Energy Efficient and Guaranteed Packet Delivery in Mobile Ad Hoc Networks

Mr. Girish J Khorate
ME Comp Engg(Network)
G H Raisoni College of Engineering & Management,
Pune,India
khorategirish@gmail.com

Prof. Ms.Urmila Biradar
Dept Of Computer Engineering
G H Raisoni College of Engineering & Management,
Pune,India
urmilakb@gmail.com

Abstract— For Ad-hoc network routing protocols, high delivery ratio with low energy consumption is one of design challenges. This paper identifies the limitations of ad hoc routing scheme, in terms of guaranteed delivery with low energy consumption. Accordingly, this paper describe a scheme, in which data is forwarded along a pre-established lone path to save energy, and a high delivery ratio is completed by path repair whenever a break is detected. This paper propose a humble, quick, local path repairing method, whereby a malicious node can be tracked by low energy. This paper implement encoding and compression technique scheme and compare its performance with those of pure lone path without repair and multi-path routing schemes.

Keywords- *Reliable delivery, Ad hoc Network, Packet Compression, Energy efficiency*

*****

I. Introduction

Wireless sensor networks signify a new type of ad hoc networks that integrate sensing, processing, and wireless communication in a distributed system. Whereas sensor networks have many likenesses with traditional ad hoc networks such as those comprised of laptops, they also face new necessities introduced by their distributed sensing applications. In particular, several critical applications (e.g. distributed detection, distributed tracking and classification) of sensor networks introduce the essential necessity of sensing coverage that does not exist in traditional ad hoc networks. In a sensing-covered network, every point in a geographic area of interest essential in the sensing range of minimum one sensor. The problem of providing sensing attention has received significant attention. Several algorithms were existing to achieve sensing coverage when a sensor network is deployed. Additional projects developed online energy conservation protocols that enthusiastically maintain sensing coverage by only a subset of nodes. Ad hoc network is an autonomous system that does not need a pre-established substructure. Nodes in ad hoc networks are linked by wireless links, and the communications amongst nodes are often attained by multi-hop links. With improved interests in mobile communications and the assurance of suitable infrastructure-free communications, the growth of large-scale ad hoc networks has drawn a lot of consideration and has been a subject of wide research. Detecting malicious behavior is the very first step in handling malicious nodes in ad hoc network. Once malicious behavior is detected, the next step would be to identify the misbehaving node(s) in the ad hoc network and then to finally isolate them so that the ad-hoc network can start functioning in accordance with its intended purpose without any performance hit. Geographic routing is a suitable routing scheme in sensor networks. Unlike IP networks, communication on sensor networks often directly use physical locations as addresses.

For example, instead of querying a sensor with a particular ID, a user often queries a geographic region. The identities of sensors that happen to be located in that region are not important. Any node in that region that receives the query may participate in data aggregation and reports the result back to the user. Due to this location-centric communication paradigm of sensor networks, geographic routing can be performed without incurring the overhead of location directory services. Furthermore, geographic routing algorithms make efficient routing decisions based on local states (e.g., locations of one hop neighbors). This localized nature enables geographic routing to scale well in large distributed micro-sensing applications. As the simplest form of geographic routing, greedy geographic routing is particularly attractive in sensor networks. Geographic routing is a routing principle that relies on geographic position information. It is mainly proposed for wireless networks and based on the idea that the source sends a message to the geographic location of the destination instead of using the network address. Here are various approaches, such as single-path, multi-path and flooding based strategies for a survey. Most single-path strategies rely on two techniques: greedy forwarding and face routing. Greedy forwarding tries to bring the message closer to the destination in each step using only local information. Thus, each node forwards the message to the neighbor that is most suitable from a local point of view. Ad-hoc network is a decentralized type of wireless network. The network is ad hoc because it does not rely on a preexisting infrastructure, such as routers in wired networks or access points in managed (infrastructure) wireless networks. The most popular and natural greedy routing algorithm is Greedy Routing. This system forwards a packet to the neighbor with the minimum Euclidean distance to destination. In the Greedy routing paradigm, messages are always forwarded to the neighbor that is closest to the terminus. The Greedy Routing to assurance packet delivery. Compass Routing is to forward a packet to a neighbor with the least angle. The algorithms are proper for application needful fast transmission of packets. Compass Routing proper for mobile ad-hoc networks. Compass Routing and have faintly larger transmission time and smaller transmission power than the other three procedures. One of the most significant factors of routing algorithms is definite delivery of packets. This paper presented that in which situation (and by which routing algorithm) packet delivery from a given birthplace to a given terminus is guaranteed. In general, greedy routing algorithms

ISSN: 2321-8169
91 - 95

often flop to deliver a packet to the destination due to the existence of a local minimum; local minimum is a node which has no neighbor nearer to the destination.

