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AN ENERGY EFFICIENT ROUTING IN SINK RELOCATION ON WIRELESS SENSOR NETWORK

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***Abstract*— The research community in wireless systems holds a keen interest in sensor networks issues. Sensor networks are dense wireless networks where information is gathered by sensor elements spread out in an interest area. Diverse sensing applications have also become a reality as a result. Wireless sensors applications cover a large field such as surveillance and security, target tracking, agriculture, health and military purposes. The main deficiency of sensors is their finite source of energy and so on. In a wireless sensor network (WSN), how to conserve the limited power resources of sensors to extend the network lifetime of the WSN as long as possible while performing the sensing and sensed data reporting tasks, is the most critical issue in the network design. In order to improve the recital of these networks, some research efforts have attentive on the mobility of data collector (Base Station / Sink) nodes. Then the Energy Proficient Relay-point Selection (EPRS) protocol and Mobile Base Station for WSN is proposed. The proposed mechanism uses information related to the residual battery energy of Relay-Point to adaptively adjust Base Station Relocation to the transmission range of Relay-Point. Some theoretical and Simulation analyze are given to show that the EPRS method can extend the network lifetime of the WSN significantly.**

Keywords - Mobility sink, Energy efficient, Performance

I. INTRODUCTION

Sensor nodes are typically powered by limited battery resources, and the large number of physically dispersed nodes makes it highly impractical to replace sensor nodes' batteries. Thus, the main challenge in any WSN is to employ energy control mechanisms through network management techniques. Hence, energy is a critical issue in the lifetime of a WSN and requires energy to be optimized in order to extend the network lifetime. Although in WSNs energy is consumed by processing and observation, the most energy intensive task is communication.

Due to the scarce energy resources, many studies have focused on energy-aware solutions in order to increase the network lifetime. An ideal WSN is scalable, consumes very little energy, is reliable and accurate over the long term, and requires little or no maintenance. Recent research results have shown that strategic positioning of the BS can effectively improve the network performance, such as throughput and delay. In this context, several BS positioning techniques have been proposed to conserve energy consumption and to prolong lifetime in WSNs. The goal of most published papers is to find a good location for the BS based on initial topological information such as distances between sensor nodes and the BS, density f sensor nodes and traffic flow within a WSN. However, such schemes are not resource-aware and can lead to misplacing the BS in the network.

II. RELATED WORKS IN MOBILE SINK RELOCATION

The Relay Point Selection protocol provides most advantages of geographical coordinate system without requiring GPS location information of the nodes. Several researchers have focused to provide very energy efficient routing protocols for Wireless Sensor Network with mobile sinks. Mobile-sink based schemes have been proposed to balance energy consumption and prolong network lifetime for WSNs in recent years.

A. Energy-Efficient In Mobile sink

A three-tier architecture having mobile entities called Data Mobile Ubiquitous LAN Extensions (MULEs). The MULE moves randomly in the sensing field, and collects data within the transmission range of certain sensors along the path. It traverses the entire network. Once it reaches the resource, all data is delivered. an energy efficient data gathering mechanism, in which a mobile data observer called SenCar works as a mobile sink. As the transmission range of a sensor is limited, it is necessary to plan the clusters of the network and find the proper turning points. It prolongs the network lifetime, but the latency is relatively high.

In the adaptive SPIN protocol is used to deliver critical data out of the communication range between the sensor and the sink. The sink moves randomly within the sensing field, and it has been proved that neither its speed nor direction would affect the transmission efficiency. The sink moves in a stationary area exploited for data buffering. The gathered data is sent into the buffer and got collected by the sink. Both energy consumption and load balancing are considered in the scheme, a relatively optimal location can be determined respectively.

B. The Energy Consumption Model for WSNs

A communication protocol lies between the sensors and the sink, which supports a fluid infrastructure and long sleep durations on energy-constrained devices. Adaptive algorithms are used to control mobility. The Shortest Path Tree (SPT) is used to select the sub-sink and relay data. Despite the mobility of the sink, multiplicity can also achieve some improvement in the aspects of network lifetime and energy consumption.

A dynamic approach exploits the mobility and multiplicity of sinks. The mobility should ensure the optimization of the performance as well as the minimization of the overhead. The algorithm is centralized and complicated. In a hierarchical topology of clustering is applied. Cluster heads work as mobile sinks, allowing collaboration with each other. Three heuristic strategies are proposed, respectively taking priority of the residual energy, event and a hybrid of both factors.

