International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE)
Volume 3, Issue 4, April 2014

Secure Data-Gathering Mechanisms in Wireless Sensor Networks with Multiple M-Collectors

Paramasivam.M[1], Balakumaran.D[2], Dinesh Thirunavukkarasu[3], Dhanasekar.S[4],

PG Scholar, Communication system, S.A Engineering College, Chennai, India,
Assistant professor, Communication system, S.A. Engineering College, Chennai, India,
PG Scholar, Communication system, S.A Engineering College, Chennai, India,
PG Scholar, Communication system, S.A Engineering College, Chennai, India,

***Abstract*--Several studies in recent years introduces mobility elements for data gathering in the wireless sensor network. Typically, practical constraints preclude a mobile element is moving through the field and collect all nodes activity in the sensor network and the solution must involve a combination of a mobile element visiting a several subtree of the nodes, while other all nodes communicate their data to the cache points wirelessly. Considering the utilization of multiple M-collectors using a data gathering algorithm where multiple M-collectors traverse through several shorter sub tours concurrently to reduce the distance and time constraints. The Multi-Hop Data Gathering Algorithm (MH-DGA) is reduce the Link broken by automatic modification in the routeand making longer network lifetime than in a network with static data sink or in a network which uses the mobile collector (*which can only move along straight lines, reaches maximum distance to the sink node and increase the capacity of the network*). This concludes that Multi-hop mobile data-gathering scheme can increasethe maximum distance to the Sink node and also increase the coverage area of the network. In addition, the proposed securedata-gathering scheme is introduce in the network and Mobility movement performance is improved. While using the Mobility in the network is significantly improved to the network lifetime and more secure the network. Also predominantly reduces the power consumption, time latencies and packet losses.**

Index Terms— Mobile Data Collector, M-Collector, Spanning tree, movement planning, Secure Data Gathering protocols, Multi-Hop Protocols, Wireless Sensor Networks

I INTRODUCTION

The Study of recent advancement in WSNs reveals about the usage of sensors in collecting the information from the surrounding environmental conditions. The sensor applications are widely used in industrial process such as traffic flow measurement, monitoring and controlling the machine activities, building safety and security, tracking the air pollutants in the surrounding environment etc. Data uploading and sensing the field area are the two major responsibilities of the wireless sensor. As a result the life time of the sensor node reduces drastically. So the wireless sensor network the mobile node refers to M-collector collects the information from all the sensor nodes in the networks and forward to the outside data sink. This reduces the power consumption and network lifetime's prolongs compare to the other networks. So finally we conclude that mobile data collector which to be mobile is perfectly suitable for data gathering. It can move very closely to the sensor nodes and sub sequentially the network lifetime is expected to prolong.

II RELATED WORK

Here, we briefly outline to some related work on the mobile data gathering mechanisms in WSNs. In [2] and [4], radio tagged goat, loin and gorilla were mobile nodes is used to collect sensing data in a wild areas or location. These animal-based nodes randomly roam in the sensing field area or location and exchange sensing data only when they travel close to each other. Thus, sensor nodes in such a wireless network are not necessarilyjoinedat all the time. Additionally, the mobility of randomly roam animals is hard to predict and control; thus, the highestdelayed data is should not be guaranteed.Cluster heads will predictably consume more energy than other sensor nodes. To avoid the trouble of cluster heads failing quicker than other nodes, sensor nodes can become cluster heads rotationally [3].

In this type of network, since every sensor node may possibly become a cluster head, each of them has to be "powerful" enough to handle incoming and outgoing traffic and cache sensing data packets, which will increase the overall cost of the entire sensor network. It has been widely known that data packet routing can cost significant energy expenditure in wireless sensor networks with a flat topology configuration. To overcome this difficulty, some related works in the literature have introduced a hierarchy to the network [6]–[9], [8], and [10]. In such a network, sensor nodes are linked into clusters and form the lower layer of the network. At the higher layer, m-collector collect sensing data from the sensors and forward data packets to the outside data sink node. In general, such two-layered hybrid networks are more scalable and energy-efficient than homogeneous sensor networks. A cluster head acts not only as a data aggregation point for collecting sensing data from sensors but also as a controller/scheduler to make various routing and scheduling decisions.Unlike homogeneous networks, a heterogeneous sensor network contains a small number of resource-rich nodes together with a large number of resource-limited basic sensor nodes. Basic sensor nodes have limited communication capability and mainly focus

on sensing the environment, whereas resource-rich nodes are equipped with more powerful transceivers and batteries.

