COMPARISON OF DIFFERENT ROUTING PROTOCOLS (DSR & AODV) ON BEHALF OF EVALUATION OF DIFFERENT ROUTING PARAMETERS WITH CONSTRAINTS

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***Abstract*—A wireless sensor network is a assortment of nodes structured into a cooperative network. It is a group of small sensor nodes and wireless communication capabilities. Each node consists of dispensation capability may contain multiple types of memory have an RF transceiver, have a power source (e.g., batteries and solar cells), and accommodate various sensors. Wireless Sensor Networks (WSNs) consist of small nodes with sensing, computation, and wireless communications capabilities. Many routing, power management, and data dissemination protocols have been specifically designed for WSNs where energy awareness is an essential design issue [2].**

A Wireless Sensor Network (WSN) contains hundreds or thousands of these sensor nodes. These sensors have the aptitude to communicate either among each other or directly to an external base-station (BS). A greater number of sensors allows for sensing over larger geographical regions with greater accuracy [1].

The functionalities and parameters of individual devices in the wireless sensor network (WSN) are very narrow like dispensation speed, storage capacity, and communication bandwidth. When these devices are integrated, it will have processing capabilities, but not creature. According to the physical phenomena within the network itself we must combine these devices. Operating systems for wireless sensor network nodes are typically less complex than general-purpose operating systems both because of the special requirements of sensor network applications and because of the resource constraints in sensor network hardware platforms. Wireless sensor network's applications can be categorized using data gathering and event-driven operational approaches: Data gathering applications require sensor nodes to periodically report their data to the base station [3] [4].

The study of wireless sensor networks is challenging in that it requires an enormous breadth of knowledge from an enormous variety of disciplines. The main focus of this paper is to discuss

and evaluate the performance of different parameters in different scenarios and different terrain areas which may be small, large and very large in wireless sensor network using Dynamic Source routing protocol (DSR) and Adhoc On-Demand Distance Vector Routing (AODV) for monitoring of critical conditions with the help of parameter Ratio of received to sent.

Keywords-component; *Adhoc On-Demand Distance Vector Routing, Bandwidth, Base-station, Dynamic source routing, Wireless Sensor Networks*

I. INTRODUCTION

Wireless Sensor Networks (WSN) is intended for monitoring an environment. The main task of a wireless sensor node is to sense and collect data from a definite domain, process them and convey it to the sink where the application lies. However, ensuring the direct communication between a sensor and the sink may vigor nodes to emit their messages with such a high power that their resources could be quickly exhausted. Therefore, the collaboration of nodes to ensure that distant nodes communicate with the sink is a requirement. In this way, messages are propagated by intermediate nodes so that a route with multiple links or hops to the sink is established [6].

Sensor applications stipulate the communication of nodes to execute certain events or algorithms. In fact, three kinds of algorithms can be executed on wireless sensor networks: 1.Centralized Algorithms: They are executed in a node that posses the knowledge of the whole network. These algorithms are quite rare because of the cost of transmitting the data to make the node know the status of the complete network. 2. Distributed Algorithms: The communication is supported by message-passing. 3. Local based Algorithms: The nodes use restricted data acquired from a close area. With this local information, the algorithm is executed in one node.

The algorithm paradigm is an important factor to take into account when deciding about the routing protocol to employ in

the network. If localized algorithms are used, the routing protocol should reinforce and optimize the communication between neighbors. On the other hand, for centralized algorithms, combining the messages that simultaneously go the central node (even when they are generated by different sources) could be an advantage. The distributed algorithms should efficiently support the communication between any two pairs of nodes. Finally, local based algorithms depend on some solution that provides geographic coordinates, like GPS, making the solution more expensive [7].

A typical Wireless Sensor Network (WSN) is built of several hundreds or even thousands of "sensor nodes". The topology of WSNs can vary among star network, tree network, and mesh network. Each node has the ability to communication with every other node wirelessly, thus a typical sensor node has several components: a radio transceiver with an antenna which has the ability to send or received packets, a microcontroller which could process the data and schedule relative tasks, several kinds of sensors sensing the environment data, and batteries providing energy supply.

