Design of SCS Protocol and Analysis of Quality of Service Parameters for Wireless Sensor Networks

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ABSTRACT: For wireless applications, significant research has been devoted to support real-time transmission with better quality of service requirements. For next generation, a wireless hybrid network that integrates a MANET (Mobile Adhoc Wireless Network) network has been proven to be a better alternative. Guaranteeing of QoS in hybrid networks remains an open problem. In this paper, we propose a new SCS protocol to enhance the QoS Support capability of hybrid networks. This SCS protocol incorporates four algorithms: 1) Path Selection Algorithm to identify the neighbouring node at shortest distance to reduce the delay 2) Routing Algorithm for hopping of data packets via different nodes.3) Mobility Algorithm to decrease the transmission time.4) Multipath Selection Algorithm in order to improve the QoS. Analytical and simulation results of SCS can provide high QoS performance in terms of delay, average delay, throughput, packet delivery ratio. The main objective of our project is to implement the routing protocols in NS2 and to compare simulation parameters like delivery ratio, end to end delay, packet drop, packet sent using SCS, AODV and DSR protocol to provide quality of service in wireless ad hoc network.

KEYWORDS: Quality of service, routing algorithm, hybrid networks.

I. INTRODUCTION

A mobile ad hoc network is an autonomous collection of mobile devices such as laptops, smart phones, sensors that communicate with each other over wireless links and cooperate in a distributed manner in order to provide the necessary network functionality in the absence of a fixed infrastructure. This type of network operates as a stand-alone network or with one or multiple points of attachment to cellular networks or the internet. It paves the way for numerous new and exciting applications.

The Wireless Networks has stimulated numerous applications that have been used in wide areas such as commerce, emergency services, military, education and entertainment due to its rapid development. The number of Smartphone users worldwide will surpass 2 billion in 2017. Next year, there will be over 1.91 billion smart phone users across the globe, figure that will increase another 12.6% to near 2.16 billion in 2018. In wireless and mobile networking environment , the emergence of envisioned future of real time and multimedia applications have stimulated the need of high QoS[1] support.
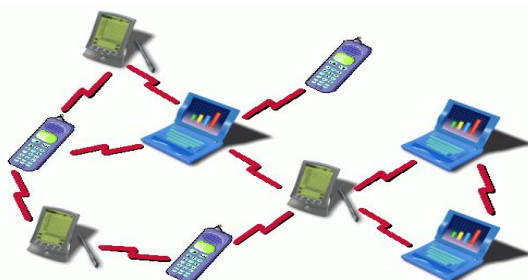

Fig 1 Mobile Adhoc Network(MANET)

For the mobile devices and wireless infrastructures the QoS support decreases and end to end transmission delay and increases throughput. The Multihop[2] cellular network have been proven to be a stringent network structure for the next generation wireless network and can help to achieve the better QoS requirements of different applications. The scalability of MANET[3] is improved by the infrastructure network , and hence the coverage area of infrastructure network is extended. From remote servers through base stations, people in vehicles can upload or download videos spreading out in a city.

However to support QoS routing in hybrid networks, little effort has been devoted. In hybrid wireless networks [4], most of the current works focus on increasing routing reliability or network capacity but cannot provide QoS-guaranteed services. When the reservation-based QoS routing protocols of MANETs are directly adopted into hybrid networks, it inherits the invalid reservation and race condition problems. Quality of Service (QoS) refers to a set of service requirements that needs to be met by the network while transporting a packet stream from a source to its destination. Informally, it refers to the probability of a packet passing between two points in the network. The network is expected to guarantee a set of measurable pre-specified service attributes to the users in terms of end-to-end performance, such as end to end delay, throughput, probability of packet loss, delivery ratio.

Some of factors that influence QoS of wireless network include

➤ **Throughput of Network**

Represents the total number of bits (in bits/sec) forwarded from wireless LAN   n   layers to higher layers in all WLAN nodes of the network.

Throughput= (nBytes*8)/(Delay[idPacket]*1000)

➤ **Delay**

End to end delay is the elapsed time between the packet sent and received.

Delay = ReceivedTime [idPacket]-SentTime[idPacket]

➤ **Packet Delivery Ratio**

Packet Delivery Ratio is the proportion of the total amount of packets reached by the receiver and amount of packet sent by the source.

Packet delivery ratio = r/s

II. THE SCS PROTOCOL

SCS is a reactive and proactive protocol; it establishes a route to a destination only on demand. It does not keep a record of all routes available in a network. The SCS Routing protocol uses an on-demand approach for finding routes, that is, a route is established only when it is required by a source node for transmitting data packets. In SCS, the source node and the intermediate nodes store the next-hop information corresponding to each flow for data packet transmission. In an on-demand routing protocol, the source node floods the route request packet in the network when a route is not available for the desired destination. It may obtain multiple routes to different destinations from a single route request. A node updates its path information only if the Destination sequence Number of the current packet received is greater or equal than the last Destination sequence Number stored at the node with smaller hop count. A Route Request carries the Source ID, Destination ID, Source Sequence Number, Destination Sequence Number, Broadcast ID, and the TTL field.