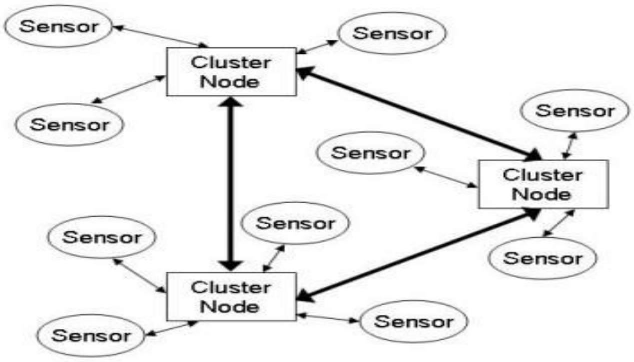

Fig 1 Cluster formation of sensor nodes

The cluster formation was done using Cluster with Mobility mechanism. Cluster head was elected using two distributed algorithms. It was observed that a better clustering factor and lesser energy consumption were achieved.

C. Lifetime Optimization of mobile sink

In most cases all sensor nodes of WSNs are battery-powered and located in the unattended or harsh environment. Battery replacement is difficult or even impossible for battery replacement. Once node's energy exhausts, the node is disabled. It will affect the network operation and even split the network to shorten network lifetime. Therefore, in WSNs, network lifetime is the important indicator of network performance. The algorithms of WSNs should save the energy and maximize the network lifetime.

Energy consumption is a major challenge in wireless sensor network (WSN). Most of the routing algorithms focus on energy efficient paths, for the analysis of such algorithms at low cost and in less time; we believe that, simulation gives the better approximation. Therefore, in this paper, we are proposing a simulation model for WSN. Literature survey is done on energy-aware routing protocols, in which, it is found that, Minimum Total Transmission Power Routing (MTPR) and Minimum Battery Cost Routing (MBCR) Protocol, most comprehensively captures tradeoffs of energy efficiency and network lifetime respectively.

III. ENERGY EFFICIENT AND DATA COLLECTION IN MOBILE SINK

The entire sensor network area is assumed to be circumscribed into a big square and then divided into different square zones. This system uses Adaptive-tree structure to improve the data collection efficiency and scalability. It constructs tree structures among the static nodes, and let mobile sink nodes use the structures to minimize the route construction cost, as well as data delivery cost. Link quality estimation is the key to instantly estimate the link qualities among sensor nodes includes the energy and received signal strength between the node and moving sink.

A. Design of EAMSRP

Wireless sensor networks (WSNs) often employs miniaturized battery-operated nodes. Since in most setups it is infeasible or impractical to replace the onboard energy supply, the design and operation of WSNs are subject to a great deal of optimization. Among the most popular strategies is the pursuance of multi-hop routes for forwarding collected sensor data to a gateway. In that case, the gateway becomes a sink for all traffic and the close-by nodes relay lots of packets and deplete their battery rather quickly. In this paper, the mobility of the gateway is exploited to balance the load on the sensors and avoid the overload on the nodes in the proximity of the gateway.

B. Tree based mobile sink nodes

Adaptive-tree structure achieves high data collection efficiency and scalability simultaneously. Fig. 3.1 briefly shows the Adaptive-tree structure. Circles indicate sensor nodes, and thin double-circle indicates Mobile Sink. When sink nodes have mobility, they cannot fully appreciate high scalability that nodes structures provide, because inter-node communication increases as sinks nodes enter different positions and coverage. Unlike the most existing routing trees, the adaptive routing tree can adjust to a better structure during routing without extra control packets. In order to solve this problem, we choose a RP node based on the sink location, and construct tree structure in it. Therefore, we argue that by utilizing Adaptive-tree structure, mobile sink nodes can appreciate both data collection efficiency and scalability.

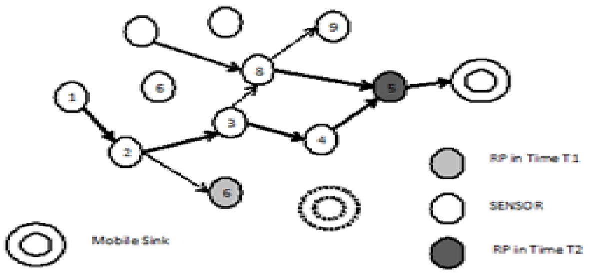

Fig.2 Adaptive tree structure

In Existing System whenever a sink node moves, it reconstructs the tree structure leveraging the whole network, hence, when a sink node has mobility, high overhead is induced not only at sink nodes, but also at static nodes. Accordingly, current Adaptive-tree based data collection protocols have high delivery ratio for leveraging tree structures, however their overhead for constructing and managing the tree structure is significant by choosing RP's.

C. Rendezvous Node Selection

In this procedure, sink nodes select the forwarding node among neighbour nodes. The Forwarding Node Selection is achieved by leveraging the information provided by link quality detection protocols. Above figure depicts how sink node receives packets from neighbour nodes, and selects node as the forwarding node. After selecting the forwarding node, the sink node leverages Forwarding Request to notify the selected node of it.

