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AD-HOC ON DEMAND DISTANCE VECTOR: STUDY OF EVALUATION OF PERFORMANCE ON WSN

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ABSTRACT

To monitor physical environment in various application like military, agriculture, medical transport, industry etc., the deployment of sensor networks are growing either manually or randomly. The main aspect of monitoring the physical environment is the inspection of critical situations in the case of wireless sensor network. The sensing of relative information at the time of emergency plays the major role in monitoring application and sensing the relative information comes under critical condition. There are various features of sensor networks that needed to be met those features termed as fast, reliable and fault tolerant. To meet these features is the big challenge in the wireless environment. There must be a system that should work fast enough in the time of explosions, fire and leaking of toxic gases. In the study researcher have focused on the working on routing protocol by using various factors such as Packet Delivery Fraction (PDF), Throughput, Normalized routing load Parameters etc. The major point of research is to discuss and evaluate the performance of the AODV routing protocol and later on to modify them.

KEYWORDS

AODV, PDF, Throughput, Normalized Routing Load etc.

INTRODUCTION

A type of mobile ad-hoc networking protocol is known as Ad-Hoc On-demand Distance Vector (AODV) routing protocol. In present a field of research among the community of network is Wireless ad-hoc routing protocols such as AODV. Therefore, simulation tools for these kinds of protocols are very much important. In this research researcher have studies and implemented existing protocol and after the study and implementation of existing protocol, researchers are required to design the new AODV protocol that gives much better result in comparison to existing AODV protocol. Various parameters are used for simulation purpose these parameters are:

Packet Delivery Fraction (PDF),
Throughput,
Normalized routing Load Parameters,
Energy.

The AODV router is contains a state machine. The state machine processes incoming requests from the scalable wireless area networks. When it is required to transmit the message from one node to another node then the task of the network is to do the transmission and for the transmission of messages from one node to another the network call upon AODV to find the next-hop. As soon as the AODV router gets a request to transmit message, it inspect its routing table to observe the existence of route. Every routing table entry has following fields:

Destination address,
Next hop address,
Destination sequence number,
Hop count.

The router routinely forwards the message to the next node or next hop if there is the existence of route. In another case, the message, which is transmitted, is saved in a message queue and then a route request is initiated to search out a route [1].

AODV ROUTE DISCOVERY

For the purpose to find the route of a message from source to destination network flooding is required by using a Route Request (RREQ) message. The initial step is the origination of node, which broadcasts a RREQ message to its nearest nodes, the receiver

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node gets the message and again broadcast the forwarded RREQ message to its neighbor and this process continues until the destination neighbor founds. While transmitting the RREQ message it must be ensured that a cycle should not be created during the transmission of the message from source to destination. To prevent the creation of cycle each node must have a technique to maintain a route request buffer, which contains the path of a node. Since these requests broadcast via the network, middle nodes store reverse paths to the beginning node. As the mediator node can have number of reverse routes but the selection of the middle node for routing the packet is based on the smallest hop count. A node getting the request either recognizes of a "fresh enough" route from source to the destination, or is itself the destination. The destination node causes a Route Reply (RREP) message, and transmits the message with the reverse path towards the source node. As soon as the passes of the RREP message via mediator nodes there is the need to update in routing tables, and making change in routing table will assist in the future because messages can be routed via concerned nodes to the destination end. The possibility for the RREQ originator is to get a RREP message from one or more mediator node. Therefore, as the result, the RREQ originator will change its routing table with the freshest routing information. It means that the routing table will maintain the route with the greatest destination sequence number. By the assistance of node, the RREQ messages are stored in some storing device known as buffer and the receiver node ultimately generates a RREP message. The main concern of having a buffer that might contains replicated RREQs arrived from various routes but the receiver node does not respond with multiple RREPs. In another situation is that if the node gets a RREQ with a better route (i.e. number of hop counts is smaller) then a new RREP will be sent. The buffer also contains the entry of each RREQ with a couple of values:

The identification numbers (RREQ id) of route request.
The node address that initiated the request.

Therefore, the pair distinctively notifies a request or demand across the entire nodes within the network. In the case of preventing, the growing size of buffers indefinitely there must be the termination of entry within a certain amount of time and then is removed. In addition, each node's buffer contains its maximum limit or size and after reaching to the maximum limit of node the oldest entries will be swapped out to make space for another node[2][3] .

