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REVIEW ARTICLE

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A REVIEW ON AODV AND GPSR ROUTING PROTOCOLS IN WSN

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Abstract— Wireless sensor networks(WSNs) are comprised of many randomly distributed sensor nodes, with features of high mobility, dynamic topology and frequent disconnection of nodes. These nodes are re-capable of measuring geographical and physical characteristics of the surrounding environment using radio waves as links between them. The physical characteristics they measure may be whether, crops, humidity, earthquakes, surveillance etc. WSNs are different from wireless Local Area Networks (WLANs) and other computer networks in terms of limited resources like memory, power and life span. Energy usage is the greatest challenge for the WSNs. Today a tremendous amount of testing and researches are being done on the WSNs and its applications but still some issues need to be rectified.
Many routing protocols are being deployed in this field. Some very important protocols are LEACH,AODV and GPSR ,etc. It is observed that AODV and GPSR are found to be very robust routing algorithms. Since AODV is routing protocol used in the MANETS hence provides a better algorithm for highly mobile nodes in WSN similarly GPSR is the well knows geographic routing protocol which uses the geographical positions of the randomly distributed nodes to make the routing path.

Index Terms-WSN,WLAN,MANETS, AODV, GPSR

1. INTRODUCTION

The Wireless Sensor Network[1] is explained as a random movement of mobile nodes in wireless scenario, in order to find the best possible path between sources to destination node; routing protocols are employed in wireless communication. As there is no dedicated link between the nodes, a routing strategy is helpful in finding the best and (low cost) shortest path. The wireless networks are mainly categorized into two types of networks these are infrastructure based network and infrastructure-less (also known as Ad-hoc network). In case of infrastructure based networks there is a base station called access point (AP) which establishes a wireless communication link between AP and a mobile data terminal having antenna (can be a laptop or tablet computer).The routing algorithm is also controlled by these access points, in wireless scenario. While in Ad-Hoc network there is no such an central point(or access point).Here nodes are self-configured and connect each other in ad-hoc manner. In WSNs the nodes are distributed in random manner and communicate to the base stations for data packet exchange.The range of transmission is fixed. While in Infrastructure less networks the base station or access point is not used. Here, every node which participates in the network fulfills all the working of base station and routing decisions are also taken by them. In a wireless network which has many distributed devices in random fashion to mutually measure the physical or geographical conditions such as heat, sound, frequencies, pressure, velocity, pollutants and humidity from different locations of the earth. In a typical WSN there exists a lot of small sensor devices in the detection zones and all the sensor nodes uses the radio signals to communicate wirelessly to form a multi-hop and self organized network system. All the sensor nodes communicates with each other to stay connect and with the data in the detected field and then send the result to the observer[2,3]. In addition nodes in WSN are prone to failure due to energy depletion, device failure, disconnection and low security due to malicious attack and so on[4].It results in low reliability of performance of sensor networks.

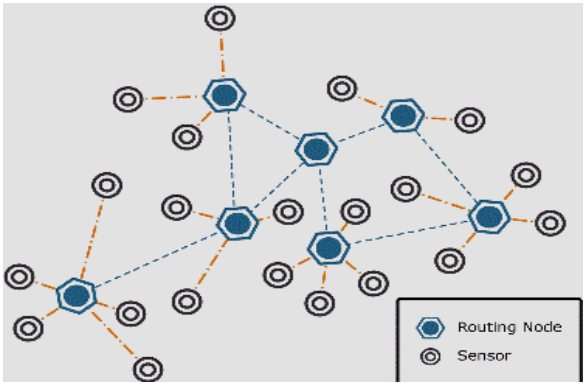

Fig 1.Wireless Sensor Terminal with Base Stations

There exists several of AODV based routing protocols proposals and implementations which are suitable are have been designed for environment of WSN such as AODVjr[5],AODVbis[6],Gossiping Based AODV,etc.In the Sections below we will discuss about some protocols and their categories.

2. BACKGROUND

2.1Wireless Sensor Network Protocols

2.1.1 MAC Protocols

Medium Access Control (MAC) protocols solve a seemingly simple task: they coordinate the times where a number of nodes access a shared communication medium.
For the case of WSNs, the balance of requirements is different from traditional (wireless) networks. Additional

requirements come up, first and foremost, the need to conserve energy.