II. Related Work

Goldsmith et al. [1] described a fresh theoretical framework for decisive fundamental performance limits of wireless ad hoc networks. The framework develops the traditional meaning of Shannon capacity to incorporate notions of delay and outage. Novel tools are defined for higher and lower bounding the network presentation regions associated with these metrics under a broad range of expectations about channel and network dynamics, state info, and network topologies. E. Altman et al. [2] studied repetition mechanisms that include Reed-Solomon type codes as well as network coding in order to advance the probability of successful transport within a given time limit. They propose an logical approach to figure these and study the result of coding on the performance of the network while enhancing parameters that govern routing. M. J. Neely and E. Modiano [10] existing a multi-hop, multi-user system for which a comparatively complete network theory can be developed. Particular expressions for network ability were derived, and a fundamental rate-delay curve was established, representing presentation bounds on throughput and end-to-end network delay for any conceivable routing and scheduling policy. P. Li et al. [14] propose a fresh multi-hop relaying scheme, and investigate the throughput, delay, and mobility in wireless ad hoc networks. Instead of global mobility, They consider a more practical restricted random mobility model, and find that they can provide smooth trade-offs between throughput and delay in mobile ad hoc networks by controlling nodes' mobility pattern. In addition, currently they only consider network delay when analyzing the trade-offs between throughput and delay.

P. Li and Y. Fang [15] investigated the throughput capacity of regular and random heterogeneous wireless networks, correspondingly, and find that various network factors such as the shape of the network area, the number of the destination nodes, the sum of the assisting nodes, and the bandwidth of the helping nodes, all have great impacts on the network capacity. They also find that by deploying wireless helping nodes into the network, heterogeneous wireless networks can offer much higher per-node amount than traditional homogeneous wireless networks under certain conditions. E. Altman and F. D. Pellegrini [3] proposed an analytical approach that allows quantifying tradeoffs between resources and performance measures (energy and delay). They studied the effect of coding on the performance of the network while optimizing parameters that govern routing. A. James et al. [5] analytically quantify the latency of both cooperative and conventional fountain-coded delay-tolerant multi-hop networks by deriving the exact closed-form equations for the channel usage. The overall latency suffered by such networks forces conservation of the end-to-end delay, particularly for real-time applications. However, by constraining the total delay (the number of encoded transmissions); the performance of fountain codes deteriorates due to the lack of encoded packets for retrieving the entire source message. F. D. Pellegrini et al. [6] model the combined effect of message fragmentation and buffering and describe the structure of the forwarding process in closed form when the message is split into K packets and delivered to the destination. Z. Kong et al. [7] use coding techniques to improve the throughput-delay tradeoff for mobile wireless networks. For the random walk mobility model, the delay is reduced from Θ(nlogn) to Θ(n) by employing a maximum distance separable Reed-Solomon coding scheme. This coding approach maintains the diversity gained by mobility while decreasing the delay. B. Yang et al. [11] propose a general two-hop relay algorithm with combination of both packet redundancy and erasure coding techniques, and focuses on the delay performance there.

III. Existing Systeme

In Present System, approaches for geometric routing algorithms were developed and they are based on greedy strategy that is, they repeatedly forward a packet to a neighbor which is “closer” to the destination node than other neighbors with respect to numerous criteria of “closeness. In general, greedy routing algorithms often fail to deliver a packet to the destination due to the presence of a local minimum; local minimum is a node which has no neighbor closer to the destination.

A. Limitaion of Existing system

- Greedy routing algorithms often fail to deliver a packet to the destination due to the existence of a local minimum.
- The disadvantage is that it is entirely possible that the most optimal short-term solutions may lead to the worst possible long-term outcome.
- Greedy geometric routing algorithms frequently fail to find a path with short edges.
- Greedy Routing alone does not have theoretical guarantee to deliver packets to terminus on super graphs of Delaunay graphs.
- Problem of minimizing transmission time and that of reducing power ingesting are incompatible.

