

Automotive open source: opportunity and peril

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4/11/12

- data fusion and mining opportunities
- security problems and solutions
- how to access vehicle-generated data
- demos

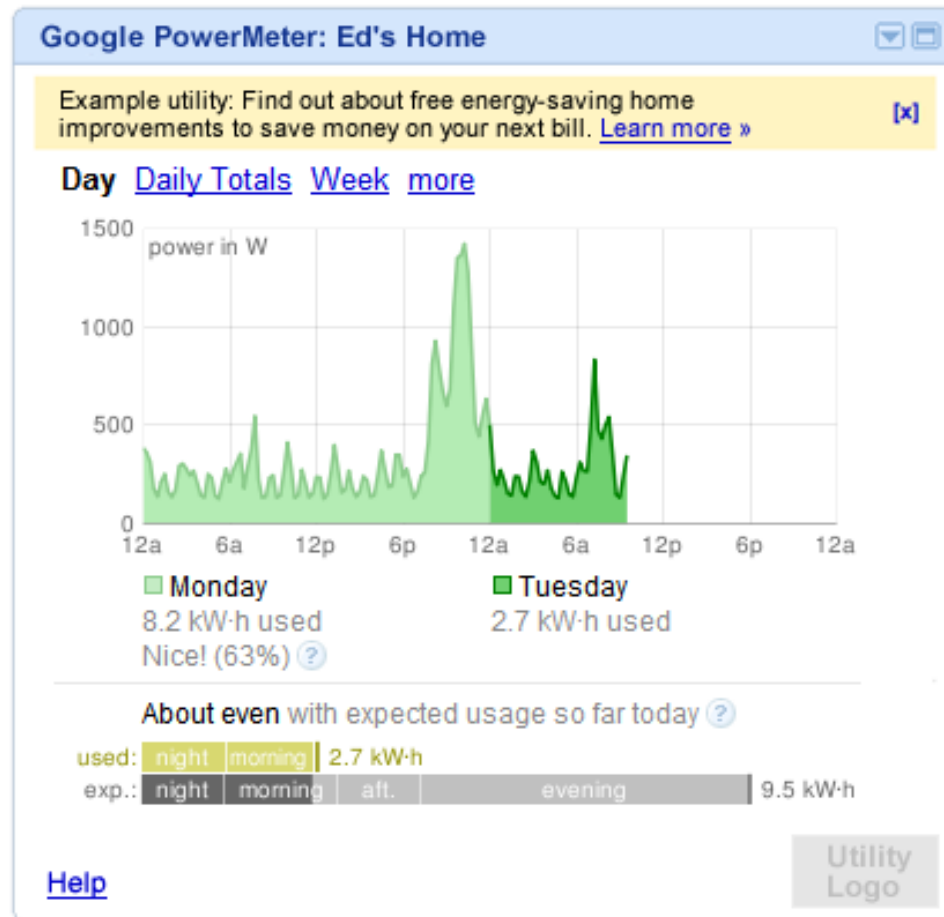


Legacy View of “In-Vehicle Infotainment”



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?