PERFORMANCE RESULTS

At the time of simulation of AODV, it is to determine that how well it scales and this is the main aim of AODV protocol. The performance of protocol varies with different number of nodes in the network. There are various scenarios to understand the different parameters of AODV protocol under the existing condition, these parameters are as follows:

The scenario is to experience the number of Packet send and receive at the same time Packet Delivery Ratio (PDR) is calculated.
The scenario is to experience the Throughput.
The scenario is to experience the energy efficiency.
The scenario is to experience the Normalize Routing Load [4][5]

Researcher has conducted various experiments to show the performance of these parameters. The conditions and specific values for implementation of AODV protocol are shown in the table below (table-1).

Table-1: Values for Implementation of AODV Protocol

Types	Values
Channel	Channel/Wireless Channel
Radio Propagation Mode	Propagation/TwoRaygroud
Network Interface	Physical/WirlessPhy
MAC	Mac/802_11
Interface Queue	Queue/DropTail/PriQueue
Antenna	Antenna/Omni antenna
Dimension of Topology (m)	800*800
Number of simulated node	100
Simulated Routing Protocol	AODV
Simulation Time	Depending
Traffic Source	CBR/FTP
Pause Time	2 sec
Packet Size	512
Performance Evaluation Metrics	PDR, Throughput, Energy, Avg End to End Delay, NRL

Sources: Authors Compilation

PROPOSED MODEL FOR AODV USING LEACH (HIERARCHICAL MODEL)

The research starts with the tcl script for AODV using LEACH protocol. Researchers have used various parameters to execute the AODV algorithm. Researchers have start their research with 100 nodes, simulation time 15ns, network size 800*800, traffic size of Constant Bit Rate and packet size is of 512 byte. The simulation starts with the simulator NS 2.35 having wireless channel with random waypoint. The AODV protocol also uses TCP protocol having MAC 802.11 type.

The selection of Cluster Head is come with a formula that is:

(expr int ($val (nn)/10))

While the selection of Master Cluster Head is calculated by:

(expr int($val (n_ch)*1/10))

The total energy occupied by the node is 1000 Joule for the transmission of packets from source to destination under the AODV protocol.

PROBLEM FORMULATION FOR PROPOSED MODEL

The following work has been done to fulfill the objective of research work as:

Proposed a new energy enhancement technique based on energy efficient mechanism.
Applying proposed technique on LEACH and AODV routing protocol, which enhances energy of nodes in ad-hoc network environment.
Performance is estimated on base of various QOS parameters such as end-to-end delay, packet delivery ratio (PDR), throughput, and energy.
Result is analyzed by comparing of proposed method on AODV and existing reactive routing protocol AODV with above-mentioned QOS parameters.
Simulation work is done on NS - 2.35 simulators (ns-allinone-2.35) using Ubuntu 14.04 LTS as operating system and find out comparative results which enhance efficient energy in network [6][7][8].

Algorithm

Begin

Step1) Source want to send some data to the destination ,before sending the data it send hello packet to all neigbour nodes and further process according to AODV routing protocol.
Step2) In optimised LEACH the motive is to save energy as much as possible. So in clustering, all clusters are not active at all time. When they are required is will be activated.
Step3) Most of time clusters will be in idle condition. By applying new level keyword in code.
Step4) if new_level>=0
if consumed_enegy=new_level_enegy than extend
(New level is nothing but updated energy) expand the energy by taking from neighbour.
Step5) When sometime the node may get decrese processing energy. It need to be calculated so that new level will be checked periodically.
By checking three attributes number_instructions, double instructions_per_second and double processing_power.
Step6) if instructions_per_second == 0
Terminate the process and calculate processing time and consume energy.
Step 7) It will check all communicated nodes and assign to zero for next simulation.
Step 8) If given enegry <= consume energy
then energy =0;
else remaining energy over
energy = energy – consume energy

RESULTS AND DISCUSSIONS

In this section, researchers are going to explore the results of their modified algorithms. The modified algorithms are to be compared with the existing algorithm. For exploration and discussion Researchers have taken On-demand (Reactive) routing

protocol routing protocol named as On-demand Distance Vector (AODV). The existing protocol of AODV is compared with the modified AODV and then conclusions have been drawn about the performance [9]. Researchers have completed their research with different parameters as discussed above the parameters are:

Packet Delivery Fraction (PDF),
Throughput,
Normalized routing load Parameters,
Energy.

