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Safe Data Discovery and Dissemination in Mobile Wireless Sensor Network

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ABSTRACT

Currently there is no standard for MWSNs, so often protocols from MANETs are borrowed. MANET protocols are preferred as they are able to work in mobile environments, whereas WSN protocols often aren't suitable. WSN routing protocols provide the required functionality but cannot handle the high frequency of topology changes as well as data discovery and dissemination in mobile wireless sensor network. So WSN protocols are not effective. So position based routing protocol like AODV, DSR, AOMDV and DSDV can be used. After checking them on Network simulator NS2 for Packet Delivery Ratio, Packet drop ratio, routing overhead, network throughput, total received packet, command packet it is found that DSR protocol best suited for secure Data dissemination and discovery.

Keywords: WSN, AODV, DSR, AOMDV, DSDV

I. INTRODUCTION

A wireless ad hoc network is an answer to novel wireless structures that are self-healing and self-organizing in which each node can participate in routing and all of devices have equal status in the network and they can have connection with definite range for other deceives. Wireless sensor network are highly distributed network of all small and light weighted nodes, which are spread over the system in large numbers for the measurement of physical parameters such as temperature, pressure, relative humidity.

Each node of the sensor network consists of three subsystems.[1,2,3]

1. Sensor subsystem which sense the environment,
2. Processing subsystem which performs local computation on the sensed data,
3. Communication subsystem is responsible for message exchange with neighboring sensor node.

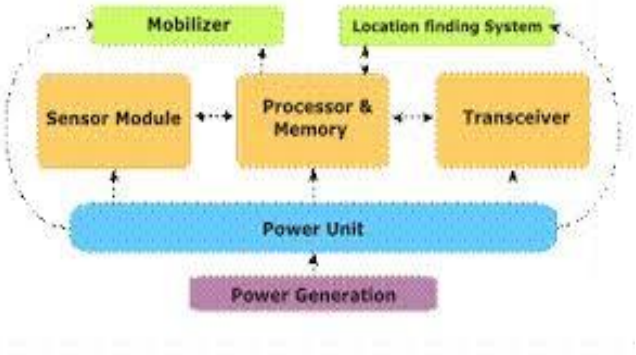

Fig. 1 Sensor node

one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a processing unit usually a microcontroller, an electronic circuit for interfacing with the sensors module and an power unit, usually a battery or an embedded form of energy harvesting. A sensor node might vary in size from very small to large. A wireless sensor network (WSN) consists of spatially distributed autonomous sensors to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity.

In other words, a wireless sensor and actuator network is a collection of small randomly dispersed devices that provide three essential functions: the ability to monitor physical and environmental conditions, often in real time, such as temperature, pressure, light, humidity and other daily life parameters, the ability to operate devices such as switches, motors or actuators that control those conditions and the ability to provide efficient & reliable communication. The sensor node has limited resources like energy, size, memory, computational power, communication range, bandwidth, so a large no of sensor nodes are distributed over an area of interest for collecting the information. So these nodes communicate with each other either directly or through intermediate nodes and thus form a network, so each node work as a router.

Most available wireless sensor devices are considerably constrained in terms of computational power, memory, efficiency and communication capabilities due to economic and technology reasons. WSNs nodes are battery powered which are deployed to perform a specific task for a long period of time, even years.

The main characteristics of a WSN include: [4,5]

1. Power consumption constrains for nodes using batteries or energy harvesting
2. Ability to cope with node failures
3. Mobility of nodes
4. Communication failures
5. Heterogeneity of nodes
6. Scalability to large scale of deployment
7. Ability to withstand harsh environmental conditions
8. Ease of use
9. Power consumption

Most commonly used applications of WSN in today's world are.

1. Area monitoring
2. Health related parameters monitoring
3. Air pollution monitoring
4. Forest fire detection
5. Landslide detection
6. Water quality monitoring
7. Natural disaster prevention
8. Industrial monitoring
9. Machine health monitoring
10. Data logging
11. Water/Waste water monitoring
12. Vehicular movement monitoring

II. LITERATURE REVIEW

D. He, S. Chan, Mohsen, Guizani, H. Yang [6] presents a first secure and distributed data discovery and dissemination protocol. To simultaneously and directly disseminate data items, it will allow the network owner to the authorized multiple network user with the different privileges to the sensor node and it addresses number of possible security vulnerability consists of four phases, system initialization, user joining, and packet preprocessing and packet verification. This protocol is suitable for Fixed WSN.