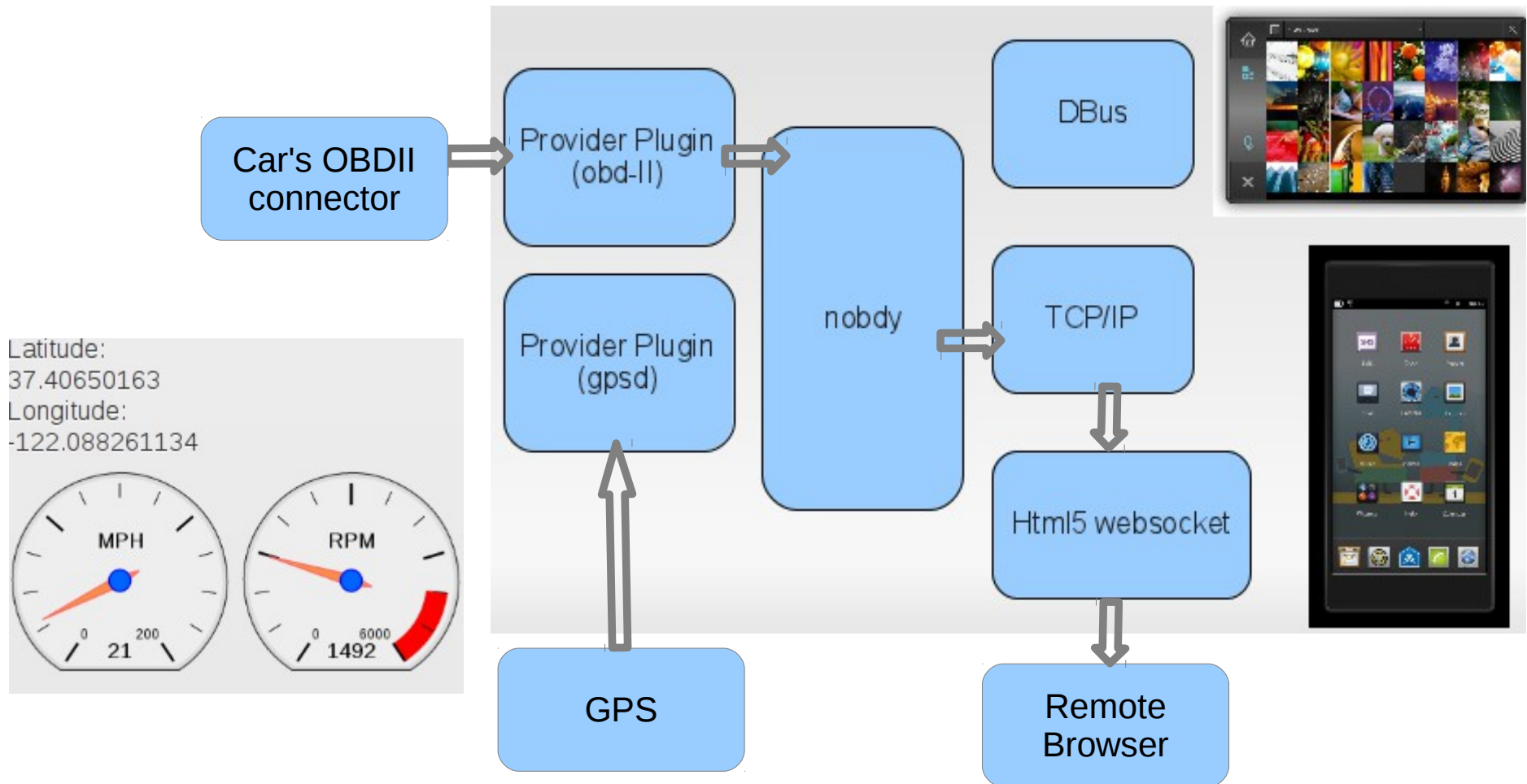


The screenshot shows the CARFAX website homepage. At the top left is the CARFAX logo with the tagline 'VEHICLE HISTORY REPORTS'. To the right is the slogan 'SHOW ME THE CARFAX®'. Below this is a dark blue navigation bar with links: 'ORDER REPORTS', 'FIND A CAR', 'REGISTER GUARANTEE', 'ABOUT US', 'HELP', 'LOGIN', and 'HOME'. The main content area has a yellow background with the heading 'Buying a Used Car? Just Say – Show Me the CARFAX!'. Below this is a paragraph: 'Don't run the risk of buying a used car with costly hidden problems. Get a detailed vehicle history report from our nationwide database within seconds.' On the left, there is a preview of a CARFAX report showing various vehicle history details. On the right, there is a search section titled 'Start Your Search' with a text input field labeled 'ENTER VIN (optional)' and a green button labeled 'Get the CARFAX!' with a right-pointing arrow. A small link 'What is a VIN?' is next to the input field. To the right of the search section is a large image of the CAR FOX mascot, a brown and white fox wearing a white t-shirt with 'CAR FOX' printed on it.

