SRF STRATEGY FOR HETROGENEOUS SWSN

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Abstract— Scheduled Wireless Sensor Network (SWSN) is a kind of WSN where network has an ad-hoc infrastructure with varying topology. Key idea of SRF (Shortest Request First) is, most limited demand is handled shortest among the solicitations in the solicitations line. A heterogeneous framework is a hub sorting out which incorporated hub's using non-practically identical outlines and traditions particularly functionalities. In this paper we are attempting to assess SWSN with SRF technique so future system would be appreciative for this approach.

Index Terms— SRF, SWSN, WSN, Scheduled, Topology

Introduction

Scheduled Wireless Sensor Network (SWSN) is a kind of WSN where network has a ad-hoc infrastructure with varying topology. Normally WSN contains group of sensor nodes, each nodes is capable of sensing environmental changes over a period. There are varieties of sensor nodes/devices are available in the market. But the motto of all sensor nodes is to detect the changes of the environment in terms of message/packet and pass onto nearby/central/leader node. Usually group of such sensor nodes is called as WSN. The usage of this network is increasing day by day due to drastic changes in the environment/nature and to predict the upcoming disaster/event/task/message etc. The usage of such network is not just limited to environmental changes but also applied to hospital (patient/health monitoring), agriculture (crop monitoring system), vehicles (movements), city monitoring, crowd monitoring, ATMs/Banks/VIP places monitoring, etc.

SWSN is a scheduling WSN where packets/events are triggered/generated/sent based on certain strategies considering many factors like node's energy, performance, network lifetime, QOS, routing, latency, efficiency, connectivity, security, etc. There are many scheduling schemes can be formed like FCFS(First Come First Serve), SFS(Shortest First Service) or SRF (Shortest Request First), Priority, Physical/Logical grouping, Time Quantum, Dynamic, Auto Triggered, Malicious Curing, Validations, etc. These strategies will help us to improve energy saving, redundancy in data, less overhead, increasing network lifetime, less maintenance, highly secured, reliable, flexible, dynamic nature, auto controlled, etc.

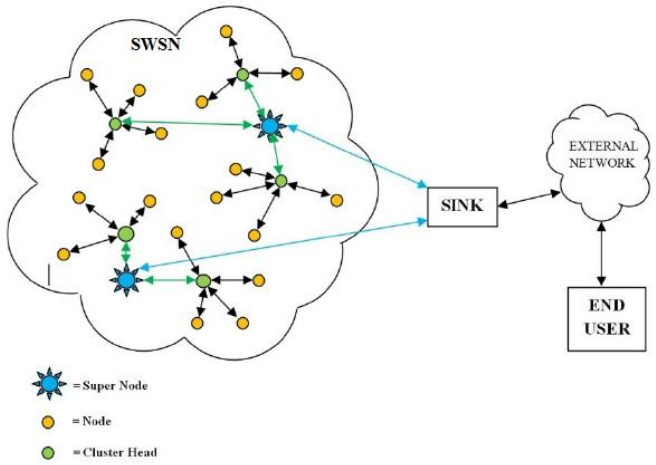

Figure 1: Structure of SWSN.

Figure 1 shows the basic architecture on the WSN, a heterogeneous network is a computer network comprised of computers using non-alike configurations and protocols.

According to the manner the data are received from the sensor nodes, SWSNs are classified into three broad categories namely (i) homogeneous sensor networks, (ii) heterogeneous sensor network and (iii) hybrid sensor network. In the homogeneous sensor networks, all the sensor nodes and base stations are identical in terms of hardware capability and initial battery energy. As proposed in LEACH algorithm, the role of cluster heads is randomly and periodically rotated over all the nodes to ensure the same rate of dissipation of battery energy for all the sensor nodes. Heterogeneous sensor networks, has two or more different types of sensor nodes with different hardware capabilities and battery power are used. The sensor nodes with higher hardware competencies and more battery power compared to other sensor nodes act as cluster heads and perform as a normal sensor node. In hybrid sensor networks several mobile base stations work cooperatively to give fast data congregation in a real-time manner.

II. RELATED Work

Book [1], briefs basics of wireless sensor network, highlights research areas of WSN; it lists popular simulators for WSN and finally briefs applications and challenges of WSN. Sensors are becoming part of the life hence its usages are also spreading across machine/human health care, traffic control, home control, military operations, inventory control, area/forest/industry monitoring, air/water testing, etc, hence this field provides a wonderful opportunity for researchers, students and others to explore more.

