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An Efficient and Secured way of Routing in Hybrid WSN

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Abstract: In networking, routing is very important in day today life. The hybrid wireless network that combine combines a mobile ad-hoc network and an infrastructure network. An efficient and reliable data routing is important for high throughput. Existing routing schemes have the drawback of both infrastructure routing and mobile ad-hoc routing which include high overhead in route discovery and maintenance and the congestion. Although current reputation systems help increase routing reliability, but they are not sufficiently effective and efficient because they rely on local information exchanges between nodes to evaluate node reputation. In this paper co-ordinately develop an efficient routing algorithm and effective approach for reliable routing. To handle this challenge, here presents a peer-to-peer (P2P)-based Market-guided Distributed Routing mechanism (MDR). It takes advantage of wide base stations to analyze efficient data routing, and effective reputation management and trading market management for reliable data routing. The packets from a source node are transmitted to nearby base stations directly or indirectly, and then they are transmitted to the near destination base station then to the destination. The base stations form a P2P structure for the collection of reputation and querying to avoid local information exchanges between the nodes. Also P2P structure used for managing the service transactions between nodes for that it uses the trading market. By using the single-relay transmission feature, base stations can monitor the actual transmitted packets of relay nodes to more accurately and efficiently. Then evaluate their reputations and execute trading market management. Also detect falsely reported reputation information. Then further propose market-based policies to strengthen cooperation incentives for high throughput. Simulation results show that MDR outperforms the traditional hybrid routing schemes and reputation systems in achieving high throughput.

Keywords: Hybrid wireless networks, routing, reputation systems, trading market model.

I. INTRODUCTION

The key characteristics of wireless network is their throughput capacity. It represents the long-term achievable data transmission rate that a network can support. In a wireless cellular network or a wireless LAN, they use base stations or access points to communicate with each other. A node first connects to the nearest base station or access point in order to communicate with other nodes. A base station (access point) serves as a communication gateway for all the nodes in its cell (basic service area). An ad hoc network is a communication network formed by a collection of nodes without the aid of any fixed infrastructure. A hybrid wireless network is a combination of a mobile ad-hoc network (MANET) and an infrastructure network. Examples of promising applications for hybrid networks include mobile file/video sharing networks and vehicular networks. The presence of selfish node in network cause some problems in packet forwarding. For reliable routing, it is faced with some serious challenge posed by selfish nodes that do not forward data in order to save resources of their own. To avoid selfish nodes, a routing algorithm can choose high-reputed nodes as relay nodes by using reputation systems. In recent reputation systems, every node locally evaluates other nodes' reputation values based on reputation information exchanged between neighbours. This frequent reputation information exchange generates high overhead in reputation evaluation based on local partial information and it may result in an insufficiently accurate reputation. Calculating a node's reputation based on all reputation information on this node can more accurately reflect the node's cooperative behaviour. To achieve high throughput in hybrid networks while using highly efficient and reliable routing, a challenge here is if , it can take advantage of the widespread base station to coordinately develop an efficient routing algorithm. Also use effective cooperation incentives for reliable routing. The routing algorithm facilitates the implementation of the cooperation incentives to overcome aforementioned drawbacks.
For solving this , propose a peer-to-peer(P2P)based Market-guided Distributed Routing mechanism (MDR). MDR takes advantage of widely-scattered base station to facilitate highly efficient single-relay distributed data routing, in which the segments of a message are transmitted to base station directly or indirectly in a distributed manner through multiple reliable nodes. The base station form a peer to peer structure for reputation collection and querying to avoid

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local information exchanges, and for managing the service transactions between nodes in the network.
By the single-relay transmission feature, BSes can monitor the actual transmitted packet so relay nodes to evaluate their reputation and execute trading market management, as well as detect falsely reported reputation information. Thus, a node's reputation is based on i) its actual relaying behavior, and ii) all rather than partial reputation information, which can calculate more accurate reputation. Specifically, MDR consists of four components: locality-awareP2P-basedinfrastructure(LP2P),a distributed routing algorithm (DRA), an efficient and accurate reputation management system (EARM), and a trading market model (TMM). Fig. 1 shows a high-level architecture of MDR. LP2P supports the efficient operations of EARM, TMM and DRA. EARM and TMM provide cooperation incentives and hence enhance routing reliability in DRA..

