



AUFGABENSTELLUNG FÜR DIE MASTERARBEIT

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Immatrikulationsnummer: 4055357
Studiengang: Master Informatik (2017)

Thema (deutsch): Datenschutzfreundliches Smart Metering Mithilfe
von DC-Netzen

Thema (englisch): Privacy-preserving Smart Metering Using DC-Nets

Zielstellung:

In the future, the classic electrical grid will be transformed into the so-called smart grid. This will enable diverse use cases, different power consumption and production patterns as well as bigger and more frequent turnovers. The central component of the smart grid will be an information and communication network, that connects energy producers and consumers.

Endpoints at the end user side will be the so-called smart meters. These electronic devices can send consumption data digitally over an information network, most likely the Internet. Yet, they can also receive data, for example new price schedules, that enable power intensive devices to plan their energy consumption.

The smart meter will be able to emit very fine-grained consumption data. Reading frequency ranges from 30 minutes down to 2 seconds between measures. This makes it possible to infer daily routines, times of absence or even which electrical devices were used by the end users.

To protect the privacy within the smart grid while at the same time allowing for advanced functionalities (dynamic billing, demand side management...), many protocols with vastly differing assumptions have been proposed in the past.

Yet, these assumptions are often not compatible with the real world (homomorphic encryption, availability of trusted third parties, reliance on the energy distribution network).

With the advent of new truly trustworthy embedded systems (as proposed in the Jupiter project), smart metering systems come into reach, which can preserve the end users privacy and at the same time providing the advanced functionalities of the smart grid (real-time metering) while not relying on unrealistic assumptions.

To this end a system shall be proposed, that employs so-called DC-Nets, as proposed by David Chaum, to implement sender anonymity for meter readings, so that an energy utility may construct the proper value of the energy consumption of a whole group of end users for a point in time, while not being able to attribute values to individual users. The leading assumption hereby is, that the smart meters are trustworthy entities, meaning the information they emit can be trusted. The proposed system shall then be prototypically implemented.

Aufgabenstellung für die MASTERARBEIT

The participants in a DC net constitute an anonymity group, where their energy consumption is added up and cannot be attributed individually. Meter readings over time (consumption curves) are very specific markers of an individuals behavior and the quality of the anonymization depends on the number of involved participants.

Therefore, additional research shall be done on the necessary size of those groups. Part of that research is to find a suitable way to measure or judge how well the individuals meter data is masked or anonymized by the aggregation of the DC net. To this end a simulation environment for smart meter networks from a previous project that employs real world data shall be employed.

In der Arbeit sollen schwerpunktmäßig folgende Teilaspekte bearbeitet werden:

- State-of-the-art analysis on related approaches (design and investigations into anonymity group sizes)
- Propose a privacy-preserving smart metering scheme, as described above (including phases for initial setup and establishment of trust between parties)
- Implementation of a prototype
- Explore and measure efficacies of different sizes of anonymity groups in actually anonymizing individual user behaviors
- Evaluation of proposed scheme

Betreuer:

Verantwortlicher Hochschullehrer:

2. Betreuer:

Beginn am:

Einzureichen am:


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Datum, Unterschrift der/des Studierenden


Unterschrift des betreuenden Hochschullehrers