IV. Proposed System

Geographic routing needs that each node can determine its own position and that the source is attentive of the location of the destination. With this info a message can be routed to the destination without knowledge of the network topology or a prior route finding. Our main aim of this paper is to give a unified view to existing greedy routing algorithms. This paper goals to overview the problem of local minimum in greedy routing algorithm by giving the combined view to greedy geometric routing algorithm. We propose two new routing algorithms to assurance packet delivery on each Delaunay graph. This state makes it easier to check whether a given routing algorithm guarantees packet delivery. Delaunay graph can be also calculated locally in a dispersed fashion. Compass Routing uses the angle amongst two nodes, which is seemly in sensor networks. Compass Routing is quite comparable and have smaller transmission power than the other routing algorithms named Compass Routing and Greedy Routing.

A. Greedy

- The most common and natural greedy routing algorithm is Greedy Routing.

- This accelerative a packet to the neighbor with the tiniest Euclidean distance to destination.
- In the Greedy routing paradigm, messages are continuously forwarded to the neighbor that is closest to the destination.
- The Greedy Routing to guarantee packet delivery.

B. Compass

- Compass Routing is to forward a packet to a neighbor with the minimum angle.
- The algorithms are suitable for application requiring fast transmission of packets.
- Compass Routing suitable for mobile ad-hoc networks.
- Compass Routing and have slightly larger transmission time and smaller transmission power than the other three algorithms.

C. Proposed system overview

The existence of malicious nodes postures a grave threat to the exact existence of an ad-hoc network. It is authoritative to handle such nodes to prevent the genuine nodes from being hit and to allow the ad-hoc network deliver its services. There are three main steps in treatment a malicious node.

- Detection: The first step in handling a malicious node is to detect the presence of any mean nodes. This is done by observing for any distinct or peculiar network performance such as improved packet drops or TCP timeouts at the source node.
- Identification: Once the existence of malicious node(s) is detected, the next step is to detect the misbehaving Nodes(s). In case, a trace route mechanism can be used to detect a malicious node. Later the positive identification of misbehaving node(s), very the nodes participating in the ad-hoc network should be informed so that they can evade those nodes in their communication routes.
- Isolation: Once all the nodes in the ad-hoc network are aware of the malicious node(s), they can unite to isolate those nodes by denying providing them with any kind of service (For example, denying packet promoting on behalf of such nodes.
- Encoding: Every coded packet is delivered to only one relay node and the performance improvement there is obtained by increasing the number of distinct coded packets.

Additionally compression technique is applied to reduce bandwidth while transferring package. There are two types of data compression methods:

A. Lossless Compression

It is used to minimize the amount of source information to be transmitted in such a way that when compressed information is decompressed, there is not any loss of information. For lossless compression, Lempel-Ziv-Welch (LZW) algorithm is used. LZW is a dictionary based algorithm suitable for nodes which changes the strings of characters using single codes in the dictionary. For any string data the compression takes place using following procedure:

1. STRING = get the first character
2. While there are still input character
C = get next character
3. look up STRING + C in the dictionary
4. if STRING+C is in the dictionary
STRING = STRING + C
5. else output the code for STRING
Add STRING+C to the dictionary
STRING = C
6. end if
7. end while
8. output the code for STRING

B. Lossy Compression

The goal of beating compression is normally not to duplicate an exact duplicate of the information. But this paper has focused only on the lossless compression methods which are used on the text data formatting and state them with the help of some algorithms.

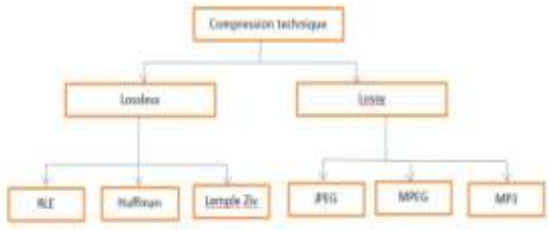

Fig. 1. Lossy and Lossless Compression

D. Steps

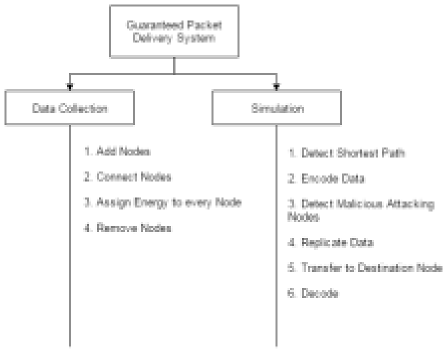

Fig. 2.Proposed steps

Process for execution can be given as in following steps:

Step1: Construct the graph.

Suppose the graph G is as follows, showing a source node defined and destination node (target) called t.

