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LIMAD – Lightweight Intuitive Multicast Adaptive Demand-Driven Protocol for WSN

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Abstract:*Multicasting real time big data and video is an active research part in all communication networks. With Emerging technologies of multi-cast wireless sensor networks, various technologies have been proposed in creating and retaining nodal trees for the said LIMAD protocol. This protocol is uncertain and mlti-dynamic in nature. This articled lays a modeled dynamic scheme for multi-casting in WSN nodes which is suitable for big data and high end streams of live multimedia(audio/video). The approach discussed is generalization scalable works under unicast routing WSNs in WSN. This article illustrates underlying LIMAD protocol in highly adaptive and desirable for association of multi-cast nodes in a session. The basis of this approach is the multicast tree of mobile nodes which are lightweight and intuitive.*
Keywords: *DDMP, LIMAD, MORP, multicast, unicast, WSN.*

I. Introduction

A wide range of protocols are available to study multicasting in WSN. These have been discussed in subsequent segments.[1] It may be noted that only a few efficiently use the technological aspects of local broadcasting principle. This research article deliberately discusses Lightweight Intuitive Multicast Adaptive Demand-Driven (LIMAD) protocol. [8]This research article illustrates unicasting method designed especially for demand driven WSN networks.Multicast Adaptive Demand-Driven Protocol in the web minimizes the requirement of identity needed in receivers. Packets using LIMAD protocols may be delivered to clients requesting for the same. [4]Many algorithms are available which make use of multicast group in the discussed scenario. Relay nodes in the vertex of the multi-cast tree span back and fro the packets needed for delivery to main tree branch. A node in the tree can associate or differentiate them by duplicating information automatically along a branch. Current World Wide Web is a vital platform to analyze big data which include heavy and high-end multimedia that include audio as well as video.[6]

The former approaches require resource relay systems to minimize bandwidth requirements where a node in a branch requests for association in order to effectively share a basis for connection with multiple trees. Large data packets must conserve energy required for accessing desired network resource.Wireless Sensor Networks (WSNs) are non-infra-structure-based wireless nodes that re linked over mobile nodes which have a transceiver unlike wired networks.[9] Multi-casting in WSN is very risky but versatile approach that forward datagrams in short range sensors which is carrier sensing in nature (Carrier Sensed Multiple Access). These are short range nodes with packet delivery based on multiple-hopping protocol. This forms a basis of distribution structure of branching in the tree using unicasting. The branching decision is based on relay link approach to freely create further nodes in a branch.

II. Multicast Adaptive Demand-driven Protocol for WSN

Demand-driven protocols for WSN are ingenuous approaches that inculcate multicast in drowning nodes of the neighbor. In this process of multicasting each node of the specified wireless network senses packet data at reception.[2]

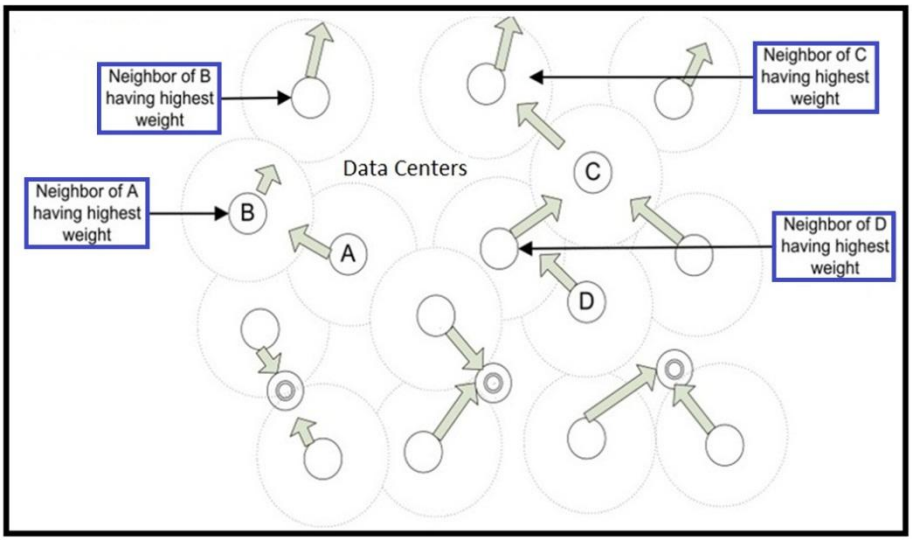

Figure1- Source Data Centers at multicast adaptive demand diven wireless networks.

