

Farzana Rahman, PhD

Assistant Professor (from fall 2013), James Madison University, Harrisonburg, Virginia, USA

CONTACT INFORMATION

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EDUCATION

- **Marquette University, Milwaukee, WI, USA**
PhD in Computational Sciences (Fall 2010 - Fall 2012)
Graduation Date: May 19, 2013
Dissertation Title: Ensuring Application Specific Security and Privacy Requirements for Current and Next Generation RFID Systems
Advisor: Dr. Sheikh Iqbal Ahamed (<http://www.mscs.mu.edu/~iq/>)
- **Marquette University, Milwaukee, WI, USA**
Masters of Science in Computer Science (Fall 2008 - Summer 2010)
Thesis Title: Towards Secure And Scalable Tag Search Approaches for Current and Next Generation RFID Systems
Advisor: Dr. Sheikh Iqbal Ahamed (<http://www.mscs.mu.edu/~iq/>)
- **Bangladesh University of Engineering and Technology, Dhaka, Bangladesh**
B.Sc. in Computer Science and Engineering (2008)
Thesis Title: Minimizing Broadcast Redundancy for Ad-hoc Wireless Network

RESEARCH INTERESTS

- My primary research area is *Security and Privacy of RFID and Computational RFID systems* or *Security of Mobile and Ubiquitous Systems* in general.
- I have research experience with *Security, Trust and Privacy issues of Mobile and Pervasive Computing, Security of Wireless Sensor Networks, and Green Computing.*
- Recently I have started to explore *Security of Mobile Applications*. My goal is to use my expertise in information security to investigate the *Security of Android Applications or Android Malware.*
- I also work on designing *Secure Healthcare Systems* for Pervasive environments and developing *mobile healthcare applications* (especially in *Android* platform).
- I am also fascinated by *Online Social Networks* and currently I am developing a tool for investigating user psychology using various *Communication and Interaction patterns* of users in different social networks.

HONORS AND AWARDS

2013

- Travel and Accommodation Grant to attend Career Mentoring Workshop Collocated with SIGCSE 2013. This grant was funded by NSF

2012

- Grace Hopper Scholarship funded by Twitter to attend Grace Hopper Conference 2012, held in MD, USA
- Travel and accommodation grant award to attend IEEE Pervasive Computing and Communication (PerCom 2012) Conference, held in Switzerland. It was funded by NSF

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- Computational Sciences Summer Research Program (CSSRP) Fellowship for summer 2012, funded by Marquette University
 - Conference Travel Grant Recipient. Awarded by Dept. of MSCS at Marquette University to attend PerCom 2012 held in Lugano, Switzerland

2011

- Grace Hopper Scholarship by NSF to attend Grace Hopper Conference 2011, held in Oregon, USA
- Travel and accommodation grant to attend ACM Conference on Computer and Communications Security (CCS 2011), held in Chicago. It was funded by NSF
- Travel and accommodation grant award to attend IEEE Pervasive Computing and Communication (PerCom 2011) Conference, held in Washington. It was funded by NSF
- Computational Sciences Summer Research Program (CSSRP) Fellowship for summer 2011, funded by Marquette University
- Conference Travel Grant Recipient. Awarded by Dept. of MSCS at Marquette University to attend PerCom 2011 held in WA, USA
- Computing Research Association (CRA) scholarship recipient to attend Grad Cohort Workshop 2011
- Travel and accommodation grant award to attend Richard Tapia Conference 2011, held in CA, USA

2010

- Grace Hopper Scholarship by NSF to attend Grace Hopper Conference 2010, held in Georgia, USA
- Google Anita Borg Scholarship finalist during 2010
- All expense paid travel and accommodation grant award to attend Google Scholars' Retreat 2010, held in Mountain View, CA, USA
- Computational Sciences Summer Research Program (CSSRP) Fellowship for summer 2010, funded by Marquette University
- Conference Travel Grant Recipient. Awarded by Dept. of MSCS at Marquette University to attend First International Green Computing Conference (IGCC'10), held in Chicago, USA
- Conference Travel Grant Recipient. Awarded by Dept. of MSCS at Marquette University to attend IEEE International Conference on Social Computing (SocialCom 2010), held in MN, USA

2009

- Travel and accommodation grant to attend ACM Conference on Computer and Communications Security (CCS 2009) Conference held in Chicago. It was funded by NSF
- Travel and accommodation grant from University of Illinois (Urbana-Champaign) to attend Illinois Wireless Summer School 2009

RESEARCH EXPERIENCE

- **Research Assistant (Fall 2008 - at present)**

Advisor: Sheikh Iqbal Ahamed (UbiComp Lab, URL: <http://www.mscs.mu.edu/~ubicomp/>)

- Worked on security and privacy issues of RFID systems, preserving privacy and maintaining scalability of RFID systems, efficient detection of counterfeit RFID tags in large scale RFID systems (ex. supply chain), ensuring robustness and survivability of critical computational RFID systems, missing tag detection in computational RFID tag based smart environments. Developed theoretical models and implemented secure, attack resistant authentication protocols to maximize the application specific requirements of different RFID systems. This resulted in publications [JL1, CF6, CF7, CF8, CF9 and CF11].

