TCIPG

Development of the Information Layer for the V2G Framework Implementation

Funding the Transportation Infrastructure in a V2G Environment

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MOTIVATION GOALS

- Deepening penetration of battery vehicles (BVs) reduces funding of the transportation infrastructure because of the absence of gasoline tax collection from BVs.
- There are 3 key goals:
  - Design a secure and privacy-preserving tax collection model for BVs that uses mileage and location of the vehicle for tax computation.
  - Compute tax amount for each authority—county, state, federal—based on the miles driven in each region.
  - Ensure the auditability of the tax computation in case of challenge by any affected entity.

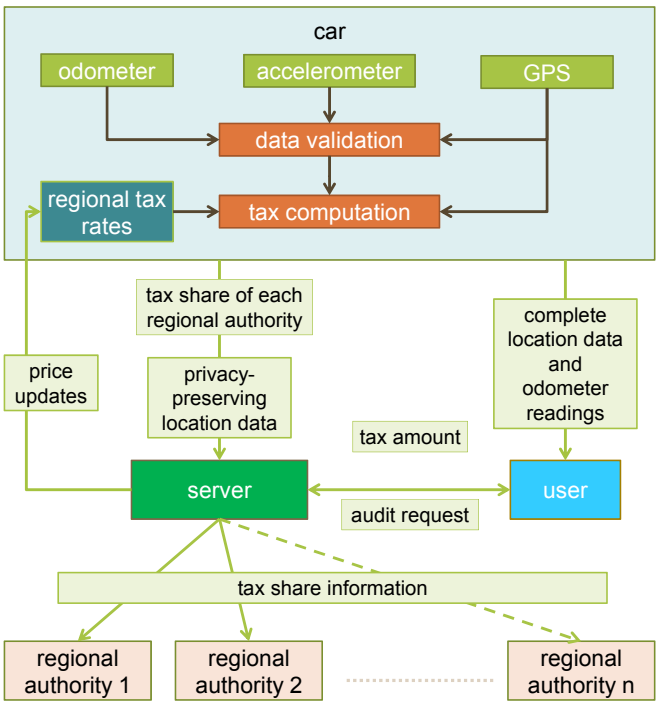
RESEARCH CHALLENGES

- Design of a system that preserves location privacy of the user but provides auditability of the tax amount.
- Development and incorporation of fail-safe mechanisms for situations such as car crashes, instrument malfunction/destruction, data unavailability, and hacking.
- Assurance of scalability, robustness, and cost-effectiveness for practically oriented system.
- Implementation of tamper-resistant mechanisms to protect the integrity of the system.

RESEARCH PLAN

- Preparation of documentation that discusses the key requirements of the system.
- Design of the system in conformance with the requirement specification.
- Implementation of the system on an open-source platform, and testing of it.

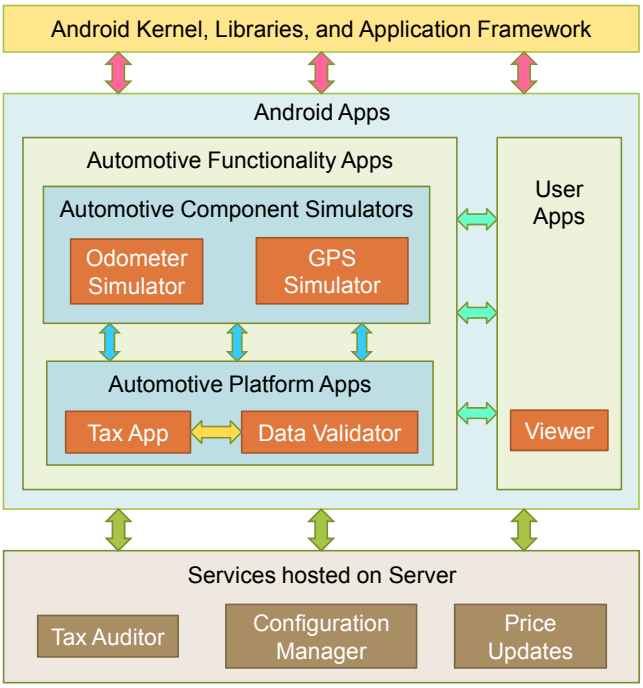
INFORMATION FLOW



MOTIVATION BEHIND ANDROID

- Car manufacturers are continuously introducing embedded functionalities—e.g., Ford Sync®, Mercedes-Benz's mbrace®—similar to those of smartphones, such as navigation, traffic reports, and health status of car.
- Many ongoing efforts, such as AUTOSAR, OVERSEE, GENIVI, and AutoLinQ™, provide automotive platforms with API support to run third-party applications.
- OVERSEE aims for a secure platform for vehicles, with all the intra-vehicle communication regulated through the firewall.
- Software implementing all the above platforms is available only to the project partners or is proprietary.
- Open-source Android platform provides many key functionalities similar to those of automotive platforms along with excellent documentation.

KEY COMPONENTS' INTERACTIONS



BROADER IMPACT

- The design can be ported to any automotive platform or smartphone platforms such as iOS, and can be deployed to Pay-As-You-Drive (PAYD) insurance schemes with minor modifications.
- The odometer simulator and GPS simulator can be used to develop other car applications.

FUTURE EFFORTS

- Development of all the applications on Android platform.
- Implementation of the tamper-resistant feature that explicitly corroborates the data collected from GPS, odometer, and accelerometer.
- Implementation of distinct levels of privacy and security for the viewer, and, if possible, test it with actual users.
- Comprehensive documentation to allow the portability of the application on a future automobile platform.

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