IMPROVEMENTS TO GATHERING ACTIVITY DATA USING PORTABLE ACTIVITY MEASUREMENT SYSTEMS (PAMS) WITH CELLULAR LINK

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Outline

- Background
- HEM Data Unit/Capabilities
- Features
- QA/QC Protocols
- Conclusions

Background

- EPA purchased Cellular Mini Data Loggers from HEM Data

- EPA worked through ERG contract with HEM Data to implement an Internet-based "Dashboard" site to allow cellular uploads from data loggers

- Loggers are currently being used to support UCR/CE-CERT's Heavy-Duty Vehicle (HDV) test program through CRADA.

HEM Data Unit Capabilities

- Summary of HEM Data DAWN Mini Logger^{TM}
  - LD OBD (Legacy / CAN) and HD (SAE J1939)
  - On-board storage and cellular communication
  - Adjustable acquisition rate
  - Configurable (user-selectable parameters)
  - Wake / Sleep modes
  - On-board accelerometer
  - On-board GPS
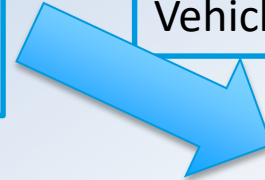 - Enhanced PID upgrades available on LD CAN

Vehicle Data Flow

"Real-World" Testing

Automatically Uploads Trip Information via Cellular Card: LD OBD & HD J1939 live data and DTCs

Database: Temporary Archive of Raw & Processed Data & Vehicle/Logger Alerts

Secured Data Site

Download all raw and processed data files for **immediate** comprehensive analysis

Access to Data by Web-based Dashboard <u>at your computer</u>:
- "generic" trip parameters
- Status of vehicle/logger

Secure Site by password

Dashboard Main Web Site Page

EPA Dashboard

Admin page

✴ Add New Project
  Upload Database

Projects

✴ Test1
  EPA1

✴ Home Admin

Access limited to your test program(s) or projects

Overall Project Summary

EPA Dashboard

Logged in as fulper.carl. Logout

All Projects

Project	Vehicles	Distance (1k mi)	Trips	Duration (days)	Idle Time (hr)	Fuel (gal)	Alerts
EPA1	4	1.342	70	2.0	14.3	97.0	1
Test1	2	0.049	6	0.1	0.5	3.0	0

Home Admin

Provides an overall project summary of key parameters:
- **Total Vehicles Testing**
- **Total Distance (Miles)**
- **Total Trips Taken**
- **Total Time Duration (Days)**
- **Total Idle Time (Hrs)**
- **Estimate of Fuel Used (Gallons)**
- **Any Alerts**

Summary of Individual Vehicles

EPA Dashboard

Logged in as fulper.carl. Logout

Test1

Project Summary

Vehicle	VIN	Serial	Last Update	Trips	Distance (mi)	Duration (hr)	Idle time (hr)	Fuel (gal)	MPG	Logger Alerts	Status
Test Truck1	None	12346	Feb. 25, 2016, 11:29 a.m.	6	48.5	1.76	0.5	2.7	17.9	None	Active
Test Truck2	None	12347		0						None	Click to edit

Home Admin Loggers

Provides an individual vehicle summary of key parameters for each vehicle being tested:

- **Vehicle's VIN**
- **Data Logger Serial Number**
- **Last Date/Time Data Logger Updated to Dashboard from Vehicle**
- **Number of Trips Taken**
- **Total Time Duration (Days)**
- **Total Idle Time (Hrs)**
- **Estimate of Fuel Used (Gallons)**
- **Estimated Fuel Economy (MPG)**
- **Any Alerts**
- **Status of Logger**

Summary of Each Vehicle's Trips

Download All Vehicle Data or Individual Trip Files: IOS and CSV

EPA Dashboard

Logged in as fulper.carl. Logout

Test Truck1

All Trips

First Trip:	Jan. 15, 2016, 11:31 a.m.
Last Trip:	Feb. 25, 2016, 11:29 a.m.

