State of Connected Vehicles

Steve Schwinke
Director Advanced System Development
16 years
25+ services
4 brands
50 models
150,000 Calls Per Day
6 Million Customers
Service Interactions to date

MONTHLY INTERACTIONS

> 2.6 Million
Turn-by-Turn Requests

~20,000
Emergency Responses

> 2,600
Automatic Crash Cases
820,000 Customers downloads

14 Million Interactions
OnStar Cloud Communication

ATOMS

Data Uploads

Service Triggers

Condition Monitoring

OnStar Service Processor

Service Delivery & On-Demand Data Requests
API Solutions

Partner Applications

API

OnStar®
Advanced Telematics Operating System (ATOMS)

Data Uploads

Service Delivery & On-Demand Data Requests
OnStar Smart API’s

Smart Grid

RelayRides

Google Gfleet Tool
MyLink and IntelliLink Radio
Data Services as Apps

- Traffic
- Weather
- Fuel
- Movies
MyLink on Traverse, Acadia, and Enclave
Chevy MyLink on Sonic & Spark: Bring Your Own Media
GoGo Nav App

Pandora, Stitcher, Phone Book Connectivity
Customer is the Centerpiece

SIMPLE
- Seamless
- Intuitive
- Customizable

SAFE
- Secure
- Piece of Mind

CONNECTED
- Keep Me Informed
- Keep Me Green
- Keep Me Communicating
- Keep Me Entertained

OnStar
High Level Vehicle Integration
OnStar Vehicle Diagnostic Email

To ensure that you continue to receive emails from OnStar in your inbox, please add vehiclediagnostics@OnStar.com to your address book. Having trouble viewing this email? Click here.

OnStar Vehicle Diagnostics from your 2013 Cadillac XTS as of 05/26/2012

Dear OVS SUBSCRIBER,

See your diagnostics report below for your vehicle's status.

Hands-Free Calling helps ensure that you're in reach, even if you don't have your cell phone or are in a low coverage area. Make and receive calls at the touch of a button. Watch our helpful videos to learn more.

OnStar Vehicle Diagnostics

OnStar Vehicle Diagnostics

2013 Cadillac XTS

Vehicle Maintenance

No required maintenance due at this time.

- Remaining Oil Life: 43%
- Mileage: 4,843

Based on oil life and mileage readings, next required maintenance estimated at 9,400 miles.

- View maintenance summary

Additional Maintenance Items

Based on your current mileage, no items on the additional maintenance list are due at this time.

- Maintenance Records

Did you know you can update your maintenance records online?

Tire Pressure: Normal

- Left Front: 35 psi
- Left Rear: 34 psi
- Right Front: 34 psi
- Right Rear: 34 psi

- View tire pressure information

ONSTAR INFORMATION

- OnStar Subscription
- Account #: 999-9999-9999
- Hands Free Calling Services
- Expires 03/25/2013

ONSTAR INFORMATION

- OnStar System

- Antilock Braking System
- StabiliTrak® Stability Control System
- Air Bag System
- Emissions System

- Engine and Transmission System

DIAGNOSTIC INFORMATION

- Vehicle Information

- Warranty Tracker

- Vehicle History

- OEM Owner Center Online

MAINTENANCE INFORMATION

- 2013 Cadillac XTS

- OnStar Subscription

- Vehicle Maintenance

- Hands-Free Calling

- XM Satellite Radio

- Insurance Benefit

- Explore Options

- SUBSCRIBE TO XM

OTHER INFORMATION
Injury Severity Score (ISS)
- Maximum score 75
- Sum of the squares of the single highest Abbreviated Injury Score (AIS) (1-6) in each of the three most severely injured body regions.

Injury Severity Prediction of High means the Probability is greater than 20% of an ISS greater than 15 (major trauma)
**TIME OF ALERT:** 20:04:39

**AUTOMATIC CRASH RESPONSE STATUS**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Bag Status</td>
<td>Airbag Deployed</td>
</tr>
<tr>
<td>Maximum Reported Delta V</td>
<td>28 mph from the left</td>
</tr>
<tr>
<td>Direction of Impact</td>
<td>Left Side (30°)</td>
</tr>
<tr>
<td>Multiple Impacts</td>
<td>No</td>
</tr>
<tr>
<td>Rollover</td>
<td>No</td>
</tr>
</tbody>
</table>

**INJURY SEVERITY PREDICTION**

|                     | HIGH
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Advisor Crash Input</td>
<td>YES</td>
</tr>
<tr>
<td>Female</td>
<td>YES</td>
</tr>
<tr>
<td>Over 55 Years Old</td>
<td></td>
</tr>
</tbody>
</table>

**UPDATE PREDICTION**

<table>
<thead>
<tr>
<th></th>
<th>UPDATE</th>
</tr>
</thead>
</table>

**VEHICLE INFORMATION**

<table>
<thead>
<tr>
<th>Details</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner's Name</td>
<td>Patty Smith</td>
</tr>
<tr>
<td>Make</td>
<td>Chevrolet</td>
</tr>
<tr>
<td>Model</td>
<td>Malibu Hybrid</td>
</tr>
<tr>
<td>Manuf. Year</td>
<td>2009</td>
</tr>
<tr>
<td>Color</td>
<td>Imperial Blue</td>
</tr>
<tr>
<td>License Plate</td>
<td>AKL3890</td>
</tr>
<tr>
<td>Emergency Contact</td>
<td>Jim Smith</td>
</tr>
<tr>
<td>Emergency Contact Phone Number</td>
<td>313-555-0001</td>
</tr>
</tbody>
</table>

**PSAP LOCATION**

<table>
<thead>
<tr>
<th>Details</th>
<th>Connect/Transmit Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
</tr>
<tr>
<td>District of Columbia</td>
<td>Primary Emergency No.</td>
</tr>
<tr>
<td>Comments</td>
<td></td>
</tr>
</tbody>
</table>

Secondary emergency no. is (202) 555-5556. This value is plotted from the latitude 38.2172 and the longitude -78.6883.

