



A Novel Approach for Trust Based Routing for WSN Using Secure Payment Scheme

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ABSTRACT: Interference is a fundamental impediment to the overall throughput of a wireless network. Due to the broadcast nature of wireless media, wireless transmissions in the same neighborhood will interfere with each other. Successive Interference Cancellation (SIC) is a new physical layer technique that enables the receiver to decode composite signals from multiple transmitters sequentially. The introduction of SIC improves the path bandwidth. Therefore, a routing protocol considering the path bandwidth with SIC is a must for improving the overall end-to-end throughput in multihop wireless networks. In this paper we propose a bandwidth-aware routing protocol with SIC, aiming at achieving high overall end-to-end throughput. We compare our proposed bandwidth-aware routing protocol to the existing traditional routing protocol. The simulation results show the effectiveness and correctness of our proposed method in terms of increased throughput.

KEYWORDS: Bandwidth, ESTAR, Interference, SIC, Throughput.

I. INTRODUCTION

In multihop wireless networks when mobile needs to communicate with destination it relies on other nodes to relay packets. Deploying relays helps to increase the network capacity, help to extend network coverage area, lower the network operational expenditures etc.. Sometimes nodes are moving and each node is performing individual tasks. This results to heterogeneous networks. Heterogeneous multihop wireless networks (HMWNs), which enable mobility of nodes, facilitate wider network coverage and more accurate service than static HMWNs. Therefore, dynamic HMWNs are being rapidly adopted in monitoring applications, such as target tracking in battlefield surveillance, healthcare systems, traffic flow and vehicle status monitoring, dairy cattle health monitoring. However, nodes are vulnerable to malicious attacks such as impersonation, interception, capture or physical destruction, due to their unattended operative environments and lapses of connectivity in wireless communication. Thus, security is one of the most important issues in many critical dynamic HMWN applications. Dynamic HMWNs thus need to address key security requirements, such as node authentication, data confidentiality and integrity, whenever and wherever the nodes move.

HMWN consists nodes with different computing power and sensing range. Compared with homogeneous network, deployment and topology control are more complex in heterogeneous network. There are real time applications which have quality of Service (QoS) requirements like bandwidth, end-to-end delay and jitter. So, to support these, it is important to have QoS mechanism. There are two types of mobile wireless networks. The first is Infrastructure Based Network and the second is Infrastructureless network commonly known as ad hoc network [1].

II. RELATED WORK

In HMWNs, if any one intermediate node moves out of the radio range of its neighbors in the route, then route will be broken. In this paper we propose a bandwidth-aware routing protocol, which is based on the reactive ad-hoc distance vector (AODV) routing protocol. Many applications have quality of service requirements (QoS) like bandwidth and jitter. In bandwidth aware routing protocol we are including the important issue of the multihop wireless network which is bandwidth. Bandwidth aware route discovery process discover a route in which intermediate nodes having bandwidth greater than required bandwidth [2]. The Trust based and energy aware routing protocol proposed to



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

establish stable routes to reduce the probability of breaking routes because of some reasons like :1)some intermediate nodes may not have sufficient energy to relay other's packets and keep route connected.2)Some nodes may break routes due to malicious action and low hardware resources.The routing establishment process are done through by SRR and BAR. Whereas SRR will find a shortest and reliable path and it avoids the low trusted nodes. BAR will find the most reliable one.In the traditional routing, a receiver can only receive one desired signal at a time and treats the interfering signals as noise. To avoid a reception from being interfered by a strong signal, the solution is to increase the bandwidth by removing the noise efficiently [3].

Trust based routing,to establish stable/reliable routes in HMWNs. The problem is the end-to-end throughput is heavily dependent on whether the routing protocol can choose a path with enough bandwidth.There is no use if the routing protocol does not select a path that offers the benefits. Therefore, a routing protocol considering the path bandwidth with SIC is a must for improving the overall end-to-end throughput in multihop wireless networks. The single path routing protocols like DSDV and DSR, normally fail to fulfill the above requirements.

III. PROPOSED ALGORITHM

Proposed system includes developing a Bandwidth-Aware Routing protocol with SIC to explore the throughput gain. A bandwidth-aware routing protocol, which is based on the reactive ad-hoc distance vector (AODV) routing protocol. Bandwidth aware route discovery process discover a route in which intermediate nodes having bandwidth greater than required bandwidth.Once the routing is performed,set of service requirements should be satisfied by the network.In the network, host's available bandwidth refers to the amount of bandwidth available to the node to send packets to the entire network.

