International Journal of Applied Engineering Research
ISSN 0973-4562 Volume 10, Number 8 (2015) pp. 19819-19827

http://www.ripublication.com

Analysing Performance Metrics For Data Centric Protocols In Wireless Sensor Networks

Manivannan D[1],Manikandan N.K[2], Saran raj S[2], Antony Kumar K[2]
[1,2]Assistant Professor,
[1,2]Department of Computer Science and Engineering,
[1,2] Vel Tech University
[2]VelTech MultiTech Dr.Rangarajan Dr.Sakunthala Engineering College,
[1]mani02.ceg@gmail.com,[2]manikandan1488@gmail.com,
[2]antonykmr32@gmail.com,[2]sarandilp.er@gmail.com

Abstract

In recent years wireless sensor networks has gained a vast access in day today's life. The basic subsystem of WSN comprises with Information processing & information gathering. Various researchers & research groups are working on this particular domain to gain the end accuracy for information routing. In this paper the contribution is towards information routing and analysing its routing performance. Various authors have contributed their valuable effort in information routing and some of the best protocols play a vital role in Sensor network routing. Here we deeply investigate two optimal protocols in WSN which plays a key role in information routing. In this paper we have demonstrated the routing performance of the two optimal Data centric protocol in terms of graphical orientation. Experimental results demonstrated in this paper shows the accuracy level, reliability, through put of the analysed data centric protocols& graphs exhibits the comparison of performance metrics for two protocols.

Introduction

Wireless sensor networks are distributed connected networks with similar characteristics such as less energy level, closed circuit etc[1][5].According to the stat by the universal WSN forum, the growth of sensor networks is reached up to 2635 million on 2013. Generally Wireless sensor networks are used for various applications such as hospitals, military etc[2]. The main component of WSN are sub system, information processing and information routing. In this paper our context is fully on information routing and analysing the routing performance metrics in WSN[4]. When the networks of sensor nodes are highly in increased order, then the routing protocol leads to be the key area of research[3].

The main motto and work of this paper is to model the two optimistic data centric protocol for information routing. During information routing[10] the performance metrics are calculated. The unique key id the proposed methodology is to measure the packet jitter within the routing parameters [2]. The two protocols implemented and compared are SPIN and Directed diffusion protocols [8][9][11][13][15][16][21][22][25]. The results obtained reveal the delivery ratio of data packets within the inbound and outbound of the network [28][21].

Algorithmic Classes& Its Representation

The state of the art, the review of WSN[13][14] protocols(table 1) yields the better solution for optimistic routing and information processing, since to evaluate the performance during routing[12][17][18], the protocol is evaluated with certain metrics like throughput, jitter, bandwidth, reliability etc. here the detailed scope of all the proposed algorithm is studied and out of that the two optimistic algorithm is taken into the consideration and evaluated.

Table1: State of the Art – Algorithms in WSN [22-25]

Routing	**Data centric**	**SPIN**	**SPIN-PP**
			SPIN-EC
			SPIN-BC
			SPIN-RL
		Direct Diffusion	
		Energy ware	
		Reliable Energy Aware Routing (REAR)	
		Rumor	
		MCFA	
		Link Quality Estimation Based	
		Gradient Based	
		Information-driven	
		Acquire	
	Hierarchical	LEACH	
		EWC	
		PEGASIS	
		TEEN/APTEEN	
		Energy-aware cluster-based	
		Self-organized	
		Minimum energy communication network	
		Small minimum energy communication network	

Location-based	Geographic Adaptive Fidelity
	Energy Aware Greedy Routing (EAGR) Geographic and Energy Aware
QoS Aware	SPEED
	MMSPEED Sequential Assignment Real-Time Power-Aware DCEERP Energy Efficient with Delay Guaranties

Data Centric Protocol

Data centric protocols in wireless sensor networks are used to handle the redundancy of data. The protocol(Table 2) plays a vital role in information processing and identity management too. Generally the WSN's[26-28] nodes do not having their addressing scheme hence data transmission is redundant in nature.

