ALBA-R: Load balancing geographic routing in wireless sensor networks

S.Sujeet, Mr.P.Karunakaran and Mr.C.Venkatesh

Abstract

In this paper, we focus on load balancing algorithms for back-to-back packet transmission, reduce delay, solving the problem of dead end. This paper gives a brief introduction to various load balancing techniques have been discussed and a detailed study has been performed. The comparison table shows it clearly that an algorithm satisfies the load balancing requirement.

Index Terms

ALBA-R, dead end, comparison of algorithm

1. INTRODUCTION

Dead ends are unable to forward the packets they generate or receive. These packets will never reach their destination and will eventually be discarded. Many geographic routing schemes fail to fully address important design challenges including,

i) Routing around connectivity holes,
ii) Resilience to localization errors, and
iii) Efficient relay selection.

The main objective is to provide load balancing among the nodes and to overcome the packet loss and dead-end. So, ALBA mechanism performs load balancing based on splitting of packets, key generation and signature on data. The splitting of packets is based on number of inputs.

2. RAINBOW MECHANISM

ALBA-R has been introduced to identify the packets. It is based on Rainbow mechanism. Rainbow mechanism selects a node for packet forwarding. The packets needed for transmission is partitioned into positive and negative. The positive packets are given even colors and negative packets are given odd colors. The negative packets are once again retransmitted and packets are achieved. Rainbow mechanism is mainly used to route packets. Geographic routing is used to monitor the packets.

3. RESEARCH ISSUES IN LOAD BALANCING GEOGRAPHIC ROUTING TECHNIQUES

3.1. Routing with guaranteed delivery in ad hoc wireless networks

MANETS (mobile ad hoc networks) consist of wireless hosts that communicate with each other in the absence of fixed infrastructure. The reason in this is that, the broadcast range is not possible for all hosts in MANETS to be able to communicate with each other directly [2]. To communicate with each other directly it requires intermediate hosts with same broadcasting range.ad hoc wireless networks modeled as unit graphs in which nodes are points in the plane and two nodes can communicate if the distance between them is less than some fixed unit.The first distributed algorithms for routing that do not require duplication of packets or memory at the nodes and yet guarantee that a packet is delivered to its destination. These algorithms can be extended to yield algorithms for broadcasting and geo casting that do not require packet duplication.The algorithm does not require duplication of packets or memory at the nodes of the graph and yet guarantee that a packet is always delivered to all of its destinations. It is useful in conjunction with simpler algorithms that do not guarantee delivery. Flooding algorithms use some type of controlled packet duplication mechanism to ensure that every destination receives at least one copy of the original packet.

3.2. Robust position-based routing in wireless ad hoc networks with unstable transmission ranges

An ad hoc network is a network consisting of mobile hosts that is established as needed, not necessarily with any assistance from the existing internet architecture. The mobile hosts can communicate with each other using wireless broadcasts [8]. However, allow the possibility that not all hosts are within the transmission range of each other. Thus communication between two hosts is achieved by multi-hop routing, where intermediate nodes cooperate by forwarding packets.Host mobility means that the topology of the network can change with time. Furthermore, no assumption can be made about the initial topology of the network. Several papers showed how to perform routing in ad hoc wireless networks based on the positions of the mobile hosts. However, all these protocols are likely to fall if the transmission ranges of the mobile hosts vary due to natural or man-made obstacles or weather conditions. These protocols may fall because in routing either some connections are not considered which effectively results in disconnecting the network, or the use of some connections causes lovelocks. These algorithms include Greedy mode and Recovery mode. The path strategies are shortest path, flooding-based, hop count. It provides low delivery rates for sparse graphs and high communication overhead for sparse graphs. It can perform up to 200 nodes geographic routing combined with GLS. Robust has the ability to deliver a message when the communication model deviates from the unit graph, due to obstacles or noise. It also involves greedy schemes for the performance of optimal shortest path algorithm for dense graphs.

3.3. A location-based routing method for mobile ad hoc networks

Using location information to help routing is often proposed as a means to achieve scalability in large mobile ad hoc networks [1]. However, location-based routing is difficult when there are holes in the network topology and nodes are mobile or frequently disconnected to save battery. Terminode routing, presented here, addresses these issues. It uses a combination of location-based routing (Terminode Remote Routing, TRR), used when the destination is far, and link state routing (Terminode Local Routing, TLR), used when the destination is close. TRR uses anchored paths, a list of geographic points (not nodes) used as loose source routing information. Anchored paths are discovered and managed by sources, using one of two low overhead protocols: Friend Assisted Path Discovery and Geographical Map-based Path Discovery. In smaller networks, the performance is comparable to MANET routing protocols. In larger networks that are not uniformly populated with nodes, terminode routing outperforms existing location-based or MANET routing protocols. LAR is an on-demand routing protocol where location information is used to reduce the search space for a desired route, but it uses a DSR-like source routes for packet forwarding. The source uses the last known destination location in order to estimate the zone in which the destination is expected to be found. This zone is used to determine a request zone, as a set of nodes that should forward route requests. DREAM proactively maintains location information at each node in routing tables and data packets are partially flooded to nodes in the direction of the destination. It able to handle node failures and provides guaranteed delivery. It does not require additional storage.