... 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/>



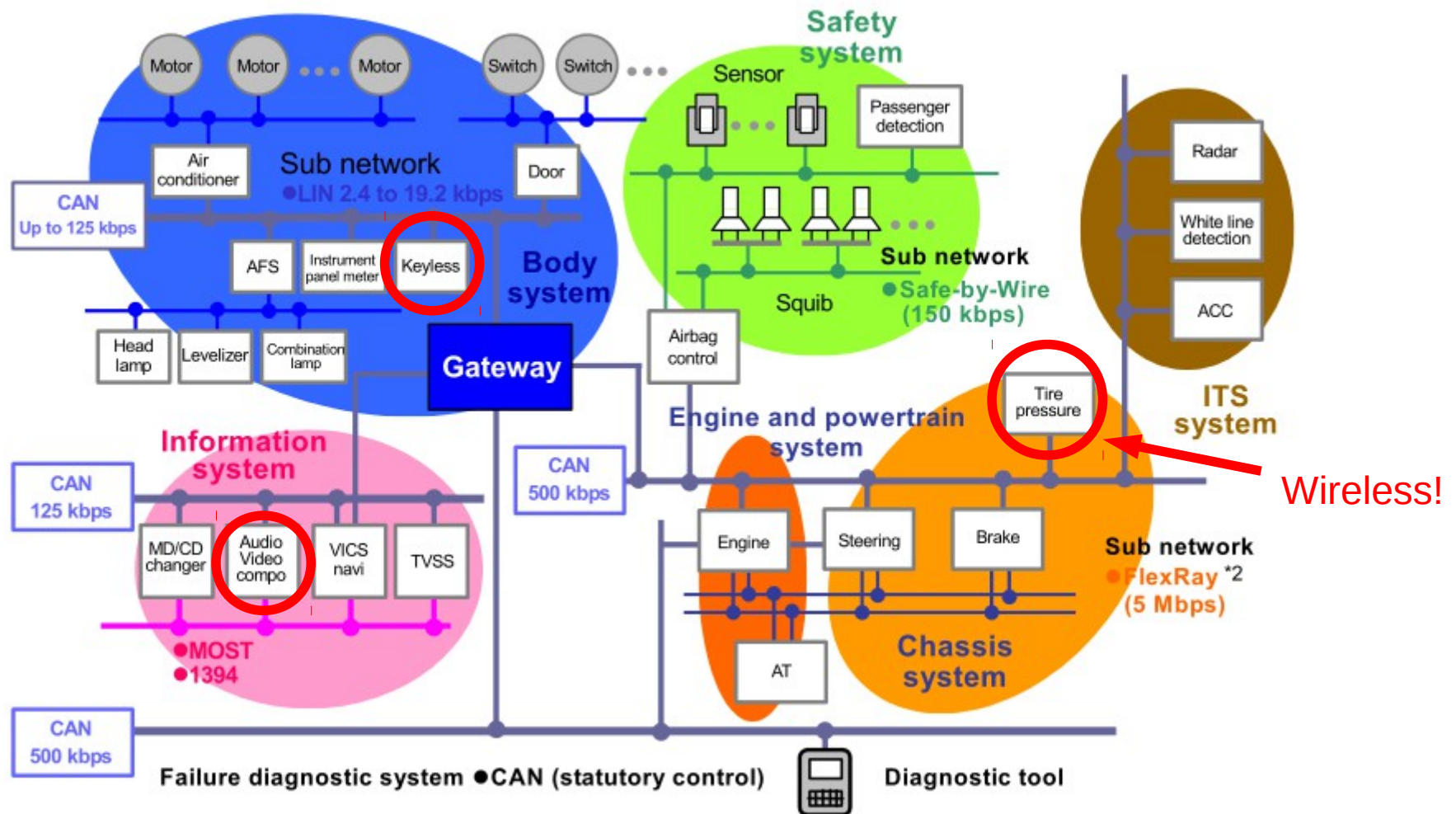
Plug-in framework with language-agnostic API.