- Designed and developed a Robust Authentication Protocol (RoAP) that supports recovery in RFID systems. The protocol can get back the desynchronized tags and readers to their normal state, and thus provides robustness. Evaluated the protocol using a prototype RFID system. Performed further development of a hexagonal cell based distributed architecture which ensures improved scalability while maintaining privacy in RFID systems. The hexagonal architecture allows readers to co-operate with one another to identify tags without compromising scalability. This resulted in publications [CF18 and CF24].

- RFID tag searching is an extension of authentication. We developed and implemented a lightweight tag searching protocol. The protocol can search a particular tag efficiently as the approach is not based on

exhaustive search and it does not employ extreme cryptographic functions. As a further extension of this project, we implemented a scalable and secure search (S-Search) protocol for searching RFID tags. This resulted in publications [JL6, JL8, CF16, and CF23].

- Since RFID tags are extremely resource constrained, in order to relieve tags from responsibility, privacy protection and security assurance was guaranteed by central server. We designed and developed serverless RFID authentication protocol. We also developed a secure ownership transfer technique for the serverless RFID systems. This resulted in publications [JL6, CF21, and CF22].
- Designed and developed a novel Privacy-sensitive architecture for Context Obfuscation (PCO) and privacy preservation in pervasive online community based applications. We implemented a contextual instant messaging application that incorporates level-based privacy of the user's contextual information. This resulted in publications [JL4 and CF13].
- Worked on the design and development of a carbon footprint calculation framework, named OCFE that can serve as a platform for various carbon footprint calculator applications. Based on the OCFE platform, we developed a Ubiquitous Carbon Footprint Calculator application (UCFC) that allows the user to be aware of their personal carbon footprint based on their ubiquitous activity and act accordingly. Using OCFE, we have also developed a mobile GPS application, EcoDrive, for iPhone platform that suggests the most fuel efficient route to the user. This resulted in publications [JL3, CF10, CF14, and CF15].
- Developed and implemented an initial trust model that categorizes services or contexts in different security levels based on their security needs, and these security needs are considered in trust bootstrapping. An extension of this project is the development of a context specific and reputation based trust model. This model uses multihop recommendation and a flexible behavioral model to handle interactions. This resulted in publications [JL8, CF17, CF19, and CF20].

URL: <http://www.mscs.mu.edu/~frahman/Publication.html>

- **Webmaster and Assistant of System Administrator (Spring 2011)**

Dept. of MSCS, Marquette University

Duties: Maintained the website of MSCS dept. of Marquette University. I have developed tutorials on different basic programming language (C, C++, JAVA, and Python), network programming, JavaScript, Servlet, SQL, MPI, OpenMP, HTML, XML, software tools, and various IDE. I have also created tutorials illustrating setup, installation and troubleshooting process of different software (for example, Matlab, SSH, PUTTY, Eclipse, and Netbeans) used by computer science students.

TEACHING EXPERIENCE

- **Teaching Assistant & Quiz Section Instructor (Fall 2012)**

Course: *Calculus 1 (MATH 1470)*

Duties: Conducted quiz/recitation section for 6 hours every week. I was in charge of three sections with almost 20 students in each section. Delivered lectures during recitation section on specific topics related to the course material and solved problems related to homework, quiz, and exam. Held weekly office hours. I have also used Wileyplus, an online teaching and learning tool to assign homework every week.

- **Teaching Assistant (Spring 2011)**

Course: *Elements of Software Development (MSCS 6050)*, Dept. of MSCS, Marquette University

Duties: Developed and graded assignments and exams on advanced software development related concepts, maintained weekly office hours and delivered lectures in couple of classes.

- **Teaching Assistant & Lab Instructor (Fall 2008-Fall 2010)**

Course: *Introduction to Programming Language (COSC 1010)*, Dept. of MSCS, Marquette University

Duties: Developed detailed lesson plans, handouts, homework, and lab projects. Graded lab projects, homework and exams. I also conducted lab discussion every week for 5 hours in total. Maintained course website and held weekly office hours. I helped the instructor to prepare lecture materials. I have also delivered lectures very often during each semester.

- **Teaching Assistant & Lab Instructor (Fall 2008-Fall 2010)**

Course: *Object Oriented Software Design with JAVA (COSC 1020)*, Dept. of MSCS, Marquette University

Duties: Designed term projects. Developed assignments, and lab projects. Graded lab projects, assignments, and exams. I also conducted lab discussion every week for 3 hours in total. Maintained course website and held weekly office hours. Conducted presentations and demonstration of term projects. I have used Piazza where students can ask questions, and participate in discussion related to the course and term projects.

- **Lecturer (Jan 2008 - May 2008)**

Dept. of Computer Science and Engineering, State University of Bangladesh (SUBD), Bangladesh

Courses: *Database, Programming Language, Computer Architecture, Operating Systems*

Duties: I worked as a full time instructor for several courses. My works included preparing lecture materials, handouts, detailed lesson plans and delivering them, preparing homework, lab assignments, quiz and exam questions. I taught 3 undergraduate level courses totaling 42 hours in each semester. Coordinated with faculty members and administrative personnel. Conducted labs and held weekly office hours. I also graded exams, quiz, and assignments. Total class size was 35.