Table 2: State of The Art – Protocol Stack

S. No	protocols	Classification	Base station	Mobility	Energy level	Data aggregation	Query based	Goal
1	**SPIN**	*Data centric*	**1**	**possible**	**Fixed**	**Possible**	**yes**	Lifetime, exchange metadata to reduce number of messages
2	**Direct diffusion**	*Data centric*	**1+**	**limited**	**Fixed**	**Possible**	**yes**	Establish efficient n-way communication paths for fault tolerance

SPIN

SPIN[6][8][9] is one of the most important data centric protocols in WSN(Figure 1) which operates in two ways. Firstly, to complete the task effectively and to conserve energy in the data processing, then it establishes the request and response throughout the base about the data which was already in the sensor nodes. Secondly, each node should adapt to the network about it changes and resource utilization. Metadata is collected for each sensor node and these metadata's are used to describe or to reference the sensor data[19-20]. Meta data does not have a specific format and mostly the Meta data format is application orientation. There are mainly three adverse flag of SPIN protocol[21][22],

ADV – advertisement flag which broadcast the Meta data
REQ – request flag to send particular request
DATA – message flag that hold on the data values (real entities not Meta data)

SPIN-PP
This protocol is designed mainly for peer to peer communication, using this protocol two sensor node or node to base station can communicate to each other without any interference.

SPIN-EC
This protocol uses 3 way handshaking with heuristic conservation. A node can make communication only with the active participation of the active node with certain threshold. Generally node with low energy level will sends REQ message along with data message.

SPIN-BC
This protocol is used for broadcasting within the network with shared channel. This protocol initially broadcast all the message within a certain range. This protocol works on basis of the three conditions mentioned below

- If a node receives an ADV advertisement message, it doesn't respond with REQ message quickly, it has to wait for certain period of time.
- If a node, except the broadcasting node receives REQ flag, the request sent from the particular node gets cancelled.
- If an advertising node with ADV flag receives the REQ flag then the node sends only the data message

SPIN-RL
This protocol is as same as SPIN-BC, here the node always track the ADV message, if the message is not received at the receiver end, then the node again sends the REQ message to gain the access with limited frequency along with time trial.

Directed Diffusion
In this protocol (Figure 2), the data generated form each sensor nodes are diffused within the sensor nodes with a naming scheme to avoid unnecessary routing happening in the sensor network at network layer to increase power efficiency. in this protocol each attribute values are notified and is requested to use the particular data pair and query the data on basis of on demand principle. Here when ever demand arises the query is submitted by requesting the data pair, the query is created based on the defined interest using the attribute values of each data pair. Interest is the broadcasting medium by the sink nodes along with caching and gradient field.

Gradient field are used as reply link to the neighbour node through which it receives the interest of the query. The cached interests are compared with the real time query interest to characterize the data rate, processing, packet duration etc. When the node failure is achieved between the sink and sources, the alternate path is traced immediately to prove the aptness of the protocol.

