

A SURVEY ON MULTIPATH ROUTING STRATEGY IN MULTI-HOP WIRELESS SENSOR NETWORK

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ABSTRACT

There are number of routing protocols proposed for the data transmission in WSN. Initially single path routing schemes with number of variations are proposed. Still there were some drawbacks in single path routing. Single path routing was unable to provide the reliability and high throughput. Also security level was not considered while routing. Recently, to remove the drawbacks of the single path routing new routing technique is proposed called as multipath routing.

In this paper we discussed the different multipath routing protocols with number of variants. Initially multipath routing was proposed for the purpose of guaranteed delivery of packet to sink in case of link or node failure. There are other protocols which are proposed for the reliability, energy saving, security and high throughput. Some multipath routing protocols have discussed the load balancing and security during packet transmission.

INTRODUCTION:

Multipath routing is able to balance the load on paths and it can provide the high bandwidth and fault tolerance. New trends in wireless communication technologies and the manufacture of inexpensive wireless devices have led to the introduction of low-power wireless sensor networks [1]. As the wireless network deployment is easy and sensors multiple functionality, WSNs are used in large variety of applications such as healthcare, target tracking, environmental monitoring. After deployment of WSN the routing of collected data is an important issue. To deal with this issue, designing suitable routing protocols to fulfill different performance demands of applications is considered at higher priority in wireless sensor networking. Researchers have proposed many routing protocols to improve performance demands of different applications through the network layer of wireless sensor networks protocol stack [4].

Single path routing has the low flexibility against node or link failures, which may significantly reduce the network performance in critical situations. When the active path fails to transmit data packets, finding an alternative path to continue data transmission process may cause extra overhead and delay in data delivery [1].

Single path routing has many disadvantages as compared to the multipath routing. To cope with the limitations of single-path routing techniques another type of routing strategy is used which is called as multipath routing approach [11]. Now multipath routing has become as a promising technique in wireless sensor and ad hoc networks [7].

Multipath routing has been widely utilized for different network management purposes such as improving data transmission reliability, providing fault-tolerant routing, congestion control and Quality of Service (QoS) support in traditional wired and wireless networks [4,5].

AOMDV is an extension of ad hoc on-demand distance vector (AODV) that supports multipath by providing a number of loop-free and link-disjoint paths [8]. Control packet of AODV is redesigned and an advertising hop-count field and a route-list field that can deal with mobility-induced routing failures are added later [8].

I2MR, it minimizes interference over multipath, and it supports the high-rate streaming [9]. I2MR does not address the problem of robustness and security in its congestion control scheme. In I2MR the source node first delivers a packet on the main path and then delivers the next packet on the second path [9]. The source node repeats the process until all packets in the queue are transmitted. Load-balancing scheme of I2MR, packet loss on the primary or secondary path may cause long delays [9].

Lu and Suda [10] proposed a load-balancing algorithm based on a balanced tree structure. The routing tree can more effectively balance the load than the breadth-first-based and the shortest-path-based routing schemes [12]. This scheme involves high overhead caused by routing optimization under multipath routing discovery.

LITERATURE SURVEY:

TAXONOMY OF MULTIPATH ROUTING

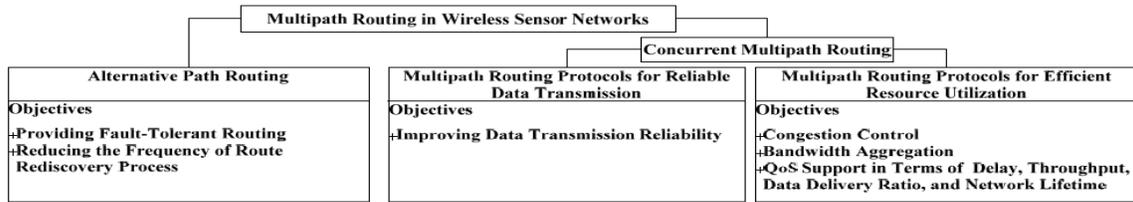


Fig. 1. Taxonomy

PROBLEMS IN MULTIPATH ROUTING:

- **PACKET DISTRIBUTION:**

A packet-distributing scheme at the source node results in routing security problems.

