## **Privacy, Security and Trust in Wireless Sensor Networks**

Date: 15<sup>th</sup> November 2007

Riaz Ahmed Shaikh, PhD Fellow

Member of uSec and USN Research Group, Ubiquitous Computing Lab, Dep., of Computer Eng., Kyung Hee University, Suwon Campus, Republic of Korea. <u>riaz@oslab.khu.ac.kr</u>

# Table of Contents

RESEARCH TAXONOMY	3
MILESTONES	4
BIBLIOGRAPHY	5



Riaz Ahmed Shaikh

Page 3

#### Milestones



## Bibliography

### 1. Sensor Networks

- 1.1. S. Tilak, N. B. Abu-Ghazaleh and W. Heinzelman, "Taxonomy of Sensor Network Communication Models", *Mobile Computing and Communication Review*, vol. 6(2), Apr 2002, pp. 28-36
- 1.2. Ian F. Akyildiz, Weilian Su, Yogesh S., and Erdal Cayirci, "A Survey on Sensor Networks", IEEE Communications Magazine, Aug 2002, pp. 102-114
- 1.3. Vassileios Tsetsos, George Alyfantis, Tilemahos Hasiotis, Odysseas Sekkas, and Stathes Hadjiefthymiades, "Commercial Wireless Sensor Networks: Technical and Business Issues", proceedings of the 2<sup>nd</sup> Annual Conference on Wireless On-demand Network Systems and Services (WONS'05), Switzerland, Jan 2005, pp. 166-173
- 1.4. Ahmed Sobeih, Jennifer C. Hou, "A Simulation Framework for Sensor Networks in J-Sim", Technical Report : TR-UIUCDCS-R-2003-2386, Dept. of Computer Science, University of Illinois at Urbana Champaign, Urbana, <u>https://netfiles.uiuc.edu/sobeih/www/files/TR-UIUCDCS-R-2003-2386.pdf</u>
- 1.5. Chen G., Branch J., Pflug M., Zhu L., and Szymanski B. In Advances in Pervasive Computing and Networking, ch. 13 SENSE: A Wireless Sensor Network Simulator: 249–267. Springer, New York, NY, 2004.

## 2. Mobile

2.1. References will be added later.

#### 3. <u>Static</u>

3.1. References will be added later.

#### 4. Mobile Anonymous Environment

4.1. N Asokan, "Anonymity in a mobile computing environment", in proceedings of the Workshop on Mobile Computing Systems and Applications, Santa Cruz, Dec. 1994, pp. 200-204

## 5. Mobile Non-Anonymous Environment

5.1. References will be added later.

## 6. Static Anonymous Environment

- 6.1. D. Kesdogan, C. Palmer, "Technical challenges of network anonymity", Computer Communications vol. 29, 2006, pp. 306–324
- 6.2. C. Boesgaard, "Anonymous Communication in Practice", Department of Computer Science, University of Copenhagen, Denmark, 2003
- 6.3. S. Olariu, Q. Xu, M. Eltoweissy, A. Wadaa, A.Y. Zomaya, "Protecting the Communication Structure in Sensor Networks", International Journal of Distributed Sensor Networks, vol. 1 (2), 2005, pp. 187-203

## 7. Static Non-Anonymous Environment

7.1. References will be added later.

#### 8. Mobile Anonymous: Non-cluster Topology

8.1. References will be added later.

#### 9. Mobile Anonymous: cluster Topology

9.1. References will be added later.

#### 10. Mobile Non-Anonymous: Other Topology

10.1. References will be added later.

#### 11. Mobile Non-Anonymous: cluster Topology

11.1. References will be added later.

#### 12. Static Anonymous: Other Topology

12.1. References will be added later.

#### 13. Static Anonymous: cluster Topology

13.1. S. Olariu, Q. Xu, M. Eltoweissy, A. Wadaa, A.Y. Zomaya, "Protecting the Communication Structure in Sensor Networks", International Journal of Distributed Sensor Networks, vol. 1 (2), 2005, pp. 187-203

#### 14. Static Non-Anonymous: Other Topology

- 14.1. IEEE P802.15 Working group of Wireless Personal Area Networks, http://www.ieee802.org/15/
- 14.2. Curt Schurgers and Vlasios Tsiatsis and Saurabh Ganeriwal and Mani Srivastava, "Topology management for sensor networks: exploiting latency and density", in proceedings of the 3rd ACM international symposium on Mobile ad hoc, Lausanne, Switzerland 2002, pp. 135-145
- 14.3. Čerpa, A. Estrin, D., "ASCENT: adaptive self-configuring sensor networks topologies", IEEE Trans. On Mobile computing, vol. 3(3), pp. 272-285

