Fleet Studies

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Fleet Studies

- Development of standards for data formats and acquisition systems, so that data collected across pilot studies can be meaningfully managed.

- Standards and protocols will be provided so that data can be uploaded on a secure server, organized, processed, and used for modeling purposes.

- Provide a database and knowledge repository function for its members, including the ability to upload and download data on a secure website.

- The availability of real world data will also help with estimating the effects of PHEV penetration on the utility energy sales, generation capacity, the transmission grid, markets economics, and environmental emissions.

Fleet Studies

Plug-in Prius
(5 kWh Hymotion pack)

10 kWh GAIA Lithium battery pack

ChallengeX Equinox
Soon to be PLUG-IN !!

Plug-in Hybrid Fuel Cell Neighborhood Electric Vehicle

EcoCAR
The NeXt Challenge

CAR will develop a Plug-in Saturn VUE..

By 2009 a fleet of 10-20 PHEVs is expected to be available in the Columbus area.

A detailed set of data related to real world duty cycles, battery aging, fuel economy, etc. will be collected and shared with the members.

Program Goals

- Define and implement a set of goals and methods for members to add, retrieve or manipulate information on an operational fleet of PHEV/EVs.

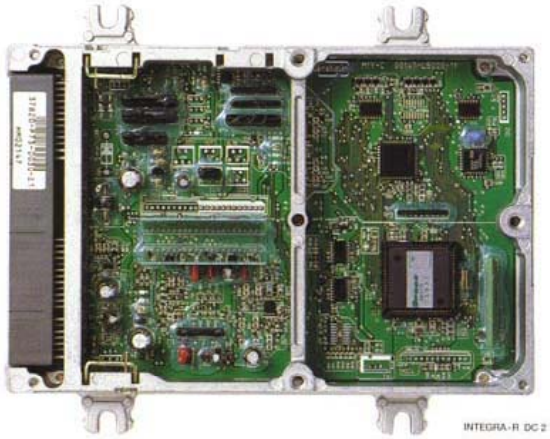
- Define and implement a set of open, interoperable standards and resource sharing for members of SMART@CAR program (utilities, OEMs, suppliers, academia, non-profit organizations)

Program Overview

- 4 major aspects to program:
  - In-Vehicle Data Collection:
    - Hardware (Embedded Controls)
    - Software (Data Acquisition)
  - Vehicle/Infrastructure Interaction:
    - Hardware Layer (Transport Layers)
    - Software Layer (Transport Protocols)
  - Data ‘Clearinghouse’:
    - Hardware Layer (Server Infrastructure and Support)
    - Software Layer (Protocols, Services, Support)
  - Standards
    - Definitions
    - Interoperability

In-Vehicle Data Collection

- Hardware:
  - Design and implement embedded hardware most suitable to instrument at minimum cost and installation time a reliable data collection system on prototype or production PHEVs/EVs.
  - Aspects to consider:
    - Parameters to collect, rate, conditioning and on-board storage volume
    - Sensors (intrusive and/or OEM-provided data, e.g. CAN, etc)
    - Data Acquisition layer
    - In-vehicle archiving methods
    - Ease of installation
    - Cost/vehicle, including installation
    - Reliability
    - Ease and convenience of retrieval



In-Vehicle Data Collection

- Software:
  - Design and implement software most suitable for reliable data collection system on prototype or production PHEVs/EVs.
  - Aspects to consider:
    - Total transparency to user/driver
    - Key-on operation
    - Key-off charging operation
    - Flexibility with different hardware layers
    - Reliability
    - Flexibility to upgrade functionality
    - Optional On-board display/HMI

Vehicle/Infrastructure Interaction

- Hardware:
  - Design and implement physical transport layer most suitable for vehicles to communicate with the data clearinghouse at minimum cost and installation time on prototype or production PHEVs/EVs.
  - Aspects to consider:
    - Ease of installation
    - Cost/vehicle and cost/fixed point, including installation
    - Reliability
    - Weatherproofing
    - Passive safety
    - Simplicity of data interface (Power Line Communication)
    - Hardware hand-shake, security, authentication (user/vehicle/stationary port)

Vehicle/Infrastructure Interaction

- Software:
  - Design and implement software interface most suitable for vehicles to communicate with ‘infrastructure’ at minimum cost, reliably and securely on prototype or production PHEVs/EVs.
  - Aspects to consider:
    - Ease of development/modular approach
    - Ease of maintenance, upgrade path
    - Reliability
    - Software hand-shake (vehicle identification), security, authentication, encryption (user/vehicle/stationary port)

Data Clearinghouse

- Hardware:
  - Use existing Web service provider (Google, others) to provide reliable hardware reliable data archiving and accessibility for data collected on prototype or production PHEVs/EVs.
  - Aspects to consider:
    - Storage space for growing data base
    - Set-up and maintenance costs
    - Security of data, archiving
    - Always on-line
    - Accessible with any Web browser/internet connection with no special hardware
    - Speed of access for convenient user upload and download of data

