Outline

- Fleet Status
- Data Acquisition Infrastructure
- MathWorks Products Used

- Web Based Solution
- Sample Analyses
- Conclusion
World Wide Fleet Description

- Iceland Hydrogen Economy (ECTOS)
- Clean Energy Partnership (Germany)
- European Bus Project CUTE
- Bus Project Beijing (China)
- JHFC Program (Japan)
- Sinergy EDB Project (Singapore)
- Bus Project STEP (Perth, Australia)
- California Fuel Cell Partnership (USA)
- DOE Program (USA)
# Specifications F-Cell:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle type</td>
<td>Mercedes-Benz A-Class (extended version)</td>
</tr>
<tr>
<td>Fuel cell system</td>
<td>PEM - 72 kW</td>
</tr>
<tr>
<td>Drive</td>
<td>Electric motor&lt;br&gt;Power (Continuous / Peak): 45 kW / 65 kW&lt;br&gt;Max. torque: 210 Nm</td>
</tr>
<tr>
<td>Fuel</td>
<td>Compressed Hydrogen (350 bar)</td>
</tr>
<tr>
<td>Battery</td>
<td>NiMh, Power (Continuous / Peak): 15 kW / 20 kW; Capacity: 1.2 kWh</td>
</tr>
<tr>
<td>Max. Speed</td>
<td>140 km/h</td>
</tr>
<tr>
<td>Range</td>
<td>177 km</td>
</tr>
<tr>
<td>Fuel Consumption</td>
<td>3.6 Liter / 100km (Diesel equivalent, NEDC)</td>
</tr>
<tr>
<td>CO₂ -Emissions</td>
<td>0 g/km TTW (0 … 100 g/km WTW)</td>
</tr>
</tbody>
</table>
### Fleet Partners

<table>
<thead>
<tr>
<th>Government Agencies</th>
<th>Non-Profit Organizations</th>
<th>For-Profit Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Bay Area AirQuality Management District" /></td>
<td><img src="image" alt="Sacramento Municipal Utilities District" /></td>
<td><img src="image" alt="Inergy Automotive Services" /></td>
</tr>
<tr>
<td><img src="image" alt="California Air Resources Board" /></td>
<td><img src="image" alt="SRI International" /></td>
<td><img src="image" alt="Los Angeles World Airports" /></td>
</tr>
<tr>
<td><img src="image" alt="California Department of Transportation" /></td>
<td><img src="image" alt="University of California at Berkeley" /></td>
<td><img src="image" alt="Pacific Gas &amp; Electric Company" /></td>
</tr>
<tr>
<td><img src="image" alt="California Department of General Services" /></td>
<td><img src="image" alt="University of California at Los Angeles" /></td>
<td><img src="image" alt="Southern California Edison" /></td>
</tr>
<tr>
<td><img src="image" alt="South Coast Air Quality Management District" /></td>
<td><img src="image" alt="Wayne State University" /></td>
<td><img src="image" alt="United Parcel Service" /></td>
</tr>
</tbody>
</table>
Data Acquisition Infrastructure

- Vehicle with Data Recorder
- LFS site #1
- Firewall
- LFS
- Firewall
- VPN Device
- DSL Modem
- Internet
- Firewall
- VPN Endpoint
- Backend Servers
- Central Site
Traditional Analysis Methods

Group A
- Software A
  - Analysis A
- Software B
  - Analysis B

Group B
- Software A
  - Analysis A
- Software C
  - Analysis C
Web Based Solution

LFS site #1
- Vehicle with Data Recorder
- Firewall
- LFS
- Firewall
- VPN Device
- DSL Modem

Internet

LFS site #n
- Vehicle with Data Recorder
- Firewall
- LFS
- Firewall
- VPN Device
- DSL Modem

Internet

Central Site
- Firewall
- VPN Endpoint
- Firewall
- Proxy Server
- Firewall
- Backend Servers

