

## Trustworthy Framework for Mobile Smart Meters

### Overview and Problem Statement

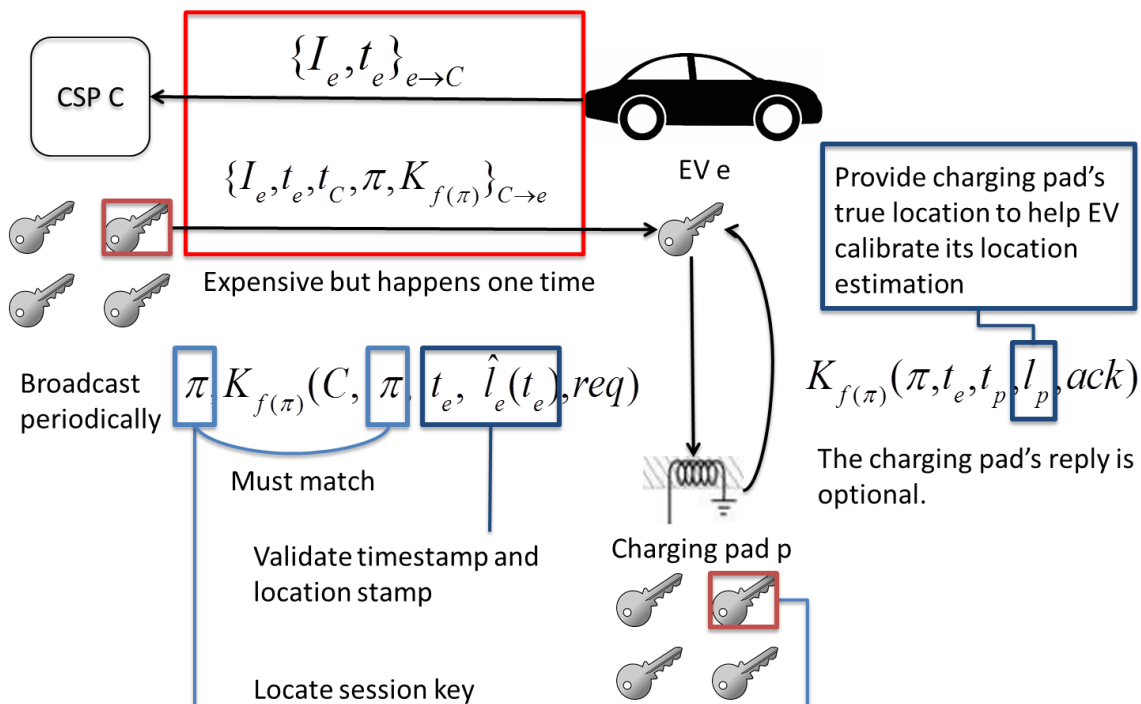
We propose to install on an electric vehicle (EV) a Mobile Smart Meter (MSM) that monitors energy usage by the car and communicates with the utility for periodic reporting, billing information, or route suggestions. The approach enables us to track energy usage more easily. It also brings new energy market models, as people generating surplus energy from their solar panels can directly sell energy to EVs, while the mobile smart meter on the EV records the energy purchase. However, securing communication between mobile smart meters and the utility might be challenging; the data may be routed through a combination of wired networks, open WiFi, and cellular networks. We are focusing on the question of how a mobile smart meter communicates with other meters and with the utility office in a secure and reliable manner. The ultimate goal is to design a trustworthy framework for communication between meters and the utility.

### Research Objectives

- Design a system for reliable demand-response communication between the mobile smart meter and the utility.
- Design a fast authentication scheme that mobile smart meters can use to prove their identity to other smart meters or to roadside units.
- Design a periodic reporting scheme for mobile smart meters that preserves users' location privacy.

### Technical Description and Solution Approach

- Current approach: proactive key dissemination approach for EV-utility authentication.
- Current approach: key predistribution-based fast authentication for EV-charging pad authentication.
- Current approach: flow-based model for charging pad/charging station location optimization.
- Future work: cyber-physical authentication that binds EV's physical presence with its digital identity.



## Results and Benefits

- Easy monitoring and accurate tracking of energy usage: meter is directly associated with the car that consumes energy.
- Flexible pricing model: a mobile smart meter receives pricing information specifically targeted at the associated car.
- Flexible energy exchange: meter-to-meter communication makes it possible for a car to sell energy directly to another and record the exchange correctly.
- Recent publications:
  - Hongyang Li, György Dán, and Klara Nahrstedt, "Portunes: Privacy-Preserving Fast Authentication for Dynamic Electric Vehicle Charging," IEEE International Conference on Smart Grid Communications (SmartGridComm), 2014.
  - Siting Chang, Hongyang Li, and Klara Nahrstedt, "Charging Facility Planning for Electric Vehicles," IEEE International Electric Vehicles Conference (IEVC), 2014.

## Researchers

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