Some of the methods for bandwidth estimation are:

A. Perceptive Admission Control (PAC) protocol:

Perceptive Admission Control (PAC) protocol monitors wireless channel and adapts admission control decisions dynamically to enable high network utilization while preventing congestion.The simulation results show that PAC minimizes delay and loss for all flows.Issues addressed in PAC are 1) shared wireless bandwidth and 2) node mobility.PAC can also be able to compute its available bandwidth and avoid congestion by limiting data traffic.So by this packet loss and delay are reduced. Bandwidth consumption of flows and available resources to a node are not only local concepts but also related to the neighboring nodes in carrier-sensing range.

B. QoS-aware routing protocol:

It is a combination of admission control scheme and feedback scheme to meet some requirements.Admission scheme admits flow with requested bandwidth and Feedback scheme provided feedback about available bandwidth to application.Two phase are there in QoS routing protocol.They are Route discovery phase and bandwidth reservation phase.In route discovery phase feasible route is discovered. In the bandwidth reservation phase, according to how many neighbouring hosts' free time slots are blocked by this time the weight of each available time slot is calculated by the hosts in the chosen path.In Fig.1 route (A→F→G→H→E) is selected by QoS aware routing protocol that satisfies the some requirements instead of selecting the shortest path (A→B→D→E).

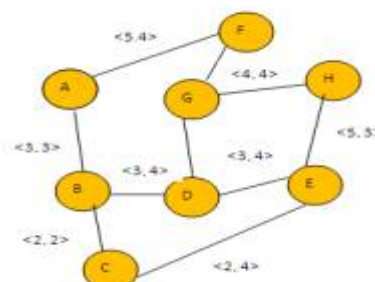


Fig. 1 Bandwidth aware routing



International Journal of Innovative Research in Computer and Communication Engineering

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For bandwidth estimation they used two methods.

- 1) —Listenl Bandwidth Estimation
- 2) —Hello! Bandwidth Estimation

They gave some results that show that QoS aware routing, the packet delivery ratio remains constantly above 90%, and the delay remains lower than 0.17s. they showed that packet delivery ratio is improved in our QoS-aware routing protocol and does not affect the overall end-to-end throughput. This protocol also decreases the packet delay and the energy consumption.

C. Contention-aware Admission Control Protocol (CACP) :

It is an efficient admission control framework with supporting some bandwidth requirements based on bandwidth allocation. The main goal of CACP is to maintain bandwidth levels for existing flows and to determine whether the available resources can meet the requirements of a new flow. CACP manages requests for bandwidth beyond capabilities of network and also reducing overhead on network. The challenges of CACP are:

1) Prediction of available bandwidth- The first challenge for CACP is evaluating the available bandwidth in the network so that the bandwidth requirements of all the flows do not exceed the resources in the network.

2) Bandwidth Consumption- The second challenge for CACP is to quantify the bandwidth that a new flow will consume so that it can be decided whether the available bandwidth can satisfy the requirements. Simulations results showed that by controlling bandwidth allocation, delay and jitter can also be controlled. Their main focused on the inclusion of information from nodes inside carrier-sensing range and outside transmission range during the admission control process. Using results they showed that CACP effectively manages requests for bandwidth beyond the capabilities of the network, imposing acceptable or even reducing the control message overhead on the network. CACP can be combined further with many existing QoS protocols, such as QoS-aware MAC protocols or end host policing protocols.

Bandwidth can also be estimated using two terms:

- Calculation of local available bandwidth
- prediction of c-neighborhood

D. B-AODV

In simulation results they showed that packet delivery ratio is increased and end-to-end average packet delay is improved in proposed QoS routing algorithm.

The basic working of proposed protocol was that

- A suitable route is selected by Source node for the destination, before starting the transmission. - Delay requirements and bandwidth requirement should be satisfied.
- Assumption was that a connection only uses a single path for transmission. So to provide X bandwidth on a path it is necessary for each node along the path to find at least X slots to transmit to its neighbours.

IV. BANDWIDTH AWARE ROUTING PROTOCOL OPERATION

A. ROUTE DISCOVERY:

Route discovery composed of Route Request and Route Reply. In Fig 2, RREQ is send from source S to destination D. To prevent duplicated RREQ, intermediate nodes only forward RREQ with a hop count no larger than minimal hop count which is maintained by each node.

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Vol. 4, Issue 4, April 2016

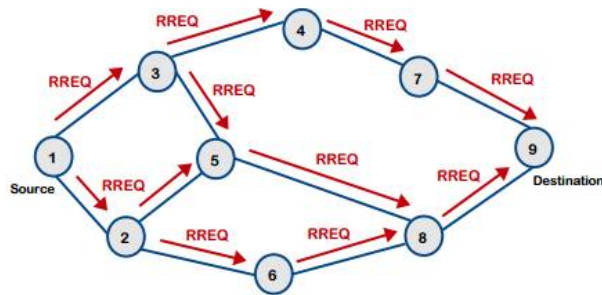


Fig 2.RREQ packets flooding in Route Discovery

In Fig 3. Route Reply, D sends back RREPs along the corresponding reverse paths.