Execution of AODV Base and Proposed Protocol

By using, the above parameter with AODV protocol researchers have executed the basic protocol as well as proposed AODV protocol and the snapshot of execution of various parameters such as PDF, Throughput, NRL and Energy by using ns2 is presented in researcher's research. In this scenario, some parameters with a specific value are considered. Those are in above table1. The values of these parameters are same in both base protocol and proposed protocol. Researcher experiment starts with the execution of AODV Base protocol and the results of the experiment is copied below and as the same Researcher has executed the AODV proposed protocol and the result is presented below. After the outcome of both AODV Base and AODV Proposed protocol now researcher can easily inspect the difference in between AODV Base and AODV Proposed. Researchers have repeated the experiment number of times and ultimately researchers find that in each execution the AODV Proposed protocol gives better results than the AODV base protocol. Therefore, researchers concluded that their AODV proposed protocol approach is better than the AODV base protocol. In this execution researchers have shown only one experiments of (AODV base and AODV proposed) to view the differences [10]. The values of experiments are presented sequentially termed as:

Table-2: AODV BASE: Test

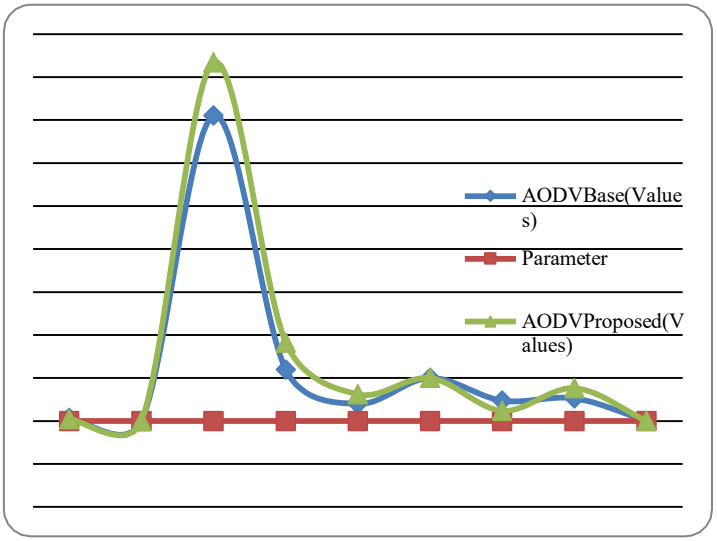
Parameter	Values
Normalized Routing Load	70.031
Packet Delivery Ratio	0.1684
Send Packets	7109
Receive Packets	1197
Average Throughput[kbps]	400.18
Total energy	1000
Total consume energy	473.32
Remaining energy	526.68
Average of consume energy	4.7332

Table-3: AODV Proposed: Test

Parameter	Values
Normalized Routing Load	45.549
Packet Delivery Ratio	0.2186
Send Packets	8344
Receive Packets	1824
Average Throughput[kbps]	622.45
Total energy	1000
Total consume energy	236.5
Remaining energy	763.5
Average of consume energy	2.365

Sources: Authors Compilation

Figure-1: Comparison Graph of Simulation



Sources: Authors Compilation

CONCLUSION

The research emphasized on protocol implementation and testing that covers simulation workflow, which includes number of steps that are used in the activity of simulation. The initially activity of simulation is to check out the scenario and topology that is using at the time of simulation. The next step is to generate the traffic file by using TCL script. Another step is to execute the TCL script by using NS command. By executing the TCL script, the Trace and NAM file is auto generated. The next step is to decide the performance of parameter (NRL, PDR, energy and throughput). The next step is to execute the AWK script to evaluate performance. The last step is to store performance data. All the steps required to be executed properly to view the outcome in expected manner.

After the understanding of different steps, researchers started their research work with the implementation of AODV protocol, the basic protocol of AODV has been discussed, route discovery and performance results have been discussed by using different parameters. The result generated during simulation is stored for the comparison purpose (comparison with the Proposed AODV protocol). After the discussion and result generation, it is time to explore proposed model for AODV using LEACH (Hierarchical Routing). Execution of base and proposed AODV under various parameter that are explained earlier uncovers the difference between AODV base and AODV proposed.

Finally researcher come to a situation where researcher can say that the base AODV protocol that is existed earlier can work in a better way by doing some little modifications [11][12].

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