

### GOALS

- **Mobile smart meter (MSM)** as on-board unit of EV.
- Secure wireless communication between MSM and the utility.
- Tamper-resistance of MSM's local storage.
- Location privacy protection of EV driver.

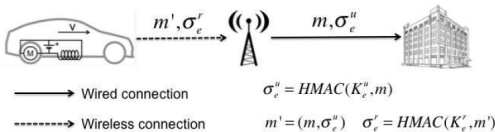
### FUNDAMENTAL QUESTIONS/CHALLENGES

- **Intermittent connectivity**
  - The EV may not be connected with the utility all the time.
- **Short contact time**
  - Due to its high mobility, the duration of time when an EV remains in contact with the roadside unit (RSU) or another EV may be short.
- **Open wireless communication media**
  - Anyone can overhear the data transmitted over wireless networks.

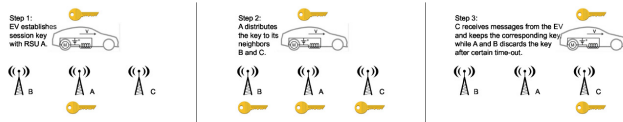
### CHALLENGE: AUTHENTICATION

- **Resource constraint**
  - Limited computation power of MSM.
  - Limited time available for authentication.
- **Varying authentication environment**
  - At charging station.
  - At home.
  - On the move.

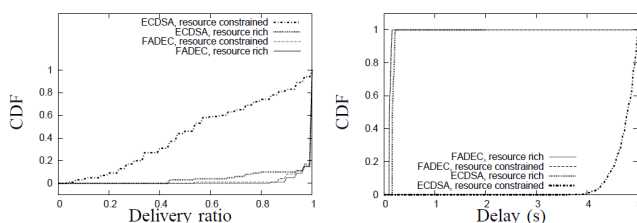
### APPROACH: FADEC



- FADEC establishes a symmetric session key for EV-RSU communication, and provides seamless handoff by allowing the EV to use the same session key with a sequence of RSUs.



- FADEC reduces authentication time and allows more data to be delivered in time from EV to the utility.



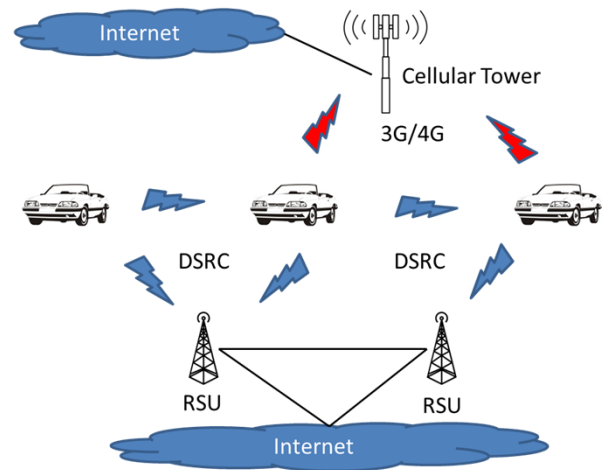
### FUTURE WORK: PRIVACY AND SECURITY

- **Motivation**
  - Sensitive information is included in messages between EV and the utility.
  - Anyone can overhear wireless communication.
- **Potential Approach for Location Privacy Protection**
  - Anonymity-based techniques: Mix zones,  $k$ -anonymity.
  - Obfuscation-based techniques.

### FUTURE WORK: OPTIMIZATION

- **Route optimization**
  - MSM suggests where to charge based on real-time pricing information from the utility.
- **Charging station deployment**
  - Centralized algorithm to compute where to put charging stations based on inputs such as traffic flow statistics, local deployment cost, etc.

### FUTURE WORK: HETEROGENEOUS NETWORK



### FUTURE WORK: INFORMATION CENTRIC NETWORK

- **Availability**
  - Pervasive caching allows EV to obtain desired information (e.g., real-time pricing information) from a nearby node.
  - Name-based routing eliminates the need to resolve associated IP address, and simplifies routing with mobile nodes.
  - ICN allows simultaneous usage of multiple network interfaces (WiFi, Cellular, DSRC, etc.), and selects the best interface for communication under different scenarios.
- **Integrity**
  - The name and the content are securely bound by public key cryptography, and EV can immediately validate the received information.