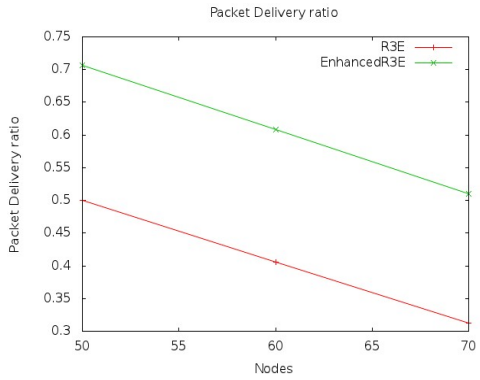

Figure 4: Graph showing comparison of packet delivery ratio between existing and proposed system.

(b) Delay: the time taken for a packet to be transmitted from the source node to the destination node.

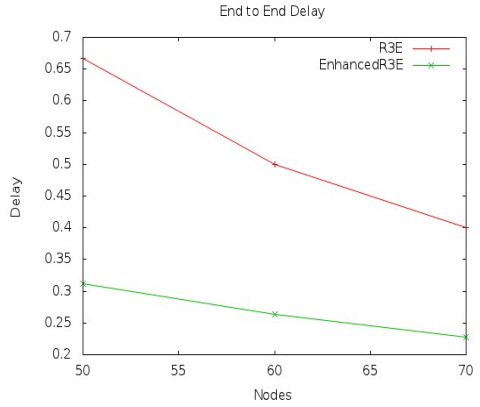

Figure 5: Graph showing comparison of throughput between existing and proposed system

(c) Throughput

Network throughput is the average rate of successful message delivery over a communication channel. This data may be delivered over a logical or physical link, or may pass through a certain network node. The throughput is generally measured in bits per second (bit/s or bps), and sometimes in data packets per time slot or data packets per second.

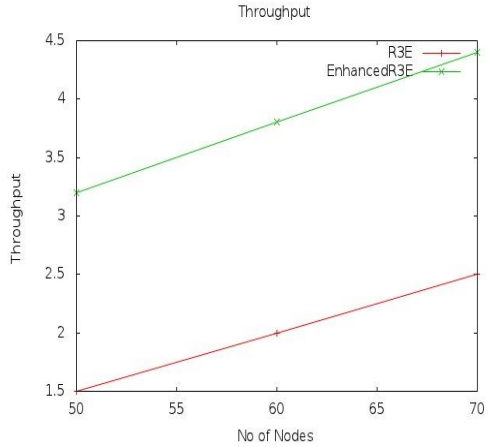

Figure 6: Graph showing comparison of throughput between existing and proposed system.

5. Conclusion

Secure and energy efficient Greedy Geographical routing supporting the dynamic nodes is presented in this project, this protocol improves the overall network performance such as end-to-end delay, throughput and energy consumption. The proposed system is well suited for dynamically distributed Wireless Sensor Networks. The performance of the proposed system is evaluated using the NS2 network simulator and the proposed protocol shows improvement in performance , energy consumption and delay when compare to the existing AODV protocol. In future , load balancing could be bought in and more focus need to be given on the security of the data or the packets tranmitted from source to destination

References

[1] J. Zhao and R. Govindan, "Understanding packet delivery performance in dense wireless sensor networks," in *ACM SenSys*, 2003, pp. 1–13.
[2] M. Zuniga and B. Krishnamachari, "Analyzing the transitional region in low power wireless links," in *IEEE SECON*, 2004, pp. 517–526.
[3] S. eun Yoo, P. K. Chong, D. Kim, Y. Doh, M.-L. Pham, E. Choi, and J. Huh, "Guaranteeing real-time services for industrial wireless sensor networks with IEEE 802.15.4," *IEEE Trans. Ind. Electron.*, vol. 57, no. 11, pp. 3868–3876, Nov. 2010.
[4] C. Perkins and E. Royer, "Ad-hoc on-demand distance vector routing," in *Proc. IEEE WMCSA*, 1999, pp. 90–100.
[5] M. Marina and S. Das, "On-demand multipath distance vector routing in ad hoc networks," in *Proc. IEEE ICNP*, Nov. 2001, pp. 14–23.
[6] D. B. Johnson and D. A. Maltz, "Dynamic source routing in ad hoc wireless networks," *Mobile Computing*, pp. 153–181, 1996.
[7] K. A. Agha, M.-H. Bertin, T. Dang, A. Guitton, P. Minet, T. Val, and J.-B. Viollet, "Which wireless technology for industrial wireless sensor networks? the development of Ocari technology," *IEEE Trans. Ind. Electron.*, vol. 56, no. 10, pp. 4266–4278, Oct. 2009.
[8] K. Yu, M. Gidlund, J. Åkerberg, and M. Björkman, "Reliable RSS-based routing protocol for industrial wireless sensor networks," in *Proc. IECON*, 2012, pp. 3231–3237.
[9] "U. D. of Energy, Industrial wireless technology for the 21st century," Office of Energy and Renewable Energy Report, 2002.
[10] Y. Gu and T. He, "Dynamic switching-based data forwarding for lowduty-cycle wireless sensor networks," *IEEE Trans. Mobile Comput.*, vol. 10, no. 12, pp. 1741–1754, Dec. 2011.
[11] V. Gungor and G. Hancke, "Industrial wireless sensor networks: Challenges, design principles, and technical approaches," *IEEE Trans. Ind. Electron.*, vol. 56, no. 10, pp. 4258–4265, Oct. 2009.
[12] V. Gungor, O. Akan, and I. Akyildiz, "A real-time and reliable transport protocol for wireless sensor and actor networks," *IEEE/ACM Trans. Netw.*, vol. 16, no. 2, pp. 359–370, Apr. 2008.
[13] Jianwei Niu, Long Cheng, Yu Gu, Lei Shu and Sajal K. Das "R3E:Reliable Reactive Routing Enhancement Routing Protocol for Wireless Sensor Network ", IEEE Trans. Ind. Informatics, vol.10, no. 1,Feb. 2014.

[14] S. Katti, H. Rahul, W. Hu, D. Katabi, M. Medard, and J. Crowcroft, "XORs in the air: Practical wireless network coding," *IEEE/ACM Trans. Netw.*, vol. 16, no. 3, pp. 497 510, Jun. 2008.
[15] R. Bruno and M. Nurchis, "Survey on diversity-based routing in wireless mesh networks: Challenges and solutions," *Computer Commun.*, vol. 33, no. 3, pp. 269–282, Feb. 2010.
[16] S. Biswas and R. Morris, "ExOr: opportunistic multi-hop routing for wireless networks," in *Proc. ACM SIGCOMM*, 2005, pp. 133–144.
[17] S. Chachulski,M. Jennings, S. Katti, and D. Katabi, "Trading structure for randomness in wireless opportunistic routing," in *Proc. AGM SIGCOMM*, 2007, pp. 169–180.
[18] L. Cheng, J. Cao, C. Chen, J. Ma, and S. Das, "Exploiting geographic opportunistic routing for soft QoS provisioning in wireless sensor networks," in *Proc. IEEE MASS*, 2010, pp. 292–301.
[19] X. Mao, S. Tang, X. Xu, Li X.-Y, and H. Ma, "Energy efficient opportunistic routing in wireless sensor networks," *IEEE Trans. Parallel Distrib.Syst.*, vol. 22, no. 11, pp. 1934–1942, Nov. 2011.