Niewiadomska-Szynkiewicz, Ewa, Piotr Kwaśniewski, and Izabela Windyga [7]in paper discussed about ad hoc networks which are the ultimate technology in wireless communication that allows network nodes to communicate without the need for a fixed infrastructure. This paper addresses issues associated with control of data trans- mission in wireless sensor networks (WSN) – a popular type of ad hoc networks with stationary nodes. Since the WSN nodes are typically battery equipped, the primary design goal is to optimize the amount of energy used for transmission.

A. Senthil Kumar, S.Velmurugan, Dr. E. Logashanmugam[8] Proposes a secure and distributed data discovery and dissemination protocol named (DiDrip). Data discovery and dissemination protocol for wireless sensor networks (WSNs) is liable for updating configuration parameters of the sensor nodes, also they are responsible for the distribution of management commands to all wireless sensor nodes,. As par author existing data discovery and dissemination protocols suffer from two drawbacks. First, they are based on the unified approach; only the base station can distribute data item. Such an approach is not suitable for emergent multi-owner and multi-user WSNs. Second, those protocols were not designed with security in mind and hence adversaries can easily launch attacks to harm the network. Paper has also given the evaluation results of DiDrip on NS2 SIMULATOR, which shows that DiDrip is feasible in practice.

III. RESULTS

After reviewing of literature it is found that currently there is no standard for MWSNs[9], so protocols from MANETs are borrowed. MANET protocols are preferred as they are able to work in mobile environments, whereas WSN protocols aren't suitable as they are required to be energy efficient as per inherent property of WSN.WSN routing protocols provide the required functionality but cannot handle the high frequency of topology changes as well as data discovery and dissemination in mobile wireless sensor network. So WSN protocol like LEACH is not effective. Choice reduced to position based routing protocol like AODV, DSR, AOMDV and DSDV. We compare them for Packet Delivery Ratio, Packet drop ratio, routing overhead, network throughput, total received packet, command packet and get the result as shown below.

Table I: Parameter value used in the simulator

Parameter	Value
Simulator	NS2
MAC_TYPE	802_11
Propagation Model	Two ray ground
Routing Protocol	AODV,AOMDV,DSR,DSDV
Networks interface type	WirelessPhy
Interface Queue Type	Queue/DropTail/PreQueue
Channel Type	Wireless Channel
Antenna Type	Omni-dirctional
Number of Nodes	24
Time	100
Area	2000 x 2000

TABLE II: Result of AODV, DSR, AOMDV, DSDV

Routing Protocol	Packet Delivery Ratio	Packet Drop ratio	Routing Overhead ratio	End-to-End Delay	Throughput	Total Recived Packet
AODV	0.945696	0.054304	0.090869	0.072415	183790.4	6757
DSR	0.200000	0.800000	0	0.035096	53.333333	2.00000
AOMDV	0.990763	0.009237	0.721430	0.138853	192548.8	7079
DSDV	0.891533	0.108467	0	0.700885	173266.7	6370