2.1.2 IEEE 802.15.4 Family Protocols

The Institute of Electrical and Electronics Engineers (IEEE) finalized the IEEE 802.15.4 standard in October 2003 . The standard covers the physical layer and the MAC layer of a low-rate Wireless Personal Area Network (WPAN).

The targeted applications for IEEE 802.15.4 are in the area of wireless sensor networks, home automation, home security, etc.

2.2. MOBILE AD HOC NETWORK ROUTING PROTOCOLS

Routing protocols for Mobile ad hoc networks can be broadly classified into three main categories:

2.2.1 Proactive (table driven) Routing Protocols

Each node in the network has routing table for the broadcast of the data packets and want to establish connection to other nodes in the network. These nodes record for all the presented destinations, number of hops required to arrive at each destination in the routing table [7]. The routing entry is assigned with a sequence number which is created by the destination node. To maintain the stability, each station broadcasts and modifies its routing table from time to time.

The proactive protocols are suitable for less number of nodes in networks, as they required to update node completely for each and every node in the routing table of every node. It results more Routing overhead problem. There is consumption of more bandwidth in routing table.

2.2.2Reactive (on-demand) Routing Protocols

In this protocol, a node starts a route discovery process throughout the network, only that time it wants to send packets to its destination. This process is completed once a route is determined or all possible permutations have been examined. Once a route has been established, it is maintained by a route maintenance process until either the destination becomes inaccessible along every path from the source or the route is no longer desired. A route search is needed for every unknown destination. Therefore, theoretically the communication overhead is reduced at expense of delay due to route search.

2.2.3Hybrid routing protocols

This protocol incorporates the advantages of proactive as well as reactive routing protocols. Nodes are grouped into zones based on their geographical locations or distances from each other. In a single zone, routing is done using table-driven mechanisms while an on-demand routing is implemented for routing beyond the zone limits. The routing table size and update packet size are reduced by some extent thus, control overhead is reduced.

3. PREVIOUS WORKS

3.1 AODV in WSN

As we know AODV is a routing protocol used in Mobile Ad-hoc Networks (MANETS).The large amount of researches are being done in this field day by day. Some of them are:

(a)-Improvement in AODV routing protocol using network node mobility rate.

(b)-Route Enhanced AODV (RE-AODV) for QoS support[8].

(c)-Non Grade Based AODV for reducing the energy Consumption.

3.2 GPSR in WSN

Like AODV, GPSR is also a routing protocol which uses the position of nodes to communicate with. This protocol also has a large area for researches. Some has been done like:

(a)-GPSR using the greedy algorithm and perimeter algorithm [9].

(b)-GPSR for asymmetric Wireless Sensor Network.

3.3 Results

Parameter	AODV	GPSR
Route Setup time	High	Low
Route Maintenance Requirements	High	Moderate
Performance while mobility	High	Low
Type	Topology Based	Position Based
Method	Establishes link by sending packets(Like RREQ,RREP)	Establishes by using Greedy Forwarding and Perimeter Forwarding
Bandwidth Requirements	High	Low

4. Ad-Hoc On Demand Distance Vector (AODV) Routing Protocol

AODV shares DSR's on-demand characteristics in that it also discovers routes on an *as needed* basis via a similar route discovery process. However, AODV adopts a very different mechanism to maintain routing information. It uses traditional routing tables, one entry per destination, which can maintain multiple route cache entries for each destination. Without source routing, AODV depends on routing table data to propagate an Route Reply data packet(RREP) back to the source node and, then, to route data packets to the destination. AODV uses sequence numbers entered at each destination packet's header to determine whether routing information is updated or not and to prevent routing loop backs. These sequence numbers are entered in the header of all routing packets. A very necessary function of AODV is the maintenance of time-value based states in each node, with respect to use of individual routing table entries. A routing table entry is *expired* if it is not used for long time(recently).A group of predecessor nodes is made for each routing table entry, indicating the group of near-by nodes which use that entry to route data packets. These nodes are notified with Route