In [2], discussed about security solutions in heterogeneous nodes in MANETs since those networks are more vulnerable to hackers or crackers. And proposed a potential enhancements and new research possibilities in the Ad-Hoc middleware. It is a solution to security challenges in middleware for scalable and non-scalable MANETs and it has found that the malicious node would not be a part of communication in the network. Tried to prove it is one of the effective techniques for security issues in heterogeneous nodes in MANETs.

In [3], paper offers to share the data load among sensor nodes based on the logical grouping of WSN nodes. Load balancing can be accomplished to optimize resource usage, maximizing throughput, minimizing response time, and avoid overload by distributing work between alike types of sensor nodes. This will utilize multiple sensor nodes with load balancing as an alternative of single sensor nodes which may increase consistency through redundancy.

In [4][5][6], since energy efficient load balancing is a very necessary in WSN which helps to optimize resource usage, maximize throughput, maximize network lifetime, minimize response time, and avoid overload by sharing out work among alike type of sensor nodes with energy efficient routes[8[10][11][12][14]. Finally proposes an energy efficient load balancing among sensor nodes anchored in the logical and/or physical grouping of WSN.

In [7], as we know WSN have broad variety of application such as environmental monitoring, traffic analysis, industrial process monitoring, and planned systems. Large-scale WSNs are likely to play more and more important role in upcoming civilian and military application. Designing of MAC layer protocol for WSN is a challenging task due to limited battery power and limited bandwidth. Time Division Multiple Access Protocol solves both problems at the level of MAC layer. A variety of scheduling method for TDMA protocol with different objective has been proposed for WSNs. In this paper, they first outlined the sensor network properties that are crucial for the design of TDMA protocols and then, they have described quite a few TDMA protocols which are proposed for sensor networks.

In [9], the author has considered the problem of balancing indivisible unit size tokens on dynamic and heterogeneous systems. By altering a randomized strategy invented for homogeneous systems, we can attain an asymptotically nominal expected overload in l 1, l 2 and l ∞ norm while only slightly increasing the run-time by a logarithmic factor.

Design and Implementation

This work has been carried out in Java language with help of Oracle Database, the results shows the consistency of data processing in the SWSN types. The simulation has targeted to improve the performance of SWSN types. The simulation experiment is assumed 500 nodes as network size, where the packet End-to-End delay is the standard time that packets get to traverse the SWSN network. The delay includes the time from the generation of the packet from the initiator up to its reception at the application layer of destination including all the delays in the network such as buffer queues, time for transmission and delays induced by the routing activities and MAC control exchanges.

Hence, End-to-End delay is depends upon how better a routing protocol chooses the variety of constraints in the network and shows the consistency of the routing protocol. So, considering proposed algorithm technique and above study on SWSN types, the algorithm has hopes of high growth in the future. The sample algorithm is as follows,

```
Begin
   t ← totalTime;
   i← 0; //current node
   N ← number of nodes;
   j← 0;
  numberOfRequests← All requests are counted;
   Begin  loop (numberOfRequests-- !=0)
          Hetero[i] = getSRFRequests();
   end loop
   Begin  loop (Hetero[j] != null)
           t =  dataProcess(Hetero[j])
   end loop
end
```

Experimental results

Above algorithm has been simulated and extracted a result shown in Fig.2. All request has been received based on SRF strategy but from heterogeneous nodes. The graph shows the consistent performance improvement when a network size grown up.

Also proposed a theoretical model for energy efficient routing in heterogeneous SWSN network but did not implement and evaluate the performance of the protocol in current simulator extensively. But we judge the impact of the model and its behaviour with respect to benchmark LEACH protocol.

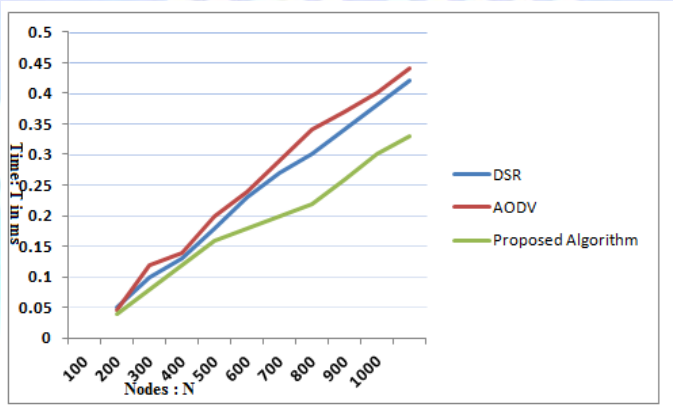

Figure 2. Time T of DSR, AODV and proposed algorithm V/S number of nodes.

