# TOP 10 MOBILE AND UBIQUITOUS COMPUTING PAPERS: RECOMMENDED READING – COMPUTER SCIENCE RESEARCH

http://airccse.org/top10/network/mobile_ubiquitous_computing.html

# Routing Protocols in Wireless Sensor Networks – A Survey

**Shio Kumar Singh 1, M P Singh 2, and D K Singh 3**
**1Maintenance Engineering Department (Electrical), Tata Steel Limited, Jamshedpur – 831001, Jharkhand, India,**
**2 Department Of Computer Science and EngineeringNational Institute of Technology, Patna, Bihar, India,**
**3 Department Of Electronics and Communication Engineering Department, Birsa Institute of Technology, Sindri, Dhanbad –828123, Jharkhand, India**

## Abstract

Advances in wireless sensor network (WSN) technology has provided the availability of small and low-costsensor nodes with capability of sensing various types of physical and environmental conditions, data processing, and wireless communication. Variety of sensing capabilities results in profusion of application areas. However, the characteristics of wireless sensor networks require more effective methods for data forwarding and processing. In WSN, the sensor nodes have a limited transmission range, and their processing and storage capabilities , as well as their energy resources, are also limited. Routing protocols for wireless sensor networks are responsible for maintaining the routes in the network and have to ensure reliable multi-hop communication under these conditions. In this paper, we give a survey of routing protocols for Wireless Sensor Network and compare their strengths and limitations.

## Keywords

Wireless Sensor Networks, Routing Protocols, Cluster Head

## REFERENCES


1. “21 ideas for the 21st century”, Business Week, Aug. 30 1999, pp. 78-167.

2. S.K. Singh, M.P. Singh, and D.K. Singh, “A survey of Energy-Efficient Hierarchical Cluster-basedRouting in Wireless Sensor Networks”, International Journal of Advanced Networking and Application (IJANA), Sept.–Oct. 2010, vol. 02, issue 02, pp. 570–580.

3. S.K. Singh, M.P. Singh, and D.K. Singh, "Energy-efficient Homogeneous Clustering Algorithm for Wireless Sensor Network", International Journal of Wireless & Mobile Networks (IJWMN), Aug. 2010, vol. 2, no. 3, pp. 49-61.

4. Jun Zheng and Abbas Jamalipour, “Wireless Sensor Networks: A Networking Perspective”, a book published by A John & Sons, Inc, and IEEEE, 2009.

5. S. Misra et al. (eds.), Guide to Wireless Sensor Networks, Computer Communications and Networks, DOI: 10.1007/978-1-84882-218-4 4, Springer-Verlag London Limited 2009.

6. Ivan Stojmenovic and Stephan Olariu. Data-centric protocols for wireless sensor networks. In Handbook of Sensor Networks, Chapter 13, pages 417–456. Wiley, 2005.

7. Christopher Ho, Katia Obraczka, Gene Tsudik, and Kumar Viswanath, “Flooding for reliable multicast in multi-hop ad hoc networks”, In Proceedings of the 3rd International Workshop on Discrete Algorithms and Methods for Mobile Computing and Communications (DIAL-M’99), 1999, pp. 64–71.

8. Ming Liu, Jiannong Cao, Guihai Chen, and Xiaomin Wang, “An Energy-Aware Routing Protocol in Wireless Sensor Networks”, Sensors 2009, vol. 9, pp. 445-462.9. Luis Javier García Villalba, Ana Lucila Sandoval Orozco, Alicia Triviño Cabrera, and Cláudia Jacy Barenco Abbas, “Routing Protocol in Wireless Sensor Networks”, Sensors 2009, vol. 9, pp. 8399- 8421.

10. E. Zanaj, M. Baldi, and F. Chiaraluce, “Efficiency of the Gossip Algorithm for Wireless Sensor Networks”, In Proceedings of the 15th International Conference on Software, Telecommunications and Computer Networks (SoftCOM), Split–Dubrovnik, Croatia, September, 2007.

11. Jamal Al-Karaki, and Ahmed E. Kamal, “Routing Techniques in Wireless Sensor Networks: A Survey“, IEEE Communications Magazine, vol 11, no. 6, Dec. 2004, pp. 6-28.

12. I.F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, “A Survey on Sensor Network”, IEEE Communication Magazine, vol. 40, no. 8, Aug. 2002, pp. 102-114.

13. Kemal Akkaya and Mohamed Younis, “A Survey on Routing Protocols for Wireless Sensor Networks”, Ad hoc Networks, vol. 3, no. 3, May 2005, pp. 325-349.

14. N. Bulusu, J. Heidemann, and D. Estrin, "GPS-less Low Cost Outdoor Localization for Very Small Devices", IEEE Personal Communication Magazine, vol. 7, no. 5, Oct. 2000, pp. 28-34.

15. Y. X:u, J. Heidemann, and D. Estrin, "Geography-informed energy conservation for ad-hoc routing", Proceedings ACM/IEEE MobiCom'01, Rome, Italy, July 2001, pp. 70-84.
16. M. Stemm and R. H. Katz, "Measuring and reducing energy consumption of network faces in handheld devices", IEICE Transaction on Communications, vol. E80-B, 8, Aug.1997, pp. 1125-1131.

17. O. Kasten,"Energy Consumption", www.infethz.ch/ kasten/researchlbathtub/energyconsumption.html.

18. P. Bahl and V. N. Padmanabhan, "Radar: A in-building rf-based user location and tracking system", Proceedings IEEE INFOCOM'OO, vol. 2, Tel-Aviv, Israel, Mar. 2000, pp. 775-784.

19. L. Doherty, K. S. Pister, and L. E. Ghaoui, "Convex position estimation in wireless sensor networks", International Journal of Computer Science & Engineering Survey (IJCSES) Vol.1, No.2, November 2010 81 Proceedings IEEE INFOCOM'OI, vol. 3, Anchorage, AK, Apr. 2001, pp. 1655-1663.

20. Y. Yu, R. Govindan, and D. Estrin, "Geographical and energy aware routing: A recursive data dissemination protocol for wireless sensor networks", Technical Report UCLA/CSD-TR-01-0023, UCLA Computer Science Department, May 2001.

21. B. Chen, K. Jamieson, H. Balakrishnan, and R. Morris, "Span: An energy-efficient coordination algorithm for topology maintenance in ad hoc wireless networks", Proceedings ACM MobiCom'01, Rome, Italy, July 2001, pp. 85-96.

22. B. Chen, K. Jamieson, H. Balakrishnan, and R. Morris, "Span: An energy-efficient coordination algorithm for topology maintenance in ad hoc wireless networks", Wireless Networks, vol. 8, no.5, Sept. 2002, pp. 481-494.

23. B. Nath and D. Niculescu, "Routing on a curve", ACM SIGCOMM Computer Communication Review, vol. 33, no.1, Jan. 2003, pp. 155-160.

24. G. Xing, C. Lu, R. Pless, and Q. Huang, "On greedy geographic routing algorithms in sensing-covered networks", Proceedings ACM MobiHoc'04, Tokyo, Japan, May 2004, pp. 31-42.

25. M. Zorzi and R. R. Rao, "Geographic random forwarding (GeRaF) for ad hoc and sensor networks: Multihop performance", IEEE Transactions on mobile Computing, vol. 2, no. 4, Oct.-Dec. 2003, pp. 337-348.

26. V. Rodoplu and T. H. Meng, "Minimum energy mobile wireless networks", IEEE Journal on Selected Areas in Communications, vol. 17, no. 8, Aug. 1999, pp. 1333-1344.

27. L. Li and J. Y. Halpern, "Minimum-energy mobile wireless networks revisited", Proceedings IEEE ICC'01, Helsinki, Finland, June 2001, pp. 278-283.

28. W. R. Heinzelman, J. Kulik, and H. Balakrishnan, "Adaptive protocols for information dissemination in wireless sensor networks", Proceedings ACM MobiCom '99, Seattle, WA, Aug.1999, pp. 174-185.

29. J. Kulik, W. Heinzelman, and H. Balakrishnan, "Negotiation-based protocols for disseminating information in wireless sensor networks", Wireless Networks, vol. 8, no. 2/3, Mar.-May 2002, pp. 169- 185.

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

31. C. Intanagonwiwat, R. Govindan, D. Estrin, J. Heidemann, and F. Silva, "Directed diffusion for wireless sensor networking", IEEE/ACM Transactions on Networking, vol. 11., no. 1, Feb. 2003, pp. 2-16.