Error (RERR) packets when the next-hop communication link interrupted. Each antecedent node, forwards the Route Error packet to its own group of antecedent nodes and hence effectively erasing all routes using the broken communication links. Route Error packets (RERR) in AODV are used to inform all source nodes using a link when a failure in communication link occurs. Route error process in AODV can be explained theoretically as a tree like data structure whose root is treated as the node at the point of failure of communication link and all source nodes using the failed communication link are its leaves. The recent specification of AODV includes an optimization technique to control the RREQ flood in the route discovery process. It uses an *expanding ring search* initially to discover routes to an unknown destination. In the expanding ring search, increasingly larger neighborhoods are searched to find the destination. The search is controlled by the Time-To-Live (TTL) field in the IP header of the RREQ packets. If the route to a previously known destination is needed, the prior hop-wise distance is used to optimize the search. This enables computing the TTL value used in the RREQ packets dynamically, by taking into consideration the temporal locality of routes.

5. Greedy Perimeter Stateless Routing (GPSR)

GPSR is a well-known geographic routing protocol which uses geographic positions of nodes to make the routing path. It assumed that each node known its own geographical location using global positioning system (GPS). GPSR makes greedy forwarding decision using only information about routers immediate node in the network topology. When a packet reaches a region where greedy forwarding is impossible the algorithm uses the concept of routing around the perimeter of the region by keeping state only about the local topology. GPSR uses the greedy approach to find out the immediate neighbors, which works on the principle that the node which is closest to the destination. An example of Greedy node explained in the figure .Here '**S**' want to send a packet to the destination '**D**'.

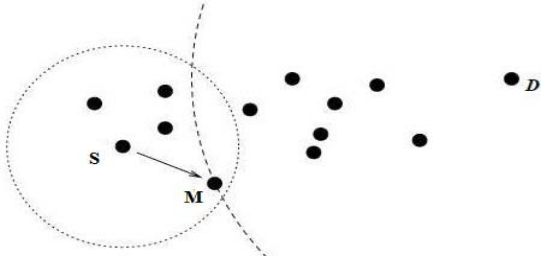

Fig.2 Routing in GPSR

S's radio range is denoted by the dotted circle and it forward the packet to '**M**', which is closest to the destination '**D**', the process continues until the packet reaches to the destination. In case of greedy failure or not receiving a packet from a neighbor for longer time than time out interval 't', GPSR router deletes the neighbor from its table. Greedy forwarding is based only on knowledge of only forwarding node immediate neighbors. This helps WSN due to high Mobility of nodes. GPSR proposed the perimeter forwarding algorithm, but it's not an efficient, especially in urban area.

6. PERFORMANCE PARAMETERS FOR COMPARISON

We will take three performance parameters for study on AODV and GPSR which are End-to End delay, Packet Delivery Ratio, Throughput for both in rural and urban environment.

6.1 End -to-End Delay

The average end-to-end delay of data packets is the interval between the data packet generation time and the time when the last bit arrives at the destination. A low end-to-end delay is desired in any network.

The average time required for transmitting a data packet from source node IP layer to the destination IP layer, including transmission, propagation and queuing delay.

Average End-to-End Delay = Σ (Time when Packets enters in the Queue) - Σ (Time when the Packet is received)

6.2 Packet Delivery Ratio

Packet Delivery Ratio (PDR) is the ratio between the number of packets transmitted by a traffic source and the number of packets received by a traffic sink. It measures the loss rate as seen by transport protocols and as such, it characterizes both the correctness and efficiency of ad hoc routing protocols. A high packet delivery ratio is desired in any network.

6.3 Throughput

Throughput is the number of packet that is passing through the channel in a particular unit of time. This performance metric show the total number of packets that have been successfully delivered from source node to destination node and it can be improved with increasing node density.

6. SUMMARY

In this paper we have studied about the WSN protocol and the various routing protocols like AODV and GPSR and various performances metric like end to end delay, packet delivery ratio, and throughput in various Environments.

In future we can simulate the above mentioned routing protocols with the same performance metrics with varying the mobility model and conclude their performance that how they behave with mobility model and packet sizes.

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