## 15. Static Non-Anonymous: cluster Topology

- 15.1. J. Y. YU and P. H. J. CHONG, "A Survey of Clustering Schemes for Mobile Ad Hoc Networks," IEEE Communications Surveys and Tutorials, First Quarter 2005, Vol. 7, No. 1, pp. 32--48.
- 15.2. Ossama Younis, Marwan Krunz, and Srinivasan Ramasubramanian, "Node Clustering in Wireless Sensor Networks: Recent Developments and Deployment Challenges", IEEE Network, vol. 20(3), 2006, pp. 20-25
- 15.3. Wendi B. Heinzelman, Anantha P. Chandrakasan, and Hari Balakrishnan, "An Application-Specific Protocol Architecture for Wireless Microsensor Networks", IEEE Transactions On Wireless communications vol 1(4), Oct 2002, pp. 660-670
- 15.4. S Lindsey, CS Raghavendra, S Raghavendra, "PEGASIS- Power-Efficient GAthering in Sensor Information Systems", in Proc. of IEEE Aerospace Conference, Montana, 2002, pp. 1125-1130
- 15.5. Arati Manjeshwar and Dharma P. Agrawal, "TEEN: A Routing Protocol for Enhanced Efficiency in Wireless Sensor Networks", in Proc. of 15th International Parallel and Distributed Processing Symposium (IPDPS'01) Workshops, San Francisco, USA, Apr 2001, pp. 2009-2015

Riaz Ahmed Shaikh

#### 16. Security

- 16.1. Madhukar Anand, Eric Cronin, Micah Sherr, Matt Blaze, Zachary Ives, and Insup Lee, "Sensor Network Security: More Interesting Than You Think", Proceedings of the 1st Usenix Workshop on Hot Topics in Security, Canada, 2006, pp. 25-30
- 16.2. John P. Walters, Zhengqiang Liang, Weisong Shi, and Vipin Chaudhary, "Wireless Sensor Networks Security: A Survey", book chapter of Security in Distributed, Grid, and Pervasive Computing, Yang Xiao (Eds.), CRC Press, later 2006
- 16.3. Djenouri, D. Khelladi, L. Badache, A.N., "A survey of security issues in mobile ad hoc and sensor networks", IEEE Communications Surveys and Tutorials, vol. 7(4), 2005, pp. 2-28
- 16.4. Anthonay D. Wood, John A. Stankovic, "Denial of Service in sensor network", IEEE Computer, 35(10), Oct 2002, pp. 54-62
- 16.5. Adrain Perrig, John Stankovic, and David Wagner, "Security in wireless sensor networks", Communications of ACM, vol 47(6), Jun 2004, pp. 53-5
- 16.6. H. S. Ng, M. L. Sim, and C. M. Tan, "Security Issues of Wireless Sensor Networks in healthcare applications", BT Technology Journal, vol. 24(2), Apr 2006, pp. 138-144
- 16.7. Haowen Chan and Adrian Perrig, "Security and privacy in sensor networks", Computer vol. 36(10), Oct. 2003, pp. 103-105
- 16.8. P A Nixon, W. Wagealla, C. English, S. Terzis, "Security, Privacy and Trust Issues in Smart Environments", book chapter in Smart Environments, D. Cooke and S. Das (Eds), Pearson Press, 2004
- 16.9. W. Diffie and M.E. Hellman, "New Directions in Cryptography", IEEE Transaction on Information Theory, vol. 22, Nov 1976, pp. 644-654
- 16.10.Riaz A. Shaikh, Sungyoung Lee, Young Jae Song, and Yonil Zhung, "Securing Distributed Wireless Sensor Networks: Issues and Guidelines", in proc. of IEEE International Conference on Sensor Networks, Ubiquitous, and Trustworthy Computing (SUTC 2006) vol. 2 Workshops, Taiwan, June, 2006, pp. 226-231