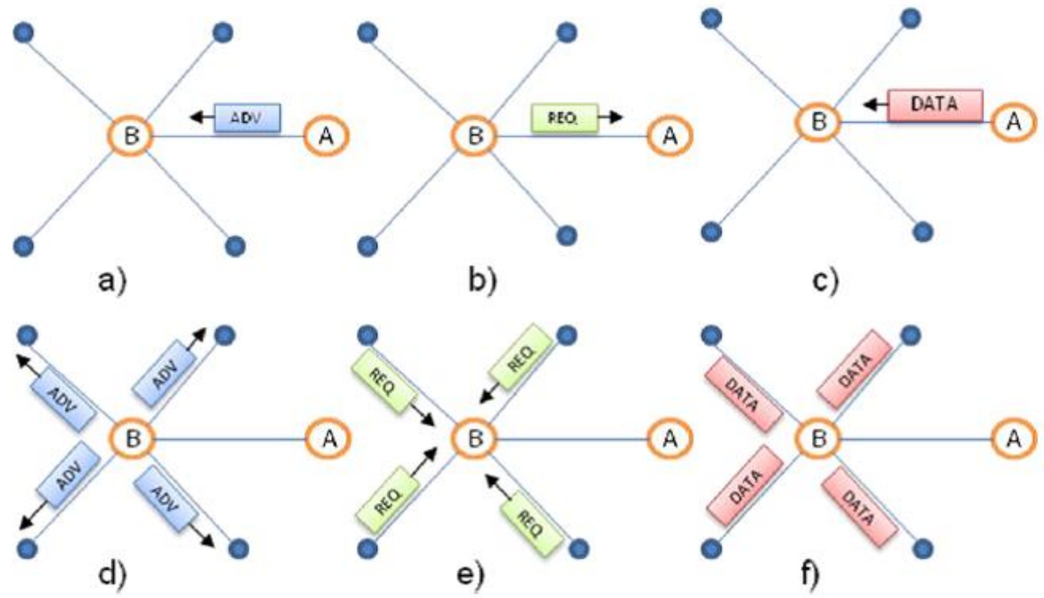

Figure 1: SPIN Protocol

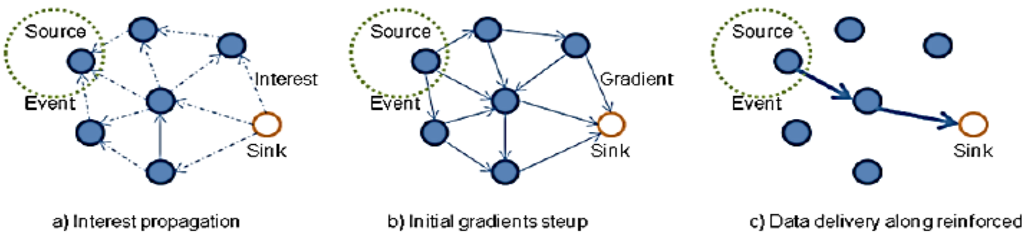

Figure 2: Directed Diffusion Protocol

Table 3: Performance Metrics of SPIN and Directed Diffusion

Routing performance metrics

S. No	*Energy consumption*	*Delay*	*Bandwidth utilization*	*Hop count*	*Base station*	*Total req*	*Successfully routed*
1	*SPIN*	*298.17*	*55.4*	*4.81*	*1*	*5884*	*5669*
2	*Direct Diffusion*	*213.06*	*45.25*	*3.44*	*1+*	*5884*	*5212*