G = {V, E}

Where V = {v1, v2,…vn} = set of vertices/node in network and E = {e1, e2, …, en} = number of edges/connections

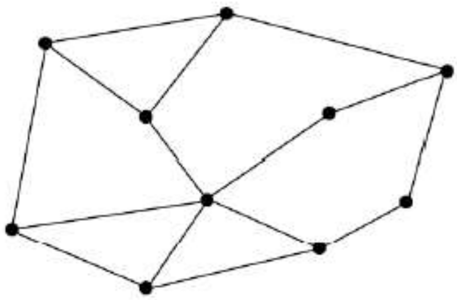

Fig 3: Graph G

Step2: Select Source and Destination for file transfer.

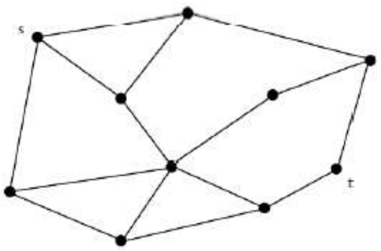

Fig 4: Graph G'

Step3: Compress file's records using lossless compression.
Compression ratio=compressed file size / Actual file size.
CR=CS/AS
Step4: Finding the Conceivable Routes in the graph by on Delaunay triangulations. Let above graph G consuming source s and target t supports the compass routing if for each duos of its vertices s and t. The Delaunay triangulation D(Pn) of a the set of n points on the plane Pn, is the splitting of the curving body of plane Pn into a the set of triangles through separate interiors such that

- The all vertices of these set of triangles are points in plane Pn
- For each triangle in triangulation the circle through its vertices shelters no other point of plane Pn in its inside.

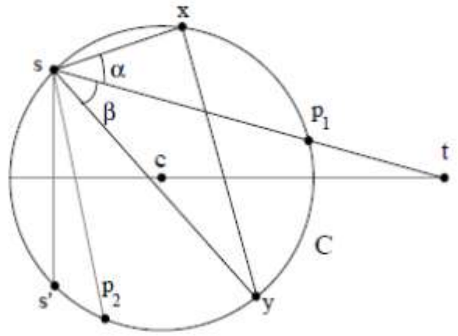

Fig 5: Plan Pn

Step5: Find the Optimal paths from source to destination.
Step6: Detect the failure of routes in the graph
Step7: Select the network path for sending packet from source node to destination nodes.

V. RESULT

The file is compacted before pass over network. The time need to compress file is depend on size of file.

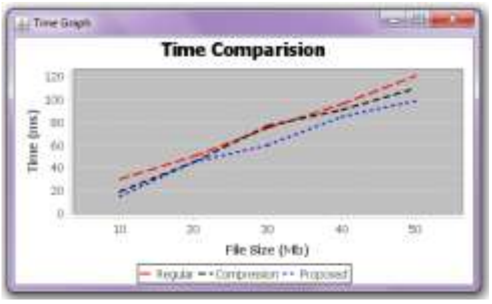

Fig. 3.Time comparison graph

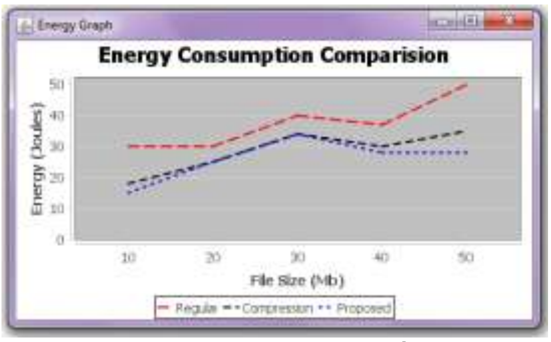

Fig. 3.Energy comparison graph

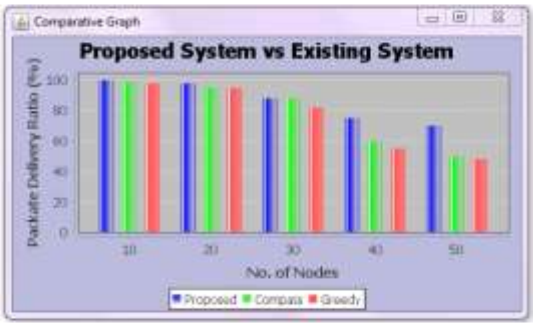

Fig. 3.packet delivery ratio comparison graph

VI. CONCLUSION

This paper inspected the packet delivery ratio and cost (energy) performance in MANETs packet delivery scheme that combines encoding and compression techniques. Extensive simulations demonstrate that our theoretical results can exactly predict the packet delivery ratio/cost performance. Dynamic packet size optimization is future interest of research.