(A) Multicast On-demand Routing Protocol (MORP)

MORP is basically demand driven protocol based on mesh routing. It incorporates a sub-nodal approach to forward characteristics of multicasting in wireless sensor networks in adaptive environment. A static approach is initiated at the very first step.[3] Then continuity is followed in order to make the process dynamic when nodes are continuously encountering demand to multicast adaptive control. A node membership becomes essential in this regard of multicast routing. As shown in figure-1 the source at the data center is always ready to broadcasts query based on data packets that control entire mesh of networking. A membership Id is required in such packet that generates Join-Reply flag (J-R). J-R holds the root of entire mesh network. Only updated datagrams in the form of packets are given pass by that has the right Id. The transit transceiver of this node at the destination is often provided with the same J-R packet for receiving multiple packets after a communication is complete. The validation of broadcast message is also vital if the right flag value (FG) is to be set at neighboring mesh of sub-trees. The origin parents must also be validated at the receiver where the intermediate mesh node checks the J-R packet. The Id of this concurrent node must have a forwarding flag in the same mesh group which is previously listed at the said parent node. The redundancy of iterative siblings in a node can be further checked by setting J-R flag as multicasting in nature before it expires. Controlling data packets that could access the J-R flag are also checked by this J-R surrounding group before it leaves the source group if present at all. A similar Similarly a receiver can stop replying with JR packets in order to leave. Nodes in the forwarding group are demoted to non-forwarding nodes if not refreshed before timeout.[14]

(B) Demand-driven Multicast Protocol (DDMP)

DDMP is one of the vital protocols in the conjecture of demand-driven multi-cast routing in WSN. It provides multiplicative approach that use identity numbers of transmitters by building multi-cast tree on the step by step basis. The tree root is always present at particular node that tracks the identity of each of the span of the demand driven routing network. [5]The receiving tree node is actually the backbone of the whole approach since it gives immense circulation of the delivery of datagrams in the whole process. The subsequent nodes that for subset of small tress are dynamic in nature and these sub-trees provide the actual multicast data for next delivery. DDMP protocol provides a Id number to each of the sub-tree to retain the continuing process rigorously. A new- session only starts when the continuing ends at message ending part of the whole network. These Id numbers of the protocol are of primary importance as the leave and simultaneously join the network

III. LIMAD Protocol - Proposed Model

Lightweight Intuitive Multicast Adaptive Demand-Driven (LIMAD) protocol in the context of wireless sensor networks is described in this section using a novel scheme of research article.In the proposed model, the incoming and assigned nodes are always made to set so that they can be routed in the multi-casting range of WSN antennas (transceivers). The network cycle for these nodes play vital role for streaming the received data to these transceivers. A typical scenario is shown below:

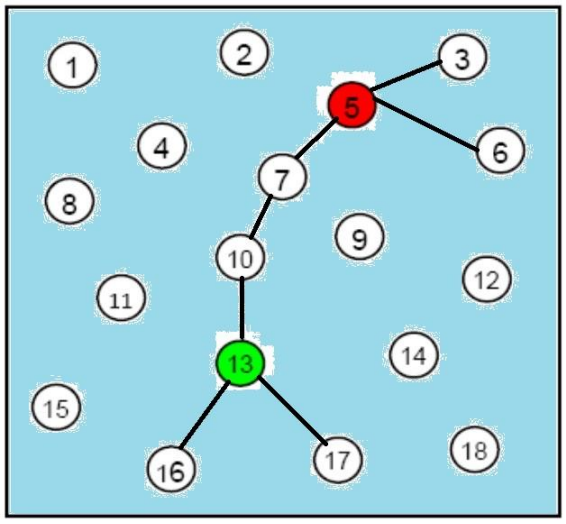

Figure 2 –Node initiation of demand-driven multicast tree

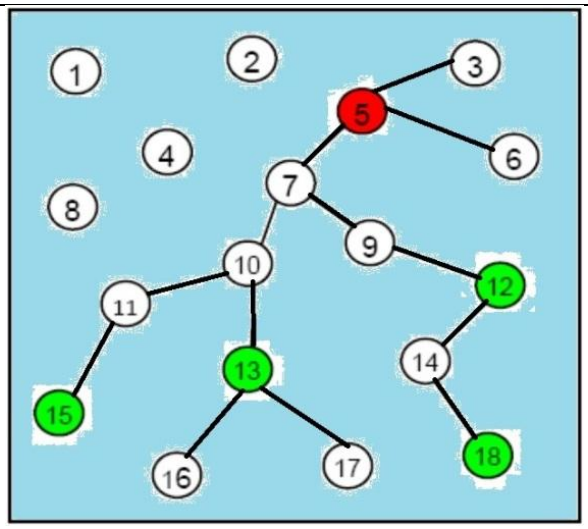

Figure 3 – Node adaption of demand-driven multicast tree in LIMAD protocol.

The typical cases that makes LIMAD protocol to come to picture is shown in figure 2& 3. The transceiving nodes entertain the ongoing request at 0.10 seconds each. [10]The entry of J-R flags are needed every (0.10 +T). For resolving this ambiguity a demand- driven adaptive multicasting scheme is introduced that lays the basis of LIMAD. In this model the parent say node 13 of figure 1 has to take the host parent which is node 3 in this case. Node 3 is the multicasting node which is responsible for node multiplication. In this proposed scheme virtual parents can be created without remaining dependent upon node 3. As shown in figure 3 virtual parent nodes are created at nodes 12, 15 and 18 with the adaption of LIMAD protocol. This has to be initiated every .01 seconds since in model it is considered that a throughput of 100 is compared with 10,000 network cycles. This method is iterative in nature and spreads like mesh tree scale. The scaling of LIMAD protocol in nodes 12, 15 and 18 of figure 2 will make more virtual parents in the next 10,000 network cycles.

A novel and dynamic model thatcreates andretains trees for multicasting scenario is elaborated in this section. The current Wireless Sensor Network scheme uses generalized approach in which current parent passes the whole data packets to subsequent nodes thereby creating virtual parents. In this method the node which is intermediate transceiving packets in the range of wireless sensor of the demand driven network transmits multicasting data packets that are already listening to the current scenario of branch trees. The receivers are retained in a hold state using unique identity based flag. This flag is light-weight and intuitive in nature. The adaptability of the network can be judged from the fact that period of active transmission is towards the source always.

IV. Performance Simulation

Performance evaluation of LIMAD protocol is presented inthis section. The simulation parameters area assumed per 0.10 seconds of delay. In this naïve model 100 throughput intervals are thought to be ideal for 10,000 network cycles. The simulation is performed on point to point scale of 100 clearly illustrating that LIMAD protocol's performance is highly desirable compared to DDMP and MORP protocols discussed in the earlier sections. In the current example the network scenario using LIMAD protocol were processed by network simulator ver.2 (NS-2) simulator. As shown in figure- 3 in which nodes 12, 15 and 18 adapt to the multicasting of demand-driven actions in which only 13 was present.Investigating thoroughly by ns-2 simulator kit it is observed that DDMP and MORP give less acute results for network cycles at 10,000 for which the overall throughput of the WSN is reduced to 100. Here an intersection point called lower optimal bound of the throughput is also observed as shown in figure 4. For lower optimal bound value LIMAD protocol produce saturated values for 400 and more as system overall throughput. As shown in figure 4, only LIMAD and DDMP approaches have a lower optimal bound situated at intersection of 10,000 network cycles for a throughput interval of about 100 seconds. This is absent for LIMAD since it has much higher throughput at this value. The throughput is calculated per 100 second time interval. Thus the effective time period being 100/10000 = 0.10 seconds