PUBLICATION LIST

- **Journal Papers**

[JL1]. Farzana Rahman and Sheikh Iqbal Ahamed, “Efficient Detection of Counterfeit Products in Large Scale RFID Systems with Batch Authentication Protocols”, *Journal of Personal and Ubiquitous Computing*, Springer-Verlag, 2012. pp. 1-12. <http://dx.doi.org/10.1007/s00779-012-0629-8>

[JL2]. Farzana Rahman, Casey O'Brien, Sheikh I. Ahamed, He Zhang and Lin Liu, “Design and implementation of an open framework for ubiquitous carbon footprint calculator applications”, *Elsevier Journal of Sustainable Computing: Informatics and Systems*, Volume 1, Issue 4, December 2011. pp. 2210-5379. <http://dx.doi.org/10.1016/j.suscom.2011.06.001>

[JL3]. Farzana Rahman, Md. Endadul Hoque, Ferdaus Ahmed Kawsar, Sheikh Iqbal Ahamed, “User privacy protection in pervasive social networking applications using PCO”, *International Journal of Social Computing and Cyber-Physical Systems*, Volume 1, Issue 3, 2012. pp. 242-267. <http://www.inderscience.com/browse/index.php?journalID=349&action=coming>

[JL4]. Farzana Rahman, Md. Endadul Hoque, and Sheikh I. Ahamed, “Preserving privacy in wireless sensor networks using reliable data aggregation”, *SIGAPP Applied Computing Review*, Volume 11, Issue 3, August 2011. pp. 52-62. <http://doi.acm.org/10.1145/2034594.2034599>

[JL5]. Md. Endadul Hoque, Farzana Rahman, Sheikh I. Ahamed, and Jong Hyuk Park, “Enhancing Privacy and Security of RFID System with Serverless Authentication and Search Protocols in Pervasive Environments”, *Journal of Wireless Personal Communication*, Springer, Volume 55, Issue 1, 2009. pp. 65-79. <http://dx.doi.org/10.1007/s11277-009-9786-0>

[JL6]. Ashikur Rahman, Md. Endadul Hoque, Farzana Rahman, Sabuj K. Kundu, and Powel Gburzynski, “Enhanced Partial Dominant Pruning (EPDP) Based Broadcasting in Ad hoc Wireless Networks”. *Journal of Networks*, Volume 4, No 9, November 2009. pp. 895-904. <http://dx.doi.org/10.4304/jnw.4.9.895-904>

[JL7]. Sheikh I. Ahamed, Munirul M. Haque, Md. Endadul Hoque, Farzana Rahman, and Nilothpal Talukder, “Design, Analysis, and Deployment of Omnipresent Formal Trust Model (FTM) with Trust Bootstrapping for Pervasive Environments”, *Elsevier Journal of Systems and Software (JSS)*, Volume 83, Issue 2, February 2010. pp. 253-270. <http://dx.doi.org/10.1016/j.jss.2009.09.040>

[JL8]. Sheikh I. Ahamed, Farzana Rahman, Endadul Hoque, Fahim Kawsar, and Tatsuo Nakajima, “Secure and Efficient Tag Searching in RFID Systems using Serverless Search Protocol”. *International Journal of Security and Its Applications (IJSIA)*, Volume 2, No 4, October 2008. pp. 57-66.

- **Peer Reviewed Conference/Workshop Papers**

[CF1]. *Farzana Rahman*, Md. Endadul Hoque, Sheikh I. Ahamed, and Mohammad Arif Ul Alam, "Preserving User Privacy in Pervasive Environments with a Collaborative Model", to appear in Proc. of International Workshop on Trustworthy Computing, Collocated with IEEE International Conference on Software Security and Reliability (SERE 2013). Washington, D.C, USA, 2013.

[CF2]. *Farzana Rahman*, Sheikh Iqbal Ahamed, Ji-Jiang Yang and Qing Wang, "PriGen: A Generic Framework to Preserve Privacy of Healthcare Data in the Cloud", to appear in Proc. of the 11th International Conference on Smart homes and health Telematics (ICOST 2013), Singapore, 2013.

[CF3]. *Farzana Rahman*, and Sheikh Iqbal Ahamed, "Towards Improving Reliability of Computational RFID based Smart Healthcare Monitoring Systems", to appear in Proc. of the 11th International Conference on Smart homes and health Telematics (ICOST 2013), Singapore, 2013.

[CF4]. *Farzana Rahman*, Casey O'Brien, Colin Ostberg, Nahid Negar, Duc Do, Sheikh I. Ahamed, Roger Smith, "Measuring Font Signage with a Smartphone Application for ADAAG Compliance Assessment", to appear in Proc. of the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Conference (RESNA 2013), Bellevue, WA, USA, 2013.

[CF5]. A.K.M. Jahangir Alam Majumder, *Farzana Rahman*, Ishmat Zerine, Ebel Jr. William, and Sheikh Iqbal Ahamed, "iPrevention: Towards a Novel Real-time Smartphone-based Fall Prevention System", in Proc. of ACM Symposium on Applied Computing (ACM SAC 2013). Italy, March, 2012.

[CF6]. *Farzana Rahman*, Sheikh Iqbal Ahamed, Ji-Jiang Yang and Qing Wang, "*I am not a goldfish in a bowl: A Privacy Preserving Framework for RFID based Healthcare Systems*", in Proc. of IEEE 14th International Conference on e-Health Networking, Applications and Services (Healthcom 2012). China, October, 2012. pp. 335 - 340. [Best paper winner]

[CF7]. *Farzana Rahman* and Sheikh Iqbal Ahamed, "*MonAC: Detecting Missing Tags for Improved Accuracy in Computational RFID based Assisted Environments*", in Proc. of the ACM Symposium on Research in Applied Computation (ACM RACS 2012). Texas, USA, October, 2012. pp. 180-185.