## 17. Privacy

- 17.1. Haowen Chan and Adrian Perrig, "Security and privacy in sensor networks", Computer vol. 36(10), Oct. 2003, pp. 103-105
- 17.2. P A Nixon, W. Wagealla, C. English, S. Terzis, "Security, Privacy and Trust Issues in Smart Environments", book chapter in Smart Environments, D. Cooke and S. Das (Eds), Pearson Press, 2004
- 17.3. Steve Webb, "A Survey of Online Anonymity", http://home.cc.gatech.edu/webb/uploads/10/MiniProject2.pdf

## 18.<u>Trust</u>

- 18.1. Haowen Chan and Adrian Perrig, "Security and privacy in sensor networks", Computer vol. 36(10), Oct. 2003, pp. 103-105
- 18.2. P A Nixon, W. Wagealla, C. English, S. Terzis, "Security, Privacy and Trust Issues in Smart Environments", book chapter in Smart Environments, D. Cooke and S. Das (Eds), Pearson Press, 2004
- 18.3. Lance J. Hoffman and Kim Lawson-Jenkins and Jeremy Blum, "Trust Beyond Security: An Expanded Trust Model", Communication of the ACM, vol. 49 (7), Jul 2006, pp. 95-101
- 18.4. T. Grandison and M. Sloman, "A Survey of Trust in Internet Applications," IEEE Communications Surveys and Tutorials, vol. 3 (4), 2000

#### 19. Protocols

- 19.1. A. Perrig, R. Szewczyk, V. Wen, D. Culler and J. D. Tygar, "SPINS: Security protocols for sensor networks", proceedings of 7th annual international conference on Mobile computing and networking, Rome, Italy, Aug 2001, pp 188-189
- 19.2. Chris Karlof, Naveen Sastry, and David Wagner, "TinySec: a link layer security architecture for wireless sensor networks", proceedings of the 2nd international conference on Embedded networked sensor systems, Baltimore, MD, USA, Nov 2004, pp 162-175

- 19.3. Sencun Zhu, Sanjeev Setia, and Sushil Jajodia, "LEAP: Efficient Security Mechanism for Large-Scale Distributed Sensor Networks", proceedings of the 10th ACM conference on Computer and communications security, Washington, USA, 2003, pp. 62-72
- 19.4. Riaz A. Shaikh, Sungyoung Lee, M. A. U. Khan and Young Jae Song, "LSec: Lightweight Security Protocol for Distributed Wireless Sensor Networks", proceedings of the of 11th IFIP Conference on Personal Wireless Communications (PWC 2006), LNCS vol. 4217, Spain, Sep 2006, pp. 367-377
- 19.5. Taejoon Park, and Kang G. Shin, "LiSP: A Lightweight Security Protocol for Wireless Sensor Networks' ACM Transactions on Embedded Computing Systems, Vol. 3(3), Aug 2004, pp. 634–660
- 19.6. K. Jones, A.Wadaa, S. Oladu, L. W|son, and M. Etoweissy, "Towards a new paradigm for securing wireless sensor networks", proceedings of the 2003 workshop on New security paradigms, Ascona, Switzerland, Aug 2003, pp 115 121

#### 20. Key Management

- 20.1. Wenliang Du, Jing Deng, Han, Y.S., Shigang Chen, Varshney P.K, "A key management scheme for wireless sensor networks using deployment knowledge", proceedings of the INFOCOM 2004, Hong Kong, Mar 2004, pp. 586-597
- 20.2. Erik-Oliver Blaß and Martina Zitterbart, "Towards Acceptable Public-Key Encryption in Sensor Networks", proceedings of the 2nd International Workshop on Ubiquitous Computing, Miami, USA, May 2005, pp. 88-93
- 20.3. Niwat Thepvilojanapong, Yoshito Tobez, Kaoru Sezaki, "Securing Group Communication in Wireless Sensor Networks", IEEE Region 10 conference TENCON 2004, Bangkok, Thailand, Nov 2004, pp. 188-191
- 20.4. H Chan, A Perrig, "PIKE: Peer intermediaries for key establishment in sensor networks", Proceedings of IEEE Infocom, 2005