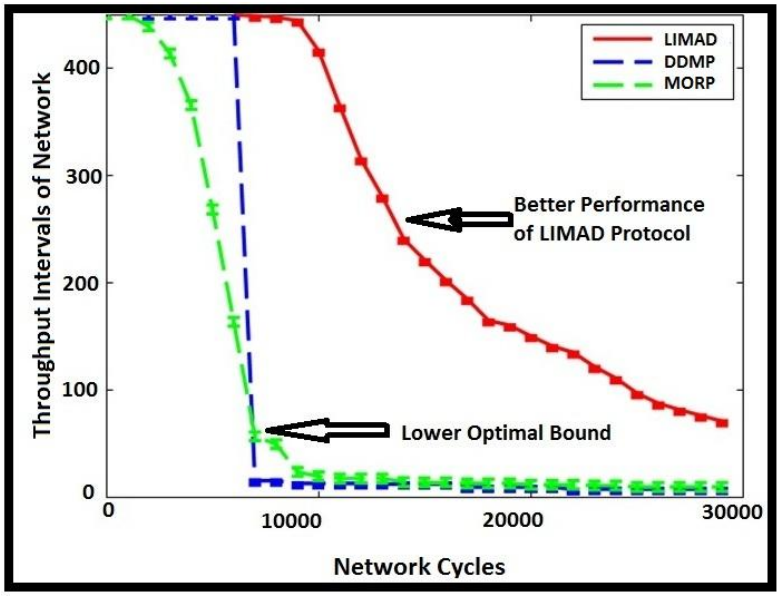

Figure 4 – Performance evaluation of LIMAD protocol w.r.t MORP & DDMP

It is assumed that node 13 has coverage for nodes 2, 6 and 7. Nodes 3, 5 and8 follow the regular path since they are nearer to parent positions. The total area is covered by creating virtual parents at nodes 12, 15 and 18. This case is clearly illustrated in figure-3.100 delay data packets are set as throughput interval limit for packets arriving from node 13. The delivery at receiver is considered for every ten thousand cycle's interval time.The request flags and J-R values are set at starting cycle of 10,000.It must be noted that parent node 13 would ultimately act as transceiver for this case. The parents at 15, 18 and 12 number nodes indicate the data traffic minimization is achieved. This proposed model is much ideal since the topological change in basic network node does not affect the system throughput.[12] The only matter of concern is that the LIMAD performance is decreasing at network cycles of 30,000. The solution to this is left as a future work by the authors. More network sustainability can be obtained by introducing discrete study of data packets per 10,000 cycles. Thus the gist of this research article has been in designing the LIMAD protocol for achieving better role in demand driven multicast adaptive wireless sensor networks.

V. Conclusion

The performance evaluation of LIMAD (Lightweight Intuitive Multicast Adaptive Demand-Driven) protocol for WSN is briefly elaborated in this research article. As shown in the figure the simulation analysis clearly describes that LIMAD protocol's performance is ace compared to DDMP and MORP. DDMP and MORP provide the result for network cycles lesser than 10,000 for which the throughput of the network is limited to 100. For the same values of network cycle and network throughput, LIMAD protocol values are saturated. For higher network cycles i.e. greater than 10,000 DDMP and MORP fail to produce network throughput. It can thus be conclude that LIMAD protocol adapts to the demand-driven multicast scenario and is independent of sensing. So it can be said that this model is not only lightweight and intuitive, but also demand driven and adaptive

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