PERFORMANCE ANALYSIS OF DIRECTED DIFFUSION AND FLOODING PROTOCOL

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Abstract : ***Wireless Sensor Networks (WSNs) consist of millions of tiny nodes having the power of sensing, computation and wireless communications. Many routing, power management, and data dissemination protocols have been specifically design for WSNs where energy consumption is an essential design issues. Since wireless sensor network protocols are application specific, so the focus has been given to the routing protocols that might differ depending on the application and network architecture. The study of various routing protocols for sensor networks presents a classification for the various approaches pursued. The three main categories explored are data-centric, hierarchical and location-based. Each of the routing schemes and algorithms has the common objective of trying to get better throughput and to extend the lifetime of the sensor network. The main categories explored in this paper are data-centric.***

IndexTerms -Wireless Sensor Networks, Routing, Flooding, Directed Diffusion

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I. INTRODUCTION

A **mobile ad hoc network** (**MANET**) is a continuously self-configuring, infrastructure-less network of mobile devices connected without wires. Ad ho*c* is Latin and means "for this purpose". Each device in a MANET[1] is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet. They may contain one or multiple and different transceivers between nodes. This results in a highly dynamic, autonomous topology.

1.1 Directed Diffusion

Directed diffusion (DD) is typical data-centric protocol for wireless sensor networks, all nodes in a directed diffusion based network are application-aware, and savings by selecting empirically good paths and by caching and processing data in-network But at the beginning of routing being established, interest must be flooded throughout the network, Directed Diffusion Protocol (DDP) which could meet the features of WSN, such as data-oriented, many-to-one transmissions and low energy costs, together with data aggregation mechanisms which emphasized on cascading timeouts, to eliminate the redundancy caused by the transmission of large amounts of data[2].

Directed diffusion finds routes from multiple sources to a single destination that allows in-network consolidation of redundant data (Aggregation). Directed diffusion is a typical query-based routing, it consists of several elements. Data is named using attribute-value pairs. A sensing task is disseminated throughout the sensor network as an interest for named data. This dissemination sets up gradients within the network designed to “draw” events (i.e., data matching the interest). Events start flowing towards the originators of interests along multiple paths. The sensor network reinforces one, or a small number of these paths.

1.2 Flooding

Flooding protocols the broadcast of messages is a frequently used operation to spread information to the whole network[2]. It is the simplest building block used by network algorithms and is often required by higher level protocols such as most routing algorithms. For this reason, it is important for the broadcast to be implemented in the most efficient way. Its performance is likely to affect the global efficiency of any protocol using it. Flooding is an old technique that can also be used for routing in sensor networks. In flooding, each node receiving a data or management packet repeats it by broadcasting, unless a maximum number of hops for the packet is reached or the destination of the packet is the node itself. Flooding is a reactive technique, and it does not require costly topology maintenance and complex route discovery algorithms.

II. Literature Review:

Table 2.1:developments in the field of routing protocols

S. No.	Paper Title	Author	Publishing Year	Features	Simulator	Conclusion
1	Routing in Wireless Sensor Networks	Gaurav Sharma	2009	Comparison of Flooding and Directed Diffusion is done	Ns2	Directed Diffusion is better than Flooding and for short range communication
2	Routing And Data Dissemination In Wireless Sensor Networks	Sanjeev Kumar Gupta	2010	Survey on Different protocols are done and a new model is	C#	Proposed architecture is helpful in crisis management

				proposed		
3	Performance Analysis Between Flooding and Directed Diffusion Protocol	Deepesh Dewangan and Ms.Manisha Rajpoot		Comparison of Directed Diffusion and Flooding protocol is done	Ns2	Directed Diffusion is much better than traditional Flooding scheme
4	Routing And Scheduling For Real-Time Data Dissemination In Sensor Networks	Ke Liu	2000	A new scheduling algo" Just-in-Time Scheduling" is developed	Ns2	accomplishes real-time support by delaying packets a fraction of their slack time at each hop
5	Data Dissemination and Sharing in Mobile Computing Environments	Xiaopeng Fan	2010	a generalized hierarchical gossiping algorithm (GosCC) is proposed and simulation is done to validate effectiveness	Ns2	Simulation results show that GosCC achieves better performance than other alternatives in terms of average interruption intervals and average interruption times
6	Directed Diffusion Routing Protocol	Rajkumar Vijayaraman	2005	An algorithm is proposed to make Directed Diffusion more secure		This algorithm can be used for applications which require authentication and confidentiality
7	Mobile Ad Hoc Networking: Imperatives and Challenges	Pravin Ghosekar, Girish Katkar, Dr. Pradip Ghorpade	2010	This paper describes about MANET and its dimensions in brief	Ns2,Glomosim	Mobile Ad-hoc network is the best solution of different problems of network
8	Energy-efficient Secure Directed Diffusion Protocol for Wireless Sensor Networks	Malika Belkadi,Rachida Aoudjit, Mehammed Daoui, Mustapha Lalam	2014	A new version of Directed Diffusion protocol is presented which provides both security and energy-efficiency	Jsim	secure Directed Diffusion outperforms the original version of Directed Diffusion in terms of energy in presence of the attacks
9	Directed Diffusion: A Scalable and Robust Communication	C. Intanagonwiwat and R. Govindan and D. Estrin	2000	This approach decouples data from the sensor that produced it and unique identification of nodes is of secondary Importance	Simple Simulator	Design is difficult & localized algorithms tend to be sensitive in the choice of parameter values
10	Energy-Efficient Data Broadcasting in Mobile Ad-Hoc Networks	Le Gruenwald, Muhammad Javed, Meng Gu	2002	Applicable to the case where multiple servers and multiple clients exist in a certain area. The (1, m) indexing scheme is used in this algorithm	Awesim	Replacement algorithms provide better energy consumption for clients and servers but do not give good broadcast hit ratio and access time.