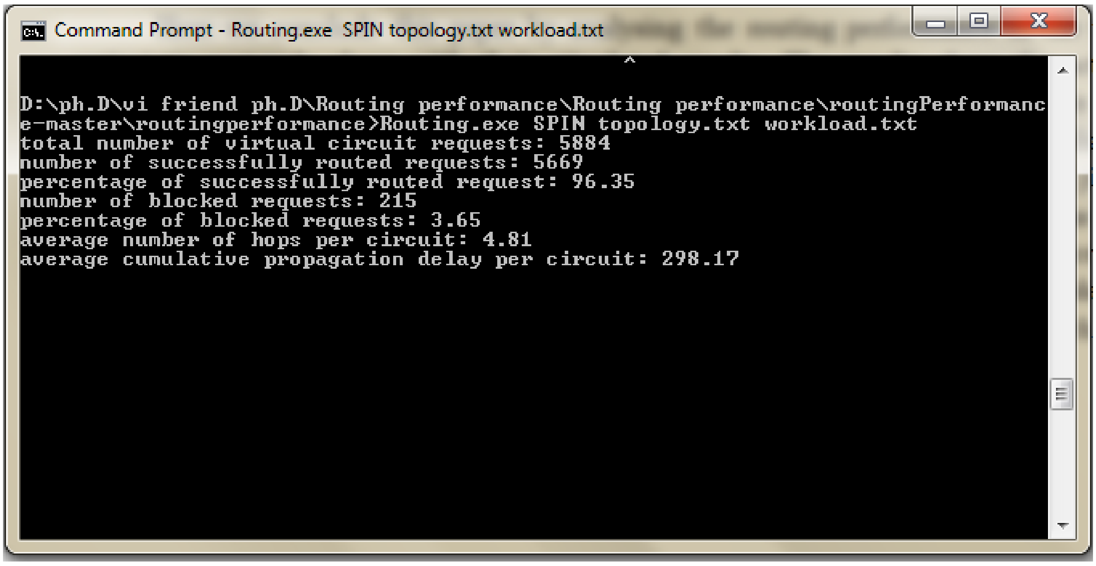

Figure 3: Routing performance metrics for SPIN protocol

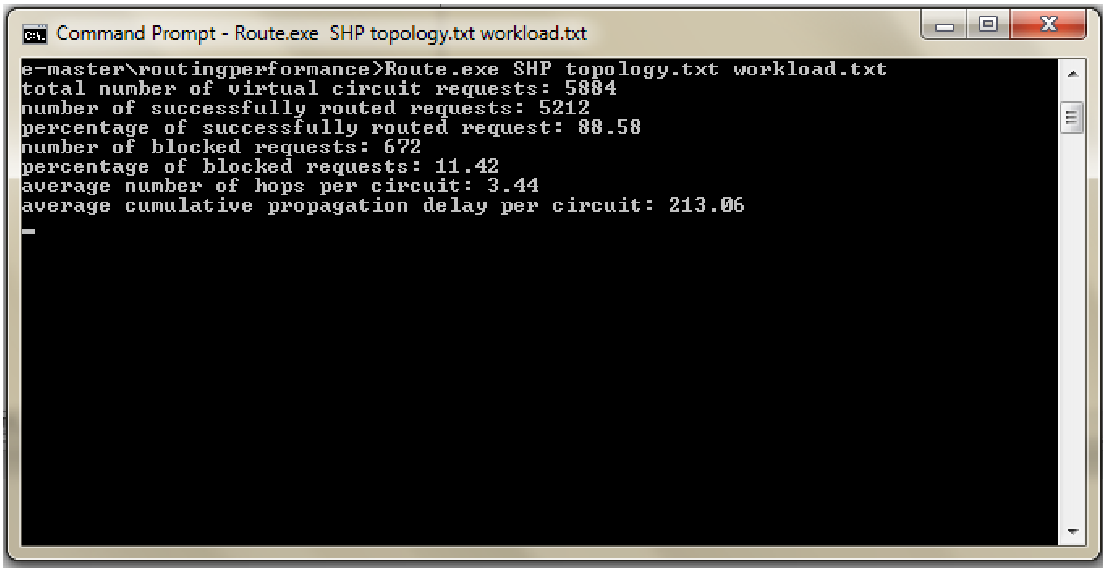

Figure 4: Routing Performance Metrics For Direct Diffusion Protocol

Conclusion

Here we conclude this paper by analysing the routing performance of the two optimistic protocols(Figure 3, Figure 4) along with their stipulated results(Table 3). The results show the actual demonstration and efficacy of the protocols in terms of throughput. According to the observation the direct diffusion protocol supports n number of base station by its reliable propagation of data and each circuited network is analysed for its delay along with its jitter and bandwidth. The uniqueness of the paper in analysing the routing performance was the optimality of the Hop is counted in the given topology which yields better results. The screen shots of the performance metrics evaluation for the two protocols are compared and updated in the (figure 5). In future, we would like to analyse the performance metrics for hierarchical protocols in Wireless sensor networks.

References

[1] I.F. Akyildiz, W. Su, Y. Sankarasubramaniam, E. Cayirci, "Wireless Sensor Networks: A Survey," Computer Networks 38 (2002) 393-422. A. Perrig, R. Szewczyk, V. Wen, D. Culler, J. D. Tygar, "SPINS: Security Protocols for Sensor Networks," Mobile Computing and Networking 2001 Rome, Italy.

[2] N. Gura, A. Patel, A. Wander, H. Eberle, S. C. Shantz, "Comparing elliptic curve cryptography and RSA on 8-bit CPUs," In Proceedings of the 11th Network and Distributed Systems Security Symposium (NDSS '04). 17-36.
P. Ning, A. Liu W. Du, "Mitigating DoS Attack against Broadcast Authentication in Wireless Sensor Networks," ACM Journal Name, Vol., No., 20, Pages 1-31.

[3] D. Liu, P. Ning, "Efficient Distribution of Key Chain Commitments for Broadcast Authentication in Distributed Sensor Networks," Washington DC:ACM Press, 2003:52-61.

[4] D. Liu, P. Ning, "Multi-level uTESLA: Broadcast Authentication for Distributed Sensor Networks," ACM Transactions in Embedded Computing Systems 3, 4, 800-836.

[5] D. Liu, P. Ning, S. Zhu, S. Jajodia, "Practical Broadcast Authentication in Sensor Networks," In Proceedings of the 2nd Annual International Conference on Mobile and Ubiquitous Systems: Networking and Services(Mobi Quitous 2005).

[6] L. Hu, D. Evans, "Using Directional Antennas to Prevent Wormhole Attacks," In Proceeding of the 11 th Network and Distributed System Security Symposium, February 2003, pp. 131-141.

[7] Siva D. Muruganathan, Daniel C. F. Ma, Rolly I. Bhasin, Abraham O. Fapojuwo, "A Centrialized Energy-Efficient Routing Protocol for Wireless Sensor Networks," IEEE Radio Communications March 2005 S8-S13. (Pubitemid 40573653)

[8] X. Du, M. Guizani, Y. Xiao, H. Chen, "Defending Dos Attack on Broadcast Authentication in Wireless Sensor Networks," In Proceeding of IEEE Communication Society subject matter experts for publication in the ICC 2008

[9] F. Akyildiz, W. Su, Y. ankarasubramaniam, and E. Cayirci, "A survey on sensor etworks," IEEE Communications Magazine, Volume: 40 Issue: 8, pp. 102-114, August 2002.

