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Qualitative mode of transmitting and Load balancing using DODAG graph

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ABSTRACT
A WSN devices is the central component of the IOT, which has been implemented into several application in real life. The devices have low battery life and less reliability. In this paper DODAG (Destination Oriented Directed Acyclic Graph) is used to transmit packets and improve the Quality of Load Balancing. The residual energy metric is used for a node to select the proper node to relay the packet. The Proposed DODAG begins the process by constructing the DODAG from its root. Using the DODAG information Object to broadcast the message and DAO (Destination Advertisement object) to propagate reverse route information and DIS (DODAG Information Solicitation) Message to search its neighbour for nearby DODAG .With the simplified flow of the DODAG we can transmit the packet

Keywords—WSN, DODAG, DIS, DAO, Load Balancing, Packet, node, IOT

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I. INTRODUCTION

ThisWSN and IOT is rapidly developing in various sectors of real time world. They are applicable in various sectors like home automation, communication and computation WSN have the Sensing ability to intrusion, danger. The WSN devices have constraints with respect to energy supply, transmission mode and memory size.

To improve the quality of packet transmitted DODAG graph can be considered. To sense packets in WSN DODAG is considered, its Topological structure is similar to that of a tree which is rooted at the destination. Each node is assigned status which helps in establishingthe relative position of the other nodes with respect to the DODAG root. When the need for nodes to transmit data-packets arises it will select one of the many node from the available table from its candidate parents for transmitting packets to the DODAG root. DAO (Destination Advertisement object) nodes that were visited along the upward path are recorded in the form of a message. In RPL, to probe its neighbour for nearby DODAG's by the use of (DODAG Information Solicitation).

Node status plays a significant role in routing the packets to the destination node. In the case of a network medium, each point to point link is technically assumed as a hop, and the count is considered only to those deviceswhich are in between the two point of connection. Hopcount considers only those devices which perform routing, non-routing devices are not considered as an hop count. One of the crucial task in network is to define the importance of nodes relation with other elements in the network. The importance of node can be defined in various ways, one such way is to rank notes according to the degree of connectivity.

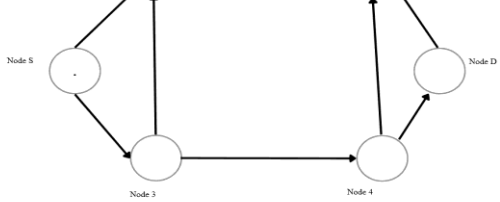

Fig1:- Basic Network Topology

Network are naturally modelled as graphs. A broad application of importance of node (i) is its degree of connectivity by counting the number of links to (ii) we can understand the importance of nodes that point to (iii). In the figure a link by node 4 is more important than a link from node 1.

Metric called as ETX (Expected Transmission count) is proposed for routing reliability and how the energy is used to calculate energy utilized in packet transmission to derive the residual energy. Distribution of traffic across multiple servers is a core networking solution for load balancing. Application availability, responsiveness and server overload can be prevented and improved by Load Balancers. The loadbalancer resides in between the customer devices and servers, receiving and then distributing incoming requests to any available server capable of fulfilling them. To determine how requests are distributed across a server the load balancer follows an algorithm. Numerous options are available in this regard from a very basic option to a compound one.

II. SOLUTES

Qualitative mode of transmitting the packets has 3 solutes: Status Determination, Total Aphasia, and Track Facilitator.

A. STATUS DETERMINATION

The circumstance of wireless links will differ with things it must endure. The ratio of packet delivery will reduce if it involves unreliable links/nodes in the list. Therefore it is necessary to choose a reliable link as the next forwarding node for transmitting the data in the network. A well-known metric to evaluate the quality of the nodes and to identify the reliable track to determine the status of the node is the expected transmission count ETX, which does not reflect the suitability of a node ,it is not the right strategy,therefore to increase the delivery ratio of the packet, link diversity is considered.In the initial state the destination node is set to
(0) Constant and source node is set to Constant
(1) Throughout the process.