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D. Forwarding Request

In this procedure, the sink node sends a request to the selected forwarding node. Sink node requests the neighbor nodes to forward packets. Request message is broadcasted, and the packet includes the ID of the specified forwarding node. Neighbor nodes, node 4 and 5, process the received packets in accordance to their role: node 4 executes Forwarding Acknowledgement; node 5 determines the effectiveness of by passing. We leverage broadcast for two reasons; first, neighbor no des which received the packet should check the effectiveness of bypassing, and second, when the sink node decides to change the forwarding no de, it may include a request to stop forwarding packets in a single request.

E. Forwarding Acknowledgement

Forwarding Acknowledgement is transmitted from the forwarding node up to the root node through the designated path. Fig. illustrates first and second Forwarding Acknowledgments, respectively. Note that Forwarding Acknowledgments are broadcasted like Forwarding Request, so that neighbor nodes can check the effectiveness of bypassing. Neighbor nodes process the Forwarding Acknowledgement in the same manner as the Forwarding Request. At first Forwarding Acknowledgment, node 4 acknowledges its parent (node 1) of forwarding packets, and node 5 and 4 checks the effectiveness of bypassing.

IV. SIMULATION RESULT & DISCUSSIONS

This section presents the results of our simulation. We are using NS-2 simulator for simulation. In Fig 4.1 shows the simulation area of the nodes that covers the maximum area and the network life time will be increased. In fig 4.2 shows the initial energy of the node which starts transmitting the packets until the energy will be decreases. In fig 4.3 shows that number of node will transmit the data packet to relay point node. The transmission range of nodes that covers the shortest path will decrease in delay time to increase the throughput as shown in fig 4.4. Therefore, the first RP node should check the reach-ability of the sink node, and transmits detach packet if necessary.

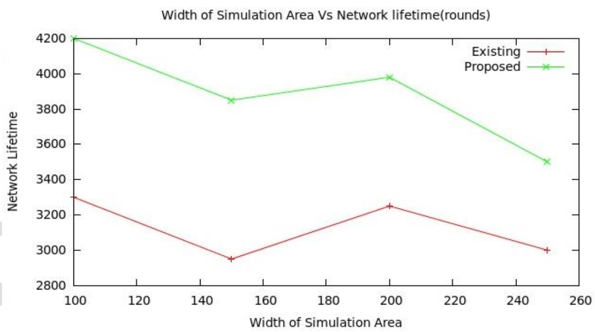

Fig. 3 width of the simulation

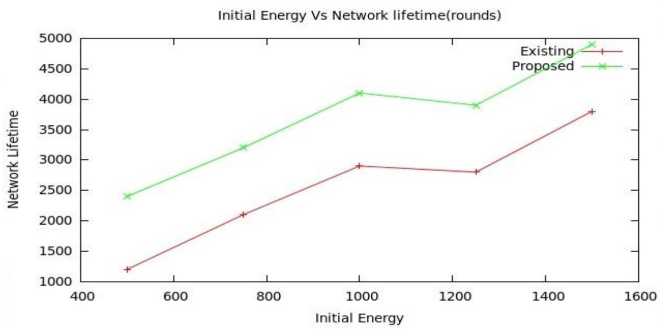

Fig 4 Initial Energy of Node

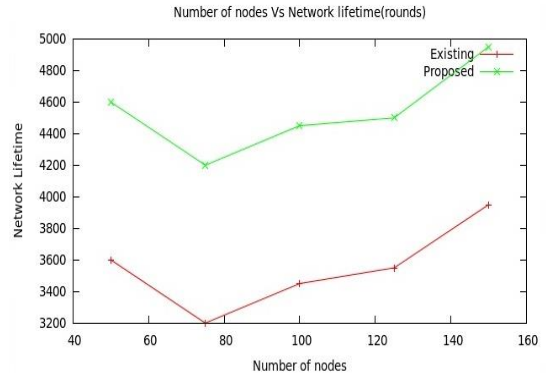

Fig 5 Network lifetime

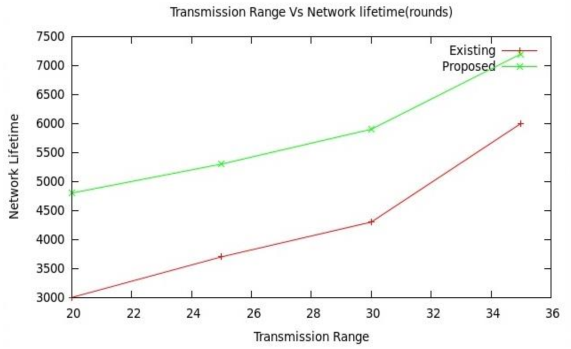

Fig 6 Transmission Range

V. CONCLUSION

We conclude that, the energy will be increases by increasing the network life time. EPRS will choose the shortest path selection. The Relay point node will receive the packets from the neighbouring node and transmit to the dynamic node while the sink is within the coverage area. The route path selection will be based on the mobile node which is nearest to the Relay Point node. From that we can save the energy and also increase the network life time in tree based networks.