32. D. Braginsky and D. Estrin, "Rumor routing algorithm in sensor networks", Proceedings ACM WSNA, in conjunction with ACM MobiCom'02,Atlanta, GA, Sept. 2002, pp. 22-31.

33. Y. Yao and J. Gehrke, "The Cougar approach to in-network query processing in sensor networks", SGIMOD Record, vol. 31, no. 3, Sept. 2002, pp. 9-18.

34. N. Sadagopan, B. Krishnamachari, and A. Helmy, "The ACQUIRE mechanism for efficient querying in sensor networks", Proceedings SNPA'03, Anchorage, AK, May 2003, pp. 149-155.

35. A. Boukerche, X. Cheng, and J. Linus, "Energy-aware data-centric routing in microsensor networks", Proceedings ACM MSWiM, in conjunction with ACM MobiCom, San Diego, CA, Sept. 2003, pp. 42- 49.

36. W.R. Heinzelman, A. Chandrakasan, and H. Balakrishnan, "Energy-efficient Communication Protocol for Wireless Microsensor Networks", in IEEE Computer Society Proceedings of the Thirty Third Hawaii International Conference on System Sciences (HICSS '00), Washington, DC, USA, Jan. 2000, vol. 8, pp. 8020.

37. W.R. Heinzelman, A. Chandrakasan, and H. Balakrishnan, "An Application-Specific Protocol Architecture for Wireless Microsensor Networks" in IEEE Tmnsactions on Wireless Communications (October 2002), vol. 1(4), pp. 660-670.

38. Lan Wang and Yang Xiao, "A Survey of Energy-Efficient Scheduling Mechanisms in Sensor Network".

39. S. Lindsey and C.S. Raghavendra, "PEGASIS: Power-efficient Gathering in Sensor Information System", Proceedings IEEE Aerospace Conference, vol. 3, Big Sky, MT, Mar. 2002, pp. 1125-1130.

40. Ossama Younis and Sonia Fahmy, Distributed Clustering in Ad-hoc Sensor Networks: A Hybrid, Energy-efficient Approach", September 2002. International Journal of Computer Science & Engineering Survey (IJCSES) Vol.1, No.2, November 2010 82

41. Ossama Younis and Sonia Fahmy Heed: A hybrid, Energy-efficient, Distributed Clustering Approach for Ad-hoc Networks, IEEE Transactions on Mobile Computing, vol. 3, no. 4, Oct.-Dec. 2004, pp. 366-369.

42. A. Manjeshwar and D. P. Agrawal, "TEEN: A Protocol for Enhanced Efficiency in Wireless Sensor Networks", in the Proceedings of the 1st International Workshop on Parallel and Distributed Computing Issues in Wireless Networks and Mobile Computing, San Francisco, CA, April 2001.

43. W. Lou, "An Efficient N-to-1 Multipath Routing Protocol in Wireless Sensor Networks", Proceedings of IEEE MASS'05, Washington DC, Nov. 2005, pp. 1-8.

44. A. Manjeshwar and D. P. Agrawal, "APTEEN: A Hybrid Protocol for Efficient Routing and Comprehensive Information Retrieval in Wireless Sensor Networks", in the Proceedings of the 2nd International Workshop on Parallel and Distributed Computing Issues in Wireless Networks and Mobile computing, San Francisco CA, April 2001, pp. 2009-1015.

45. J. Luo, and J.- P. Hubaux, "Joint mobility and routing for lifetime elongation in wireless sensor networks", Proceedings IEEE INFOCOM'05, vol. 3, Miami, FL, Mar. 2005, pp. 1735-1746.

46. R.C. Shah, S. Roy, S. Jain, and W. Brunette, "Data MULEs: Modeling a three-tier architecture for sparse sensor networks ", Proceedings SN P A '03, Anchorage, AK, May 2003, pp. 30-41.

47. B. Karp and H. T. Kung, "GPSR: Greedy perimeter stateless routing for wireless networks", Proceedings ACM MobiCom'00, Boston, MA, Aug. 2000, pp. 243-254.

48. W. Chang, G. Cao, and T. La Porta, "Dynamic proxy tree-based data dissemination schemes for wireless sensor networks", Proceedings IEEE MASS'04, Fort Lauderdale, FL, Oct. 2004, pp. 21-30.

49. S. Lindsey, C. S. Raghavendra, and K. M. Sivalingam, "Data gathering in sensor networks using the energy-delay metric", Proceedings IPDPS'01, San Francisco, CA, Apr. 2001, pp. 2001-2008.

50. S. Lindsey, C. S. Raghavendra, and K. M. Sivalingam, "Data gathering algorithms in sensor networks using energy metrics", IEEE Transactions on Parallel and Distributed Systems, vol. 13, no. 9, Sept. 2002, pp. 924-935.

51. M. Chu, H. Haussecker, and F. Zhao, "Scalable information-driven sensor querying and routing for ad hoc heterogeneous sensor networks", International Journal of High-Performance Computing Applications, vol. 16, no. 3, Feb. 2002, pp. 293-313.

52. X. Du and F. Lin, "Improving routing in sensor networks with heterogeneous sensor nodes", Proceedings IEEE VTC'05, Dallas, TX, Sept. 2005, pp. 2528-2532.

53. I. F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, "Wireless sensor networks: a survey", Computer Networks (Elsevier) Journal, Vol. 38, no. 4, Mar. 2002, pp. 393-422.

54. T. He et al., "SPEED: A stateless protocol for real-time communication in sensor networks," in the Proceedings of International Conference on Distributed Computing Systems, Providence, RI, May 2003.

55. D. B Johnson et al., "Dynamic Source Routing in Ad Hoc Wireless Networks", in Mobile Computing, edited by Tomas Imielinski and Hank Korth, Kluwer Academic Publishers, ISBN: 0792396979, 1996, Chapter 5, pp. 153-181.

56. C. Perkins et al., "Ad hoc On-Demand Distance Vector (AODV) Routing," Internet Draft draftietfmanet-aodv-11.txt, June 2002 (work in progress).

57. K. Akkaya and M. Younis, "An Energy-Aware QoS Routing Protocol for Wireless Sensor Networks," in the Proceedings of the IEEE Workshop on Mobile and Wireless Networks (MWN 2003), Providence, Rhode Island, May 2003.

# Computer-Aided Diagnosis of Thyroid Nodule: A Review

**Deepika Koundal1 , Savita Gupta1 and Sukhwinder Singh1 1University Institiute of Engineering & Technology, Panjab University, Chandigarh, India**

## ABSTRACT

Diagnostic imaging is an important tool in medical science due to the constrained observations of the expert and uncertainties in medical knowledge. A thyroid ultrasound is a non-invasive imaging study used to detect and classify abnormalities of the thyroid gland. Computerized system is a valuable and beneficial means for feature extraction and classification of thyroid nodule in order to eliminate operator dependency and to improve the diagnostic accuracy. The aim of this paper is to review existing approaches to the automatic classification of nodules in thyroid ultrasound images, highlighting the keypoints and main differences between the used strategies. The aim of this paper is to review existing approaches for the diagnosis of Nodules in thyroid ultrasound images with their performance measures.

## KEYWORDS

Thyroid Gland, Nodule, TIRADS, Ultrasound Images, Computer-Aided Diagnosis, Feature Extraction, Classification.

## REFERENCES


[1] Unnikrishnan A.G. and Menon U.V., "Thyroid disorders in India: An epidemiological perspective," Indian Journal of Endocrinology and Metabolism, Vol. 15, pp.78-81, Supplement 2, 2011.

[2] Horvath E., Majlis S., Rossi R., Franco C., Niedmann J.P. and Castro A., "An ultrasonogram reporting system for thyroid nodules stratifying cancer risk for clinical management," J. Clin .Endocrinol Metab, pp.748-751, 2009.

[3] Ain K. and Rosenthal M.S., "The Complete Thyroid Book," Second Edition, 2011, Mc Graw Hill.

[4] Silver J. K., Parangi S. and Phitayakorn R., "Biographies of Disease," Series Editor, 2011.

[5] Baskin H.J., "Thyroid Ultrasound and Ultrasound-Guided FNA," Second Edition, springer, 2008.

[6] Kharchenko V.P., Kotlyarov P.M., Mogutov M.S., Alexandrov Y.K., Sencha A.N., Patrunov Y.N. and Belyaev D.V, "Ultrasound Diagnostics of Thyroid Diseases," Springer 2010.

[7] Sarti A., Corsi C., Mazzini E. and Lamberti C., "Maximum likelihood segmentation of ultrasound images with Rayleigh distribution," IEEE Trans. Ultrason. Ferroelect. Freq. Control, vol. 52, no. 6, pp. 947–960, 2005.