III PRELIMINARIES WORK

In Existing work, The Multi-Hop Data Gathering Algorithm (MH-DGA) is considering as multiple M-Collector is connected together and as results to reduce the Link broken by automatic modification in the route and making longer network lifetime than in a network with static data sink or in a network which uses the mobile collector (which can only move along straight lines, reaches maximum distance to the base station and also increase the capacity of the network). In Fig. 1, this concludes that Multi-hop mobile data-gathering algorithm is increase the maximum distance to the Sink node and the coverage area of the network.

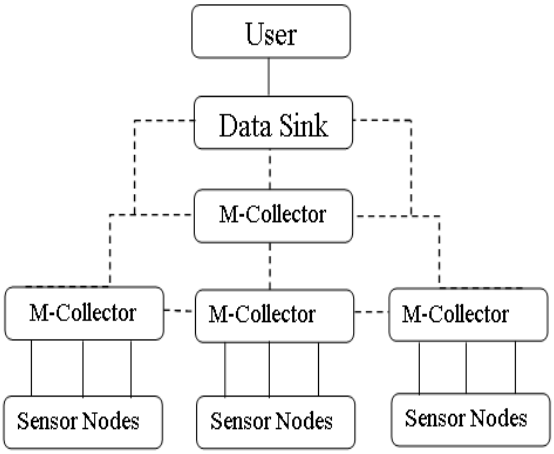

Fig. 1.Multi-Hop Data-Gathering

IV PROPOSES WORK

The proposed new secure data-gathering scheme is introduce in the multi-hop with the network and as a results the Mobility movement performance is improved. While using the Mobility in the network is significantly improved to the network lifetime and more secure data gathering scheme.Because in proposed system to use digital signature key to overcome the problem of unauthorized person access. Also predominantly reduces the power consumption, time latencies and packet losses.The M-Collector is to collect the required information from the sensor nodes. All the M-Collector is to share the secret key. In Fig. 2, the mobile nodes send a route request massage to the all the sensor nodes and the sensor nodes is responsible for only key matched M-Collectors in the networks. After the sensor nodes send informationto the nearest M-Collector and finally the entire data packet is forward to the outside the data sink.

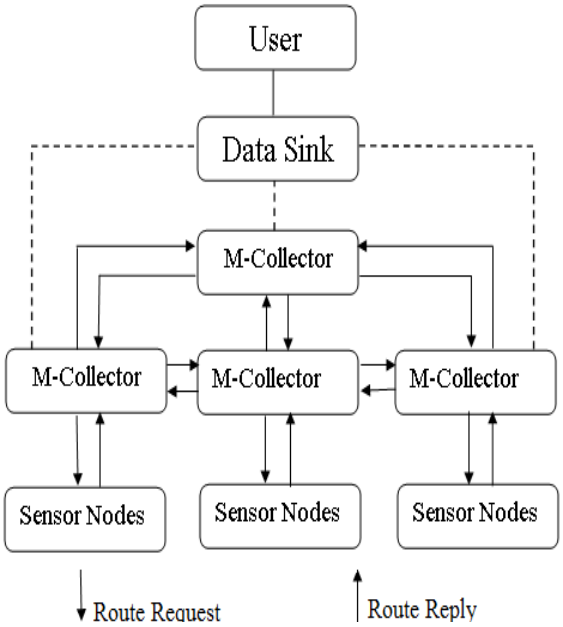

Fig. 2.Secure Multi-Hop Data-Gathering

A Before entering the network, each sensor node obtains a digital signature key certificate from a trusted certificate server. The M-Collector visit from hop to hop authentication between intermediate nodes sensor only trusts M-Collector to choose return path. M-Collector is share the signed key along with own certificate and it does contain the source IP address, along with a source-specific nonce (to detect duplicates key). Nodes send signed error messages to indicate link breaks, and packets arriving on deactivated paths. ERR message contains IP address of originating node, along with its signature. The Digital Signatures are used to protect the integrity of the non-mutable data packet in RREQ and RREP messages. Sign every field of the message except the Hop Count and hash chain fields.