[CF8]. *Farzana Rahman* and Sheikh Iqbal Ahamed, "*Looking for needles in a haystack: Detecting Counterfeits in Large Scale RFID Systems using Batch Authentication Protocol*", in Proc. of IEEE PerCom Workshop on Pervasive Wireless Networking (PWN12). Switzerland, March, 2012. pp. 811 - 816. [Acceptance rate: 20%]

[CF9]. *Farzana Rahman* and Sheikh Iqbal Ahamed, "*DRAP: A Robust Authentication Protocol to Ensure Survivability of Computational RFID Networks*", in Proc. of ACM Symposium on Applied Computing (ACM SAC 2012). Italy, March, 2012. pp. 498-503. [Acceptance rate: 24%]

[CF10]. *Farzana Rahman*, Casey O'Brien, Kristine Manning, Jason Cowdy, Sheikh Iqbal Ahamed, "*Let EcoDrive be Your Guide: Development of a Mobile Tool to Reduce Carbon Footprint and Promote Green Transport*", in Proc. of ACM Symposium on Applied Computing (ACM SAC 2012). Italy, 2012. pp. 519-524. [Acceptance rate: 24%]

[CF11]. Md. Endadul Hoque, *Farzana Rahman*, and Sheikh I. Ahamed, "*AnonPri: An Efficient Anonymous Private Authentication Protocol*", in Proc. of the IEEE International Conference on Pervasive Computing and Communications (PerCom 2011), WA, USA, March 2011. pp. 102-110. [Acceptance rate: 11%].

[CF12]. *Farzana Rahman*, Md. Endadul Hoque, and Sheikh I. Ahamed, "*REBIVE: A Reliable Private Data Aggregation Scheme for Wireless Sensor Networks*", in Proc. of the ACM Symposium on Applied Computing (ACM SAC 2011), Taiwan, March 2011. pp. 439-444. [Acceptance rate: 26%]

[CF13]. *Farzana Rahman*, Md. Endadul Hoque, Ferdous Kawser, and Sheikh Iqbal Ahamed, "*Preserve Your Privacy with PCO: A Privacy Sensitive Architecture for Context Obfuscation for Pervasive E-Community based applications*", in Proc. of the IEEE International Conference on Social Computing (SocialCom 2010), MN, USA, 2010. pp. 41-48. [Acceptance rate: 13%].

[CF14]. *Farzana Rahman*, Sheikh Iqbal Ahamed, Md. Endadul Hoque, Casey O Brian, Lin Liu, He Zhang, "*UCFC Ubiquitous Personal Carbon Footprint Calculation Platform*", in Proc. of the Workshop for The Work in

[CF15]. He Zhang, Lin Liu, Sheikh Iqbal Ahamed, and Farzana Rahman, "Open Carbon Footprint Calculation Platform for Personal Users", in Proc. of the Second International Workshop on Software Research and Climate Change (ICSE 2010), South Africa, 2010.

[CF16]. Md. Endadul Hoque, Farzana Rahman, and Sheikh I. Ahamed, "S-Search: Finding RFID Tags using Scalable and Secure Search Protocol", in Proc. of the ACM Symposium on Applied Computing (ACM SAC 2010), Switzerland, March, 2010. pp. 439-443.

[CF17]. Md. Endadul Hoque, Farzana Rahman, Sheikh I. Ahamed, and Lin Liu, "Trust Based Security Auto-Configuration for Smart Assisted Living Environments", in Proc. of the ACM Workshop on Assurable & Usable Security Configuration (SafeConfig 2009) collocated with ACM CCS 09, Chicago, USA, 2009, pp. 7-11.

[CF18]. Md. Endadul Hoque, Farzana Rahman, and Sheikh Ahamed, "Supporting Recovery, Privacy and Security in RFID Systems Using a Robust Authentication Protocol", in Proc. of the 24th ACM Symposium on Applied Computing (ACM SAC 2009), Hawaii, USA, March, 2009. pp. 1062-1066.

[CF19]. Md. Endadul Hoque, Farzana Rahman, and Sheikh Iqbal Ahamed, "An Adaptive Initial Trust and Demand Aware Secure Resource Discovery (AID-SRD) Model for Pervasive Environments", in Proc. of the IEEE International Workshop on Web and Pervasive Security (WPS 2009) in conjunction with PerCom 2009, Texas, USA, March, 2009. pp. 1-6.

[CF20]. Sheikh I. Ahamed, Endadul Hoque, Farzana Rahman, and Mohammad Zulkernine, "Towards Secured Trust Bootstrapping in Pervasive Computing Environment", in Proc. of the IEEE High Assurance Systems Engineering Symposium (HASE 2008), China, December, 2008. pp.89-96. [Acceptance rate 22%]

[CF21]. Sheikh Iqbal Ahamed, Farzana Rahman, and Md. Endadul Hoque, "ERAP: ECC based RFID Authentication Protocol", in Proc. of the IEEE International Workshop on Future Trends of Distributed Computing Systems (FTDCS 2008), Kunming, China, October 21-23, 2008, pp.219-225.