[8] Ma J., Luo S., Dighe M., Lim D. and Kim Y., "Differential Diagnosis of Thyroid Nodules with Ultrasound Elastography based on Support Vector Machines," IEEE Int. Ultrasonics Symp. Proc., pp.1372-1375, 2010.

[9] Savelonas M.A., Iakovidis D.K., Dimitropoulos N., and Maroulis D., "Computational Characterization of Thyroid Tissue in the Radon Domain", IEEE International Symposium on Computer-Based Medical Systems,pp.1-4, 2007.

[10]Chang C., Tsai M., and Chen S., "Classification of the Thyroid Nodules Using Support Vector Machines" 2008 International Joint Conference on Neural Networks (IJCNN 2008) pp.3093-3098.

[11]Temurtas F., "A comparative study on thyroid disease diagnosis using neural networks," Expert Systems with Applications 36, pp. 944–949, 2009. [12]Keramidas E.G., Iakovidis D.K., Maroulis D. and Karkanis S., "Efficient and Effective Ultrasound Image Analysis Scheme for Thyroid Nodule Detection," ICIAR, LNCS 4633, pp. 1052–1060, Springer 2007.

[13]Savelonas M.A., Iakovidis D.K., Legakis I. and Maroulis D., "Active Contours Guided by Echogenicity and Texture for Delineation of Thyroid Nodules in Ultrasound Images," in IEEE Transactions on Information Technology in Biomedicine, vol. 13, pp.519-527, 2009.

[14]Morifuji, H., Analysis of ultrasound B-mode histogram in thyroid tumors. Nippon Geka Gakkai Zasshi 90(2):pp.210 –221, 1989.

[15]Hirning, T., Zuna, I., and Schlaps, D., Quantification and classifica-tion of echographic findings the thyroid gland by computerized b-mode texture analysis. Eur J. Radiol 9:244–247, 1989.

[16]Saiti F., Naini A.A., Shoorehdeli M. A. and Teshnehlab M., "Thyroid Disease Diagnosis Based on Genetic Algorithms using PNN and SVM,"pp.1-4, 2009, IEEE. [17]Keramidas E.G., Iakovidis D.K., Maroulis D. and Dimitropoulos N., "Thyroid Texture Representation via Noise Resistant Image Features," IEEE Int. Symp. on Computer-Based Medical Systems, pp.560-565, 2008.

[18]Shariati S. and Haghighi M.M., "Comparison of ANFIS neural network with several other ANNS and support vector machine for diagnosing hepatitis and thyroid diseases" In Int. Conf. on Computer Information Systems and Industrial Management Applications (CISIM), pp.596-599, 2010 IEEE.

[19]Chang C., Lei Y., Tseng C. and Shih S., "Thyroid Segmentation and Volume Estimation in Ultrasound Images," IEEE Int. Conf. on Systems, Man and Cybernetics (SMC 2008), pp.3442-3447.

[20]Tsantis S., Cavouras D., Kalatzis I., Piliouras N., Dimitropoulos N. and Nikiforidis G. "Development of A Support Vector Machine-Based Image Analysis system for assessing the Thyroid Nodule malignancy risk on ultrasound," Ultrasound in med. & biol., vol. 31, no. 11, pp. 1451–1459, 2005.

[21]Seabra J.C.R. and Fred A.L.N., "Towards the Development of a Thyroid Ultrasound Biometric Scheme Based on Tissue Echo-morphological Features," in Springer-Verlag, BIOSTEC, CCIS 52, pp.286–298, 2010.

[22]Selvathi D. and Sharnitha V.S., "Thyroid Classification and Segmentation in Ultrasound Images Using Machine Learning Algorithms," In Proc. of Int. Conf. on Signal Processing, Communication, Computing and Networking Technologies, pp. 836-841, IEEE, 2011.

[23]Tsantis S., Dimitropoulos N., Cavouras D., Nikiforidis G., "Morphological and wavelet features towards sonographic thyroid nodules evaluation" Computerized Medical Imaging and Graphics 33 (20 09) 91–99

[24]Pal S.K., "A review on image segmentation techniques," Pattern Recognition 29, pp.1277-1294, 1993.

[25]Noble J.A. and Boukerroui D., "Ultrasound image segmentation: A survey," IEEE Trans. on Medical Imaging, 25, pp. 987-1010, 2006.

[26]Keles A., "ESTDD: Expert system for thyroid diseases diagnosis," Expert Systems with Applications, pp.242–246, Elsevier, 2008.

[27]Dogantekin E., Dogantekin A. and Derya A., "An expert system based on Generalized Discriminant Analysis and Wavelet Support Vector Machine for diagnosis of thyroid diseases," Expert Systems with Applications, 38, pp.146–150, 2011.

[28] Koundal D., Gupta S. and Singh S., "Survey of Computer-Aided Diagnosis of Thyroid Nodules in Medical Ultrasound Images", The Second International Conference on Advances in Computing and Information Technology (ACITY 2012).

[29]Cheng H.D., Shan J., Ju W., Guo Y. and Zhang L., "Automated breast cancer detection and classification using ultrasound images: A survey," Pattern Recognition 43, pp.299-317, 2010.

[30]Joo S., Moon W.K. and Kim H.C. "Computer-aided diagnosis of solid breast nodules on ultrasound with digital image processing and artificial neural network," In IEEE Int. Conf. Proc. on Engg. in Medicine and Biology Society, pp.1397-13400, 2004.

[31]Fu K.S. and Mui J.K., "A survey on image segmentation," Pattern Recognition, 131, pp.3-16, 1981. [32]Zhang G., Berardi V. L., "An investigation of neural networks in thyroid function diagnosis" Health Care Management Science 1 (1998) pp.29–37.

[33]Savelonas M.A., Maroulis D.E., Iakovidis D.K. and Dimitropoulos N., "Computer-Aided Malignancy Risk Assessment of Nodules in Thyroid US Images Utilizing Boundary Descriptors," in Panhellenic Conf. on Informatics, pp.156-160, 2008, IEEE.

[34]Shukla A., Kaur P., Tiwari R. and Janghel R.R., "Diagnosis of Thyroid Disorders using Artificial Neural Networks," IEEE Int. Advance Computing Conf., pp.1016-1020, 2009.

[35]Rouhani M. and Mansouri K., "Comparison of several ANN architectures on the Thyroid diseases grades diagnosis," Int. Association of Computer Science and Information Technology-Spring Conf., pp.526-528, 2009, IEEE.

[36]Polat K., Sahan S. and Gunes S., "A novel hybrid method based on artificial immune recognition system (AIRS) with fuzzy weighted pre-processing for thyroid disease diagnosis," Expert Systems with Applications 32, pp.1141–1147, 2007.

[37]Kodaz H., Seral O., Arslan A. and Salih G., "Medical application of information gain based artificial immune recognition system (AIRS): Diagnosis of thyroid disease," Expert Systems with Applications, pp.3086–3092, 2009.

[38]Chang C.Y., Lei Y., Tseng C. and Shih S., "Thyroid Segmentation and Volume Estimation in Ultrasound Images," In IEEE Transactions on Biomedical Engineering, vol. 57, pp. 1348-1357, 2010.

[39]Koundal D., Gupta S. and Singh S., "Applications of Neutrosophic and Intuitionistic Fuzzy Set on Image Processing" in National Conference on Green Technologies: Smart and Efficient Management (GTSEM-2012).

[40]Chuan-Yu Chang and Yong-Cheng Hong, "A Neural Network for Thyroid Segmentation and Volume Estimation in CT Images" November 2011, IEEE Computational Intelligence Magazine, pp 43-55.

[41]F. Molinari, A. M. vani, M. Deandra, P. Limone, R. Acharya, R. Garberogio, and J. S "Skeletonization of 3D Contrast Enhanced Ultrasound Images for the Characterization of Single Thyroid Nodule" A. El-Baz et al. (eds.), Multi Modality State-of-the-Art Medical Image Segmentation and Registration Methodologies, pp 137-159.