V MULTI-HOP DATA GATHERING WITH MULTIPLE M-COLLECTORS

In the scenario say that, the header sensor nodes are to collect data from the nearest node and directly sent to the base station. As a results network life time is drastically. So we introduces Mobile Data Collector is refers M-Collector in the wireless sensor network. The M-Collector is move close to the sensor nodes and collects entire network information. In Fig. 3, All the M-Collectors is wirelessly connected in the network to overcome the problem of route breakage, if it's any link is disconnected to change the alternate path. So finally all data information is forwarded to the outside the data sink.

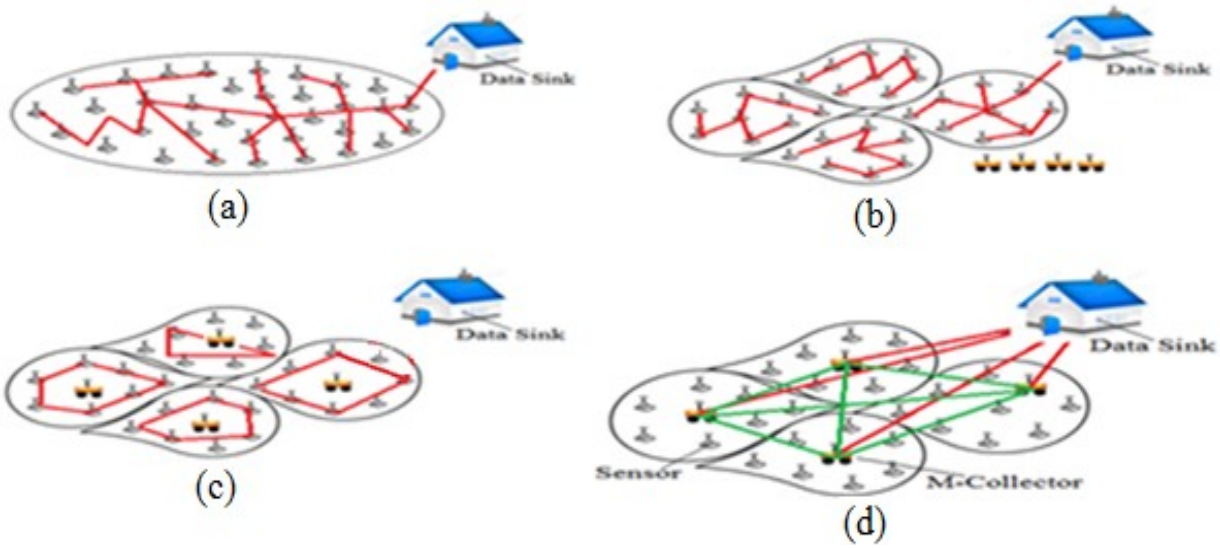

Fig. 3.Secure Data gathering with multiple M-Collectors. (a) Wireless sensor network (b) Decompose the spanning covering tree into a set of subtrees. (c) Find an approximate shortest tour on points of each subtree. (d) Sensing data collected from sensors are forward to the M-Collector to nearest M-Collector to the outside data sink.

A. Multi-hop Secure Data Gathering algorithm

The Multi-Hop Secure Data Gathering Algorithm step is shows as in fig.3 .Descriptionof (a), (b), (c) and (d).

Step1:
Input: Number of partition
Output: Segmented M-Collector WSN Network
Step2:
Source: n
M-Collector:M
Neighbor segment
Sink:S
Step3:
M-Collector data Gathering process from source node
Step4:
Multi-hop Secure Data Gathering Protocol
Step5:
To send the route request message,
To receive the route reply message, (Ack)
To share the digital signature key
Source sent to near m-collector and More than one M-collector collect all information directly transferred sink.
Step6:
Evaluate performance Analysis.

B. Data Transmission Range

The data transmission range is shown the simulation result is to analyze the M-Collator data gathering performance of the Wireless Networks using multi-hop secure data gathering algorithm. The Mobile data collector is used mixer integer programs such as spanning tree covering algorithms is used to segment the several sub areas. In Fig. 4, so we easily used multiple M-Collectors in the network and each and every M-Collector is covered some areas. Finally all mobile data collector is visitingthe sub areas and gather data is forwarded to sink.