III. Proposed Work:

Most current MANET routing protocols assume that the wireless network in benign and every node in the network strictly follow the routing behavior and is willing to forward packets to/for other nodes. Most of these protocols cope well with the dynamically changing topology. However, they do not address the problems when misbehavior nodes are present in the network. A commonly observed misbehavior is packet dropping. Practically, in a WSN, most devices have limited computing and battery power while packet forwarding consumes a lot of such resources. The design of routing protocols for WSN's must consider the power and resource limitation of the network different protocols with different topologies has been evaluated with different simulation time. The primary objective of this paper is to improve the throughput in WSNs which is achieved by the following manner:

- To analyze, implement and evaluate Flooding protocol.
- To analyze, implement and evaluate the directed diffusion protocol.
- A comparison is being performed between the two protocols.
- In order to evaluate the performance of the network, the throughput with different topologies was analyzed. Now the results of the simulation is analyzed. The analysis is being done on the basis of the results of *.nam file and the *.tr file. We also evaluate the performance of the protocol. In the ns2-allinone package NAM is a build-in program. NAM helps us to see the flow of message between the nodes. It also shows the packets are dropping or reaching to the destination properly. When the TCL file is written, NAM is invoked inside that file. With the help of 2D and 3D graphs we have tried to analyze the simulation with different simulation time. The scripts for the NAM is stored as *.nam and for tracegraph *.tr is used. The simulation has been mainly divided in two parts that are given below:
- Simulation of flooding protocol
- Simulation of Directed Diffusion protocol
- The comparison between Flooding and Directed Diffusion is performed over the common factors like throughput of dropped packets, end-to-end delay and energy consumption in the network for different number of nodes.
- The performance metrics chosen for the evaluation of black hole attack are average end-to-end delay, average throughput and average energy:

  Average End-to-end Delay (EED)-It is average time taken for a data packet to shift from source to the receivers. It is measured in milliseconds (ms).EED = Total EED msNumber of packet sent

  Average Throughput-It refers to how much data can be moved from source to the receivers in a given period of time. It is measured in Kbps (kilo Bits per Second) [52].Average Throughput = Number of bytes received * 8 kbps

  Simulation Time * 1000

All the simulation work is performed in Ns2 wireless network simulator version 2.34. Number of nodes ranges from10 to 50 under 200seconds as simulation time. All the scenarios have been designed within a terrain 750m*750m. Packet size of each datagram is 1000 bytes and maximum queue length is set to 50 packets. The overall simulation parameters are depicted in table below:

Table3.1:Simulation Parameters

Parameters	**Value**
Simulator	Ns-2.34
Area	750m * 750m
Routing Protocol	Directed Diffusion & Flooding
Simulation Time	100s
Number of nodes	10, 20, 30 , 40, 50
Packet Size	1000 bytes
Movement Model	Random Way Point

IV: Result:

Table4.1:Throughput (Kbps) Vs Number of Nodes (n)

Number of Nodes	10	20	30	40	50
Flooding	321.5216	324.1674	328.4602	335.5839	337.1196
Directed Diffusion	324.2339	352.9425	416.5442	585.1765	619.4549

Table4.2: Average Energy (%) Vs Number of Nodes (n)

Number of Nodes	10	20	30	40	50
Flooding	70.27606	201.3017	381.0686	568.3496	780.9345
Directed Diffusion	62	30	20	15	12

Table4.3:Average End-to-End Delay Vs Number of Nodes (n)

Number of Nodes	10	20	30	40	50
Flooding	46.6338	42.2752	35.8713	34.2834	36.8612
Directed Diffusion	80.4398	79.8997	82.0223	81.0224	82.1354

V: Conclusion:

Routing is a significant issue in Wireless Sensor Networks. The objectives listed in the problem statement have been carried out properly. In the presented work, we have discussed a comparison of two routing protocols for wireless sensor network with different simulation times.We sincerely hope that our work will contribute in providing further research directions in the area of routing.

With the results of tracegraph, we can conclude that in the case of flooding, throughput of delivered packets is quite less than the throughput in the case of directed diffusion. Also end-to-end delay is also better in the case of directed diffusion. In Directed Diffusion protocol the end to end delay is not increasing continuously. Directed Diffusion is data centric so there is no need for a node addressing mechanism. Directed diffusion can reduce the bandwidth needed for sensor networks. The energy efficiency of Directed Diffusion is nearly stable and has little impact by the increase of the network size. These results indicate that the Directed Diffusion algorithm is more efficiency in energy than the Flooding

Protocol and perform much better than the traditional Flooding scheme in similar condition of network size and work load.Since Directed Diffusion is data centric so there is no need for a node addressing mechanism. Directed diffusion can reduce the bandwidth needed for sensor networks. Each node is assumed to do aggregation, caching and sensing. Directed diffusion is energy efficient since it is on demand and no need to maintain global network topology.

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