# Probabilistic Broadcasting Protocol In AD-HOC Network And Its Advancement: A Review

**Tasneem Bano1, Jyoti Singhai2**
**1Department of Computer Science And Engineering, MANIT, Bhopal, India**
**2Department of Electronics And Communication Engineering, MANIT, Bhopal, India**

## ABSTRACT

Broadcasting is a fundamental operation in MANETs where a source node transmits a message that is to be disseminated to all the nodes in the network. Broadcasting is categorized into deterministic and probabilistic schemes. This paper reviews the probabilistic broadcasting protocol because of its adaptability in changing environment. Probabilistic broadcasting is best suited in terms of ad hoc network which is well known for its decentralized network nature. Probability, counter and distance based scheme under probabilistic scheme are discussed in this paper. Besides the basic probability scheme this paper also includes their recent advancements. Rebroadcast is one of the initial task for route discovery in reactive protocols. This review paper identify which protocol gives better performance in terms of reachability, saved rebroadcast and average latency in rebroadcasting a route request message. Simulation results are presented, which shows reachability, saved rebroadcast and average latency of the probabilistic broadcast protocols and their enhancement schemes. The comparative study shows the improvement of enhanced scheme over probabilistic schemes.

## KEYWORDS

Probabilistic broadcasting, Probability-based scheme, Counter based scheme, Distance based scheme, Reachability, Saved Rebroadcast.

## REFERENCES


[1] B. Williams and T. Camp, "Comparison of broadcasting techniques for mobile ad hoc networks". In Proc. ACM Symposium on Mobile Ad Hoc Networking &Computing (MOBIHOC 2002), pp. 194–205, 2002.

[2] S.-Y. Ni, Y.-C. Tseng, Y.-S. Chen, and J.-P. Sheu, "The broadcast storm problem in a mobile ad hoc network", Proc.Mobicom_99, 1999.

[3] Y. Sasson, D. Cavin, and A. Schiper, "Probabilistic Broadcast for flooding in wireless mobile ad Hoc networks", In Proc. IEEE Wireless Communications & Networking Conference (WCNC 2003), pp. 1124–1130, March 2003.

[4] C. E. Perkins, E. M. Belding-Royer, and S. R. Das, "Ad hoc On-Demand Distance Vector (AODV) Routing," IETF Mobile Ad Hoc Networking Working Group INTERNET DRAFT, 19 January 2002.

[5] V. Park and S. Corson, "Temporally-Ordered Routing Algorithm (TORA) Version 1," http://www.ietf.org/internet-drafts/draft-ietf-manettora-spec-02.txt, IETF, Work in Progress, July 2001.

[6] M. R. Pearlman, and Z. J. Haas, "Determining the optimal configuration of the zone routing protocol", IEEE Journal on Selected Areas in Communications, Vol. 17, No. 8, pp. 1395–1414, 1999.

[7] C. Ho, K. Obraczka, G. Tsudik, and K. Viswanath, Flooding for reliable multicast in multihop ad hoc networks, In Proc. ACM DIALM_99, pp. 64–71, 1999.

[8] J. Wu and W. Lou, "Forward-node-set-based broadcast in clustered mobile ad hoc networks," Wireless s Communication and Mobile Computing, vol. 3, pp. 155 –173, 2003.

[9] A. Keshavarz-Haddad, V. Ribeiro, and R. Riedi, "Color-Based Broadcasting for Ad Hoc Networks," in Proceeding of the 4th International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Network (WIOPT' 06). Boston, MA, 2006, pp.1 - 10. [10] S. Ni, Y. Tseng, Y. Chen, and J. Sheu., "The broadcast storm problem in mobile ad hoc networks," in Proceeding of the ACM/IEEE International Conference on Mobile Computing and Networking (MOBICOM),1999, pp. 151-162.

[11] Y.-C. Tseng, S.-Y. Ni, and E.-Y. Shih, "Adaptive approaches to relieving broadcast storms in a wireless multihop ad hoc networks," IEEE Transaction on Computers,, vol. 52, pp. 545- 557, 2003.

[12] Q. Zhang and D. P. Agrawal, "Dynamic Probabilistic Broadcasting in MANETs," Journal of Parallel and Distributed Computing, vol. 65, pp. 220-233, 2005.

[13] J. Cartigny and D. Simplot, "Border node retransmission based probabilistic broadcast protocols in ad hoc networks," Telecommunication Systems,, vol.22, pp. 189-204, 2003.

[14] C Chen, Chin-Kai Hsu and Hsien-Kang Wang, "A distance-aware counter-based broadcast scheme for wireless ad hoc networks", Military comm. Conference-2005, MILCOM 2005 IEEE 17-20 Oct 2005 pages1052-1058 Vol-2

[15] W. Peng and X.C. Lu, "On the reduction of broadcast redundancy in mobile ad hoc networks," in Proceedings of the Annual Workshop on Mobile and AdHoc Networking and Computing (MobiHOC 2000), Boston, Massachusetts, USA, Aug. 2000, pp. 129–130.

[16] I. Stojmenovic, M. Seddigh, and J. Zunic, "Dominating sets and neighbor elimination-based broadcasting algorithms in wireless networks," IEEE Transactions on Parallel and Distributed Systems, vol. 12, no. 12, Dec. 2001.

[17] A. Qayyum, L. Viennot, and A.Laouiti, "Multipoint relaying for flooding broadcast messages in mobile wireless networks," in Proceedings of the 35th Annual Hawaii International Conference on System Sciences(HICSS'02), Hawaii, 2002.

[18] H. Lim and C. Kim. "Multicast tree construction and flooding in wireless ad hoc networks". In Proceedings of the ACM International Workshop on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWIM), 2000

[19] VINT Project. The UCB/LBNL/VINT network simulator-ns (Version http://www.isi.edu/nsnam/ns).

[20] Yassein, M. B., M. O. Khaoua, et al. (2006). "Improving route discovery in on-demand routing protocols using local topology information in MANETs". Proceedings of the ACM international International Journal of Computer Science & Engineering Survey (IJCSES) Vol.1, No.2, November 2010 14 workshop on Performance monitoring, measurement, and evaluation of heterogeneous wireless and wired networks. Terromolinos, Spain, ACM Press, pp. 95-99.

[21] L. M. M. M. Bani-Yassein, M. Ould-Khaoua and S. Papanastasiou. "Performance analysis of adjusted probabilistic broadcasting in mobile ad hoc networks". International Journal of Wireless Information Networks, March 2006. Springer Netherlands pages 114.

[22] Hanashi A. M, A.Siddique, et al. "Performance evaluation of dynamic probabilistic flooding under different mobility models in MANETs", Proceedings of the IEEE International Conference on Parallel and Distributed Systems, Vol. 2, Dec.2007, pp. 1-6.

[23] Y.-C. TSENG, S.-Y. NI, Y.-S. CHEN and J.-P. SHEU, "The Broadcast Storm Problem in a Mobile Ad Hoc Network," Wireless Networks 8, pp. 153–167, 2002

[24] S. al-Humoud, L. M. Mackenzie, M. Ould-Khaoua, and J.Abdulai, "RAD Analysis of Adjusted Counter-Based Broadcast in MANETs," Proc. PGNET'08, 2008.

[25] Xiaoman Wu, Yilan Yang, Jie Liu, Yue Wu, Fasheng Yi, "Position-Aware Counter-Based Broadcast for mobile Ad Hoc Networks," International Conference on Frontier of Computer Science and Technology,2010.

# SECURE AND RELIABLE ROUTING IN MOBILE ADHOC NETWORKS

**Rachid Haboub and Mohammed Ouzzif**
**RITM laboratory, Computer science and Networks team.**
**ENSEM - ESTC - UH2C, Casablanca, Morocco**

## ABSTRACT

The growing diffusion of wireless-enabled portable devices and the recent advances in Mobile Ad-hoc NETworks (MANETs) open new scenarios where users can benefit from anywhere and at any time for impromptu collaboration. However, energy constrained nodes, low channel bandwidth, node mobility, high channel error rates, channel variability and packet loss are some of the limitations of MANETs. MANETs presents also security challenges. These networks are prone to malicious users attack because any device within the frequency range can get access to the MANET. There is a need for security mechanisms aware of these challenges. Thus, this work aims to provide a secure MANET by changing the frequency of data transmission. This security approach was tested, and the results shows an interesting decreased of through putfrom malicious node when the number of frequency used is increased, that way the MANET will not waste it's resources treating malicious packets. The other contribution of this work is a mobility aware routing approach, which aims to provide a more reliable routing by handling effectively the nodes mobility.

## KEYWORDS

Security, Reliability, Mobile Ad-hoc Networks (MANETs), Routing protocols.

## REFERENCES


[1] William Stallings (2003). 3 rd Ed. "Cryptography and Network Security - Principles and Practices". Pearson Education Inc. New Jersey.

[2] José Carlos Castillo, Teresa Olivares and Luis Orozco-Barbosa, "Routing protocols for wireless sensor networks", 2011.