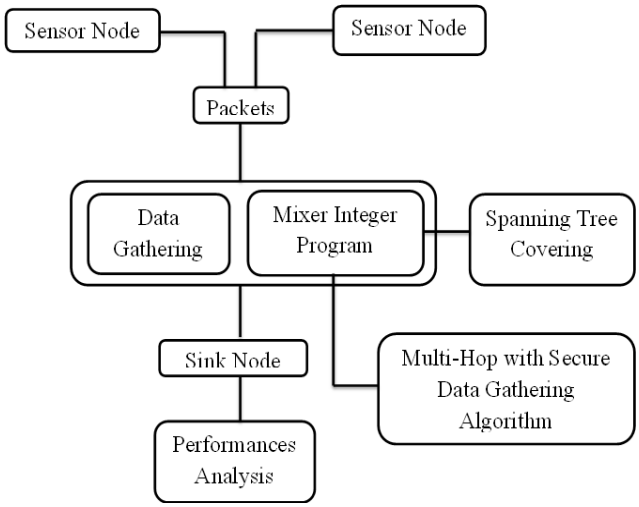

Fig. 4.Data Transmission Range

VI SIMULATION AND RESULTS ANALYSIS

Our simulation result is to analyze the performance of the Wireless Networks using AODV with multi-hop secure data gathering algorithm. The execution were approved out using the wireless Sensor network environment of sensor nodes over a simulation area of 1200 meters x 1200 meters level gap in service for 10 seconds of simulation time. In table 1, shows the radio and IEEE 802.11 MAC layer models were used. The network based data processing is most expensive and

data communication level on their performance on the network. Hence, the simulation results is do not account for the overhead produced when a multicast members leaves a group. Multiple sources create and end sending packets; each data has a steady size of 512 bytes. Each M-Collector to move randomly on their network, it's more and most expect-able on their WSN networks.

Table.1 Data Gathering Parameters

Parameter	Value
Version	Ns-allinone 2.28
Protocols	AODV, Secure Data gathering Protocols
Area	1200m x 1200m
Broadcast Area	250m
Transfer model	UDP, CBR
Data Size	512 bytes

A. Tour length of a Multi-hop network

The data transmission range is equal to 40, 60, 80 is all combination of the average tour length of M-Collector. The sensors are fixed in the 500m x 500m to the field. An M-Collectors moving through the field and collect the data from the point (0 m, 250 m) and returns to the same point after each tour. In a very sparsely deployed network where the transmission range is relatively short compared with the average distance between a sensor node and its nearest neighbor, it is very possible that the network is totally disconnected. In this case, the M-collector is travel or visit every sensor node regardless of the algorithm employed.

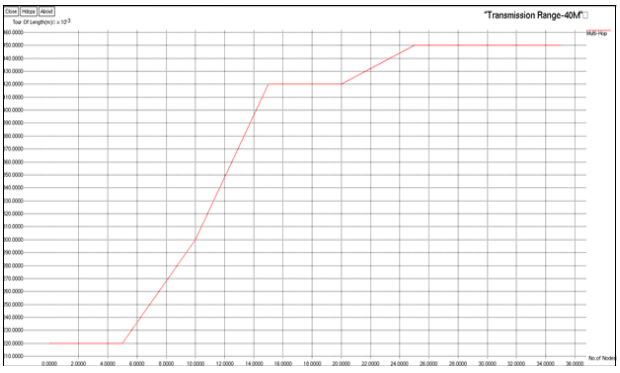

Fig. 5(a).Transmission range of sensors equal to 40 m.

We can observe in Fig. 5(a) that when 20 nodes with a relatively short transmission range of 40 m are deployed, both the spanning tree covering algorithm and the covering line algorithm have very close tour length to the optimal solution.

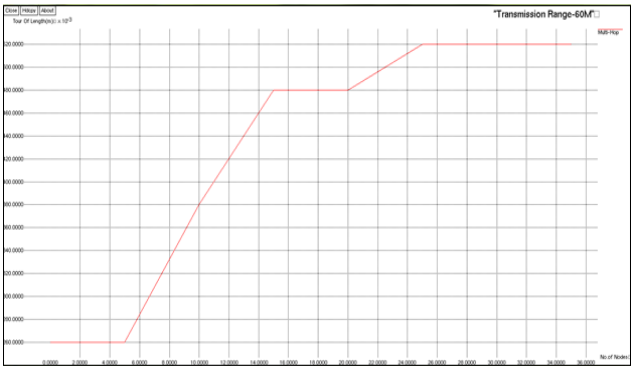

Fig. 5(b).Transmission range of sensors equal to 60 m.

However, as the transmission range is increases, we can see in Fig. 5(b) and (c) that the spanning tree covering algorithm performs much better than very close to the optimal solution and the covering line algorithm. We also compare the M-Collector tour length of the spanning tree covering algorithm with the covering line algorithm in larger networks.