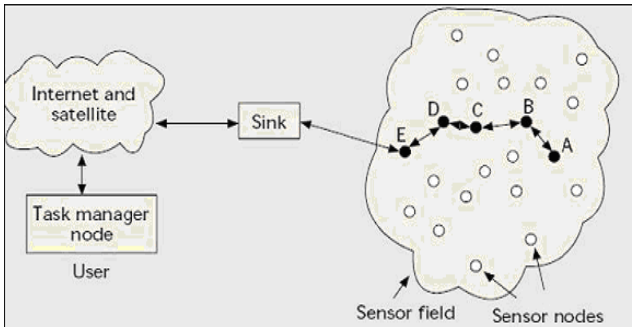

Figure 1: Basic Architecture of Wireless Sensor Network [7]

Mobile nodes in wireless sensor networks are classified into two types, sensor and sink nodes. First the sensor node is a mobile node moving freely to monitors the physical environment. Once it detects its physical target, it engenders a data packet and sends it to the sink node via the wireless channel. The processor in the sensor node may be set the threshold value to compare with the detected data before it generates and sends a data packet. Second the sink node collects all data packets from sensor nodes. Users use these collected data to analyze their targets.

Sensors can be positioned something known by sense perception. In this approach, large sensors that use some complex techniques to distinguish the targets from environmental noise are required. Several sensors that perform only sensing can be deployed. The states of the sensors and communications topology are cautiously engineered. They transmit time series of the sensed phenomenon to the central nodes where computations are performed and data are fused. A sensor network is composed of a large number of sensor nodes, which are densely deployed either inside the phenomenon or very close to it.

II. ROUTING PROTOCOLS

Sensor networks have emerged as a promising tool for monitoring and actuating the physical worlds, utilizing self-organizing networks of battery-powered wireless sensors that can sense, practice and correspond. In sensor networks, energy is a critical resource, while applications exhibit a limited set of characteristics. Thus, there is both a need and an opportunity to optimize the network architecture for the applications in order to minimize resource consumed. The design space for routing algorithms for WSNs is quite large and we can classify the routing algorithms [29] for WSNs in many different ways. Routing protocols are classified as node centric, data-centric, or location-aware (geo-centric) and QoS based routing protocols [15].

Routing protocols are also classified based on whether they are destination-initiated (Dst-initiated) or source-initiated (Src-initiated). A source-initiated protocol sets up the routing paths upon the demand of the source node, and starting from the source node. A destination initiated protocol, on the other hand, initiates path setup from a destination node. Routing protocols are also classified based sensor network architecture [8]. Some WSNs consist of Homogenous nodes, whereas some consist of heterogeneous nodes.

DSR: The Dynamic Source Routing Protocol (DSR) is an efficient routing protocol designed specifically for use in multi-hop wireless adhoc networks of mobile nodes. DSR allows the network to be completely self-organizing and self-configuring, without the need for any existing network hauling. Dynamic Source Routing is a imprudent routing protocol that uses source routing to send packets. DSR uses source routing which means that the source must know the complete hop sequence to the destination [16]. In DSR the source determines the complete sequence of hops that each packet should traverse. This requires that the sequence of hops is included in each packet's header. A negative consequence of this is the routing overhead every packet has to carry.

AODV: AODV is a method of routing messages between mobile computers. It allows these mobile computers, or nodes, to pass messages through their neighbors to nodes with which they cannot directly communicate. AODV shares the DSR feature of on-demand characteristics in that it also does this by discovering the routes on an as needed basis along which messages can be passed via a similar route discovery process as DSR. AODV makes sure these routes do not contain loops and tries to find the shortest route possible. AODV is also able to handle changes in routes and can create new routes if there is an error.

III. SIMULATION TOOLS

Simulation is defined as the process of designing a model of a real system and conducting experiments with this model for the purpose of understanding the behavior of the system and/or evaluating various strategies for the operation of the system. Ns-2 is a packet-level simulator and essentially a centric

discrete event scheduler to schedule the events such as packet and timer expiration. Centric event scheduler cannot accurately emulate "events handled at the same time" in real world, that is, events are handled one by one. The C++ classes of ns-2 network components or protocols are implemented in the subdirectory "ns-2", and the TCL library in the subdirectory of "tcl". NS2 is simply an event driven simulation tool that has proved useful in studying the dynamic nature of communication networks. Simulation of wired as well as wireless network functions and protocols (e.g., routing algorithms, TCP, UDP) can be done using NS2. In general, NS2 provides users with a way of specifying such network protocols and simulating their corresponding behaviors [9].

NS-2 provides the Network components like Node, Link, Queue, etc. they are created from the corresponding C++ classes; The other are compound components, that is, they are composed multiple simple C++ classes like Link are composed of Delay (emulating propagation delay) and Queue. We can say that in ns-2, all network components are created, plugged and configured from TCL. NS-2 provides the Event Scheduling that is associated with time. class Event is defined by {time, uid, next, handler}, where time is the scheduling time of the event, uid is the unique id of the event, next is the next scheduling event in the event queue that is a linklist, and handler points to the function to handle the event when the event is scheduled. Events are put into the event queue sorted by their time, and scheduled one by one by the event scheduler [11].