[3] D. Wood and J. A. Stankovic. "Denial of service in sensor networks". Computer, 35(10):54–62, 2002.

[4] Xiuli Ren and Haibin Yu, "Security Mechanisms for Wireless Sensor Networks", International Journal of Computer Science and Network Security, VOL.6 No.3, March 2006.

[5] Dr. Shahriar Mohammadi and Hossein Jadidoleslamy, "A comparison of link layer attacks on wireless sensor networks", Vol.3, No.1, March 2011.

[6] Sanjay E. Sarma, Stephen A. Weis, and Daniel W. Engels, "RFID Systems and Security and Privacy Implications", Cambridge, Springer 2003.

[7] Saurabh Singh, Dr. Harsh Kumar Verma , "Security For Wireless Sensor Network", International Journal on Computer Science and Engineering, Vol. 3 No. 6 June 2011.

[8] Ritu Sharma, Yogesh Chaba, Yudhvir Singh, "Analysis of Security Protocols in Wireless Sensor Network", International Journal Advanced Networking and Applications, Volume: 02, Issue: 03, Pages: 707-713 (2010).

[9] Jinat Rehana, "Security of Wireless Sensor Network", 2009.

[10] M.Devi and Dr.V.Rhymend Uthariaraj, "Routing with AODV Protocol for Mobile ADHOC Network", International Journal of Technology And Engineering System, Jan – March 2011-Vol2. No1.

[11] Kevin Fall, Kannan Varadhan, "The NS manual", May 9, 2010.

[12] Jia Huang, Hamid Shahnasser, "A preprocessor Tcl script generator for NS-2 communication network simulation", San Francisco State University, USA, pp. 184-187, 5 May 2011.

[13] Kamal Kumar Sharma, Ram Bahadur Patel and Harbhajan Singh, "A Reliable and Energy Efficient Transport Protocol for Wireless Sensor Networks", International Journal of Computer Networks & Communications (IJCNC) Vol.2, No.5, September 2010.

# A Survey Of Sql Injection Countermeasures

**Dr R.P.Mahapatra and Mrs Subi Khan**
**Department of Computer Engineering, SRM University, Modinagar, India**
**Department of Computer Engineering, SRM University, Modinagar, India**

## Abstract

SQL injection has become a predominant type of attacks that target web applications. It allows attackers to obtain unauthorized access to the back-end database to change the intended application-generated SQL queries. Researchers have proposed various solutions to address SQL injection problems. However, many of them have limitations and often cannot address all kinds of injection problems. What's more, new types of SQL injection attacks have arisen over the years. To better counter these attacks, identifying and understanding existing countermeasures are very important. In this research , I had surveyed existing techniques against SQL injection attacks and analyzed their advantages and disadvantages. In addition, I identified techniques for building secure systems and applied them to my applications and database system and illustrated how they were performed and the effect of them.

## Keywords

SQL injection attacks, Database, Authentication Bypass, Secure Systems

**More Details:**http://airccse.org/journal/ijcses/papers/3312ijcses05.pdf

http://airccse.org/journal/ijcses/current2012.html

## REFERENCES


[1] IBM Internet Security Systems X-Force® research and development team, "IBM Internet Security Systems™ X-Force® 2009 Mid-Year Trend and Risk Report," Aug. 2009. [Online]. Available: www-935.ibm.com/services/us/iss/xforce/trendreports/. [Accessed: Apr. 10, 2010].

[2] V. Chapela, "Advanced SQL Injection," OWASP Foundation, Apr. 2005. [Online]. Available: www.owasp.org/images/7/74/Advanced_SQL_Injection.ppt. [Accessed: Mar. 2, 2010].

[3] W. G. Halfond, J. Viegas, and A. Orso, "A Classification of SQL-Injection Attacks and Countermeasures," In Proc. of the Intern. Symposium on Secure Software Engineering (ISSSE 2006), Mar. 2006.

[4] E. M. Fayó, "Advanced SQL Injection in Oracle databases," Argeniss Information Security, Black Hat Briefings, Black Hat USA, Feb. 2005. [Online]. Available: http://www.orkspace.net/secdocs/Web/SQL%20Injection/Advanced%20SQL%20Injection%20In%20Oracle%20Databases.pd f. [Accessed: Mar. 18, 2010].

[5] "Oracle® Database PL/SQL Language Reference 11g Release 1 (11.1)," Oracle Corp., 2009. [Online]. Available: http://download.oracle.com/docs/cd/B28359_01/appdev.111/b28370/toc.htm. [Accessed: Feb. 19, 2010].

[6] "SQL Injection Tutorial," Oracle Corp., 2009. [Online]. Available: http://stcurriculum.oracle.com/tutorial/SQLInjection/index.html. [Accessed: Mar. 11, 2010].

[7] C. Anley, "Advanced SQL Injection in SQL Server Applications," NGSSoftware Ltd., United Kingdom, 2002. [Online]. Available: http://www.ngssoftware.com/papers/advanced_sql_injection.pdf. [Accessed: Feb. 09, 2010].

[8] D. Litchfield, "Lateral SQL Injection: A New Class of Vulnerability in Oracle," NGSSoftware Ltd., United Kingdom, Feb. 2008. [Online]. Available: www.databasesecurity.com/dbsec/lateral-sqlinjection.pdf. [Accessed: Mar. 15, 2010].

[9] D. Litchfield, "David Litchfield's Weblog: Lateral SQL Injection Revisited - No Special Privs Required," July 2008. [Online]. Available: http://www.davidlitchfield.com/blog/. [Accessed: Mar. 15, 2010]. International Journal of Computer Science & Engineering Survey (IJCSES) Vol.3, No.3, June 2012 73

[10] "Oracle SQL Injection in web applications," Red-Database-Security GmbH company, Germany, 2009. [Online]. Available: http://www.red-database-ecurity.com/whitepaper/oracle_sql_injection_web.html. [Accessed: Mar. 16, 2010].

[11] M. Nystrom, SQL injection defenses, Sebastopol, Calif.: O'Reilly, 2007, pp. 19-39.

[12] S. Kost, An Introduction to SQL Injection Attacks for Oracle Developers Integrigy Corp. Chicago, IL, Jan. 2004. [Online]. Available: www.integrigy.com /security/Integrigy_Oracle_SQL_Injection_Attacks.pdf. [Accessed: Feb. 22, 2010].

[13] C. Gould, Z. Su, and P. Devanbu, "Static Checking of Dynamically Generated Queries in Database Applications," In Proceedings of the 26th International Conference on Software Engineering (ICSE 04), pp. 645–654, 2004.

[14] C. Gould, Z. Su, and P. Devanbu, "JDBC Checker: A Static Analysis Tool for SQL/JDBC Applications," In Proceedings of the 26th International Conference on Software Engineering (ICSE 04), pp. 697–698, 2004.

[15] Y. Kosuga, K. Kono, M. Hanaoka, M. Hishiyama, and Y. Takahama, "Sania: Syntactic and Semantic Analysis for Automated Testing against SQL Injection," In Proceedings of the 23rd Annual Computer Security Applications Conference (ACSAC '07), Miami Beach, Florida, pp. 107-116, 2007.

[16] Y. Huang, F. Yu, C. Hang, C. Tsai, D. Lee, and S. Kuo, "Securing Web Application Code by Static Analysis and Runtime Protection," in Proceeding of the 13th International Conference on World Wide Web, New York, NY, USA, pp. 40-52, May 2004.

[17] C. C. Michael, W. Radosevich, and K. V. Wyk, "Black Box Security Testing Tools," Cigital Inc., USA, July 2009. [Online]. Available: https://buildsecurityin.us cert.gov/bsi/articles/tools/blackbox/261-BSI.html#dsy261-BSI_BWG. [Accessed: Apr. 02, 2010].

[18] A. Kornbrust, "Bypassing Oracle dbms_assert," Red-Database-Security GmbH company, Germany, 2006. [Online]. Available: http://www.red-database security.com/wp/bypass_dbms_assert.pdf. [Accessed: Mar. 12, 2010].

[19] K. Kemalis and T. Tzouramanis, "SQL-IDS: A Specification-based Approach for SQL-Injection Detection," SAC '08: Proceedings of the 2008 ACM symposium on Applied computing, pp. 2153- 2158, March 2008.

[20] G. T. Buehrer, B. W. Weide, and P. A. Sivilotti, "Using parse tree validation to prevent SQL injection attacks," In Proceedings of the International Workshop on Software Engineering and Middleware (SEM) at Joint FSE and ESEC, pp. 106-113, Sept. 2005.