We measured the relative M-Collector tour length of the spanning tree covering algorithm compared with that of the covering line algorithm for transmission ranges 40, 60, and 80 m, respectively, when the number of nodes is increases from 100 to 1000. Sensors node are randomly deployed into a 1000 m x 1000 m field. The M-collector needs to visit the data sink at point (0 m, 500 m) in each tour.

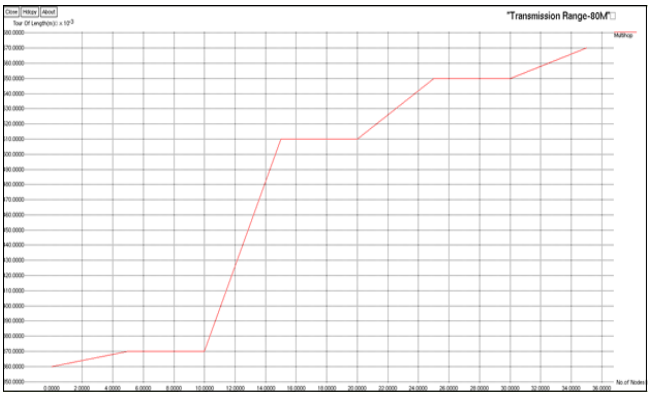

Fig. 5(c).Transmission range of sensors equal to 80 m.

In Fig. 6.Below, we can observe that, for any transmission range, the relative tour length keeps decreasing as the network size increases. For the network as large as 1000 nodes with the transmission range equal to 80 m, the spanning tree covering algorithm can save up to 70% moving distance compared with the covering line algorithm.

A. Data Transmission of Multi-hop with multiple M-Collectors

The Multi-hop data aggregate in all the M-Collector is broadcast the Id address and the sensor is response.

The mobile node and sensor is shared the secret signature key, if the keys are same. The M-Collector is continuouslyauthenticated to exchange the data's. In case any error, link break, or duplicate key is found in the network. The M-Collector is notifies the message alert. Like that, each and every M-Collector aggregate to collect the data information to nearest sensor node. In Fig. 6. Shows, All the M-Collector shared the required information. Finally, the data packet is forwarded to hop by hop to the outside the data sink and all the M-Collector is communicate in Mesh topology. So the Network is good connection between sensors to outside sink and avoid link break.

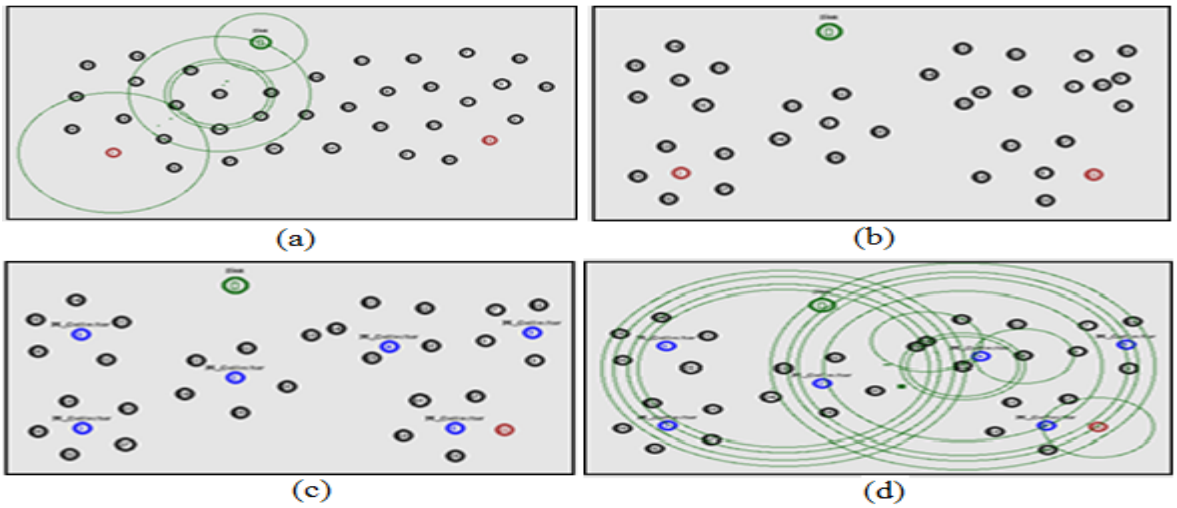

Fig. 6.Multi-hop data gathering with multiple M-Collectors. (a) Broadcasting WSNs (b) spanning covering tree (c) spanning covering tree is decomposed into a set of subtrees (d) An approximate shorter subtour is found on nodes of each subtree and M-Collector to M-Collector forward the data packets to outside the sink node.

