

FIELD OF STUDY

Computer Science

DISSERTATION TOPIC

A secure Privacy-Preserving Advanced Metering Infrastructure Supporting Fine-grained Energy Consumption Data Analysis

EXAMINING COMMITTEE

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ABSTRACT

This dissertation proposes a suite of novel security, privacy, and energy data analysis solutions applicable to the Advanced Metering Infrastructure of the Smart Grid.

With the inclusion of novel technologies in the electrical grid, the grid has been slowly transitioning to becoming the Smart Grid. The Smart Grid allows gathering fine-grained energy consumption data for billing and analysis purposes. However, the data can potentially expose sensitive information about consumers, violating their privacy. To demonstrate the validity of such concerns, we applied Fuzzy C-Means clustering for consumer behavior profiling with smart meter data.

Even though energy consumption data can be misused to profile consumers, the analytics of such can serve various useful purposes, such as advising consumers about energy efficiency, monitoring the network load, etc. Therefore, there is a great need to develop a secure protocol that can protect consumer privacy but, at the same time, allow both utility companies and consumers to take advantage of fine-grained energy measurements. We propose a comprehensive privacy-preserving protocol that provides granular data mining opportunities and keeps consumers' identities safe from being exposed.

To demonstrate the usefulness of fine-grained energy consumption data in adding the business value to the utility companies, we have developed an energy fraud detection system for addressing the common problem of the energy theft. We demonstrate the application of the fraud detection system, which can be incorporated in the proposed privacy-preserving infrastructure.

Finally, we have designed and implemented an AMI protocol simulation framework based on a discrete networking simulator for comparing various privacy-preserving protocols' performance, including ours.

BIOGRAPHICAL SKETCH

Vitaly Ford was born in Yekaterinburg, Russia. He received B.S. in Information Systems and Technology Engineering from Ural Federal University, Russia in 2012 and M.S. in Computer Science from Tennessee Tech University, USA in 2015. He is currently a Ph.D. candidate in Engineering at Tennessee Tech University, USA, concentrating on cybersecurity.

His research focus is on addressing privacy and security issues in the Advanced Metering Infrastructure of the Smart Grid. He has previously worked on computer vision systems, cybersecurity education, and applications of machine learning in cybersecurity.

EDUCATION

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Announces the Dissertation Defense of

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