[21] W. G. Halfond and A. Orso, "Combining Static Analysis and Runtime Monitoring to Counter SQLInjection Attacks," In Proceedings of the Third International ICSE Workshop on Dynamic Analysis (WODA 2005), St. Louis, MO, USA, pp. 22–28, May 2005. International Journal of Computer Science & Engineering Survey (IJCSES) Vol.3, No.3, June 2012 74

[22] W. G. Halfond and A. Orso, "Preventing SQL Injection Attacks Using AMNESIA," ICSE'06, Shanghai, China, May 2006.

[23] G. T. Buehrer, B. W. Weide, and P. A. Sivilotti, "Using parse tree validation to prevent SQL injection attacks," Presentation, Ohio State University, 2005. [Online]. Available:www.cse.ohiostate.edu/~paolo/research/publications/sem05_talk.pdf. [Accessed: Apr. 02, 2010]

[24] A. Liu, Y. Yuan, D. Wijesekera, and A. Stavrou, "SQLProb: a proxy-based architecture towards preventing SQL injection attacks," SAC '09: Proceedings of the 2009 ACM symposium on Applied Computing, pp. 2054-2061, March 2009.

[25] O. Maor and A. Shulman, "Sql injection signatures evasion: An overview of why sql injection signature protection is just not enough," iMPERVA Inc., Israel, Apr. 2004. [Online]. Available: http://www.www.packetstormsecurity.org/papers/bypass/SQL_Injection_Evasion.pdf. [Accessed: Mar. 01, 2010].

[26] F. Valeur, D. Mutz, and G. Vigna, "A Learning-Based Approach to the Detection of SQL Attacks," In Proceedings of the Conference on Detection of Intrusions and Malware and Vulnerability Assessment (DIMVA), Vienna, Austria, pp. 123-140, July 2005.

[27] A. Roichman and E. Gudes, "Fine-grained access control to web databases," In 12th ACMsymposium on Access Control Models and Technologies, pp. 31-40, 2007.

# A SURVEY OF REAL-TIME ROUTING PROTOCOLS FOR WIRELESS SENSOR NETWORKS

**Sandhya Rachamalla1 Dr Anitha Sheela Kancharla2**
**1Department of Electronics and Communications Engineering, Sreenidhi Institute of Science and Technology, Hyderabad, Andhra Pradesh, India**
**2Department of Electronics and Communications Engineering, JNTUH, Hyderabad, Andhra Pradesh, India**

## ABSTRACT

Sensor networks is an interdisciplinary research area that draws on contributions from signal processing, wireless networking and associated routing protocols, database management and information systems, distributed algorithms and MEMS technology. Recent developments in Wireless Sensor Networks have resulted in wide variety of real-time applications. Many real-time routing protocols are designed to meet the requirements of these applications where timely delivery of the sensed information is given the top priority. This paper presents the comparative analysis of various existing real-time routing protocols for wireless sensor networks, which emphasizes on various factors like end-to-end delay, energy, mobility, scalability and highlighted various challenges for future research.

## KEYWORDS

Wireless Sensor Networks (WSNs), Micro-Electro-Mechanical Systems (MEMS), Real-time routing (RT), Routing protocols (RPs), QoS, Deadline miss ratio (DMR), Energy consumption, Void avoidance, end-to end delay

## REFERENCES


[1] C.Y.Chong, S.P. Kumar," Sensor Networks: evolution, opportunities, and challenges", Proc. IEEE,vol 91, no.8, pp 923-933, November 2006

[2] T. He. A. Pascal, T. Yan, L. Luo, L. Gu, G. Zhou, R. Stoleru, Q. Cao, J. Stankovic, and T. Abdelzaher, " Achieving real time target tracking using wireless sensor networks", in Proc. IEEE RTAS, pp 37-48, September 2006

[3] D. Malan, T. Fulford Jones, M. Welsh, and S. Moulton, " An ad hoc sensor network infrastructure for emergency medical care," in Proc. Int Workshop Wearable implantable body Sensor networks, April 2004.

[4] A. Zhan, T. Xu, G. Ghen, B. Ye and S. Lu," A survey on Real-Time Routing Protocols for Wireless Sensor Networks", In Proc. Of the 2nd China Wireless Sensor Network Conference (CWSN-2008), Chongqing, China, October 13-14, 2008. International Journal of Computer Science & Engineering Survey (IJCSES) Vol.4, No.3, June 2013 44

[5] C.E. Perkins, E.M. Royer, " Ad hoc On-Demand Distance Vector Routing," Proc. of 2nd IEEE Workshop on Mobile Computing Systems and Applications, New Orleans, LA, February 1999, pp 90-100.

[6] C.E. Perkins, E.M. Royer, " Multicast operation of the Ad-hoc On-Demand Distance Vector Routing," Proc. of %5th annualACM/ IEEE Workshop on Mobile Computing Systems and Applications, pp 207-218, 1999.

[7] David B. Johnson, David A Maltz, Josh Broch "DSR: The dynamic source routing protocol for multihop wireless adhoc networks", in Mobile Computing, Chapter5, pp 153-181, Kluwer Academic publishers, 1996.

[8] C lu, B. M. Blum, T.F.Abdelzaher, J.A. Stankonic and T.He, " RAP : A real time Architecture for large scale wireless sensor networks," in proceedings of RTA S, 2002, September, 2002.

[9] Tian He, John A Stancovic, Chenyang Lu, Tarek Abdelzaher," Speed: A Stateless protocol for real time communication in Sensor network", Proceedings of International Conference on Distributed Computing Systems, Providence, RI, May 2003.

[10] Emad Felemban, Chang Gun lee and Eylem Elcici, "MM SPEED: Multipath Mulit-speed protocol for QoS guarantee of reliability and Timeliness in Wireless sensor networks", IEEE transactions on Mobile computing[J], pp 738-754, 2006.

[11] O. Chipura, Z.He, G.Xing, Q. Chen, Xiaorui Wang, C. Lu, J. Stankovic, T.Abdelzaher, " Real time Power Aware Routing Protocol in Sensor networks", in the proceedings of IWQoS 2006, June 2006. [12] Yanjun Li, Chung Shue Chen, Ye-Qiong Song, Zhi wang, Youxian Sun," Enhancing Real-Time Delivery in Wireless Sensor Networks with two-hop information." , IEEE Transactions on industrial informatics, Vol 5, No. 2, May 2009.

[13] P. Rezayat, M. Mahdavi, M.. Ghasemzadeh, M.Agha.S, " A Novel Real time Power Aware Routing Protocol", in the proceedings of IJCSNS, Vol 10, April, 2010.

# Analysis Of Recent Checkpointing Techniques For Mobile Computing Systems

**Ruchi Tuli1and Parveen Kumar 2**

**1Research Scholar, Singhania University (Pacheri Bari), Rajasthan (INDIA)**
**2Professor, Meerut Institute of Engineering & Technology, Meerut (INDIA)**

## Abstract

Recovery from transient failures is one of the prime issues in the context of distributed systems. These systems demand to have transparent yet efficient techniques to achieve the same. Check point is defined as a designated place in a program where normal processing of a system is interrupted to preserve the status information. Checkpointing is a process of saving status information. Mobile computing systems often suffer from high failure rates that are transient and independent in nature. To add reliability and high availability to such distributed systems, checkpoint-based rollback recovery is one of the widely used techniques for applications such as scientific computing, database, telecommunication applications and mission-critical applications. This paper surveys the algorithms which have been reported in the literature for checkpointing in Mobile Computing Systems.

## Keywords

Mobile computing systems, Co-ordinated checkpoint, rollback recovery, mobile host.

## REFERENCES


1. Bhargava B. and Lian S.R., "Independent Checkpointing and Concurrent Rollback for Recovery in Distributed Systems – An Optimistic Approach," Proceedings of 17th IEEE Symposium on Reliable Distributed Systems, pp 3-12, 1988

2. Storm R., and Temini, S., "Optimistic Recovery in Distributed Systems", ACM Trans. Computer Systems, Aug, 1985, pp. 204-226

3. Weigang Ni, Susan V. Vrbsky and Sibabrata Ray, Low-cost Coordinated Checkpointing in Mobile Computing Systems, Proceeding of the Eighth IEEE International Symposium on Computers and Communications, 2003.

4. Chandy K.M. and Lamport L., "Distributed snapshots : Determining Global State of Distributed Systems, " ACM Transaction on Computing Systems, vol., 3 No. 1, pp 63-75, February, 1985

5. Koo R. and Tueg S., "Checkpointing and Rollback recovery for Distributed Systems", IEEE Trans. On Software Engineering, Vol. 13 no. 1, pp 23-31, January 1987.