[CF22]. Sheikh I. Ahamed, Farzana Rahman, Endadul Hoque, Fahim Kawsar, Tatsuo Nakajima; "YA-SRAP: Yet Another Serverless RFID Authentication Protocol", in Proc. of the IET International Conference on Intelligent Environment (IE08), Seattle, USA, July, 2008, pp. 640--.

[CF23]. Sheikh I. Ahamed, Farzana Rahman, Endadul Hoque, Fahim Kawsar, and Tatsuo Nakajima, "S³PR: Secure Serverless Search Protocols for RFID", in Proc. of the IEEE International Conference on Information Security and Assurance (ISA 2008), Korea, April, 2008, pp.187-192.

[CF24]. Sheikh Iqbal Ahamed, Farzana Rahman, and Md. Endadul Hoque, "Secured Tag Identification Using EDSA (Enhanced Distributed Scalable Architecture)", in Proc. of the ACM Symposium on Applied Computing (ACM SAC 2008), Brazil, March, 2008. pp. 1902-1907.

- **Book Chapter**

[BC1]. Farzana Rahman, Sheikh Iqbal Ahamed, Casey O'Brien, He Zhang, and Lin Liu. "Evolution of Energy Awareness using an Open Carbon Footprint Calculation Platform (OCFP)", in Handbook of energy aware and green computing, CRC Press, 2011.

- **Posters**

[PS1]. Farzana Rahman, A.K.M. Jahangir Majumder, Kristina Mensch, Colin Ostberg, Syam Ahmed, and Sheikh Iqbal Ahamed, "mHealthMTT: Bridging the Gap in Communication Using a Mobile Based Intervention for Maternal and Child Healthcare in Rural Bangladesh." in Proc. of the Forward Thinking Poster Session/Colloquy Presentation, Marquette University, December 2012. [Best poster in International Research Category, Awarded \$1500 as startup grant from Marquette University].

[PS2]. "Big Brother is watching you: Preserving Privacy in RFID Based Ubiquitous Healthcare Systems", in Computational Sciences Day at Marquette University, April, 2012.

[PS3]. "Healthcare Privacy for the People by the People: Investigation of practices and attitudes to Healthcare Data Privacy in Rural Countries", in Proc. of the Forward Thinking Poster Session/Colloquy

Presentation, Marquette University, December 2011.

[PS4]. *Farzana Rahman*, Md. Endadul Hoque, and Sheikh I. Ahamed, "*ProQuPri: Towards Anonymity Protection with Privacy Quantification for Context-aware Applications*", in Proc. of the ACM Symposium on Applied Computing (*ACM SAC 2011*), Taiwan, March 2011.

[PS5]. "*Towards a Lightweight Security Solution for Computational RFID (CRFID)*", at the 2010 Anita Borg Institute Grace Hopper Celebration of Women in Computing. Atlanta, GA, USA, September 2010.

[PS6]. "*MonAC : A batch-mode search technique for computational RFID tags*", in Proc. of the Forward Thinking Poster Session/Colloquy Presentation, Marquette University, December 2010, pp. 5.

[PS7]. "*Towards Green Software Infrastructure*", in Proc. of the Forward Thinking Poster Session/Colloquy Presentation, Marquette University, December 2009, pp. 5.

[PS8]. "*IMPriv: A Context Aware Privacy Sensitive Instant Messaging (IM) Technique*", in Proc. of Computational Sciences Symposium, Marquette University, April 2009.

[PS9]. "*Measuring Privacy in Pervasive Computing Environment*", in Proc. of ORSP Forward Thinking Poster Session/Colloquy, Marquette University, November 2008.

• **Conference/Journal Papers under submission**

[1] *Farzana Rahman*, Sheikh Iqbal Ahamed, Ji-Jiang Yang and Qing Wang, "A Brief Taxonomy of Security and Privacy Goals in RFID based Healthcare Systems", under submission in a journal.

[2] *Farzana Rahman* and Sheikh Iqbal Ahamed, "An Efficient Anonymous Private Authentication Protocol for RFID Systems", under submission in a journal.

[3] *Farzana Rahman*, Sheikh Iqbal Ahamed, Ji-Jiang Yang and Qing Wang, "A Privacy Preserving Framework for RFID based Healthcare Systems", under submission in a journal.

[4] *Farzana Rahman*, Casey O'Brien, Kristine Manning, Jason Cowdy, Sheikh Iqbal Ahamed, He Zhang and Lin Liu, "*EcoDrive: A Smartphone based Tool to Reduce Carbon Footprint and Promote Green Transportation*", under submission in a journal.

[5] *Farzana Rahman*, Casey O'Brien, Colin Ostberg, Nahid Negar, Duc Do, Sheikh Iqbal Ahamed, and Roger Smith, "Measuring Font Signage with a Smartphone Application for Disability Compliance Assessment", under submission in a conference.

[6] *Farzana Rahman* and Sheikh Iqbal Ahamed, "Preserving User Privacy in Pervasive Environments with a Collaborative Model", under submission in a conference.

[7] *Farzana Rahman* and Sheikh Iqbal Ahamed, "PriCollect: Privacy Preserving Data Collection in Sensor Enabled RFID Systems", under submission in a conference.