References

[1] O. Younis, and S. Fahmy 2004, "HEED: a hybrid, energy-efficient, distributed clustering approach for ad hoc sensor networks". IEEE Trans. Mobile Comput., 3(4), pp.366-379.

[2] B. Gong, L. Li, S. Wang, and X. Zhou. 2008, "Multihop routing protocol with unequal clustering for wireless sensor networks" in Proc. CCCM, pp.552-556.

[3] R.C. Shah, S. Roy, S. Jain, and W. Brunette. 2003 "Data MULEs: modeling and analysis of a three-tier architecture for sparse sensor networks". Ad Hoc Networks, 1, pp.215–233.

[4] R. Sugihara, and R. K. Gupta, 2010 "Optimal speed control of mobile node for data collection in sensor networks". IEEE Transactions on Mobile Computing, 1(9), pp: 127-139.

[5] M. Ma, and Y. Y. Yang, 2007 "An energy-efficient data gathering mechanism for large-scale multi-hop sensor networks". IEEE transactions on Parallel and Distributed Systems, 10(18), pp: 1476-1488.

[6] Puthal, Sahoo, and Bibhudatta, 2012 "Adaptive protocol for critical data transmission of mobile sink wireless sensor networks". In Proceedings of IEEE sponsored International Conference on Computing, Communication and Applications, 2, pp: 22-24.

[7] T. Shi, and M. H. Liao, 2007 "Movement-assisted data gathering scheme with load-balancing for sensor networks". Journal of Software, 18(9):2235-2244.

[8] J. M. Wang, 2009 "Research on optimization WSN with movement-assisted data gathering scheme". Computer Engineering and Applications, 45(12), pp: 90-92.

[9] L. Friedmann, and L. Boukhatem, 2007 “Efficient multi-sink relocation in wireless sensor network”. Third International Conference on Networking and Services, pp.90.

[10] Heinzelman W. Chandrakasan A. Balakrishnan H.,”energy-Efficient Communication Protocol for Wireless Microsensor Network”s, Proceedings of the 33rd Hawaii International Conference on System Sciences, January 2000.

[11] Meenakshi Sharma, Kalpana Sharma. An Energy Efficient Extended LEACH (EEE LEACH), 2012 International Conference on Communication Systems and Network Technologies, 2012.

[12] Arezoo Yektaparast, Fatemeh-Hoda Nabavi, Adel Sarmast. An Improvement on LEACH Protocol(Cell-LEACH), Advanced Communication Technology (ICACT), 2012 14th International Conference on, Feb. 2012.

[13] Scow Guther, CertCo, November 1997, “Wireless Relay Networks”, IEEE Network.

[14] Ke Liu, Nael Abu-Ghazaleh, “Reliable Energy Aware Routing in Wireless Sensor Networks”, Proceedings of the Second IEEE Workshop on Dependability and Security in Sensor Networks and Systems, 2006.

[15] R. Fonseca, O. Gnawali, K. Jamieson, S. Kim, P. Levis, and A. Woo. TEP 123: The Collection Tree Protocol.Aug. 2006.

[16] Kyle Jamieson, David Moss and Philip Levis. “Collection Tree Protocol”, Proceedings of the 7th ACM Conference on Embedded Networked Sensor Systems, 2009.

[17] Joakim Flathagen, Erlend Larsen, Paal E. Engelstad, etc. O-CTP: Hybrid Opportunistic Collection Tree Protocol for Wireless Sensor Networks, Local Computer Networks Workshops (LCN Workshops), 2012 IEEE 37th Conference on, Oct. 2012.

[18] K. Dasgupta et al., “An efficient clustering-based heuristic for data gathering and aggregation in sensor networks,” in the Proceedings of the IEEE Wireless Communications and Networking Conference (WCNC’03), New Orleans, Louisiana, March 2003.

[19] Ye, et al., "A Scalable Solution to Minimum Cost Forwarding in Large Scale Sensor Networks, "in the Proceedings of International Conference on Computer Communications and Networks (ICCCN), Dallas, TX, October 2001.

[20] K. Akkaya and M. Younis, “Energy and QoS aware routing in wireless sensor networks”, in special issue of Journal of Cluster Computing on Ad Hoc Networks (to appear).