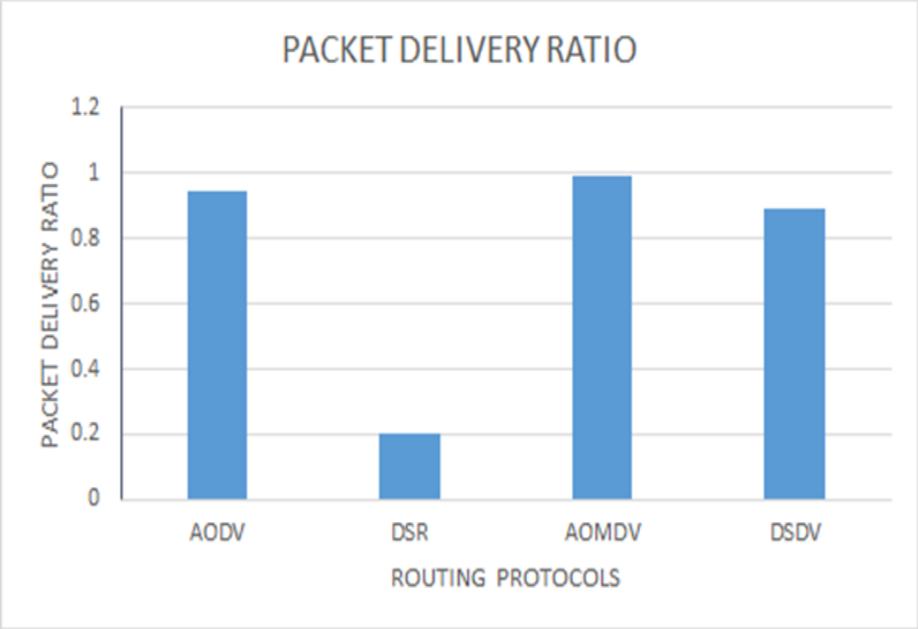

Fig. 2 Graph of Packet delivery ratio

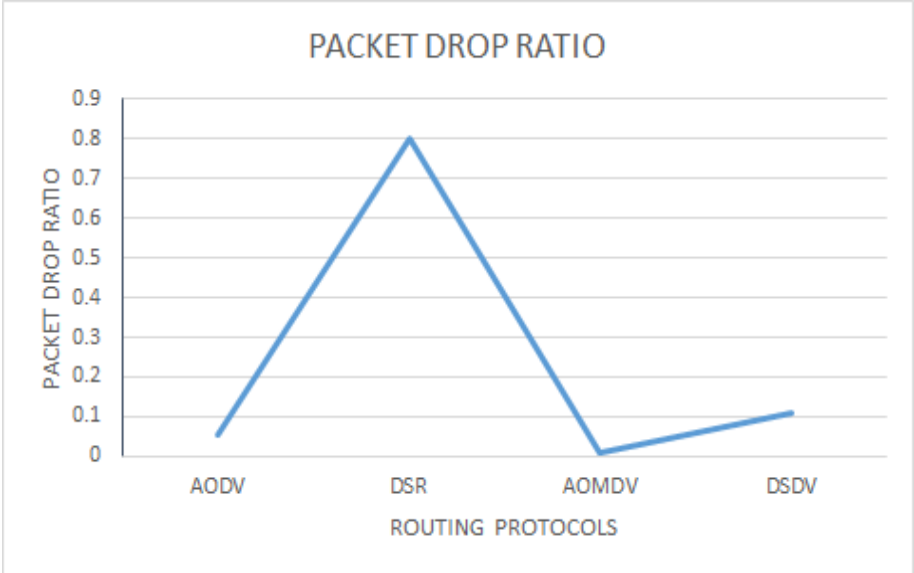

Fig. 3 Graph of Packet Drop ratio

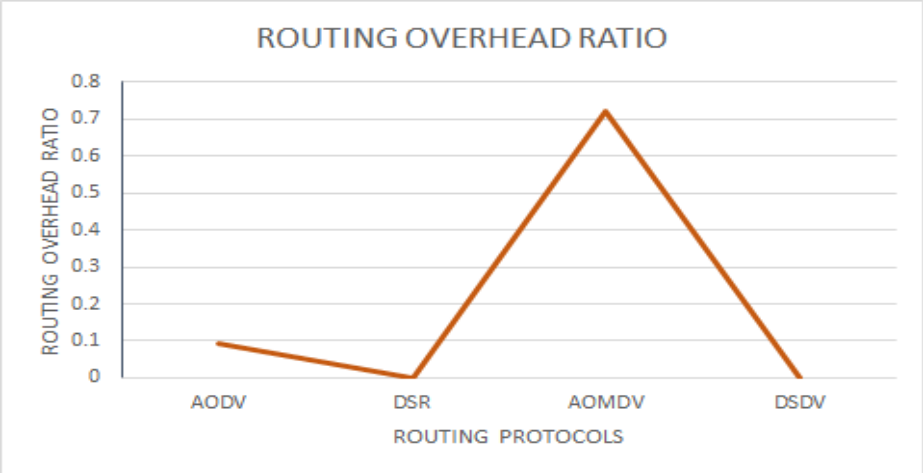

Fig. 4 Graph for routing overhead ratio

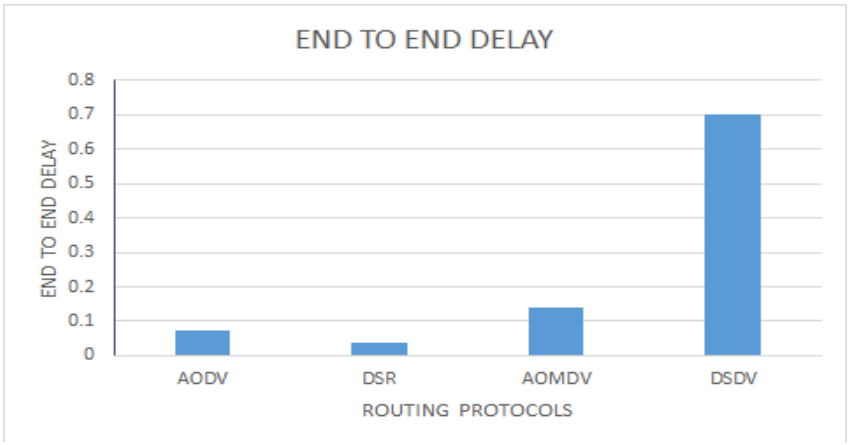

Fig. 5 Graph for End to End delay

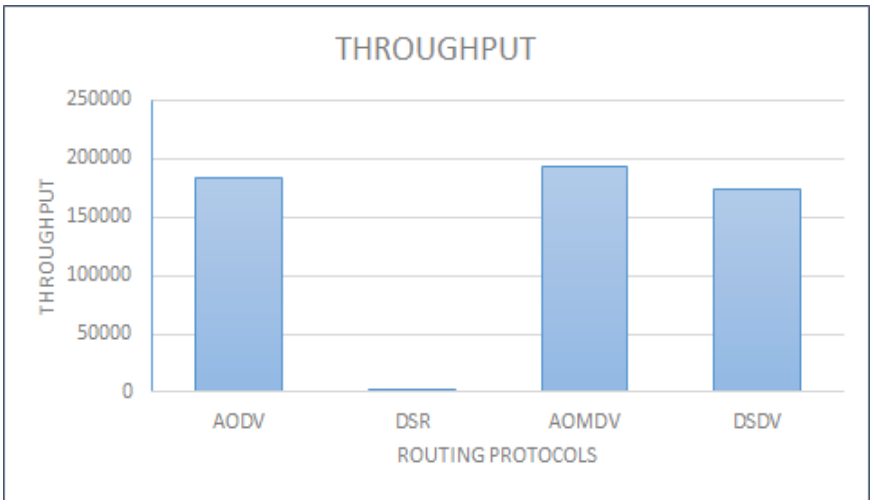

Fig. 6 Graph for Throughput

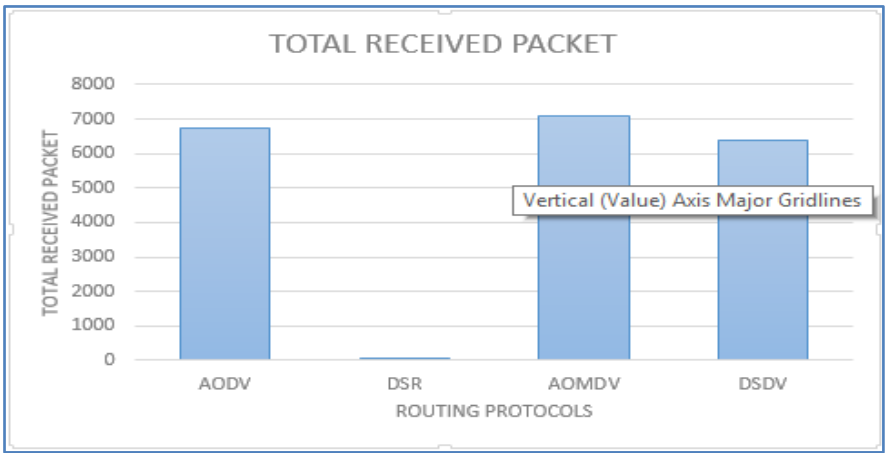

Fig. 7 Graph for total received packets

CONCLUSION

Since there is no fixed topology in these networks, one of the greatest challenges is routing data from its source to the destination. Generally these routing protocols are motivated from two fields; WSNs and MANET. WSN routing protocols provide the required functionality but cannot handle the high frequency of topology changes. MANET routing protocols can deal with mobility in the network but they are designed for two way communication, which in sensor networks is often not required. But in case of mobile Wireless sensor, MANET protocols are used for WSN. AODV, DSR, DSDV, AOMDV protocols are preferred as they are able to work in mobile environments, whereas WSN protocols often aren't suitable. After all the above protocol, it is concluded that AOMDV is Suitable for mobile wireless

sensor network. as parameter which are fit for Data dissemination like Packet delivery ratio, packet drop ratio, throughput, total received packet are better in case of AOMDV. But for better performance low end to end delay is required which is lowest for DSR. Also, for good Data discovery a routing overhead is required which is better in case of AODV that why if AOMDV have this capability that of AODV than it is better for Data discovery.

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