[10] G. Pottie and W. Kaiser, Wireless Sensor Networks. Communications of the ACM, 43(5): 51-58, May 2000.

[11] V. D. Park and M. S. Corson, "A highly adaptive distributed routing algorithm for mobile wireless networks," in IEEE INFOCOM '97, 1997, pp. 1405-1413.

[12] C. Karlof, D. Wagner, Secure Routing in Wireless Sensor Networks: Attacks and Countermeasures. Ad Hoc Networks, 2003, 1 (223):2932315.

[13] J. Kulik, W. R. Heinzelman, and H. Balak- rishnan, "Negotiation- based protocols for disseminating information in wireless sensor networks," Wireless Networks, Volume: 8, pp. 169-185, 2002.
M. Esler, J. Hightower, T. Anderson, and G. Borriello, Next century challenges: Data- centric networking for invisible computing: The portolano project at the University of Washington. In Proc. ACM Mobicom, 2000.

[14] H. C□am, S. Ozdemir, D. uthuavinashiappan, and P.Nair, "Energy-efficient security protocol for wireless sensor networks", IEEE VTC Fall 2003 Conference, October 4-9, Orlando, 2003.

[15] J. P. Hubaux, L. Buttyán and S. Capkun, The quest for security in mobile ad hoc networks, in: ACM Symposium on Mobile Ad Hoc Networking and Computing (2001).
Burges,C.J.C., A tutorial on support vector machines for pattern recognition, Data Mining and Knowledge Discovery, 1998, Vol.2, pp.121-167.

[16] Lee,K. L. and Billings,S. A., Time series prediction using support vector machines, the orthogonal and the regularized orthogonal least-squares algorithms.International Journal of Systems Science, 2002,Vol.33, 811-821.

[17] Yuh-JyeLeeE and Mangasarin,O.L., SSVM: A Smooth Support Vector Machine for Classification. Computational Optimization and Applications, 2001,Vol.20, pp.5-22.

[18] Yong Quan and Jie Yang, An Improved Parameter Tuning Method for Support Vector Machines . Lecture Notes in Computer Science, 2003,Vol.2639, pp.607-610.

[19] Zenios, S.A., Pinar,M.C., Dembo,R.S., A smooth penalty function algorithm for network-structured problems. European Journal of Operation Research. 1993,Vol.64, pp.258-277.

[20] ZhiqingMeng, Gengui Zhou, Yihua Zhu, A Smoothing Support Vector Machine Based on Exact Penalty Function, Lecture Notes in Artificial Intelligence,2005, Vol.3801, pp.568-573.

[21] Yang,X.Q.,Meng, Z.Q.,Huang,X.X., Pong,G.T.Y.: Smoothing nonlinear penalty functions for constrained optimization, Numerical Functional Analysis Optimization, 2003,Vol.24,pp. 351-364.

[22] Rubinov, A. M., Glover, B. M. and Yang, X. Q., Decreasing functions with applications to penalization, SIAM Journal of Optimization, 1999, Vol.10, pp.289-313.

[23] S.Tilak, N.Abu-Ghazaleh, W.Heinzelman, "A taxonomy of wireless micro-sensor network models", ACM SIGMOBILE Mobile Computing and Communications Review, Volume 6, Issue 2 (April 2002), pp 28-36.

[24] JN Al-Karaki, AE Kamal. Routing techniques in wireless sensor networks:a survey. IEEE Wireless Comm., 2004, 11: 6-28.

[25] C. Intanagonwiwat, R. Govindan, and D. Estrin, "Directed diffusion: a scalable and robust communication paradigm for sensor networks," Proceedings of ACM MobiCom '00, Boston, MA, 2000, pp. 56-67.

[26] Fabio Silva, John Heidemann, Ramesh Govindan, and Deborah Estrin. "Directed Diffusion". Technical Report ISI-TR-2004-586,USC/Information Sciences Institute, January, 2004.

[27] M Gerla, T J Kown, G Pei. On Demand Routing in Large Ad Hoc Wireless Networks with Passive Clustering[A]. Proc of IEEE WCNC 2000[C]. 2000.

[28] Y. Yi, M. Gerla, T.J. Kwon. Efficient flooding in ad hoc networks using on-demand (passive) cluster formation. Proc. of the 3rd ACM MobiHoc, Lausanne, Switzerland, June 9-11, 2002.

[29] Silva, F., Heidemann, J., Govindan, R. Network routing application programmer's interface (API) and walk through 9.0.1. Technical report, USC/ISI (2002).