3.4. Locating and bypassing holes in sensor networks

In routing, holes cause difficulties in organizing the networks. Holes define the “hot spots” regions created by traffic congestion and sensor power shortage. A commonly used assumption in studying sensor networks is that sensors are uniformly densely distributed in the plane [5]. However, in a real system deployment, this assumption does not generally hold. Even if sensors are distributed uniformly at random, there are still regions with sensor density much lower than others. In practice, sensor networks usually have holes, i.e. regions without enough working sensors. An example of a large number of dead sensor nodes it creates a big hole in the network. A packet is forwarded to a 1-hop neighbor who is closer to the destination than the current node. This process is repeated until the packet reaches the destination, or the packet is stuck at a node whose 1-hop neighbors are all farther away from the destination. Here, holes define to be simple regions enclosed by a polygon cycle which contains all the nodes where local minima can appear. The information storage and Memory requirement are based on boundary node. The applications are avoiding network hot spots, supporting path migration. The applications are avoiding network hot spots, supporting path migration, information storage mechanisms. It can able to handle node failures, information storage and memory requirement. It uses TENT rule and BOUNDHOLE techniques to identify and build around holes. TENT rule requires each node to know its 1-hop neighbors locations. To help packets get out of stuck nodes, BOUNDHOLE to find the boundary of the hole

3.5. A scalable logical coordinates framework for routing in wireless sensor networks

Recent technology has made exciting progress in large scale sensor networks, which opens the door for myriads of civil, meteorological and military applications. Large scale sensor networks can be deployed to carry out various tasks without the need for human intervention [4]. Efficient data dissemination among different parts of the network is crucial for overall application performance. Such dissemination hinges on the design and implementation of efficient routing protocols. The latter implicitly defines a set of destinations by their attributes and delivers the data to all matching destinations. It is likely that future sensor networks need both types of routing protocols. Content-based routing may be used as an efficient multicast mechanism that discovers a set of destinations matching given criteria (and returns their addresses to the sender if needed). Address-based routing can then be used to unicast data individually to particular destinations in the content-based groups as dictated by application logic. In this paper, focus on the latter type and assume that when the address-based routing is needed, the addresses of the destinations have been obtained in advance, presumably through some content based mechanism. Unicast defines transmitting same data to all the destinations. Unicast messaging is used for all network processes in which a private or unique resource is requested. All LANs (e.g. Ethernet) and IP networks support the unicast transfer mode, and most users are familiar with the standard unicast applications (e.g. http, smtp, ftp and telnet) which employ the TCP transport protocol.

3.6. Survey of localization techniques in wireless sensor networks

The localization methods algorithms are centralized, Distributed, Range-free, absolute and Relative [7]. In Centralized localization method requires base station to gather network wide environment information & with plenty of computational power. Examples are SDP-semi definite programming. It performs longer-delay, lower energy. In Distributed localization method each node is independent. It performs up to limited communication and poor localization. Example is diffusion and approximate point of triangular test. In Range-free localization method is based on distance between nodes to obtain unknown node's location. Therefore, it requires additional energy consumption. Examples are centroid localization, APIT. In absolute localization method is based on GPS. It requires sensor equipped with GPS receiver. It is easily understood and used by users. In relative localization method is used to obtain the relationship of distance (or) angle between nodes. It is performed by manual configuration or reference nodes.

3.7. Geometric spanners for routing in mobile networks

It is based on the restricted Delaunay graph (RDG), for mobile ad hoc networks. Each node only needs constant time to make routing decisions. Obtaining the location information is difficult (or) expensive [6]. Location is performed by means of GPS and it is costly to perform. In this, source node first acquires the location of the destination node it wants to communicate and then forwards the packet to a neighbor closer to the destination .It does not require hash tables or make global broadcasts. It suffers from local minimum in which a packet stuck at a node does not have a closer neighbor to the destination.Therefore, it provided a way to maintain a planar sub graph of the underlying connectivity. When a packet is stuck at a node, the protocol will route the packet around a face of the graph to get out of the local minimum. This process is repeated until it reaches the destination. It consists of sub graphs such as relative neighborhood graph and Gabrial graph to solve the local minima problem.

3.8. On the effect of localization errors on geographic face routing in sensor networks

The reason for geographic routing protocols does not need to maintain per destination information and only neighbor location information is needed to route packets. Geographic routing protocols are very attractive choices for routing in sensor networks. Most geographic routing protocols use greedy forwarding for basic operations [9]. Greedy forwarding is based on next forwarding hop is chosen to minimize the distance of the destination. It fails in dead-ends. Most geographic routing protocols use greedy forwarding for basic operations.In order to provide correct routing in the presence of dead ends, face routing has been introduced. GPSR is a geographic routing protocol for wireless networks that combines greedy forwarding and face routing. GPSR uses GHT is a geographic hash table system that hashes keys into geographic location and stores the key-value pair at the sensor node closest to the hash of its key.GHT uses mainly for geographic routing to the hash location. The applications are data centric storage and distributed indexing.

