## V. CONCLUSION

In this project we have studied the shortest path Minimum Broadcast Energy conserving (SME) Protocol for Asymmetric Wireless Sensor Network. Our proposed protocol improves upon ProHet, Layhet, Egyhet with the metrices of delay, delivery ratio, loss ratio, throughput and overhead. This protocol finds the shortest path and conserves energy in asymmetric wireless network. The SME protocol is better than the other protocols with the various metrics as the delivery rate of SME is highest among all the four protocols. The throughput of SME is highest among all the four protocols .The delay of SME is least among all the four protocols. The Loss ratio of SME is least among all the four protocols .The overhead of SME is highest among all the four protocols. This protocol achieve performance enhancement with better delivery rate consuming minimum energy and slow sinking with reduction in energy during data routing process for data transmission to destination for the way route selected in an asymmetric environment.

## REFERENCES

[1]. I. Alyildiz, Y. Sankarasubramaniam W. Su, and E. Cayicrci, ``A survey on sensor networks," *IEEE Commun. Mag.*, vol.40, no.8, pp. 102-116, Aug.

[2]. I. A. Essa, ``Ubiquitous sensing for smart and aware environments," *IEEE Personal Commun.*, vol. 7, no. 5, pp. 47_49, Oct. 2000.

[3]. A. M. Mainwaring, D. E. Culler, J. Polastre, R. Szewczyk, and J. Anderson, ``Wireless sensor networks for habitat monitoring," in *Proc.1st ACM Int. Workshop WSNA*, 2002, pp. 88_97.

[4]. D. Ganesan, B. Krishnamachari, A. Woo, D. Culler, D. Estrin, and S. Wicker, ``An empirical study of epidemic algorithms in large scale multihop wireless networks," Intel Corp., Santa Clara, CA, USA,Tech. Rep. IRB-TR-02-003, Mar. 2002.

[5]. P. Juang, H. Oki, Y. Wang, M. Martonosi, L. S. Peh, and D. Rubenstein,``Energy-efficient computing for wildlife tracking: Design tradeoffs and early experiences with ZebraNet," in *Proc. 10th Int. Conf. ASPLOS*,Oct. 2002, pp. 96_107.

[6]. M. K. Marina and S. R. Das, ``Routing performance in the presence of unidirectional links in multihop wireless networks," in *Proc. IEEE Symp.Mobile Ad Hoc Netw. Comput.*, Jun. 2002, pp. 85_97

[7]. V. Ramasubramanian and D. Mosse, ``BRA: A bidirectional routing abstraction for asymmetric mobile ad hoc networks," *IEEE/ACM Trans. Netw.*, vol. 16, no. 1, pp. 116_129, Feb. 2008.X.

[8]. X. Chen, W. Y. Qu, H. L. Ma, and K. Q. Li, ``A geography_based heterogeneous hierarchy routing protocol for wireless sensor networks," in *Proc.10th IEEE HPCC*, Sep. 2008, pp. 767_774.

[9]. T. Clausen and P. Jacquet, "Optimal link-state routing," RFC 3626, Oct. 2003

[10]. C. Perkins and P. Bhagwat, "Highly dynamic destination-sequenced distance-vector routing (DSDV) for mobile computers," in *Proc. ACM SIGCOMM*, Aug. 1994

[11]. R. Prakash, "Unidirectional links prove costly in wireless ad hoc networks," in Proc. ACM DIAL-M Workshop, Seattle, WA, Aug. 1999

[12]. C. E. Perkins, E. M. Royer, and S. R. Das, "Ad-hoc on demand distance vector (AODV) routing," RFC 3561, Jul. 2001

[13]. Xio Chen, Zanxun Dai, Wenzhong Lee and Hongch Shi, "Performance Guaranteed Routing Protocols for Asymmetric Sensor Networks", VOLUME 1, NO. 1, JUNE 2013, IEEE Transactions

[14]. X. Chen, Z. X. Dai, W. Z. Li, Y. F. Hu, J. Wu, H. C. Shi, and S. L. Lu, ``Prohet: A probabilistic routing protocol with assured delivery rate in wireless heterogeneous sensor networks," *IEEE Trans.Wireless Commun.*, vol. 12, no. 4, pp. 1524_1531, Apr. 2013.

[15]. E. Duros,W. Dabbous, H. Izumiyama, N. Fujii, and Y. Zhang, *A Link Layer Tunneling Mechanism for Unidirectional Links*. New York, NY, USA: RFC Editor, 2001.

[16]. S. Nesargi and R. Prakash, ``A tunneling approach to routing with unidirectional links in mobile ad hoc networks," in *Proc. 9th ICCCN*, Oct. 2000, pp. 522-527.