Automotive open source: opportunity and peril

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- data fusion and mining opportunities
- security problems and solutions
- how to access vehicle-generated data
- demos
Legacy View of “In-Vehicle Infotainment”

Do same stuff in car as at home: boring.
“Personal total environmental impact” tracking possible by “mining” gas mileage data aggregated with other sources.
How about a driver-generated used-car report?

… if the report included a web-based verifiable summary of real-time performance data?
Example: publish your car's data to the WWW

http://openice.org/

Plug-in framework with language-agnostic API.
CAN bus is **not** ready for Internet age

UCSD, UWa, Rutgers: http://autosec.org/
Automotive data buses have little security
V2V and V2I: making use of real-time data

Early-warning hazard alert system pilots already in U.S., Germany.
Expert security help is on the way

NOT automotive “patch Tuesday” & anti-virus software!
How to access a car's data

OBDII connector found in every U.S. car since 1996.

Determine protocols in use by examining populated pins.

2006 Mazda 3

1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16

COM
LS-CAN
HS-CAN
GND
How to select a scantool

• Check which pins are populated in the OBDII connector of target car.
  - Tells you which protocol(s) are supported.

• Need only 4, 5, 6, 14 for OBDII (“smog test”).

• Best choice for novice is **USB ELM327**:
  - Cheaper (less than $50).
  - Won't drain car battery and won't write to CAN data bus.
  - Easier to connect than Bluetooth.
Ford's Android-Based OpenXC Platform
chipKIT Max32™ Prototyping Platform

32-bit MIPS processor, Arduino pin-compatible, open toolchain, two CAN controllers, $50
BeagleBone from TI

$89, widely available

CAN “cape” for BeagleBone

€79, available via mail-order

Runs QCanObserver based on Qt
Demo 1: replay of prerecorded trip using nOBDy
Demo 2A: live data demo using nOBDy, OBDLink MX and EcuSim (lunchtime)
Summary

- Automotive software is rapidly evolving, both within and outside vehicle.
- Serious security exploit may trigger a regulatory lock-down, killing innovation.
- Opportunity right now for small businesses and individuals is tremendous.
- Great time to get into the field!
## Status of Automotive Open Source

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Confirmed Operating system</th>
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<tbody>
<tr>
<td>Fiat-Chrysler Blue&amp;Me (500, Delta), Kia Uvo, BYD, Nissan Leaf</td>
<td>Microsoft Windows Embedded Automotive</td>
</tr>
<tr>
<td>Ford (all?)</td>
<td>MyTouch/Sync-Microsoft; OpenXC-Android</td>
</tr>
<tr>
<td>General Motors (new 2012 Cadillacs), Chevy Volt</td>
<td>MontaVista's GNU/Linux</td>
</tr>
<tr>
<td>Geely (China); Hawtai (China)</td>
<td>GNU/Linux: Moblin (MeeGo predecessor)</td>
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<tr>
<td>Renault R-Link</td>
<td>Android</td>
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<tr>
<td>Honda (Accord, Odyssey, Pilot), Audi, BMW (7-series and M models), Chrysler, Daewoo, GM (OnStar), Hyundai, Land Rover, Porsche, Saab (9-3) Renault (SM7)</td>
<td>QNX</td>
</tr>
</tbody>
</table>

Linux Foundation members: Toyota, Pelagicore, Symbio, Tieto.
Automotive Linux Summit 2011 presenters: Toyota, Nissan, BMW.
MeeGo Conference 2011 presenter: Nissan.
Volkswagen has a pilot using Maemo (Linux).
Demo 2B: live data demo using nOBDy, OBDLink MX and Mazda (evening)
What do developers (and start-ups) really want?

1. Peer-group recognition:
   - winning contest;
   - “committer” or “maintainer.”

2. Limited-availability items:
   - pre-release devices;
   - prototypes;
   - invitations to closed events;
   - access to proprietary data.

3. Fun!
   - games.

4. Money, like everybody else.

source: Engadget Mobile
Fueling the Ecosystem: what do developers want?

Stereotype:
1. Free beer
2. Free food
3. Free t-shirts
How do we reach developers?

- *Exclusive events* where pre-release or prototype hardware is distributed.

- *Exclusive events*: pre-release API demos.

- *Exclusive access*: (with NDA) proprietary data for mining.

- Hackathons and coding contests with desirable prizes.
  - Can be a “winner” t-shirt or an autographed book.

- Foosball, video games, ping pong, Bawls, coffee are attractive.

- Lowest barrier to entry: contests and summer students.
Why Right to Repair is important

- Preserve owner-driver ability to read automotive data.
- Forces of FUD will seize on an (inevitable) incident as an excuse to lock everything down.
- A chance for software developers to communicate with technophobic home- and small-business mechanics.
- National Act is stuck in a Congressional committee.
- MA has 2012 ballot initiative.
“Right to Repair” movement a natural ally of open source

Motor Vehicle Owners Right to Repair Act
NHTSA moves to ban phone use in moving vehicles

*Prediction*: touchscreen ban will be next.
Ford's vehicle-data “Fuel Efficiency Challenge”

As part of its OpenXC announcement, Ford and Bug Labs showed off the Fuel Efficiency Challenge, which allows drivers of Ford Sync-enabled cars to share their fuel efficiency with others.

(Credit: Daniel Terdiman/CNET)

Vehicle data is provided by Android- and Arduino-based “OpenXC Platform.”
Small-biz and community contributions already

Pratik Patel · 7:40 PM · Public
I'm writing a Perl script that's grabbing data from Google Maps to get a better idea of distances and travel times between multiple places. I'm writing this Perl script to pretty much save money on gasoline.


I'm using the Google's Distance Matrix API.
http://code.google.com/apis/maps/documentation/distancematrix/

Real-time CAN-bus

Data-mining