**LOCATION**

<table>
<thead>
<tr>
<th>Details</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington, D.C.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Details</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude</td>
<td>38° 53' 9&quot; N</td>
</tr>
<tr>
<td>Longitude</td>
<td>77° 02' 51&quot; W</td>
</tr>
</tbody>
</table>

**LOCAL**

- Montgomery Village
- Gaithersburg
- Germantown
- Rockville
- Silver Spring
- Washington
- Alexandria
- Arlington
- Alexandria
- Washington
- Virginia
Not Just a Service for OnStar Customers

Everyday over 130,000 GM vehicles call OnStar to provide:

- Odometer and Oil Life
- Diagnostic codes (current) for Engine/Transmission, Emission, Airbag, Stability Control, Antilock Brake, and OnStar systems
- Tire Pressure Data

All data is fed daily to GM’s Quality Database

Wealth of data

- Usage trends and statistics (impact of fuel costs, tire pressure, etc)
- Diagnostic trends and correlations (region, season, trends, maturing vehicles, etc)
- Improved dealer service (history of vehicle, etc)
## Retrieving Data from the Vehicle

<table>
<thead>
<tr>
<th>Data Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diagnostic Trouble Codes</strong></td>
<td>• DTC’s as used for vehicle service at the dealership</td>
</tr>
<tr>
<td>(DTCs)</td>
<td>• Retrieved from electronic controllers on the vehicle data busses</td>
</tr>
<tr>
<td></td>
<td>• Example: P0522 Engine Oil Pressure Sensor Circuit Low Voltage</td>
</tr>
<tr>
<td><strong>Vehicle Data Parameters</strong></td>
<td>• Requested from electronic controllers on the vehicle data busses</td>
</tr>
<tr>
<td></td>
<td>• Examples: Battery voltage, Radio Preset Settings, Outside Air Temperature</td>
</tr>
<tr>
<td><strong>Cached Signals</strong></td>
<td>• Last data bus broadcast value stored inside the OnStar module</td>
</tr>
<tr>
<td></td>
<td>• Retrievable over-the-air even w/ ignition off</td>
</tr>
<tr>
<td></td>
<td>• Examples: Tire Pressure, Odometer, Fuel Level</td>
</tr>
<tr>
<td><strong>Native Data</strong></td>
<td>• Parameters determined directly by the OnStar module</td>
</tr>
<tr>
<td></td>
<td>• Examples: GPS Location, Time of Day</td>
</tr>
</tbody>
</table>
### Means to Trigger Contact with OnStar

<table>
<thead>
<tr>
<th>Direction</th>
<th>Triggers</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle Initiated</td>
<td>• Odometer&lt;br&gt;• Timestamp&lt;br&gt;• Ign On/Off events&lt;br&gt;• Elapsed Time&lt;br&gt;• Elapsed Miles&lt;br&gt;• Response to diagnostic request&lt;br&gt;• Value of cached signals&lt;br&gt;• Diagnostic Triggered Alert</td>
<td>OnStar Vehicle Diagnostic email uses Timestamp&lt;br&gt;• Uses message from a module to OnStar when a DTC sets&lt;br&gt;• Can be configured to trigger by module, DTC, DTC status, etc</td>
</tr>
<tr>
<td>Call Center Initiated</td>
<td>Condition external to vehicle</td>
<td>• OnStar Remote Link Mobile App uses Call Center Initiated</td>
</tr>
</tbody>
</table>
Data Collections on Smaller, Targeted Populations

AutoDTC

- More frequent data collection from all modules on all GM company vehicles in field service
- Vehicles report in every 10 – 40 ignition cycles
- ~10k Vehicles
- Data automatically pushed to Quality Database

OnStar Lab

- Highly capable, flexible data collection programs
- Periodic or Event driven data collection
- Usually < 5000 Vehicles
- Data provided directly to requester, usually in csv format
OnStar Lab Collects Data for Pre-Launch Quality Analytics

Highly capable data collection on GM new vehicle programs during their Captured Test Fleet phase

- All captured test fleet vehicles are enrolled ~ 200 vehicles
- Collect: Software part numbers
  - Calibration ID’s
  - Diagnostic data
  - Freeze frame data
- Special vehicle specific data elements as requested by GM Engineering (e.g. fuel economy)

- 24/7 near real time email notification to GM Engineering if a diagnostic trouble code sets in any of the vehicles
In Summary…..

OnStar’s embedded connection to the vehicle is enabling

- Industry leading customer facing features
- Powerful data collection capabilities for GM’s “before production” and “after the sale” use

GM can leverage the capability of an embedded connection to

- Maintain a relationship with our customers after the sale
- Offer new services to enhance the reason for purchase of a GM vehicle
- Improve vehicle performance through insights gained from data collection and mining