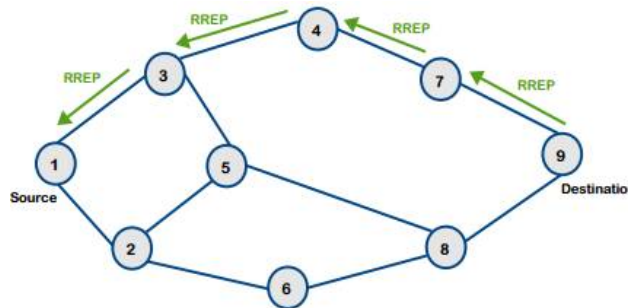


Fig 3.RREP packets in Route Reply

B. Data Transmission:

Once route discovery procedure is done, source S sends data packets into the two parallel paths according to path's available bandwidth. Suppose S selects two paths p1 and p2, and their path's available bandwidths are PB(p1) and PB(p2) respectively. The ratio of packets transmitted via the corresponding paths become

$$\frac{PB (P1)}{PB (P1)+PB (P2)}$$

And

$$\frac{PB (P2)}{PB (P1)+PB (P2)}$$

C.Route Maintenance:

During data transmission,if any node detects that next hop link to destination fails it notifies source with RERR(Route Error).Once source receives RERR it checks with the failed path and suspend transmission in that path.So that it can follow other path if it is still efficient.When source receives RREP it sends data packets in that path.

Procedures for route maintenance:

- Step 1. The node that identifies the next-hop link failure notifies the source with a RERR (Route ERROR). The RERR is forwarded by unicast to the source.
- Step 2. When the source receives the RERR, it first checks the failed path and suspends the transmission on this path. The other path can continue to deliver data packets if it is still efficient. Otherwise, the source restarts a new route discovery procedure to obtain new routes.
- Step 3. When the source receives the new RREP, it begins to send data packets via the newly discovered path.

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V. SIMULATION RESULTS

The new routing protocol performance studied using ns-2 simulations. The main objective of our simulation is to evaluate the effectiveness and correctness of our proposed method in terms of increased throughput. Other objective includes evaluating Packet loss ratio and Packet delivery ratio.

Performance Metrics Analysed:

i) The Packet Loss Ratio is calculated by using the following formula:

$$\text{Packet Loss Ratio} = \frac{T_x - R_x}{T_x}$$

The difference of the number of transmitted packets (Tx) minus the number of received packets (Rx) divided by the number of transmitted packets (Tx) to obtain the end-to-end average packet loss ratio.

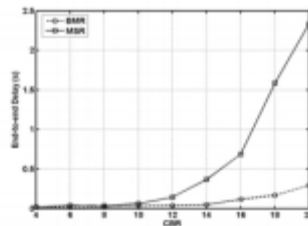


Fig 4. Packet Loss Ratio

ii) The Throughput is calculated by using the following formula:

$$\text{Throughput} = \frac{R_x}{\text{Time}}$$

To obtain the end-to-end average throughput the number of received packets (Rx) are expressed in bits and divided by the total time of simulation

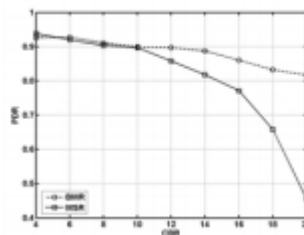


Fig 5. Throughput

iii) The Packet Delivery Ratio is calculated by using the following formula:

$$\text{Packets Delivery Ratio} = \frac{R_x}{T_x}$$

The number of received packets (Rx) is divided by the number of transmitted packets (Tx) in order to obtain the end-to-end average packet delivery ratio.

International Journal of Innovative Research in Computer and Communication Engineering

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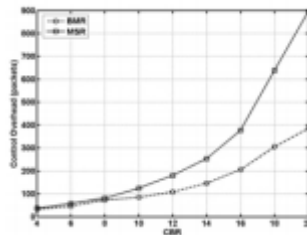


Fig 6.Packet Delivery Ratio

VI. CONCLUSION

This paper presents bandwidth Aware Routing Protocol ,in which path selection is done based on path available bandwidth. The proposed Bandwidth aware routing protocol with SIC achieved high overall end-to-end throughput. Performance evaluation is done based on the results of the simulation done using ns2. The simulation results shows that the protocol has better performance in improving end-to-end throughput,packet delivery ratio.We discussed various methods for bandwidth estimation.

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