- **Load Balancing:**

The load over the multipath must be balanced adaptively according to the rate on disjoint paths.

- **Delay and Packet loss:**

Congestion may decrease channel usage and cause the packet loss rate to raise that leads to packet drop and long packet delay.

A. Multipath Routing over Wireless Mesh Networks For Multiple Description Video Transmission

In this paper, authors studied the multipath routing for multiple description (MD) video Delivery over IEEE 802.11 based WMN [1]. The proposed multipath routing framework relies on the maximally disjoint paths to achieve good traffic engineering performance. The video applications usually have strict delay requirements, which make it difficult to find multiple qualified paths with the least joints [1]. Authors developed an enhanced version of Guaranteed-Rate(GR) packet scheduling algorithm to achieve the strict delay requirement called virtual reserved rate GR (VRR-GR). The proposed method shortens the packet delay of video communications in multiservice network environment [1].

B. H-SPREAD: A Hybrid Multipath Scheme for Secure and Reliable Data Collection in Wireless Sensor Networks

Authors in [2] proposed a hybrid multipath scheme(H-SPREAD) to improve both security and reliability in wireless sensor network. H-SPREAD scheme is based on a distributed N-to-1 multipath discovery protocol [2]. This protocol is able to find multiple node-disjoint paths from every sensor node to the base station simultaneously in one route discovery process as like N to 1. End-to-end multipath data dispersion combined with secret sharing enhances the security of end-to-end data delivery [2]. This method considers that the compromise of a small number of paths will not result in the compromise of a data message.

C. K-Multipath Routing Mechanism with Load Balancing in Wireless Sensor Networks

In this, paper [3] authors designed and implemented a k-multipath routing algorithm. Proposed algorithm allows source node to send samples of data to sink node in a large-scale sensor networks. Proposed Multipath routing increase end-to-end throughput and provide load balancing [3]. This method has drawback of traffic interfere with each other along the multiple paths.

Multipath routing [3] algorithm tries to keep multipath as node disjoint routes to achieve a minimum mean delay for network.

D. Multipath Routing in Wireless Networks

This work was developed for modeling process of the multipath secure information transferring [5]. The first step in modeling (Beat: 0) by modified Deijkstra's algorithm finds the set of disjoint paths. This characterizes the reliability of delivering information for each of the selected paths [5]. In the second step separation of the original message based on the pair of characters (with up-filled characters "0" to the top of the message in case of inconsistency with the message length or requirements dividing/collecting message algorithms [5]). After that received pairs of characters are converted in accordance with the modified threshold algorithm to the function from which we get a pair of <coefficient> | <value of function> [5].

E. Energy Saving Multipath Routing Protocol for Wireless Sensor Networks

In [6] authors propose energy saving multipath routing protocol (ESMRP). This scheme makes use of load balancing algorithm to transfer the data. Protocol also calculates node strength to discover its next best hop [6]. ESMRP uses two versions, first version: data is transmitted through single path if path failure occurs or node strength goes below 15% of alternative path node strength. The second version of ESMRP, message is split into various segments and some correction codes are added to these segments [6]. Lastly, these segments are transmitted across multiple paths.

F. Multiple Trust in Trust-Based on-Demand Routing in Mobile ad hoc Networks

A concept of trust is introduced in MANETs to decrease the attacks from malicious nodes. By introducing the Trust concept, the new protocol developed is AOTDV [7]. In AOTDV protocol, before sending the data we calculate the trust of the neighboring node by control packet forwarding [7]. Once the trusted path is constructed, the packets are sent over that path to sink node. In some cases it may be possible that trusted node may get converted into the malicious node, to avoid this authors in [7] proposed a concept that multiple times trust calculation using time windows in network when we are sending data packets.

CONCLUSION

In this paper we discussed the different multipath routing in wireless ad hoc network. Traditional single path routing protocol has the number of drawbacks, which are removed using the multipath routing. There are number of variants of the multipath routing proposed to achieve the improved performance and high QoS in routing.

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