6. Elonzahy E.N., Alvisi L., Wang Y.M. and Johnson D.B., "A survey of Rollback-Recovery protocols in Message-Passing Systems", ACM Computing surveys, vol. 34 no. 3, pp 375-408, 2002.

7. Baldoni R., Hélary J-M., Mostefaoui A. and Raynal M., "A Communication- Induced Checkpointing Protocol that Ensures Rollback-Dependency Trackability," Proceedings of the International Symposium on Fault-Tolerant-Computing Systems, pp. 68-77, June 1997.

8. Hélary J. M., Mostefaoui A. and Raynal M., "Communication- Induced Determination of Consistent Snapshots," Proceedings of the 28th International Symposium on Fault-Tolerant Computing, pp. 208- 217, June 1998. International Journal of Computer Science & Engineering Survey (IJCSES) Vol.2, No.3, August 2011 140

9. Manivannan D. and Singhal M., "Quasi-Synchronous Checkpointing: Models, Characterization, and Classification," IEEE Trans. Parallel and Distributed Systems, vol. 10, no. 7, pp. 703-713, July 1999.

10. Alvisi, Lorenzo and Marzullo, Keith," Message Logging: Pessimistic, Optimistic, Causal, and Optimal", IEEE Transactions on Software Engineering, Vol. 24, No. 2, February 1998, pp. 149-159.

11. L. Alvisi, Hoppe, B., Marzullo, K., "Nonblocking and Orphan-Free message Logging Protocol," Proc. of 23rd Fault-Tolerant Computing Symp., pp. 145-154, June 1993.
12. L. Alvisi," Understanding the Message Logging Paradigm for Masking Process Crashes,"PhD Thesis, Cornell Univ., Dept. of Computer Science, Jan. 1996. Available as Technical Report TR-96- 1577.

13. Elnozahy and Zwaenepoel W, " On the Use and Implementation of Message Logging," 24th int'l Symp. Fault-Tolerant Computing, pp. 298-307, IEEE Computer Society, June 1994.

14. D. Johnson, "Distributed System Fault Tolerance Using Message Logging and Checkpointing," Ph.D. Thesis, Rice Univ., Dec. 1989.

15. S. Venketasan and T.Y. Juang, "Efficient Algorithms for Optimistic Crash recovery", Distributed Computing, vol. 8, no. 2, pp. 105-114, June 1994.

16. Taesoon Park, Namyoon Woo and Heon Y. Ycom, "An Efficient Optimistic Message Logging Scheme for Recoverable Mobile Computing Systems", IEEE Tran. On Mobile Computing, 2002.

17. Taesoon Park, Namyoon Woo and Heon Y. Yeom, "An Efficient Recovery Scheme for Fault Tolerant Mobile Computing Systems", FGCS- 19, 2003.

18. Yi-Wei ci, Zhan Zhang, De- Ching Zuo, Zhi- Bowu and Xiaa-Zong Yang, "Area Difference Based Recovery Information Placement for Mobile Computing System", 14th IEEE international Conference on Parallel and Distributed Systems, 2008.

19. Sapna E. George, Ing-Ray Chen and Ying Jin "Movement Based Checkpointing and Logging for Recovery in Mobile Computing Systems", ACM, June 2006.

20. Mehdi Lotfi, Seyed Ahmad Motamedi and Mojtaba Bandarabadi, "Lightweight Blocking Coordinated Checkpointing for Cluster Computer Systems", Sym. On System Theory, 2009.

21. Lalit Kumar P. Kumar "A synchronous ckeckpointing protocol for mobile distributed systems: probabilistic approach" Int Journal of information and computer security 2007

22. Suparna Biswas and Sarmistha Neogy "A Low Overhead Checkpointing Scheme for Mobile Computing Systems", Int. Conf. Advances Computing and Communications, IEEE 2007.

23. Guohui Li and LihChyun Shu "A Low-Latency Checkpointing Scheme for Mobile Computing Systems" Int. Conf. Computer Software and Applications, IEEE, 2005.

24. Biswas, S., & Neogy, S.,"A Mobility-Based Checkpointing Protocol for Mobile Computing System", International Journal of Computer Science & Information Technology, Vol.2, No.1, pp135-151, 2010

25. G.Cao, M.Singhal, "Mutable Checkpoints: A New Checkpointing Approach for Mobile Computing Systems", IEEE Transactions on Parallel and Distributed system, vol.12, Issue 2, Feb., 2001, pages: 157-172, ISSN: 1045-9219

26. Jiannog Cao, Yifeng Chen, Kang Zhang, Yanixing He: Checkpointing In Hybrid Distributed Systems, Proceedings of 7th international symposium of Parallel architectures, Algorithms and Network, IEEE, 2004

27. Bidyut Gupta, Shahram Rahimi, Ziping Liu: A new high performance checkpointing approach for mobile computing systems, International Journal of Computer science and network security, 2006 International Journal of Computer Science & Engineering Survey (IJCSES) Vol.2, No.3, August 2011 141

28. Bidyut Gupta, Shahram Rahimi, and Ziping Liu: Design of high performance distributed snapshot/recovery algorithms for ring network, Journal of Computing and information Technology-CIT, 2008

29. Partha Sarathi Mandal and Krishnendu Mukhopadhyaya, "Mobile Agent based Checkpointing with Concurrent Initiations", International J. of Foundation of Computer Science, 2007.

30. Qiangfeng Jiang and D. Manivannan: An Optimistic Checkpointing and selective message logging approach for consistent global checkpoint collection in distributed systems, IEEE, 2007

31. Ajay D Kshemkalyani: a symmetric O(n log n) message distributed snapshot algorithm for large scale systems, IEEE, 2010

32. Jin Yang, Jiannong Cao and Weigang Wu, "CIC: An Integrated Approach to Checkpointing in Mobile Agent System", Proceedings of Second International Conference on Semantics, Knowledge and Grid, 2006.

33. Surender Kumar, R.K. Chauhan and Parveen Kumar, "Minimum process Error discovery algorithm for mobile Distributed system using Global Checkpoint", International Journal of Information Technology and Knowledge Management, Jan-June, 2008, Vol. 1, No. 1, pp 25-33

34. Parveen Kumar, Rachit Garg, "Soft Checkpointing Based Hybrid Synchronous Checkpointing Protocol for Mobile Distributed Systems", International Journal of Distributed Systems and technologies, 2(1), 1-13, Jan-March, 2011

35. Parveen Kumar, "A Low-Cost Hybrid Coordinated Checkpointing Protocol for Mobile Distributed Systems", Mobile Information Systems, An International Journal from IOS Press, Netherlands, pp 13-32, Vol. 4, No. 1, 2007, Listed in ACM Portal & Science Citation Index Expanded

# Firewall and VPN Investigation on Cloud Computing Performance

Siddeeq Y. Ameen1 , Shayma Wail Nourildean2 1Department of Computer and Information Engineering, University of Mosul , Mosul, Iraq 2 Foundation of Technical Institute, Technical Institute – Al-Dour, Tikrit, Iraq

## ABSTRACT

The paper presents the way to provide the security to one of the recent development in computing, cloud computing. The main interest is to investigate the impact of using Virtual Private Network VPN together with firewall on cloud computing performance. Therefore, computer modeling and simulation of cloud computing with OPNET modular simulator has been conducted for the cases of cloud computing with and without VPN and firewall. To achieve clear idea on these impacts, the simulation considers different scenarios and different form application traffic applied. Simulation results showing throughput, delay, servers traffic sent and received have been collected and presented. The results clearly show that there is impact in throughput and delay through the use of VPN and firewall. The impact on throughput is higher than that on the delay. Furthermore, the impact show that the email traffic is more affected than web traffic.

## KEYWORDS

VPN, firewall, cloud, computing, OPNET

## REFERENCES


[1] Maneesha Sharma, Himani Bansal, Amit Kumar Sharma, "Cloud Computing: Different Approach & Security Challenge", International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231- 2307, Volume-2, Issue-1, pp. 421-424, March 2012.

[2] Young B. Choi, Jeffrey Muller, Christopher V. Kopek and Jennifer M. Makarsky "Corporate wireless LAN security: threats and an effective security assessment framework for wireless information assurance", Int. J. Mobile Communications, Vol. 4, No. 3, pp 266 – 290, 2006.