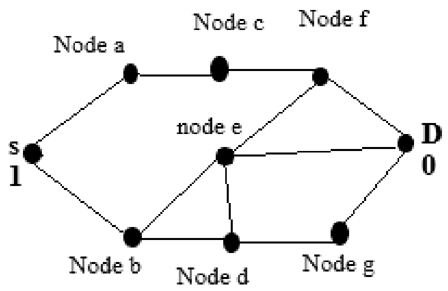

Fig2. Status determination

Which makes it easy to trace the node which is not the destination, where the node status is less than its neighbour node for forwarding
The status of each node is identified by broadcasting Request to Calculate Status. The nodes are deployed with the current status of it. The non-source and non-destination node upon receiving the RTCS performs the algorithm to determine the status.

ALGORITHM 1: STATUS DETERMINATION ALGORITHM
Step 1: Read the neighbours of node (ng) and their respective IDs

Step 2: If neighbouring node is not source then initialize sum to be zero else jump to step 7

Step 3: for every i^{th} element to be equal to 1 repeat the step 3 for N number of neighbouring nodes.

Step 4: Calculate the ETX, ETX of the neighbouring node (ng) with the identifier of the i^{th} element.
To compute we need to divide 1 by 1 minus the probability of the forward node for each neighbours of node with the identifier of the i^{th} element multiplied by 1 minus the probability of reverse node with the neighbouring nodes identifying the i^{th} element.

Step 5: The probability of success of neighbouring nodes for i^{th} element can be computed by dividing 1 by the expected transmission count result from step 3.

Step 6: Determine the total nodes by summing up the total from step 4 multiplied by the probability of success for every identifier of i^{th} element

Step 7: end the loop

Step 8: we can calculate the probability of success of neighbouring node by the sum divided by the number of neighbouring nodes.

Step 9: Status of the node can be determined by subtracting constant 1 by the resultant derived in step7.

Step 10: if the difference between old status of the node and new status of the node is greater than predetermined threshold replace the current node with the new node.

Step 11: RTCS packet to be deployed if greater

Step 12: end of step 9

Step 13: end of step 2

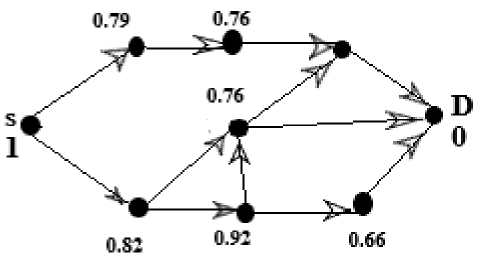

Fig 3.Result of the status determination

B. TOTAL APHASIA

The loss of packets in this stage can be resolved using DODAG. The DODAG construction process starts from the root DODAG. The transmission of packets to the destination node with directed graph which gives proper route to the destination without any cycles.

In the initial phase, the DODAG root broadcasts the DODAG information by transmitting a DIO. Neighbours of the root receive and process the DIO and are sent to other nodes in the DODAG table one after the other. A node which is not part of the DODAG table, calculate the cost of track for the DODAG information object sender and then decides whether to join DODAG table or not. Once a neighbour joins the DODAG table, the route is established and that root becomes a DODAG parent of the node. Once route is established the node calculates its status in the DODAG and replies with a DAO Message to its parent to inform its participation. Nodes which have not received any DIO messages and have not joined any DODAG table can request DODAG information by sending DIS messages to its neighbours periodically. This process is repeated by the neighbouring nodes until all have joined the DODAG table.

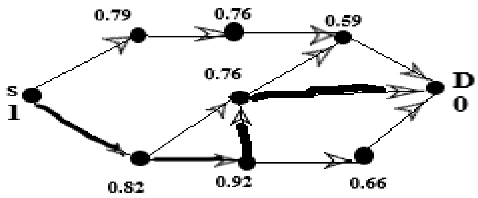

Fig 4. Result of DODAG construction

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There are situation where a node can have more than one parent in the DODAG that has been constructed, with which the data packets are transmitted to the destination through its parent node. Only one node can be considered to be the next forwarding node only with this technique can redundant traffic be avoided.

Maximum strength gained strategy can be initiated, the parent node with the highest remaining strength will be opted as the next node to be forwarded, to aid the data transmission and extend the life.