[8] *Farzana Rahman*, Osman Gani, and Sheikh Iqbal Ahamed, "A Four Way Fusion of User Authentication Techniques for Efficient Usable Security on Mobile Devices", under submission in a conference.

[9] Ferdous kawser, *Farzana Rahman*, and Sheikh Iqbal Ahamed, "Healthcare Privacy for the People by the People: Investigation of Practices and Attitudes to Healthcare Privacy in Developing Countries", under submission in a conference.

Please visit DBLP: <http://www.informatik.uni-trier.de/~ley/db/indices/a-tree/r/Rahman:Farzana.html>

TECHNICAL SKILLS

- *Programming Language:* C/C++, JAVA, 80x86 Assembly Language, Shell Script, PL/SQL, PROLOG, HTML, PHP, Verilog HDL
- *Mobile Platform:* Android, iOS
- *Framework:* Jakarta Struts, JavaServer Faces, JAVA Persistence API
- *Database:* Oracle 9i, MySQL

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- *Web Server:* ApacheWeb Server, Tomcat, Sun Java Application Server
 - *Modeling Language:* Unified Modeling Language (UML) and ER Diagram (ERD)
 - *Operating System:* Linux/Unix, Windows
 - *Tools and Software:* MPI, OpenMP, RMI, JBuilder, JCreator, Sun Java Studio Creator, NetBeans, LaTeX, Microsoft Visio, PSPICE, CircuitMaker, Router Simulator, MATLAB, Lex/Yacc

ONGOING RESEARCH PROJECTS

- **Investigating Android application security:** In today's modern world, the adoption of smartphone have increased the diffusion of mobile malware, especially on popular platforms like Android. However, there remains little insight into broader security characteristics of smartphone applications. In this context, the Android application security issues that I would like to investigate are: 1) to understand the vulnerability that is exploited by the application to compromise the entire system. 2) to study the severity of the attack and combat measures. 3) to penetrate into the compromised data in order to investigate its origin and to obtain information about other compromised applications.
- **Social Isolation Detection using Mobile Technology:** Since modern smartphone are now capable of gathering information about users' social interactions, our goal is to develop a system that can use this information rich data to detect the onset of social isolation in a human being.
- **Secret sharing based lightweight batch authentication for RFID systems:** Our goal is to develop a lightweight batch authentication protocol based on key transportation and authentication using threshold secret sharing scheme which provides strong security on low-cost RFID tags.
- **Privacy Preserving Framework for Massive Data in Cloud:** Our goal in this project is to implement a preserving privacy framework for the massive data that are in the cloud. As part of this project, we also plan to design data partitioning algorithm and data merging algorithm for private data and general data.
- **Healthcare Epidemic Outbreak Prediction using Social Networks:** In this project, our main goal is to find out a temporal timeline of tweets for specific disease related keywords for a geographical location. We would also like to predict disease outbreak for various locations of the world, ex. Asia, Africa or more specific to countries, like USA, China, Bangladesh, and India.

SELECTED GRADUATE AND UNDERGRADUATE PROJECTS

- **Selected Graduate level Projects**

1. *Automated Transportation System Using Location Based Services:* A prototype is developed to automate the traditional student transportation system of Marquette University within the campus. Utilizing the location of user's mobile device and with the help of some LBSs running on the server, PriLoc can automate as well as reduce the complexity of the existing manual system. This project is done for "Distributed Computing" course.
2. *Being Green with Real Time Carbon Footprint Calculators:* In this project, we first developed *Open Carbon Footprint Framework (OCFF)* that maintains a clouded knowledge base and provides the necessary interfaces for carbon footprint application developers. Based on this platform, we developed a Ubiquitous Carbon Footprint Calculator application (UCFC). In this application, we used low cost sensors to collect environment parameters and used a mathematical model to determine carbon footprint of a person in small room/lab.
3. *Development of a Mobile Tool to Reduce Carbon Footprint and Promote Green Transport:* In this project, we developed a mobile GPS application, EcoDrive, for iPhone that suggests the fuel efficient route to the user. The EcoDrive application runs on iPhone running the iOS operating system and is programmed in Objective C. The application uses Google's mapping API to display the map and resolve location using the built in geocoding.
4. *A simulator for predicting ecological transition of lakes:* Eutrophication is an increase in the concentration of chemical nutrients in an ecosystem to an extent that increases the primary productivity of the ecosystem. Though any exact model of eutrophication is unknown, increased variance of water phosphorus level is an important clue of regime shift (a state when lake approaches a transition from oligotrophic to eutrophic). In this project, we developed a software or simulator to predict the timing and progression of Lake Eutrophication using a computational model. Using Gaussian distribution as initial soil phosphorus level, this simulator can predict the

timing in years for a lake to turn from oligotrophic to eutrophic state.

5. *A Reliable Private Data Aggregation technique for Wireless Sensor Networks*: In WSNs, achieving ideal data accuracy is complicated due to collision, heavy network traffic, processing delays and/or several attacks. The problem of gathering accurate integrated data is further intensified if the environment is adverse. Hence how to attain data privacy and perfect data accuracy are two major challenges for data aggregation in wireless sensor networks. To address this problem, we designed a new privacy preserving data aggregation scheme, REBIVE (REliAble prIVate data aggrEGation scheme). In REBIVE data accuracy maintenance and data privacy protection mechanisms work cooperatively. Different from past research, our proposal have the following features: providing privacy preservation technique for individual sensor data and aggregated sensor data; maintaining perfect data accuracy for realistic environments; being highly efficient; and being robust to popular attacks launched in WSNs.