## 21. Secure Routing

- 21.1. Changqing Yin, Shaoyin Huang, Pengcheng Su, Chuanshan Gao, "Secure Routing For Large-scale Wireless Sensor Networks", in proceedings of the ICCT2003, Beijing, China, Apr. 2003, pp. 1282-1286
- 21.2. Roberto Di Pietro, Luigi V. Mancini, Yee Wei Law, Sandro Etalle, Paul Havinga, "LKHW: A Directed Diffusion-Based Secure Multicast Scheme for Wireless Sensor Networks", International Conference on Parallel Processing Workshops, Taiwan, Jul 2003, pp. 397- 406
- 21.3. K.D. Kang, K. Liu, and N. Abu-Ghazaleh, "Securing Geographic Routing in Wireless Sensor Networks", The 9th Annual NYS Cyber Security Conference: Symposium on Information Assurance, Albany, New York, June, 2006
- 21.4. Xiaojiang Du, Fengjing Lin, "Secure Cell Relay Routing Protocol for Sensor Networks", in Proc. of First IEEE Workshop on Information Assurance in Wireless Sensor Networks (WSNIA 2005), in conjunction with IPCCC 2005, April 2005, pp. 477-482
- 21.5. Jing Deng, Richard Han, and Shivakant Mishra, "INSENS: Intrusion-tolerant routing for wireless sensor networks", Computer Communications, Volume 29, Issue 2, 10 Jan 2006, pp. 216-230

## 22. Identity Privacy

- 22.1. Satyajayant Misra and Guoliang Xue, "Efficient anonymity schemes for clustered wireless sensor networks", Int. J. Sensor Networks, Vol. 1, Nos. 1/2, 2006, pp. 50-63
- 22.2. C. Ozturk, Y. Zhang, and W. Trappe, "Source-location privacy in energy-constrained sensor network routing", proceedings of the of the 2nd ACM workshop on Security of Ad hoc and Sensor Networks, Washington, DC, USA, Oct 2004, pp. 88-93
- 22.3. A. Wadaa, S. Olariu, L. Wilson, M. Eltoweissy, K. Jones, "On Providing Anonymity in Wireless Sensor Networks", proceedings of the 10th International Conference on Parallel and Distributed Systems (ICPADS'04), Calafornia, USA, Jul 2004, pp. 411-418

## 23. Route Privacy

23.1. Satyajayant Misra and Guoliang Xue, "Efficient anonymity schemes for clustered wireless sensor networks", Int. J. Sensor Networks, Vol. 1, Nos. 1/2, 2006, pp. 50-63

#### 24. Location Privacy

- 24.1. C. Ozturk, Y. Zhang, and W. Trappe, "Source-location privacy in energy-constrained sensor network routing", proceedings of the of the 2nd ACM workshop on Security of Ad hoc and Sensor Networks, Washington, DC, USA, Oct 2004, pp. 88-93
- 24.2. Marco Gruteser, Graham Schelle, Ashish Jain, Rick Han, and Dirk Grunwald, "Privacy-Aware Location Sensor Networks", proceedings of the 9th Workshop on Hot Topics in Operating Systems USENIX, May 2003, pp. 163-168

#### 25. Data Privacy

25.1. References will be added later.

#### 26. Distributed Trust Management Approach

- 26.1. R. Housley, W. Polk, W. Ford, and D. Solo, "Internet x.509 public key infrastructure certificate and certificate revocation list (CRL) profile", Internet Request for Comments (RFC 3280., 2002
- 26.2. A. Abdul-Rahman and Stephen Hailes, "A Distributed Trust Model", Proceeding of ACM New Security paradigms workshop, 1997, Cumbria, UK ,pp. 48-60
- 26.3. Saurabh Ganeriwal and Mani B. Srivastava, "Reputation-based Framework for High Integrity Sensor Networks", proceedings of the ACM Security for Ad-hoc and Sensor Networks (SASN 2004), Washington DC, USA, Oct 2004, pp. 66-76
- 26.4. Azzedine Bouukerche and Xu Li, "An Agent-based Trust and Reputation Management Scheme for Wireless Sensor Networks", proceedings of the IEEE GLOBECOM 2005, St. Louis, MO, USA, 28 Nov- 2 Dec 2005, pp. 1857-1861

## 27. Hybrid Trust Management Approach

- 27.1. K. Krishna and A. bin Maarof, "A Hybrid Trust Management Model for MAS Based Trading Society", The International Arab Journal of Information Technology (IAJIT), vol. 1, Jul 2003, pp 60-68
- 27.2. Riaz A. Shaikh, Hassan Jameel, Sungyoung Lee, Young Jae Song, and Saeed Rajput, "Trust Management Problem in Distributed Wireless Sensor Networks", in proc. of 12th IEEE International Conference on Embedded Real Time Computing Systems and its Applications (RTCSA 2006), Sydney, Australia, Aug 2006, pp. 411-414