3.9 Table: Comparison of Various Load balancing geographic routing algorithms and techniques

Title	Algorithm **(or)** Techniques	Advantage	Disadvantage
Position based routing in ad hoc networks	Greedy mode and Forward mode	It provides excellent delivery rates, short hop counts.	High communication overhead
On the effect of Localization errors on Geographic face routing in sensor networks	Face routing,GPSR	Low discovery overhead and conserve energy	Information Hiding
Position with guaranteed delivery in ad hoc networks	MANETS	Does not require duplication of packets	Dynamic changing
Survey of localization techniques in wireless sensor networks	Localization techniques	Combination of different localization methods	Overhead and not scalable
Geometric spanners for mobile Networks	Relative neighborhood and Gabriel graph	Shortest path	Geographical Routing
Integrated Data gathering and interest dissemination system for wireless sensor Networks	Fireworks data dissemination protocol	Able to perform in low power range	Sink cost

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4. COMPARISON OF PERFORMANCE EVALUATION

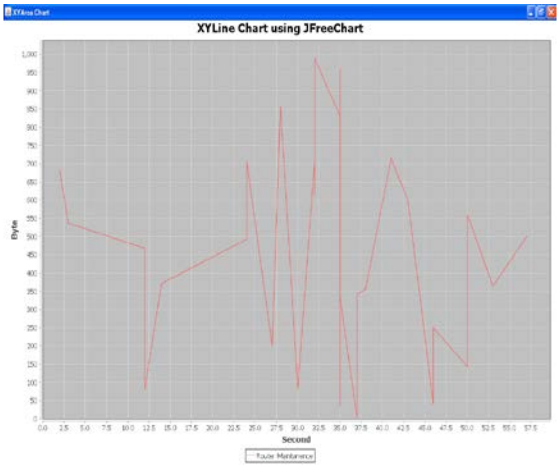

Figure1. Existing chart

X axis → No. of packets loaded

Y axis → No. of packets achieved in terms of bytes

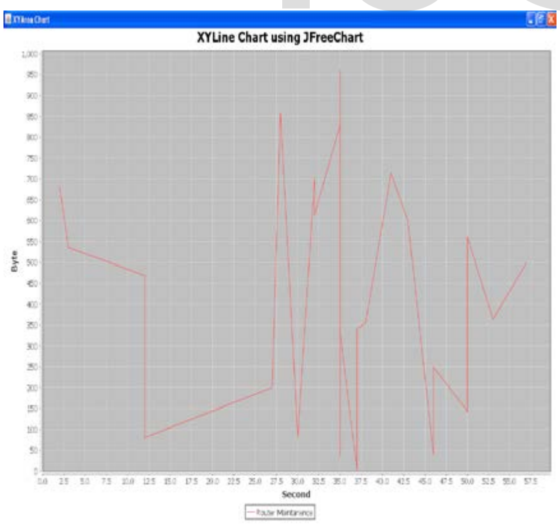

Figure2. Proposed chart

X axis → No. of packets loaded

Y axis → No. of packets achieved in terms of bytes

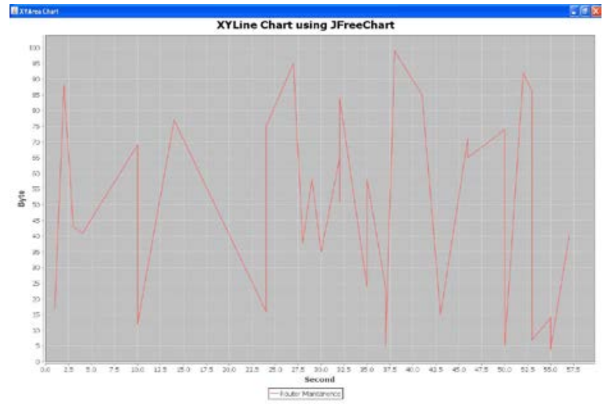

Figure3. Router Monitoring

X axis → No. of packets loaded

Y axis → No. of packets achieved in terms of bytes

5. CONCLUSION

The advantages and limitations of various load balancing techniques are summarized with reference to various issues related to wireless sensor networks. This paper defines a brief study of load balancing in wireless sensor networks.

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S.Sujeet[1], Mr.P.Karunakaran[2] and Mr.C.Venkatesh[3]

PG Student[1], Dept of Computer Science & Engg.,

Erode Sengunthar Engineering College,
Erode,Tamilnadu,India

sujeets164@gmail.com

Assistant professor[2], Dept. of Computer Science & Engg.,

Erode Sengunthar Engineering College,
Erode,Tamilnadu,India

Dean[3], Faculty of Engineering, EBETi