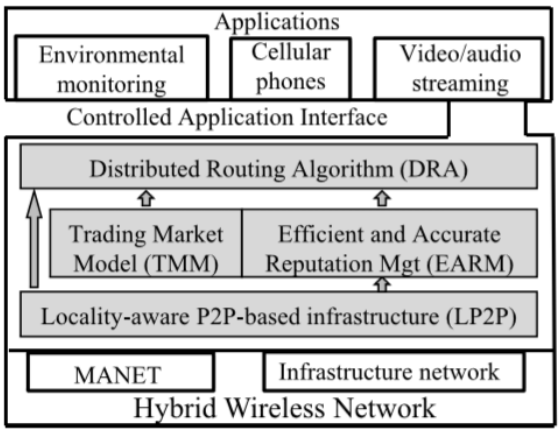

fig 1: A high-level view of the MDR mechanism

As far as know, MDR is the first work that takes advantage of widespread BSes to co-ordinately realize efficient distributed routing, reputation management and trading market management to enhance routing efficiency and reliability. The remainder of this paper is organized as follows. Section II details the MDR mechanism with descriptions of the different MDR components. Section III briefly discusses our strategies to handle node misbehaviors that exploit the vulnerabilities of MDR to gain unfair benefits. Section IV shows the related paper description. Finally, Section V concludes the paper with remarks on plans for future work then section VI shows the future work.

II. BACKGROUND

MDR: P2P-BASED MARKET-GUIDED DISTRIBUTED ROUTING MECHANISM
This introduce the four components of MDR

A. Locality-Aware P2P-Based Infrastructure

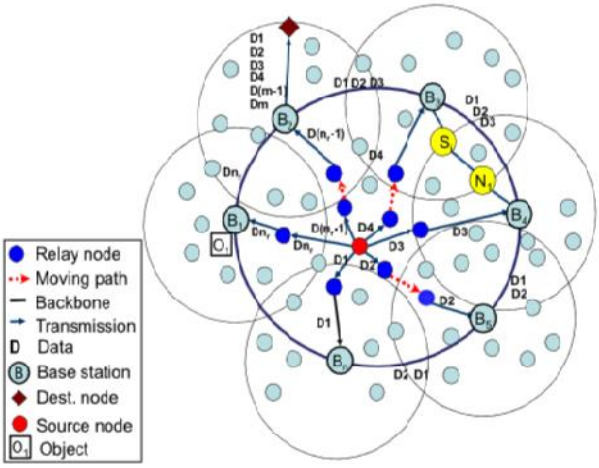

Fig 2: MDR in a hybrid wireless network.

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In Fig. 2, MDR builds LP2P for the substrate of the infrastructure component of a hybrid network. The overlay network provides two main functions Insert(ID, object) and Lookup(ID) to store an object to a node responsible for the ID of the object, and to retrieve the object based on its ID, respectively. In LP2P, the logical proximity abstraction derived from the overlay network matches the physical proximity information in reality, which enables BSes to communicate with their physically closest nodes for high efficiency.

Here use the landmark method to build LP2P. The landmark clustering technique is based on the intuition that nodes located close to each other are likely to have similar distances to a few selected landmark nodes. Given m landmark BSes that are randomly scattered in the network, each BS measures its physical distances to landmarks and uses the vector of distances <d1,d2,…...dm> as its coordinate. Two physically close BSes have similar landmark vectors. Based on the Insert(ID, object) and Lookup(ID) functions provided by the structured P2P, now can efficiently operate the information stored in the distributed BSes.

B. Distributed Single-Relay Routing Algorithm (DRA).
As in Fig. 2, to send a message D from the source node to the destination, DRA is comprised of five steps as follows.