[3] Songjie, Junfeng Yao, Chengpeng Wu, "Cloud computing and its key techniques", International Conference on Electronic & Mechanical Engineering and Information Technology, pp. 320-324, 12- 14 August, 2011.

[4] Kevin Hamlen, Murat Kantarcioglu, Latifur Khan and Bhavani Thuraisingham, "Security Issues for Cloud Computing", International Journal of Information Security and Privacy, 4(2), 39-51, April-June 2010.

[5] Richard Chow, Philippe Golle, Markus Jakobsson, Ryusuke Masuoka, Jesus Molina, "Controlling Data in the Cloud: Outsourcing Computation without Outsourcing Control", CCSW'09, November 13, 2009, Chicago, Illinois, USA. , ACM 978-1-60558-784-4/09/11, pp. 85-90, 2009.

[6] Aderemi A. Atayero, Oluwaseyi Feyisetan, "Security Issues in Cloud Computing: The Potentials of Homomorphic Encryption", Journal of Emerging Trends in Computing and Information Sciences, VOL. 2, NO. 10, pp. 546-552, October 2011.

[7] Weili Huang, Fanzheng Kong , "The research of VPN on WLAN" , International Conference on Computational and Information Sciences, 2010 IEEE, PP 250 – 253.

[8] H. Bourdoucen, A. Al Naamany and A. Al Kalbani, "Impact of Implementing VPN to Secure Wireless LAN", World Academy of Science, Engineering and Technology 51, pp 625 – 630, 2009.

[9] Charlie Scott, Paul Wolfe, Mike Erwin, "Virtual Private Networks, Second Edition", O'Reilly, Second Edition January pp 12, 1999.

# Study on the Path Tracking and Positioning Method of Wheeled Mobile Robot

**Cheng Jing and Cheng Wushan**

**College of Mechanical Engineering, Shanghai University of Engineering Science, Shanghai 201620, China**

## ABSTRACT

As a kind of wheeled mobile robot used in intelligent logistics system, AGV is mainly used for automatic material transportation, the precise positioning and path tracking is the assu- rance of accurate material transportation. In this article, the laser coordinate positioning technology is used to realize accurate positioning for AGV, a new method of target reference point selection is put forward, and path tracking is implemented in combination with the kinematics model of single steering wheel AGV, the objective function that AGV successfully reaches the destination accurately according to the preset trajectory is completed finally. The study is in trial stage, and obtains good operation effectiveness.

## KEYWORDS

Wheeled Mobile Robot, Laser Positioning, Path Tracking, Kinematics Model.

## REFERENCES


[1] Shi Enxiu,Huang Yumei.Study on Positioning Method of Autonomous Navigation Vehicle AGV.Journal of transducer technology,2007,01:233-236.

[2] Fang Qiang, Xie Cunxi.Autonomous Positioning Navigation of Mobile Robot Based on Vision[J]. Machine Tool & Hydraulics, 2004, (17) : 40—56.

[3] Ni Zhen. Research on the key technology of laser guidance of four wheel differential omnidirectional mobile AGV [D].Chongqing University,2013.

[4] Liu Yang. Discussion on laser positioning algorithm of laser guidance AGV[J].Logistics Technology and Application,2007,11:100-101.

[5] Teng Yunlong, Shi Yibing. A three-dimensional positioning method based on three satellites[J].Journal of Central South University,2012,12:3449-3453.

[6] A New Method of Global Path Planning for AGV[J]. International Journal of Plant Engineering and Management,2006,01:51-58.

[7] Yuan Wei, Sun Jie, Cao Zuoliang, Tian Jing, Yang Ming. A combined object-tracking algorithm for omnidirectional vision-based AGV navigation[J]. Optoelectronics Letters,2010,02:137-139.

[8] S.Butdee,A.Suebsomran, F.Vignat, P.K.D.V.Yarlagadda.Control and pathprediction of an Automate Guided Vehicle[J].Journal of Achievements in Materials and Manufacturing Engineering.2008,2(3); P 70-75

[9] Mehdi Yahyaei, J.E.Jam&R.Hosnavi.Controlling the navigation of automatic guided vehiele (AGV) using integrated fuzzy logic controllerwith programmable logic controller (IFLPLC)IJ8. Int J Ady Manuf Technol.2010.47:795-807.

[10] Yao Jiajia. Vision-based Road Detection and Navigation for AGV Systems[D].Zhejiang University, 2014.

# QoS aware Hierarchical Multi-hop Routing Protocols in MANETs

**Narendar Reddy Mandhadi1 and Lakshmi Rajamani2 1Dept. of Computer Science & Engineering, Osmania University, Hyderabad, A.P, INDIA 2Dept. of Computer Science & Engineering, Osmania University, Hyderabad, A.P, INDIA**

## ABSTRACT

Ad hoc wireless networks are multi-hop networks that are dynamic, and are formed by a group of nodes which are mobile in nature, on a shared wireless links. Mobile ad hoc network (MANET) is a collection of autonomous nodes that communicate with each other by forming a multi hop radio network. The analysis and design of routing protocols is a significant issue in ad-hoc wireless networks. Since the previously proposed routing algorithms have not considered the multi-hop flow with an end-to-end scenario, and had shown to perform well in providing blond sharing of bandwidths among the single-hop wireless flow. Compared to host- based routing, Hierarchical Multi-hop routing significantly reduces the routing table sizes and the amount of routing related signalling traffic, at the expense of reducing path efficiency and generating some management traffic. This paper focuses on QoS aware Hierarchical Multi-hop routing schemes for mobile ad hoc networks. The best path from a source to a destination is calculated using the QoS information available with either group heads or with each member. Separate clusters are created using the cluster creation algorithm. Depending on the QoS information available with each gateway node, packets are routed. Because of the hierarchical architecture, the performance is unaffected by the increase in the number of mobile nodes, at the same time the Packet Loss is reduced. The proposed dynamic clustering algorithm manages the handover dynamically and hence the efficiency is not degraded by node mobility.

## KEYWORDS

Mobile ad hoc network, MANET, Quality of Service, QoS enabled Routing, FQMM, Dynamic Cluster Creation Algorithm

## REFERENCES


[1] Narendar Reddy Mandhadi, Dr. Lakshmi Rajamani, "QoS enabled Cluster Based Routing Protocols in MANETs", IJCSIS, Vol. 9, Issue. 8, August 2011, pp. 246-250.

[2] S.-J. Lee and M. Gerla, "Dynamic Load-Aware Routing in Ad Hoc Networks," Proc. ICC, Helsinki, Finland, June 2001.

[3] H. Xiao, W.G. Seah, A. Lo, K.C. Chua, "Flexible Quality of Service Model for Mobile Ad-hoc Networks (FQMM)", in Proceedings of IEEE Vehicular Technology Conference (VTC 2000-Fall), Vol. 1, No.4, May 2000, pp.397-413.

[4] E. M. Royer and C.-K. Toh. "A Review of Current Routing Protocols for Ad-Hoc Mobile Wireless Networks," IEEE Pers. Commun., Apr. 1999, pp. 46–55.

[5] H. Luo, S. Lu, V. Bharghavan, Cheng, G. Zhong, "Packet Scheduling Approach to QoS Support in Multi-hop Wireless Networks", Mobile Networks and Applications Vol. 9, Issue 3, 2004, pp. 193- 206.

[6] V. Bharghavan, K. Lee, J. R. Li, D. Dwyer, "Adaptive Resource Management Architecture", IEEE Personal Communication Magazine, Vol. 5, No.8, August 1998, pp. 20-31.

[7] A. Campbell, O. Angin, M. Kounavis, R. Liao, "Programmable Support for Adaptive MobileComputing: The Mobiware Toolkit", IEEE Personal Communications Magazine, Special Issue on Adapting to Network and Client Variability, Vol. 5, No.4, August 1998, pp. 32-44.

[8] D. Thomson M. Mirhahhak, N. Schult, , "Dynamic Quality-of-Service for Mobile Ad-hoc Networks", Proceedings of the 1st ACM International Symposium on Mobile Ad-hoc Networking &Computing, 2000, pp. 137 - 138.

[9] X. Zhang, S. B. Lee, A. Gahng-Seop, and A. T. Campbell, "INSIGNIA: An IP-based Quality of Service Framework for Mobile Ad-hoc Networks", Journal of Parallel and Distributed Computing, Vol. 60, No.4, April 2000, pp. 374-406.

[10] J. Barcel, Garc, R. Guimar, J. Morillo, L. Cerd, "Quality of service for mobile Ad-hoc Networks: An Overview", Technical Report UPC-DAC-2004-24, Polytechnic University of Catalonia, June 2004.