IOS ☐	CSV ☐	Start Time	Duration (hr)	Distance (mi)	Idle Time (min)	Avg Speed (mph)	MPG	Logger Alerts	Parameter Alerts	Comments
☐	☐	Feb. 25, 2016, 11:29 a.m.	0.06	0.0	0.0	0.3	0.4	None	None	Click to edit
☐	☐	Feb. 25, 2016, 9:34 a.m.	1.53	46.6	0.4	30.5	17.7	None	Engine Speed > 2500.0	Click to edit
☐	☐	Jan. 19, 2016, 1:03 p.m.	0.05	1.8	0.0	35.4	0	Data Missing	None	Good
☐	☐	Jan. 18, 2016, 7:26 p.m.	0.08	0.1	0.0	0.8	1.9	None	None	Click to edit
☐	☐	Jan. 15, 2016, 2:08 p.m.	0.02	0.0	0.0	0.0	0.0	None	None	Click to edit
☐	☐	Jan. 15, 2016, 11:31 a.m.	0.03	0.0	0.0	1.4	0	Data Missing	None	Click to edit

Download Selected

Home Admin Loggers Alerts

Logger and Vehicle Parameter Alerts

Information on Loggers Installed on Each Vehicle

Summary of Each Logger's Status

Logger First and Last Update and Logger Status

EPA Dashboard

Logged in as fulper.carl. Logout

Test1

Overview of All Logger Statuses

Logger	Project	First Update	Last Update	Type	VIN	Vehicle	Veh Owner	Location	Antenna	Firmware	Alert	Comments
12345		Jan. 12, 2016	Jan. 19, 2016	Removed			Click to edit	Click to edit	no	645:654M, Sun Oct 5 19:22:38 2014	None	Updated by hemdata
12346	Test1	Jan. 19, 2016	Jan. 20, 2016	Database	None	Test Truck1	Click to edit	Click to edit	no		None	Updated by hemdata
12347	Test1	Jan. 27, 2016	Jan. 27, 2016	Added	None	Test Truck2	Click to edit	Click to edit	no		None	Added by hemdata
1433	EPA1	Feb. 23, 2016	Feb. 23, 2016	Added	None	**Vehicle #1**	Click to edit	Click to edit	no		None	Added by dsandez
1434	EPA1	Feb. 23, 2016	Feb. 23, 2016	Added	None	**Vehicle #2**	Click to edit	Click to edit	no		None	Added by dsandez
1435	EPA1	Feb. 23, 2016	Feb. 23, 2016	Added	None	**Vehicle #3**	Click to edit	Click to edit	no		None	Added by dsandez
1436	EPA1	Feb. 23, 2016	Feb. 23, 2016	Added	None	**Vehicle #4**	Click to edit	Click to edit	no		None	Added by dsandez

Home Admin Loggers

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Status of Individual Logger

EPA Dashboard

Logged in as fulper.carl. Logout

History of Logger 12346

First Added:	Jan. 19, 2016, 2:17 p.m.
Last Changed:	Jan. 20, 2016, 1:19 p.m.

Date	Type	Project	VIN	Vehicle	Veh Owner	Location	Firmware	Antenna	Comments
Jan. 20, 2016, 1:19 p.m.	Database	Test1	None	Test Truck1				no	Updated by hemdata
Jan. 19, 2016, 2:17 p.m.	Added	Test1	None	Test Truck1				no	Updated by hemdata

Change Config

Home Admin

Summary Parameters on Each Logger:
- **First and Next Database Change**
- **On What Vehicle**
- **Logger Configuration**
- **Ability to change Logger's configuration file: "config.sys"**

Benefits of Cellular PAMS and Dashboard

- Data Loggers Install Quickly
  - Very little staff time spent with the vehicle

- "Real-Time" Monitoring
  - Both Data Logger & Vehicle Performance
    - Checks on data logger
      - Alerts given if something might be wrong with data logger
      - Alerts for bad data files (IOS)
    - Checks on vehicle usage and data files
      - Alerts given if vehicle not used for 3, 5 or 7 days
      - Quality checks each vehicle's trip data

Dashboard Benefits

- Access to Vehicle Activity Data:
  - Dashboard "generic" data review
    - Summary of full test program activity data
    - Summary of each vehicle's total activity
    - Summary of each vehicle's individual trip
  - Download all or part of each vehicle's activity data <u>at any time, in "real-time"</u>
  - Able to change LD or J1939 config.sys file as needed

Thank You
and
Questions