1) The source node first uses the erasure coding technique to encode the message D into D1 to Dnr coded segment.
2) The source node sends these segments to different capable neighbours selected in a distributed manner. To do that, the source node first broadcasts a request with the segment length. Its neighbours with sufficient capacity for the forwarding reply to the source node. The source node relies on EARM and TMM for reliable and cooperative relay node selections. It then sends its segments to the selected relay nodes.
3) The relay nodes carry the segments and send the segments to BSes when they enter their coverage areas.
4) The BSes then forward the segments to the base station where the destination resides. To locate the destination base station, DAR takes advantage of LP2P for destination tracking. Each mobile node has a P2P ID which is the consistent hash value of its IP address. Each mobile nodes location is maintained in its owner base stations. Basically, every time a mobile node moves to another cell, the base station in the cell, denoted by Bi, reports to nodes owner base station by the P2P function Insert(IDi;Bi). The destination base station Bi can be obtained by asking nodes owner base station with Lookup(IDi).
5) The base station where the destination resides forwards the segments of a message to the destination node, and the destination reassembles the message.

C. Efficient and Accurate Reputation Management (EARM)
EARM helps achieve this objective while offering incentives for node cooperation in routing. Compared to traditional reputation systems, EARM has the following advantages:

(1) Rather than depending on frequent local information exchange among neighbours, which does not guarantee the accuracy of reputation values due to partial reputation information for reputation calculation and incurs a high overhead, EARM relies on LP2P to efficiently collect all reputation information on each node that helps calculate more accurate reputation values.
(2) Taking advantage of the single-relay feature of DRA, EARM calculates a node's reputation value based on its actual number of forwarded bytes rather than other nodes' feedback, which may be falsely reported by misbehaving nodes.
(3) Relying on LP2P, EARM offers efficient global reputation querying.

Reputation value calculation.
In EARM, the reputation is measured by a value between 0 and 1. Every node is initially considered to be untrustworthy with zero initial reputation value. A base station increases the reputation value of a relay node when receiving a forwarding segment from the node. That is, $R \leftarrow \min\{R+b.l, 1\}$ where R is a node's reputation value ($0 <= R <= 1$), b denotes a constant and l denotes the length of the received segment

D. Trading Market Model (TMM)
Basic Trading Market Model
TMM manages data transmission operations between source nodes and relay nodes for reliable and efficient data transmission. Each node is assigned a certain amount of credits initially when it joins the system. Source nodes pay credits to relay nodes and relay nodes charge source nodes for data forwarding services. Since the data forwarding cost is directly related to the data length, TMM uses the product of the data length and unit service price per byte to determine the forwarding service price.

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III. MISBEHAVIOR PREVENTION

This section, briefly discuss the strategies to handle node misbehaviors that exploit the vulnerabilities of MDR to gain unfair benefits.

Misbehaviour 1: Packet forging and modification.
Since a node's reputation R is determined by the size and the number of its forwarded packets, a selfish relay node may send bogus packets or insert junk data into the packet to earn higher R. To prevent these attacks, here use symmetric key to ensure the authenticity and integrity of the packets, considering that the public key authentication consumes immense energy of the nodes and leads to long transmission delay.

Misbehaviour 2: False transaction reporting
Since a source node needs to pay for the packet fowarding service, it may report a smaller number of packets to its owner base station than the actual number in order to pay less. In this way a source node reporting a false reported value.

Misbehaviour 3: Colluding.
In a collusion, colluders report high reputation values for each other in order to boost their reputations. In TMM, since R is calculated based on actual forwarding activities recorded by base station rather than reported reputation by nodes, such collusion misbehaviour can essentially be avoided.

Misbehaviour 4: Packet dropping
Since the reputation is calculated based on the number of segments received, for the nodes that do not want a high reputation, they can drop the packets on purpose to maintain their reputation value to a certain degree. Previous price systems cannot monitor the packet dropping behaviour. In MDR, as explained previously, based on the sequence of the hash value in hash chain, BSes can censor the dropping behaviours of the mobile nodes by counting the number of used hash values in the hash chain.