Central Site

Web Based Solution

DaimlerChrysler Partners
- Computer
- Computer

DaimlerChrysler
- Computer
- Computer
- Computer
MathWorks Tools

- Statistics Toolbox
- Mapping Toolbox
- MATLAB® Report Generator
- Database Toolbox
## Matlab Report Generation

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESRI Mop Demo</td>
<td>Plots the drive route of the vehicle for a given MDF data file by extracting the GPS data of the drive route upon map data using Matlab Mapping Toolbox (note: the example uses Northern California maps).</td>
</tr>
<tr>
<td>Load Save Data Demo</td>
<td>Sample report demonstrating loading and saving Matlab data from a report. The report is delivered in TXT format.</td>
</tr>
<tr>
<td>Location Report in PDF format</td>
<td>Location Report in PDF format.</td>
</tr>
<tr>
<td>Locations Report HTML</td>
<td>Location Report in HTML format.</td>
</tr>
<tr>
<td>Mileage By Region</td>
<td>Mileage By Region</td>
</tr>
<tr>
<td>Output Format Demo HTML</td>
<td>Sample report demonstrating output in HTML format using the Matlab Report Generator.</td>
</tr>
<tr>
<td>Output Format Demo PDF</td>
<td>Sample report demonstrating output in PDF format using the Matlab Report Generator.</td>
</tr>
<tr>
<td>Output Format Demo RTF</td>
<td>Sample report demonstrating output in RTF format using the Matlab Report Generator.</td>
</tr>
<tr>
<td>Output Format Demo TXT</td>
<td>Sample report demonstrating output in TXT format.</td>
</tr>
<tr>
<td>Output Format Demo XML</td>
<td>Sample report demonstrating output in XML format.</td>
</tr>
</tbody>
</table>
Web Based Solution

Report Generation - Step 1 - Enter Time Period relevant for Report

Report Generation - Step 2 - Enter vehicles relevant for Report

Report Generation - Step 3 - Enter signals relevant for Report

Report Generation - Step 4 - Enter sites relevant for Report

Report Generation - Step 5 - Enter additional parameters relevant for Report

New Parameter Creation (following Matlab type format)

Key:
Value:

Add Parameter

Report Parameter (following Matlab type format)

Key:
Value:

Next Cancel

Report Help Text
Web Based Solution

Chapter 1. First Chapter

Dear Professor

Please insert your specific data here.

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Figure 1.1. This is the title for the Matlab-generated figure

Table 1.1. Test Table

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>A2</td>
<td>A3</td>
</tr>
</tbody>
</table>

1.1. 1st Section in Chapter 1
Implementation Results

- Standardized Analyses
- Common Toolset Between Groups
- Enabling Both Internal and External Customers to perform analyses
- More Analysis, Less Toolkit Development
Sample Analyses

Untangling data to provide insight and guidance.
Regional Mileage Analysis
Fuel Consumption Analysis
Spatial Histogram Analysis
Pedal Position Analysis

Pedal Position History for 2 Vehicles

Percent of Time of Drive Cycle [%]

Pedal Position [%]

Vehicle 1

Vehicle 2

VS.

18
Google Earth Integration
Looking Forward
Computational Challenges

- Increasingly Sophisticated Analyses
- Minimize Computation Time
- Large Datasets and Memory Constraints
- Automating Archive Tasks
Looking Forward

Fleet Technology

- Technology Benchmarking
- Analysis of current fleet operations guide the design parameters for the next generation vehicle
- Customer usage patterns and expectations
- Geographic and Climatic
Looking Forward

**Fleet Customers**

- Preparation for next fleet
- Hydrogen Infrastructure
- How many drivers per vehicle?
- Who makes a “good” customer?
- Contract working points
  - Required Mileage
  - Hydrogen Station Access
Thank You!

Questions?

Taylor Roche
DaimlerChrysler REDNA, Inc.
Taylor.Roche@daimlerchrysler.com