With the fast development of the Internet, wireless communications and semiconductor devices, home networking has received   significant   attention.   Consumer   products   can   collect   and

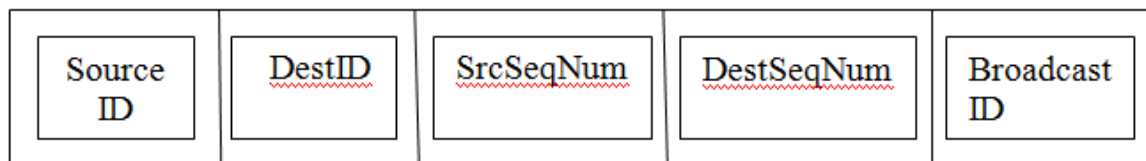| Source ID	DestID	SrcSeqNum	DestSeqNum	Broadcast ID

Fig: 2 Format for routing protocol

transmit various types of data in the home environment. Typical consumer sensors are often equipped with tiny, irreplaceable batteries and it therefore of the utmost importance to design energy efficient algorithms to prolong the

home network lifetime and reduce devices going to landfill. Sink mobility is an important technique to improve home network performance including energy consumption, lifetime and end-to-end delay. Also, it can largely mitigate the hot spots near the sink node. The selection of optimal moving trajectory for sink node(s) is an NP-hard problem jointly optimizing routing algorithms with the mobile sink moving strategy is a significant and challenging research issue.

When an intermediate node receives a route request, it either forwards it or prepares a route reply if it has a valid route to the destination. The validity of a route at the intermediate node is determined by comparing the sequence number at the intermediate node with the destination sequence number in the route request packet. If a route request is received multiple times, which is indicated by the Broadcast ID – Source ID pair, the duplicate copies are discarded. All intermediate nodes having valid routes to the destination, or the destination node itself, are allowed to send route reply packets to the source. Every intermediate node, while forwarding a route request, enters the previous node address and its Broadcast ID. A timer is used to delete this entry in case a route reply is not received before the timer expires. When a node receives a route reply packet, information about the previous node from which the packet was received is also stored in order to forward the data packet to this next node as the next hop toward the destination. After implementing SCS protocol in MANET we need to take measurements like

➢ Packet sending
➢ Packet receiving
➢ Delivery ratio
➢ Delay
➢ Throughput

In this all we need to take optimal estimations, and generate x-graph for SCS implementation.

III. AODV MEASUREMENTS

The Ad hoc On-Demand Distance Vector (AODV) is a simple and efficient routing protocol designed specifically for use in multi-hop wireless ad hoc networks of mobile nodes. AODV allows the network to be completely self-organizing and self-configuring, without the need for any existing network infrastructure or administration. It uses source routing which means that the source must know the complete hop sequence to the destination. Each node maintains a route cache, where all routes it knows are stored. The route discovery process is initiated only if the desired route cannot be found in the route cache. To limit the number of route requests propagated, a node processes the route request message only if it has not already received the message and its address is not present in the route record of the message. The sequence of hops is included in each packet's header.
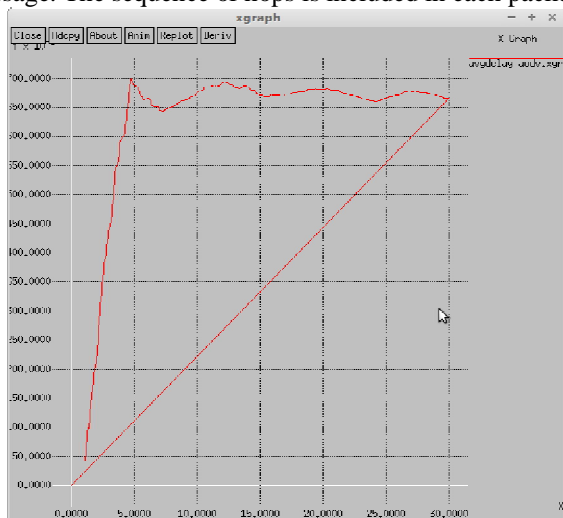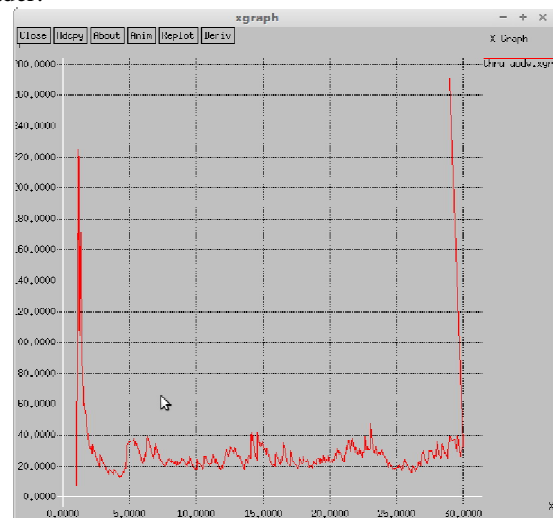