IV. RELATED WORKS

In recent years, extensive research has been conducted on hybrid wireless networks. A Highly Adaptive Distributed Routing Algorithm for Mobile Wireless Networks [1] in this paper a new routing protocol is introduced. That is Link Reversal protocol. The advantages of this paper is it is a loop free multipath routing protocol. But this result in inefficient use of available bandwidth and temporary construction of false replay propagation. Distributed Routing Algorithms for Wireless Ad Hoc Networks using d-Hop Connected d-Hop Dominating Sets [2] in this paper a cluster hierarchical based and back-bone based routing mechanisms are used. There are some drawback , that is sometimes the cluster heads are fail to propagate nodes to destination. For each cluster there will be a cluster head. This cluster head are responsible for routing. Another drawback is whenever the network become larger the gateway nodes become weaker. A Secure Incentive Architecture for Ad-hoc Networks [3].In this paper a new architecture model is proposed it needs limited power and computation resources. But one of the main disadvantages is that the selfish nodes present in the network are willing to send its resources and also these selfish nodes are expect other nodes to forward the packets. SORI: A Secure and Objective Reputation-based Incentive Scheme for Ad-hoc Networks[4] this paper is the advancement of the third paper. Here the selfish node get punished. But the drawback is it suffer from lack of effective mechanism to measure and propagate reputation mechanism and no efficient secure and effective routing. A P2P based intelligent resource discovery mechanism in internet-based distributed system [5] this paper tells about P2P overlay by using locality sensitive hashing. But it has low efficiency and high overhead in resource discovery. The COMMIT Protocol for Truthful and Cost-Efficient Routing in Ad Hoc Networks with Selfish Nodes[6]. In this paper it mention about Truthful, and energy-efficient routing in ad hoc networks but there is presence of selfish node reduces the efficiency of routing. Routing security scheme based on reputation evaluation in hierarchical ad-hoc networks[7].this paper introducing a new security routing based on reputation evaluation of nodes. For security purpose the protocol uses different approaches like encryption , authentication , intrusion detection etc. But one of the disadvantage is, it has limited capability to resist attack especially for new and variant nodes added to the network. A P2P-Based Market-Guided Distributed Routing Mechanism for High-Throughput Hybrid Wireless Networks[9]. This paper is the base paper that going to implement. Here a new method is proposed called Market Guided Distributed Routing mechanism(MDR). MDR synergistically integrates the two data transmission modes by taking advantage of the widespread BSes while avoiding the drawbacks of adhoc routing. This is a two-hop transmission scheme to eliminate multi-hop route maintenance overhead. However MDR is geared towards multi-cell networks. The single-relay feature

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of the MDR routing scheme also facilitates the effective reputation management and trading market management in MDR. The advantages of this mechanism is no packet loss ,less energy utilisation, high security and efficient routing.

V. CONCLUSION

This paper propose a P2P-based Market-guided Distributed Routing mechanism to improve the throughput of hybrid wireless networks, where channel resources are stringent and nodes may not cooperate in data forwarding. Current routing algorithms for hybrid networks do not fully exploit the BSes for efficient routing. Also, current reputation systems are not sufficiently efficient and effective for reliable routing. Here fully utilize the BSes by forming them into a locality-aware P2P overlay, on which here develop a distributed routing algorithm, efficient and accurate reputation system and trading market model. DRA splits packet stream based on erasure coding, transmits data in a distributed manner, selects relay nodes guided by EARM and TMM, and relies on LP2P to collect distributed segments at the destination. EARM is superior to current reputation systems due to its efficient reputation information collection, querying based on LP2P, and more accurate reputation values calculated based on global information of actual relayed packets of relay nodes. TMM strengthens the incentives for node cooperation in routing by new market-based policies. These MDR components coordinately contribute to efficient and reliable routing for high throughput.

VI. FUTURE WORK

The current routing mechanism is used for single hop routing, that can be extended to multi hop routing. Then identifying the selfish nodes in network sand inactive these selfish nodes.

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