Conclusion

In this paper, we offer a new SRF strategy on new kind of network which is heterogeneous SWSN, since currently existed network is becoming invalidated or less popular, so it is good to have a new technology. The proposed algorithm on this SWSN will increase the network lifetime, battery saving, bandwidth saving, and performance improvement by computing the SRF requests of each node based on the arrival information provided by each sensor node in the network.

References

[1] Chandrakant Naikodi, “Wireless Sensor Network for Beginners,” Mudranik Technologies Pvt Ltd 2014. ISBN: 9789351747277, Edition: 1 - Pub Date: 30-07-14,
Book Link: http://pothi.com/pothi/book/chandrakant-n-wireless-sensor-network-beginners

[2] Chandrakant N, *et al.*, “Middleware Services for Security in Scalable and Non-Scalable Heterogeneous Nodes of MANETs”, International Journal of Future Generation Communication and Networking(IJFGCN), ISSN: 1738-995x, June 2011, Issue Vol.4 No.2, Page No 1-12.

[3] Chandrakant N, "Logical Grouping of Heterogeneous Nodes in Wireless Sensor Network to Achieve Load Distribution and Balancing", International Journal of Advanced Engineering and global Technology (IJAEGT), ISSN:2309-4893, Volume-2 Issue-5, MAY 2014, Pages 705-708.

[4]Chandrakant N, "Energy Efficient Load Balancing among Heterogeneous Nodes of Wireless Sensor Network", International Journal of Advanced Engineering and global Technology (IJAEGT),ISSN:2309-4893, Volume-2 Issue-5, MAY 2014, Pages 700-704.

[5] Chandrakant N, "Energy Aware Load Balancing in Secure Heterogeneous Wireless Sensor Network", International Journal of Advanced Engineering and global Technology (IJAEGT), ISSN:2309-4893, Volume-2 Issue-5, MAY 2014, Pages 694-699.

[6] N. B. Fatma Bouabdallah and R. Boutaba. On balancing energy consumption in wireless sensor networks. Pages 1–16, march 2008.
[7]Sumit Kumar, Siddhartha Chauhan,"A Survey on Scheduling Algorithms for Wireless Sensor Networks", International Journal of Computer Applications (0975-8887), Volume 20 – No.5, April 2011.
[8] Y. Liao, H. Qi, and W. Li. Load-balanced clustering algorithm with distributed self-organization for wireless sensor networks. Sensors Journal, IEEE, 13(5):1498–1506, 2013.
[9] Robert Elssser and Burkhard Monien and Stefan Schamberger. In Load Balancing in Dynamic Networks.
[10] A. Tarachand, V. Kumar, A. Raj, A. Kumar, and P. Jana.
An energy efficient load balancing algorithm for clusterbased
wireless sensor networks. In India Conference (INDICON), 2012 Annual IEEE, pages 1250–1254, 2012.
[11] U. Wijetunge, A. Pollok, and S. Perreau. Load balancing
effect of stochastic routing in wireless sensor networks. In Telecommunication Networks and Applications Conference (ATNAC), 2012 Australasian, pages 1–6, 2012.
[12] F. Xia, X. Zhao, H. Liu, J. Li, and X. Kong. An energy efficient and load-balanced dynamic clustering protocol
for ad-hoc sensor networks. In Cyber Technology in Automation, Control, and Intelligent Systems (CYBER), 2012 IEEE International Conference on, pages 215–220, 2012.
[13] S. zdemir. Secure load balancing for wireless sensor networks via inter cluster relaying. In Kithab Proceedings, pages 249–253, 2007.
[14] R. Zhang, Z. Jia, and L. Wang. A maximum-votes and load-balance clustering algorithm for wireless sensor networks. In Wireless Communications, Networking and Mobile Computing, 2008. WiCOM '08. 4th International Conference on, pages 1–4, 2008.