Fig: 3 Average delay in AODV

Fig: 4 Throughput in AODV

IV. DSR MEASUREMENTS

DSR (Dynamic Source Routing protocol)[6] is also a routing protocol, which is similar to AODV protocol. But, it relies on source routing instead of routing table formation at
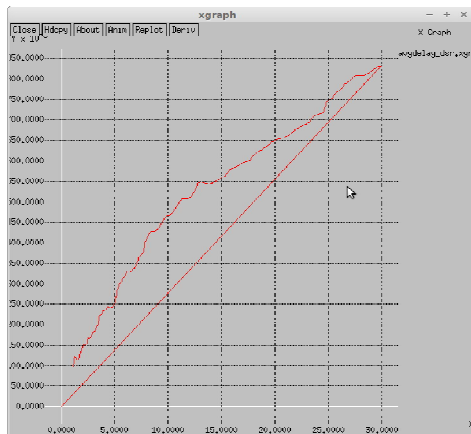
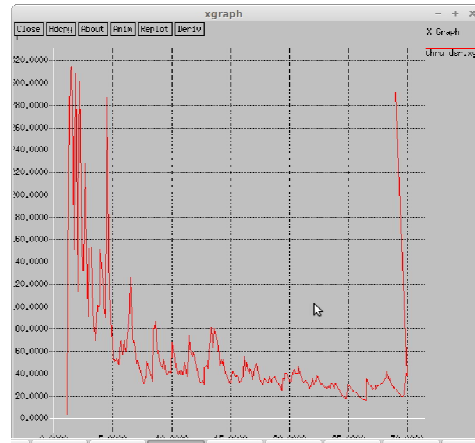

Fig: 5 Average delay in DSR

Fig: 6 Throughput in DSR

intermediate nodes. During route discovery process, source routes determining requires accumulating the address of each device between the source and destination. It uses caches for storing the routes. The intermediate nodes use the source route included in a packet to determine to whom a packet should be forwarded. The disadvantages of DSR over AODV can be given by, the packet header size grows with route length due to source routing. AODV attempts to improve on DSR by maintaining routing tables at the nodes, so that data packets do not have to contain routes.

V. PERFORMANCE ANALYSIS

The packet delivery ratio of the three protocols can be analysed using the fig: 7, Performance of the DSR is reducing regularly while PDR is increasing in the case of AODV and SCS. SCS is better among the three protocols.
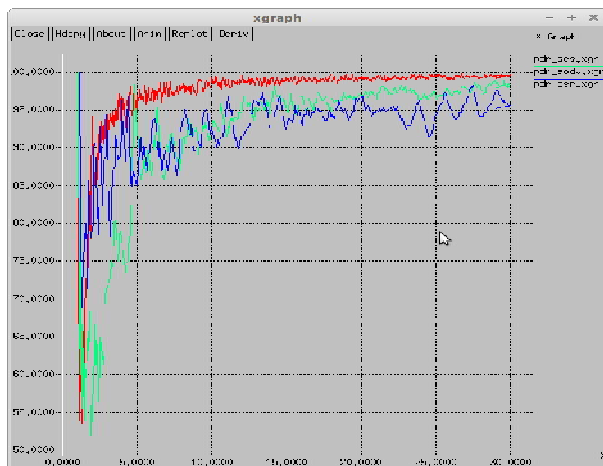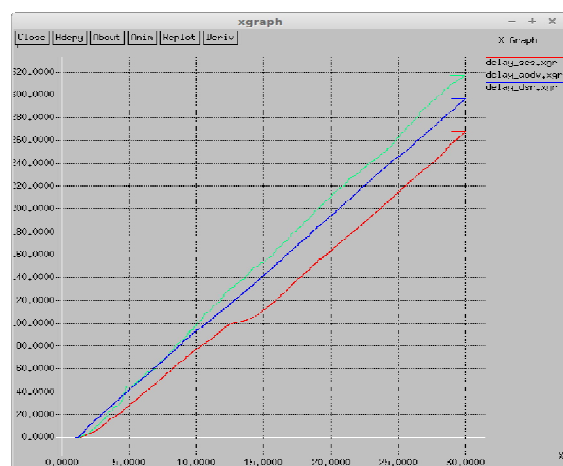

Fig: 7 Packet delivery ratio analysis

Fig: 8 Analysis of Delay

The delay of the three protocols can be analysed using the analysis graph, as Delay is defined as the time taken by the data packets to reach the destination. This includes all possible delays caused by buffering during route discovery latency, queuing at the interface queue.

VI. CONCLUSION

In hybrid networks, little effort has been devoted to support QoS routing. In this paper, we propose an SCS protocol for hybrid networks to provide QoS services in a highly dynamic scenario. The source node schedules the packets to a number of qualified neighbour nodes. Thus the three popular ad hoc routing protocols SCS, AODV and DSR [5] have been compared. The performance of the protocols were measured with respect to metrics like Packet delivery ratio, delay etc. Performance levels of the general AODV decrease when the numbers of malicious node increase. But performance levels of the general SCS increase even though the numbers of malicious node increasing. The results of the simulation indicate that performance of the SCS protocol is better than AODV and DSR protocols. Use of location, mobility, power consumption, probability of resource, and route availability are some of the issues currently being examined and needing further.

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