6. *Performance analyzer tool for parallel sorting algorithms*: Developed an MPI based tool that can take list of integers as input. The tool includes parallel implementation of Mergesort, Quicksort, Bubblesort, Bucketsort, and Insertionsort algorithms. The tool allows users to select more than 1 sorting algorithm (up to 5 different algorithms) and sorts the input list of integers. The tool also allows users to enter number of processors that will be used for parallel algorithms. Finally, the tool displays graphs that illustrate the comparison relationship between different parallel execution time for different sorting algorithms. The tool can also display graphs that illustrate timing comparison between serial execution and different parallel executions for varying data set sizes and varying processing speed.

• **Selected Undergraduate level Projects**

1. *Automobile Service Center Management System*: It is web based software that is used for the maintenance of internal transaction of an automobile service center. Different phases of software development have been followed during its development. Platform: J2EE, Framework: JavaServer Faces, Database: MySQL.

2. *Department Resource Management System*: A large scale web based software that is used to manage resources of a university department. Platform: J2EE Framework: Jakarta Struts 1.1 Database: Oracle 9i, Software tool used: JBuilder, Dreamweaver.

3. *Client-Server Based Interactive Application with Thin Client*: A device interfaced to the PC's parallel port, which acts as the server and accepts user response from the remote client. Server and client can communicate both by wired and wireless (RF) Technology. Server side is built using JAVA COMM API in J2SE and Client side software is written in C and then converted to microcontroller's machine code using Keil uVision2.

4. *Simulator for Analyzing Results of Broadcasting Algorithms in MANET*: A J2SE based MANET broadcasting simulator, accepting a graph as input and providing simulation result of PDP, DPDP and EPDP algorithms.

5. *Implementation of File System*: A File system for UNIX operating system is implemented in C.

PROFESSIONAL ACTIVITIES

• **Paper Reviewer (through adviser)**

- Elsevier Journal of Systems and Software (2013)
- IEEE Transactions on Information Forensics & Security (2012)
- IEEE International Conference on e-Health Networking, Application & Services (2012)
- ACM Conference on Human Factors in Computing Systems, CHI (2011, 2012)
- IEEE Computer Software and Applications Conference (2009, 2010, 2011, 2012)
- IEEE Transactions on Services Computing (2008, 2009)
- Journal of Wireless Comm. & Mobile Computing, Wiley InterScience (2008, 2009, 2011)

• **Student Volunteer**

- IEEE Conference on Pervasive Computing and Communications (PerCom 2011), USA, 2011

RELATED COURSEWORK

• **Major Graduate Level Courses**

- Network Infrastructure, Network Applications, Component Architecture, Probability, Simulation,

Applied Mathematical Analysis, Distributed Computing, Elements of Software Engineering, Parallel & Distributed Computing, Applied Linear Algebra, Pervasive Computing

- **Graduate Level Independent Study Courses**
 - Security, Trust and Privacy in Pervasive Computing, RFID Systems and Software, Computational RFID, Green Computing Using Pervasive Computing Technologies, Privacy in Assistive Rehabilitation, Secure Human Computer Interaction
- **Major Undergraduate Level Courses**
 - Object Oriented Programming Language (C++, Java), Data Structures, Compiler, Data Communication, Operating System, Microprocessors and Microcontrollers, Artificial Intelligence, Pattern Recognition, Database, Computer Networks, Digital Logic Design, Algorithms, Theory of Computation, System Analysis and Design, Computer Interfacing, Machine Learning, Computer Architecture

PRESENTATIONS AND TALKS

- **March 24, 2012**
 - *“Looking for needles in a haystack: Detecting Counterfeits in Large Scale RFID Systems using Batch Authentication Protocol”*, In IEEE PerCom Workshop on Pervasive Wireless Networking (PWN12). Lugano, Switzerland.
- **April 2, 2012**
 - *“Design, Development and Deployment of Mobile Computing in Healthcare”*, Speaker at Computational Sciences Day, Dept. of MSCS, Marquette University, WI, USA.
- **November 4, 2011**
 - *“Looking for needles in a haystack: Detecting Counterfeits in Large Scale RFID Systems using Batch Authentication Protocol”*, Colloquium speaker, Dept. of MSCS, Marquette University, WI, USA.
- **April 18, 2011**
 - *“DRAP: A Robust Authentication Protocol to Ensure Survivability of Computational RFID Networks”*, Colloquium speaker, Dept. of MSCS, Marquette University, WI, USA.
- **March 23, 2011**
 - *“AnonPri: An Efficient Anonymous Private Authentication Protocol”*, In IEEE International Conference on Pervasive Computing and Communications (PerCom 2011), WA, USA.
- **August 21, 2010**
 - *“Preserve Your Privacy with PCO: A Privacy Sensitive Architecture for Context Obfuscation for Pervasive E-Community based applications”*, In IEEE International Conference on Social Computing (SocialCom 2010), MN, USA.
- **August 17, 2010**
 - *“UCFC Ubiquitous Personal Carbon Footprint Calculation Platform”*, In International Workshop for The Work in Progress in Green Computing (WIPGC 2010), Collocated with Green Computing Conference 2010, Chicago, USA.