ACKNOWLEDGMENT

I profoundly grateful to Prof. Ms. Urmila K. Biradar for her expert guidance and continuous encouragement throughout to see that these paper its target since its commencement to its completion.

REFERENCES

[1] A. Goldsmith, M. Effros, R. Koetter, M. Medard, A. Ozdaglar, and L.Zheng, "Beyond shannon: The quest for fundamental performance limits of wireless ad hoc networks," IEEE Communications Magazine, vol. 49, no. 5, pp. 195–205, May 2011.
[2] E. Altman, F. D. Pellegrini, and L. Sassatelli, "Dynamic control of coding in delay tolerant networks," in INFOCOM, 2010.
[3] E. Altman and F. D. Pellegrini, "Forward correction and fountain codes in delay-tolerant networks," IEEE/ACM Transactions on Networking, vol. 19, no. 1, pp. 1–13, February 2011.
[4] E. Altman, L. Sassatelli, and F. D. Pellegrini, "Dynamic control of coding for progressive packet arrivals in DTNs," IEEE Transactions on Wireless Communications, vol. 12, no. 2, pp. 725–735, February 2013.
[5] A. James, A. S. Madhukumar, E. Kurniawan, and F. Adachi, Performance analysis of fountain codes in multihop relay networks,"IEEE Transactions on Vehicular Technology, vol. 62, no. 9, pp. 4379– 4391, November 2013.

[6] F. D. Pellegrini, R. E. Azouzi, and F. Albini, "Interplay of contact times, fragmentation and coding in DTNs," in WiOpt, 2013.
[7] Z. Kong, E. M. Yeh, and E. Soljanin, "Coding improves the hroughputdelay tradeoff in mobile wireless networks," IEEE Transactions on Information Theory, vol. 58, no. 11, pp. 6894–6906, November 2012.
[8] Y. Li, D. Jin, Z. Wang, L. Zeng, and S. Chen, "Coding or not: optimal mobile data offloading in opportunistic vehicular networks," IEEE Transactions on Intelligent Transportation Systems, vol. 15, no. 1, pp. 318–333, February 2014.
[9] Y. Cai, X. Wang, Z. Li, and Y. Fang, "Delay and capacity in MANETs under random walk mobility model," Wireless Networks, vol. 20, no. 3, pp. 525–536, April 2014.
[10] M. J. Neely and E. Modiano, "Capacity and delay tradeoffs for ad-hoc mobile networks," IEEE Transactions on Information Theory, vol. 51,no. 6, pp. 1917–1936, June 2005.
[11] B. Yang, J. Gao, Y. Zhou, and X. Jiang, "Two-hop relay algorithm with packet redundancy and erasure coding in MANETs," in ICCC, 2013.
[12] C. Zhang, Y. Fang, and X. Zhu, "Throughput-delay tradeoffs in largescale MANETs with network coding," in INFOCOM, 2009.
[13] C. Zhang, X. Zhu, and Y. Fang, "On the improvement of scaling laws for large-scale MANETs with network coding," IEEE Transactions on Selected Areas in Communications, vol. 27, no. 5, pp. 662–672, June 2009.
[14] P. Li, Y. Fang, J. Li, and X. Huang, "Smooth trade-offs between throughput and delay in mobile ad hoc networks," IEEE Transactions on Mobile Computing, vol. 11, no. 3, pp. 427–438, March 2012.
[15] P. Li and Y. Fang, "On the throughput capacity of heterogeneous wireless networks," IEEE Transactions on Mobile Computing, vol. 11,no. 12, pp. 2073–2086, December 2012.
[16] J. Liu, X. Jiang, H. Nishiyama, and N. Kato, "Delay and capacity in ad hoc mobile networks with f-cast relay algorithms," IEEE Transactions on Wireless Communications, vol. 10, no. 8, pp. 2738–2751, August 2011.
[17] S. Panichpapiboon and W. Pattara-Atikom, "A review of information dissemination protocols for vehicular ad hoc networks," IEEE Communications Surveys & Tutorials, vol. 14, no. 3, pp. 784–798, July 2012.
[18] P. Gupta and P. Kumar, "The capacity of wireless networks," IEEE Transactions on Information Theory, vol. 46, no. 2, pp. 388–404, March 2000.