C. TRACK FACILITATOR

Based on the created DODAG graph the source node and the destination node is set and finalised only upon the intentions of the source node to transmit data, the data transmission part of a network can be done by the source node.The node makes use of the 1^{st} order model for the hardware strength dissolution. The transmitter depletes the energy of the node to power the electronic gadgets and theamplifiers. The energy used to calculate energy consumed in transmitting the packets to derive the remaining energy, welet the estimated transmission count for k^{th} element to be the energy utilized by radio electronics for a node to transmit a packet of n-bit. Estimated transmission count of the amplifier with n bit packet and the distance between one-node to another be the energy utilization of power amplifiers for one node to transmit a packet of n-bit over a distance of current node and the next new node. Energy utilization of packet transmitted can be computed by a node with respect to $E^{tx}(k,d_{(i,j)})=E^{TX}(k)+E^{TX}_{amp}(k,d_{(i,j)})$ and derive its remaining energy.

Messages from DIS (DODAG Information solicitation) are sent when a new node joins the network medium. In order to join the DODAG table a node asks information from its neighbors. DIO messages are typically broadcast messages sent from the root to its children according to concept of the trickle timer. A node advertises its status and the objective function to be used in a DIO message. Status represents the position of a node with respect to the root node. The main objective of the function is to compute the status of a node based on routing metrics and optimization objectives

4. FLOW OF THE **DODAG** FORMATION PROCESS

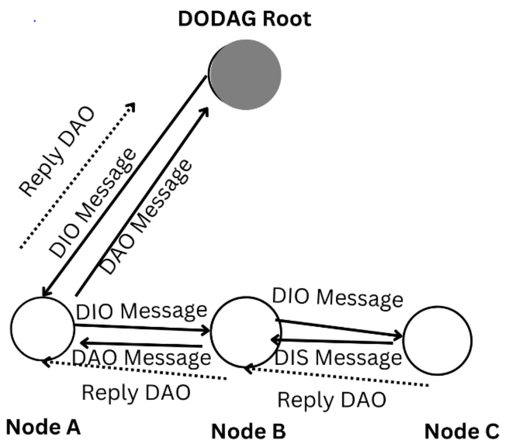

Figure 5. Flow diagram of the formation process for DODAG

Step 1: DIO messages with DODAG information are sent from the DODAG root;
DIO messages are received by Node A and joins the DODAG root and Broadcasts a DAO message which has prefix information to the root.

Step 2: Next the DIO Message is sent by Node A which has the DODAG information and Node B which is in Node A's transmission Scope receives the message, joins the DODAG, and broadcast with a DAO Message to Node A.

Step 3: DIS request message is received by node B from Node C but does not respond because it has not part of any DODAG table.

Step 4: DIO Message is sent from Node B to Node C inviting it to join the DODAG table once Node B joins the DODAG table

Step 5: Node C has joined the DODAG table now the Node C replies with a DAO Message to Node B.

Step 6: upon receiving the messageNode B will collect all information and then send the DAO Message to its preferred parent Node A.

The DODAG root upon acquiring all nodes prefix information about their DAO messages to form a downward route.
Parent node is selected based on the Node which is nearer to the DODAG root, status of a node rises in the downward direction of the DODAG and reduces in the upward direction. The status of a parent node should be lesser than its nodes of its children, the algorithm prevents routing loops from occurring in the network. Parent candidate set is updated upon a node receiving a DIO message and a parent is chosen based on the status values of the nodes in this set later its status value is calculated. Upon finding if the status is more than its parents (i.e., the node is on a downward route from the parents), the DIO message is updated with the new status information. The DIO Message is passed to the neighboring nodes finally. Outcome by the usage of DIO messages every node in the network builds its upward path. With the help of DODAG, DAO messages tranenable a node to transmit its target information upwards, allowing the construction of downward path between the DODAG root and their connective nodes.DIO and DAO messages are used for the uncovering of upper and lower paths, respectively.

III. CONCLUSION

The past few decades there has been a lot of attention on routing in wireless sensor network compared to its wired counterpart. Sensors network are designed for specific application each and every application has its own uniqueness be it in the application of home automation, communication, choosing an energy efficient path to transmit the packets and manage the traffic is a critical task there is a lot of routing protocol,techniques to choose from to come out with the precise solution. This paper proposes an Qualitative mode of transmitting packet and load balancing using the DODAG graph, a understanding of the phases what a node has to undergo to determine its rank to choose the right path to reach the destination node .Future perspective of this work are to analyse the residual energy of the node in transmitting packet to determine residual energy we need to know the current available energy then propose a state based model which will enable to analyse the energy and their mobility.

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