

Scientific Appendix of Sarwar Morshed

PhD Research

In my PhD research, I created the scope of a new energy-efficient medium access control (MAC) layer communication protocol for wireless sensor networks exploiting the transmit reference (TR) modulation in underlying physical layer. This protocol is called transmit reference–medium access control (TR-MAC), which provides energy-efficient connectivity with traffic-adaptive behavior together with multiple access control. I identified the required features for the protocol, designed technical solutions by exploiting the features, developed mathematical model to analyze different aspects of the protocol using UML based state machines and programming tools, e.g., Matlab, and realized the protocol behavior using a discrete event driven C++ based simulator called OMNeT++.

I worked in the WALNUT (Wireless Ad-hoc Links using robust Noise-based Ultra-wideband Transmissions) project in the Design and Analysis of Communication Systems (DACS) research group of University of Twente. The WALNUT project had industry partners NXP semiconductors, Thales, TNO, Plantronics, DevLab, and STmicroelectronics, and was funded by Dutch Technology Foundation (STW). Three research groups within University of Twente worked in this project to realize the TR modulation in circuit implementation, analyzing the modulation characteristics in the physical layer, and finally modelling a MAC layer communication protocol on top.

https://www.utwente.nl/ctit/research/research_projects/national/stw/walnut/
https://www.utwente.nl/ctit/research/phd/meet/phd/sarwar_morshed.html

Masters Research

During my Masters research, I worked on verification and finalizing the proposal for DVB-T2 (Digital Video Broadcasting - 2nd generation Terrestrial) standard. DVB is an international standard for digital television broadcasting and is standardized by ETSI (European Telecommunication Standards Institute). I analyzed the proposal for the DVB-T2 standard using simulations in C++ based CCSS and Matlab programming tools to identify possible limitations in the proposal and propose suggestions.

My Masters thesis was done while I was working as a research assistant in the Wireless Communications and Positioning research group in Tampere University of Technology in Finland. The work was funded by the European project EUREKA/CELTIC B21C (Broadcasting for 21st Century), and Tekes (The Finnish Funding Agency for Technology and Innovation).

<https://www.celticplus.eu/project-b21c/>

Bachelors Research

In my Bachelor thesis, I along with my group members developed a simplified process for grid job migration. We learned about the key existing approaches, techniques, and proposals for migrating jobs on flexible grid architecture. This thesis was done in the department of Computer Science in Islamic University of Technology in Bangladesh.

Scientific publications

2016

- **Morshed, S.** and Baratchi, M. and Mandal, P. K. and Heijenk, G.J. (2016) A multi-channel Multiple Access Scheme for Wireless Sensor Networks Using Frequency Offsets – Modelling and Analysis. In: Proceedings of the 12th International Conference on Wireless and Mobile Computing, WiMob 2016, Networking and Communications 2016, 17-19 October, New York, USA.
- **Morshed, S.** and Baratchi, M. and Heijenk, G.J. (2016) Traffic-adaptive duty cycle adaptation in TR-MAC protocol for Wireless Sensor Networks. In: Proceedings of the 8th International Conference on Wireless Days 2016, 23-25 March, Toulouse, France.

2015

- **Morshed, S.** and Heijenk, G.J. (2015) Optimization and Verification of the TR-MAC Protocol for Wireless Sensor Networks. In: Proceedings of the 13th International Conference on Wired/Wireless Internet Communications, WWIC 2015, Revised Selected Papers, May 25-27, 2015, Malaga, Spain. pp. 396-410. Lecture Notes in Computer Science 9071. Springer International Publishing. ISSN 0302-9743 ISBN 978-3-319-22571-5.
- **Morshed, S.** and Heijenk, G.J. (2015) TR-MAC: An energy-efficient MAC protocol for wireless sensor network. In: ICT.OPEN 2015, 24 Mar 2015, Amersfoort, The Netherlands.

2014

- **Morshed, S.** and Heijenk, G.J. (2014) TR-MAC: an energy-efficient MAC protocol exploiting transmitted reference modulation for wireless sensor networks. In: Proceedings of the 17th ACM International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems, MSWiM 2014, 21-25 Sep 2014, Montreal, Canada. pp. 21-29.ACM. ISBN 978-1-4503-3030-5

2013

- **Morshed, S.** and Heijenk, G.J. (2013) TR-MAC: an energy-efficient MAC protocol for wireless sensor networks exploiting noise-based transmitted reference modulation. In: 2nd Joint ERCIM eMobility and MobiSense Workshop, 4 Jun 2013, St. Petersburg, Russia. pp. 58-71. University of Bern. ISBN 978-3-9522719-4-0
- **Morshed, S.** and Heijenk, G.J. and Meijerink, A. and Ye, Dawei and van der Zee, R.A.R. and Bentum, M.J. (2013) A new energy-efficient MAC protocol with noise-based transmitted-reference modulation for wireless sensor network. In: Sense of Contact 15 - Sensors across the application domains, 10 Apr 2013, Soesterberg, The Netherlands.pp. 1-2. Technology Foundation (STW)

2012

- **Morshed, S.** and Heijenk, G.J. and Meijerink and Mahboob M. and Bentum, M.J. (2012) Noise Based Transmitted Reference Modulation for Wireless Sensor Networks. In: Sense of Contact 14 - Sensors across the application domains, 2 Apr 2012, Soesterberg, The Netherlands.pp. 1-2. Technology Foundation (STW).

2010

- **Morshed, S.** and Mahmud, H. and Didar-Al-Alam, S. M. (2010) "Evaluation of nonlinearity effects on performance of DVB-H transmission link," International Journal of Engineering Science and Technology, vol. 2, no. 8, pp. 3854-3864, 2010.
- Mahmud, H. and Didar-Al-Alam, S. M. and **Morshed, S.** and Haque M. O. and Hasan M. K. (2010) "Designing access control model and enforcing security policies using PERMIS for a smart item e-health scenario," International Journal of Engineering Science and Technology, vol. 2, no. 8, pp. 3777-3787, 2010.
- Hasib, A. A. and Azfar, A. and **Morshed, S.** (2010) "Towards Public Key Infrastructure less authentication in Session Initiation Protocol". In: International Journal of Computer Science Issues (IJCSI), January 2010, ISSN: 1694-0814, Vol. 7, Issue. 1, No. 2, pp. 10-17.

2005

- Azfar A. and **Morshed, S.** and Islam, Z. and Ullah, A. S. S. M. B. and Pathan, A. M. K. (2005) "A Simplified Process for Grid Job Migration". In: International Conference of Computer and Information Technology (ICCIT), held in Islamic University of Technology (IUT), Bangladesh, 28-30 December 2005. ISBN: 984-32-2873-1. pp. 706-709.
- **Morshed, S.** and Kamal, A. R. M. and Ullah, A. S. S. M. B. (2005) "Susceptible SQL Detector (SSD) – a parser-based security solution to prevent SQL-injection attack". In: International Conference of Computer and Information Technology (ICCIT), held in Islamic University of Technology (IUT), Bangladesh, 28-30 December 2005. ISBN: 984-32-2873-1. pp. 1229-1233.