B. Network lifetime

An m-collector, which can be move along straight line a well-plannedsecure data aggregate visit that starts from and ends at anchor point. The M-Collector is to collect the required information from the sensor nodes. All the M-Collector is to share the secret key and Broadcast route request massage to the all the sensor nodes and the sensor nodes is responsible for only key matched M-Collectors. After the sensor nodes send information to the nearest M-Collector and finally the entire data packet is forward to the outside the data sink.Before that each sensor node that can decode the 'HELLO' message correctly replies with an 'ACK' message to notify the M-Collector where it is. Upon receiving the 'ACK' message from the sensor node, the M-Collector mark the sensor location and after to share ID address before collecting the required information. So the multi-hop data gathering mechanisms is more secured and also improved the network life time.

VII CONCLUSION

The multi-hop secure data-gathering algorithm can greatly reduce the moving length compared with the covering line and spanning covering tree algorithm and is close to the optimal algorithm in small networks. This concludes that Multi-hop mobile data-gathering scheme can improve the maximum distance to the sink and increase the coverage area of the network. Also predominantly reduces the power consumption and packet losses.

REFERENCES

[1] A. Mainwaring, J. Polastre, R. Szewczyk, D. Culler, and J. Anderson, "Wireless sensor networks for habitat monitoring," in *Proc. ACM Int.Workshop Wireless Sens. Netw. Appl.*, Atlanta, GA, Sep. 2002, pp. 88–97.
[2] S. Chessa and P. Santi, "Crash faults identification in wireless sensor networks," *Comput.Commun.*, vol. 25, no. 14, pp. 1273–1282, Sep. 2002.
[3] L. Schwiebert, S. K. S. Gupta, and J. Weinmann, "Research challenges in wireless networks of biomedical sensors," in *Proc. ACM MobiCom*, 2001, pp. 151–165.
[4] P. Juang, H. Oki, Y. Wang, M. Martonosi, L. Peh, and D. Rubenstein, "Energy-efficient computing for wildlife tracking: Design tradeoffs and early experiences with ZebraNet," in *Proc. ASPLOS*, 2002, pp. 96–107.
[5] C. Ma and Y. Yang, "A battery-aware scheme for routing in wireless ad hoc networks," *IEEE Trans. Veh. Technol.*, vol. 60, no. 8, pp. 3919– 3932, Oct. 2011.
[6] T. Small and Z. Haas, "The shared wireless infostation model—A new ad hoc networking paradigm (or where there is a whale, there is a way)," in *Proc. ACM MobiHoc*, 2003, pp. 233–244.
[7] I. Vasilescu, K. Kotay, D. Rus, M. Dunbabin, and P. Corke, "Data collection, storage and retrieval with an underwater sensor network," in *Proc.ACM SenSys*, 2005, pp. 154–165.
[8] A. Chakrabarty, A. Sabharwal, and B. Aazhang, "Using predictable observer mobility for power efficient design of a sensor network," in *Proc.2nd Int. Workshop IPSN*, Apr. 2003, pp. 129–145.