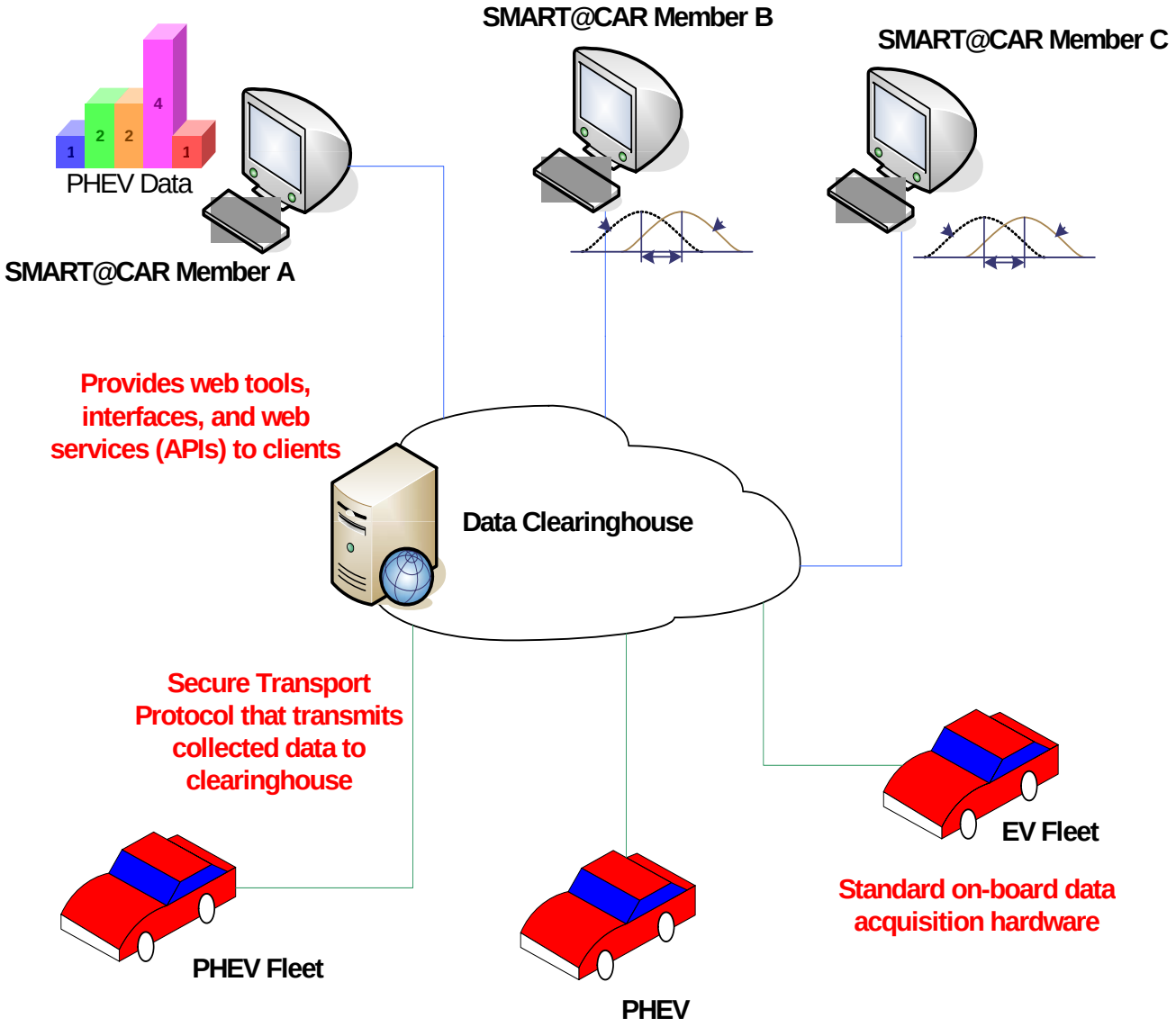
Data Clearinghouse

- Software:
  - Design and implement software interface most suitable for vehicles to communicate with ‘infrastructure’ at minimum cost, reliably and securely on prototype or production PHEVs/EVs.
  - Aspects to consider:
    - Ease of development of user interface
    - Ease of developing web service API’s and SDK’s for data conformity
    - Ease of maintenance, upgrade path
    - Reliability
    - Security, authentication, encryption
    - Search tools, data preview with charts and graphs
    - Generic post-processing/data extraction tools
    - API’s selection for import/export format (i.e., .csv, .mat, etc.)

Standards

- **Open Standards**
  - Define standards for data type, data format, data storage, data retrieval, data mining, and data uploading.
  - Definition of open standards documented and distributed to the user community
  - Open and proprietary standards interoperability
  - Defined web services and conformance standards

Abstract Architecture Overview



Thank you!