IV. SIMULATION PARAMETERS

To evaluate the performance of wireless sensor network we evaluate the Ratio of received to sent(r/s) with the help of received parameter and send parameter.
Send parameter(s): Send parameter defines the number of packets send by the sender node to the destination node by using a specific topology [13].
Received parameter(r): Received parameter defines the numbers of packets received by the destination node from a sender node by using a specific topology/root [12].
Ratio of received to sent(r/s): In this simulation we are getting the send parameter and received parameter which defines the number of packets sent and received by the sender node and received node, after that we conclude the ratio of received to sent(r/s) parameter with the help of above both parameters.

V. RESEARCH WORK

There are many research papers on routing protocols in wireless sensor network and all are used for evaluating performance of different parameters in different scenario. Researchers specify the difference between routing protocols and its performance for different parameters and which one is best for the case of Wireless Sensor Network.

In comparison of AODV, DSDV and DSR the Average end-to-end delay and throughput in DSR are very high. While in comparison of DSDV and AODV routing protocols, AODV performed better than DSDV in terms of bandwidth as AODV do not contain routing tables so it has less overhead and consume less bandwidth while DSDV consumes more bandwidth.

In this paper we selected to investigated DSR and AODV protocol using Ratio of Received to sent for different Terrain areas like small (100 m. x 100 m.), large (1000 m. x 1000 m.) . Analysis were done using ns-2 simulator on these three cases of terrain areas in order to derive an estimation of the performance parameters.

VI. SIMULATION SETUP

In this paper, we tested and investigated ratio of received to sent using DSR protocol and AODV protocol with a scenario where a total of 100 nodes are used with the maximum connection number 10; and a hop that have 10 CBR; transfer rate is taken as 4 packets per second and the pause time is varied starting from 0 sec., 10 sec., 20 sec., 30 sec., 40 sec., and 50 sec. (i.e. in the steps of 10 sec.) implemented respectively in a 100 m. x 100 m., 1000 m. x 1000 m terrain areas. The simulation time was taken to be of 100 seconds.

Table 1: Simulation Parameter Values

1	Transmitter range	250m
2	Bandwidth	2 Mbps
3	Simulation time	50 sec
4	Number of nodes	100
5	Max Speed	10
6	Pause time	0, 10, 20, 30, 40, 50 sec
7	Terrain Area	100 m. x 100 m., 1000 m. x 1000 m.
8	Traffic type	Constant Bit Rate
9	Packet size	512 bytes data
10	MAC type	IEEE 802.11b
11	Antenna type	Omni-Antenna
12	Radio propagation method	Two Ray Ground

VII. RESULT AND ANALYSIS

(A) The investigations were performed on Parameter ratio of received to sent using DSR routing protocol. When Nodes-100, Pause Time - 0-50secs, Maximum Speed- 10m/s, Routing protocol- DSR, and Evaluating Parameter- Ratio of received to sent

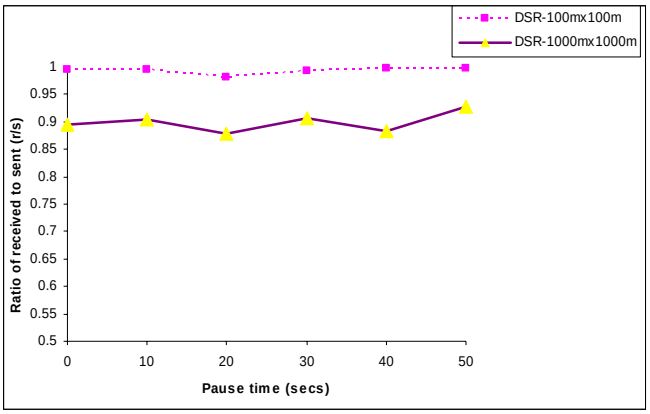

Figure 2: Pause time versus Ratio of received to sent(r/s) when terrain areas are 100 m. x 100 m., 1000 m. x 1000 m. for DSR

Using the DSR routing Protocol with 100 nodes, maximum Speed 10.00m/s, varying pause time (0-50sec by interval of 10sec) and 100 m. x 100 m. and 1000 m. x 1000 m. terrain areas, we examine that Ratio of Received to sent in 100 m. is more optimal than 1000 m. x 1000 m. So if we implement wireless sensors in biggest terrain areas, the Ratio of Received to sent is decreased on varying pause time.