[9] B. Hull, V. Bychkovskiy, K. Chen, M. Goraczko, E. Shih, Y. Zhang, H. Balakrishnan, and S. Madden, "CarTel: A distributed mobile sensor computing system," in *Proc. ACM SenSys*, 2006, pp. 125–138.
[10] A. Pentland, R. Fletcher, and A. Hasson, "Daknet: Rethinking connectivity in developing nations," *Computer*, vol. 37, no. 1, pp. 78–83, Jan. 2004.
[11] D. Jea, A. A. Somasundara, and M. B. Srivastava, "Multiple controlled mobile elements (data mules) for data collection in sensor networks," in *Proc. IEEE/ACM Int. Conf. DCOSS*, Jun. 2005, pp. 244–257.
[12] R. C. Shah, S. Roy, S. Jain, and W. Brunette, "Data MULEs: Modeling a three-tier architecture for sparse sensor networks," in *Proc. IEEE WorkshopSens. Netw. Protocols Appl.*, 2003, pp. 30–41.
[13] S. Jain, R. C. Shah, W. Brunette, G. Borriello, and S. Roy, *Exploiting mobility for energy efficient data collection in wireless sensor networks*.Norwell, MA: Kluwer, 2005.
[14] W. Zhao, M. Ammar, and E. Zegura, "A message ferrying approach for data delivery in sparse mobile ad hoc networks," in *Proc. ACM MobiHoc*, 2004, pp. 187–198.
[15] J. Luo and J.-P.Hubaux, "Joint mobility and routing for lifetime elongation in wireless sensor networks," in *Proc. IEEE INFOCOM*, 2005, pp. 1735–1746.
[16] A. Kansal, A. Somasundara, D. Jea, M. Srivastava, and D. Estrin, "Intelligent fluid infrastructure for embedded networks," in *Proc. ACM MobiSys*, 2004, pp. 111–124.
[17] A. A. Somasundara, A. Ramamoorthy, and M. B. Srivastava, "Mobile element scheduling for efficient data collection in wireless sensor networks with dynamic deadlines," in *Proc. IEEE RTSS*, Dec. 2004, pp. 296–305.
[18] W. Wang, V. Srinivasan, and K. C. Chua, "Using mobile relays to prolong the lifetime of wireless sensor networks," in *Proc. ACM Mobicom*, Aug. 2005, pp. 270–283.
[19] I. Slama, B. Jouaber, and D. Zeghlache, "Multiple mobile sinks deployment for energy efficiency in large scale wireless sensor networks," *e-Bus.Telecommun.,Commun. Comput. Inf. Sci.*, vol. 48, no. 5, pp. 412–427,
2009.
[20] H. Lee, M. Wicke, B. Kusy, O. Gnawali, and L. Guibas, "Data stashing: Energy-efficient information delivery to mobile sinks through trajectory prediction," in *Proc. ACM IPSN*, 2010, pp. 291–302.
[21] J.W. Lee, B. Kusy, T. Azim, B. Shihada, and P. Levis, "Whirlpool routing for mobility," in *Proc. ACM Mobihoc*, 2010, pp. 131–140.
[22] E. Ekici, Y. Gu, and D. Bozdag, "Mobility-based communication in wireless sensor networks," *IEEE Commun. Mag.*, vol. 44, no. 7, pp. 56–62, Jul. 2006.
[23] X. Xu, J. Luo, and Q. Zhang, "Delay tolerant event collection in sensor networks with mobile sink," in *Proc. IEEE INFOCOM*,Mar. 2010, pp. 1–9.
[24] G. Xing, T. Wang, W. Jia, and M. Li, "Rendezvous design algorithm for wireless sensor networks with a mobile base station," in *Proc. ACMMobihoc*, May 2008, pp. 231–240.

BIOGRAPHY

ParamaSivam.M received B.E. degree in Electronics Communication Engineering from Anna University of Affiliated Institution in 2011 and now currently pursuing the Master of Engineering Degree in Communication systems from Anna University of affiliated institution. From 2011 to 2012, he was a junior Engineer in Elcon System at Madurai. His research interests Include wireless sensor networks, wireless mesh networks, wireless local area networks and Ad-hoc Network.

Balakumaran.D received B.E. degree in ECE from anna universityin April 2004and M.E. degree in Communication Systems from anna university in June 2008. He was Assistant Professor in Anna university affiliation Engineering College from May 2009 to Dec 2010. He was ASIC design Engineer in C2SiS from Jan 2011 to Dec 2012. Currently working as an Assistant Professor in Anna university affiliation Engineering College from Jan 2013 till now.His research interests Include wireless sensor networks and VLSI deign.

Dinesh Thirunavukkarasureceived the B.E. degree inElectronics &TeleComm., Engineering from Textile and engineering Institute, Shivaji University, May 2010 and now currently pursuing the Master of Engineering Degree in Communication systems from Anna University of affiliated institution. From 2011 to 2012, he was a Project Trainee Engineer in i-Source InfoSystems at Pune. His research interests Include wireless sensor networks, and wireless Ad-hoc Network.

DahanaSekar.S received the B.Eng degree in Electronics Communication Engineering from Anna University of Affiliated Institution in 2011 and now currently pursuing the Master of Engineering Degree in Communication systems from Anna University of affiliated institution. His research interests Include wireless sensor networks, and Ad-hoc Network (VANET, MANET).