MENTORING EXPERIENCE

- **Graduate Level Project Supervision (Ongoing)**
 - *Mentee:* A.K.M. Jahangir Alam Majumder, Benjamin Rizzo, Kristina Mensch
Project: The goal of this project is to develop an sms based mobile system for maternal and child healthcare systems for the developing countries of the world. This system is a two-way sms based mobile system that will allow community health events reporting, emergency alert generation, health status monitoring, managing follow-up care of pregnant women, newborns and children. One unique feature of this system is that it will be able to generate customized text messages (reminders) regarding healthcare appointment, follow-up visits, motivational and awareness related messages and etc
- **Supervision of Graduate Research Assistant (Spring 2012)**
 - *Mentee:* Mifta Uddin, MS Student at Dept. of MSCS of Marquette University

Project: Anaphylaxis is a serious allergic reaction that is rapid in onset and may cause death, especially in children. Worldwide school staff and teachers need emergency response training to deal with anaphylaxis while children are at school. In this project, we designed and developed an android based mobile application to train or guide teachers deal with the emergency situations related to student's nut allergy, asthma or other such extreme diseases.

- *Mentee:* Osman Gani, PhD Student at Dept. of MSCS of Marquette University
Project: Designed a four way fusion of user authentication techniques for efficient usable security on mobile devices. In this approach user is not required to remember any alphanumeric password. The location traces, gait pattern, emotion and context of pre-selected images are used as metric for authentication. There is a multilayer authentication system that silently performs authentication using location traces and gait pattern of its user. If the silent authentication fails then system uses user's emotion sequence and pre-selected image for authentication.
- **Supervision of Undergraduate Students** (Fall 2009 - Spring 2011)
 - *Mentee:* Casey O'brien, Undergraduate student majoring in CS at Marquette University
 - *Mentee:* Kristine Manning, Undergraduate student majoring in CS at Marquette University
 - *Mentee:* Jason Cowdy, Undergraduate student majoring in CS at Marquette University
Project: Designed and developed a mobile GPS application, EcoDrive, for iPhone platform that suggests the most fuel efficient route to the user. It can inform user about alternative public transportation to the same destination. EcoDrive supports awareness of personal transportation activities, reminds users of additional reasons for being green (e.g., financial savings) and emphasize to adopt eco-friendly behavior.

PROFESSIONAL AFFILIATIONS

- Student member, ACM
- Student member, IEEE
- Member of Networking Networking Women (N² Women) Community

COLLABORATION EXPERIENCE

- *Tsinghua university:* We have designed and implemented a framework for developing various ubiquitous carbon footprint applications in iOS platform
- *International Breast Cancer Research Foundation (IBCRF):* To understand the healthcare privacy views and concerns of people in developing countries, we interviewed 18 people of Bangladesh. Our study reveals that the rural people of developing countries have different and unique healthcare privacy concerns. Their privacy concerns are influenced by their demographic background, cultural and traditional issues, and some other key factors that are specific to developing countries.
- *Tsinghua university:* We have developed a privacy preserving framework for RFID based healthcare systems
- *Medical College or Wisconsin (MCW):* We are currently working to develop a mobile phone based system that can detect the onset of social isolation in a human being

ADDITIONAL SKILLS

- Expertise in following topics: Authentication, Usable Security, Security of Wearable and Body Worn Sensors, Device Authentication, Classical Security Protocols
- As part of my research, I have good experience with symmetric and asymmetric encryption, hash functions, authentication, and related topics. This includes presentation of classical research papers in RFID security and privacy, anonymization techniques in pervasive environments, network protocols and security, and reliable distributed protocols.
- Proficient in a range of computer and network simulation tools, languages, and sensor/software testing
- Demonstrated excellent communication skills and ability to work in inter disciplinary groups

OTHER EXPERIENCE

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- I achieved highest points in the Graduate Teaching Assistant training among 33 TAs from various departments, and was invited as a senior TA the following year to groom new TAs
 - Opening speaker and conductor of the workshop on Design, Development and Deployment of Mobile Computing in Healthcare. The workshop was held during Computational Sciences day at Marquette University in 2012.
 - Speaker in seminar on *Research and Professional Development*, Marquette University (May 2012)
 - Volunteer of Marquette University International Office activities (2008 - current)
 - Participating and organizing international student orientation
 - Assisting international TAs to learn about US culture
 - Mentor for International Incoming Students of Marquette University. (2008-2012)
 - Member of *Preparing Future Faculty (PFF)*, Marquette University (2011 - current)
 - Speaker in *Assistive Technology Panel* of CTSI Rehabilitation Collaborative Research Workshop, Marquette University (August 2010)
 - Speaker in seminar on Teaching and Learning, Marquette University (2009, 2010)
 - Speaker in *Community Engagement Workshop*, Marquette University (February 2012)
 - Member of *Hridoya Bangladesh* [It is a US based non-profit organization to help financially challenged people of Bangladesh to continue higher education]
 - Member of *Teach for America* [TFA is an American non-profit organization that aims to eliminate educational inequity with the help of recent college graduates who commit two years to teach in under-resourced urban and rural public schools]

REFERENCES

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