(B) The investigations were performed on Parameter ratio of received to sent using

When Nodes-100, Pause Time - 0-50secs, Maximum Speed-10m/s, Routing protocol- AODV, and Evaluating Parameter-Ratio of received to sent

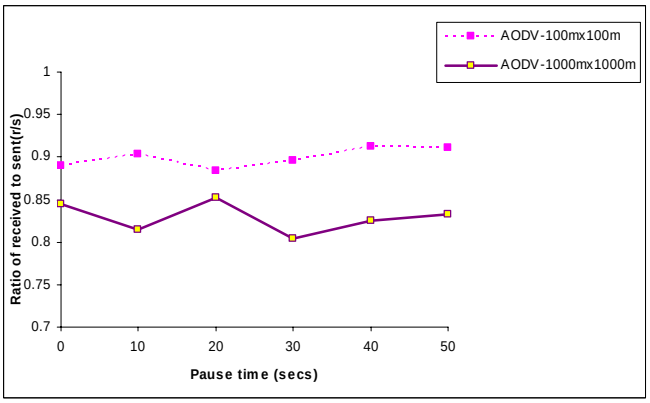

Figure 3: Pause time versus Ratio of received to send(r/s) when terrain areas are 100 m. x 100 m., 1000 m. x 1000 m. for AODV.

Using the AODV routing Protocol with 100 nodes, maximum Speed 10.00m/s, varying pause time (0-50sec by interval of 10sec) and 100 m. x 100 m. and 1000 m. x 1000 m. terrain areas, we examine that Ratio of Received to sent in 100 m. is more optimal than 1000 m. x 1000 m. So if we implement wireless sensors in biggest terrain areas, the Ratio of Received to send is decreased on varying pause time.

(C) The investigations were performed on Parameter ratio of received to sent using DSR and AODV routing protocols. Comparison of Ratio of Received to sent DSR and AODV Routing protocol:

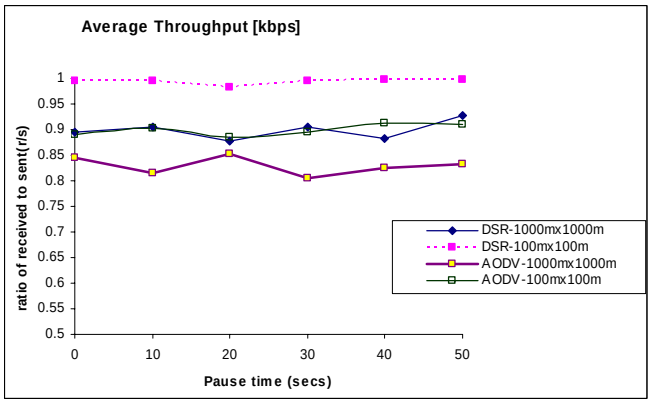

Figure 4: Pause time versus Ratio of received to sent(r/s) when terrain areas are 100 m. x 100 m., 1000 m. x 1000 m. for DSR and AODV.

Using the DSR and AODV routing protocol with 100 nodes, maximum Speed 10.00m/s, varying pause time (0-50sec by interval of 10sec) we analyze that DSR Routing protocol for 100 m * 100 m terrain area is high as compared to 1000 m* 1000 m for DSR and 100 m* 100 m and 1000 m * 1000 m for AODV. In the graph the points of 100 m * 100 m of AODV using pause time (00-50) is approximate of 1000 m * 1000 m of DSR using pause time (00-50). The overall results says that when we implement sensor nodes in small terrain area 100 m * 100 m for DSR it give better performance as compared to 1000 m * 1000 m for DSR, 100 m * 100 m terrain area for AODV and 1000 m * 1000 m terrain areas for AODV.

VIII. CONCLUSIONS

The results of our simulations are analyzed and discussed in this section. The results are analyzed and discussed in different terrain areas having networks of 100 sensor nodes on varying Pause time (00-50secs with interval of 10secs.) for evaluating performance of Ratio of Received to sent in small and large terrain areas.

Our study provides an optimal result which is fully based on simulation and analysis. Every case explains evaluation of parameter with the help of table and generated graph. Each case represents a special issue for metric and Terrain area (which is small (100 m. x 100 m.) and large (1000 m. x 1000 m.). According to the analysis value we plot graphs for different terrain areas, varying the pause time (00-50sec). When we use the DSR Routing protocol for 100 m * 100 m terrain area it is high as compared to 1000 m* 1000 m for DSR and 100 m * 100 m and 1000 m * 1000 m for AODV. In the graph points of 100 m * 100 m of AODV using pause time (00-50) is approximate of 1000 m * 1000 m of DSR using pause time (00-50). The overall results says that when we implement sensor nodes in small terrain area 100 m * 100 m for DSR it give better performance as compared to 1000 m * 1000 m for DSR, 100 m * 100 m terrain area for AODV and 1000 m * 1000 m terrain areas for AODV.

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