CAN bus is **not** ready for Internet age

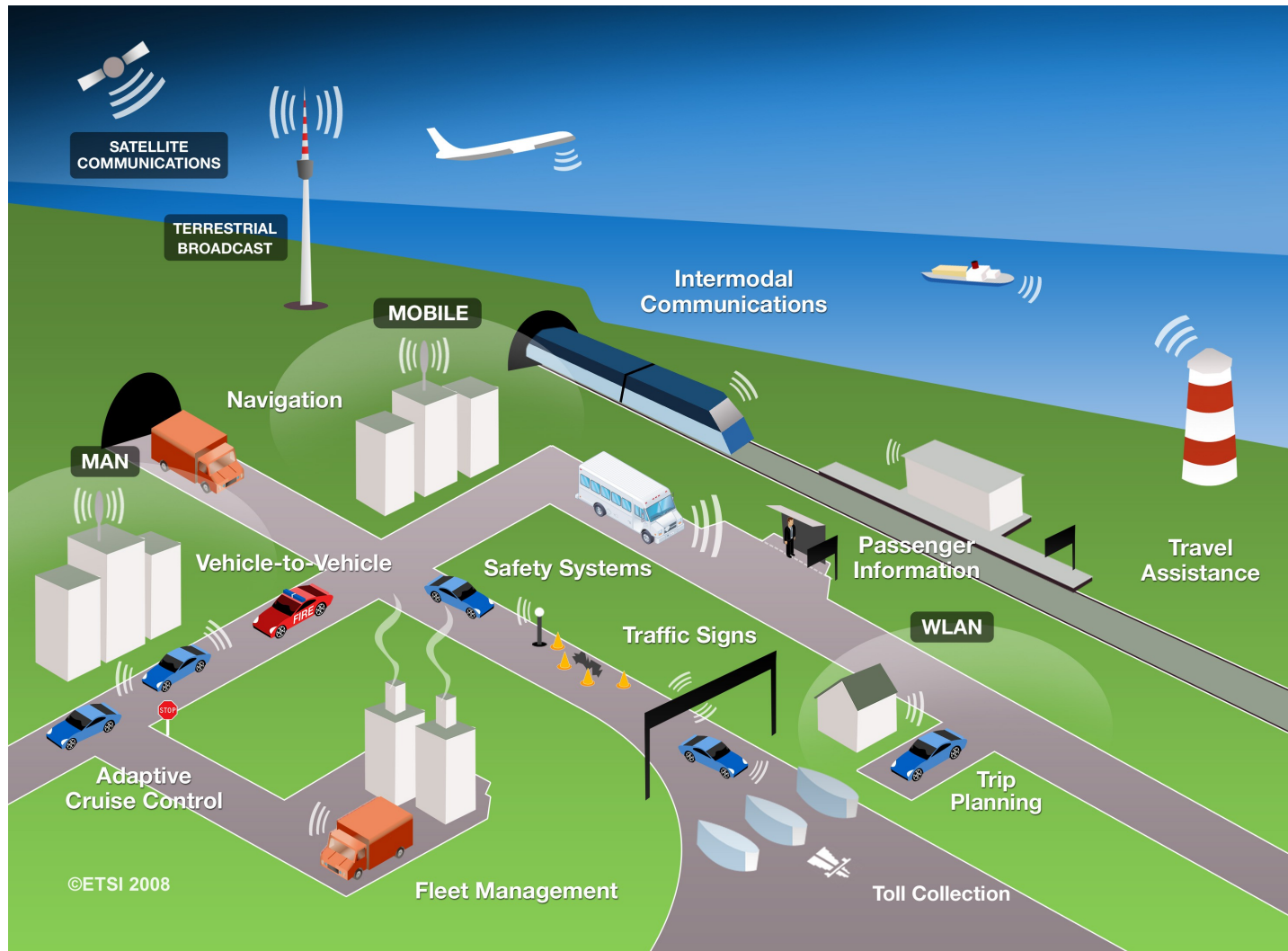


UCSD, UWa, Rutgers: <http://autosec.org/>

Automotive data buses have little security



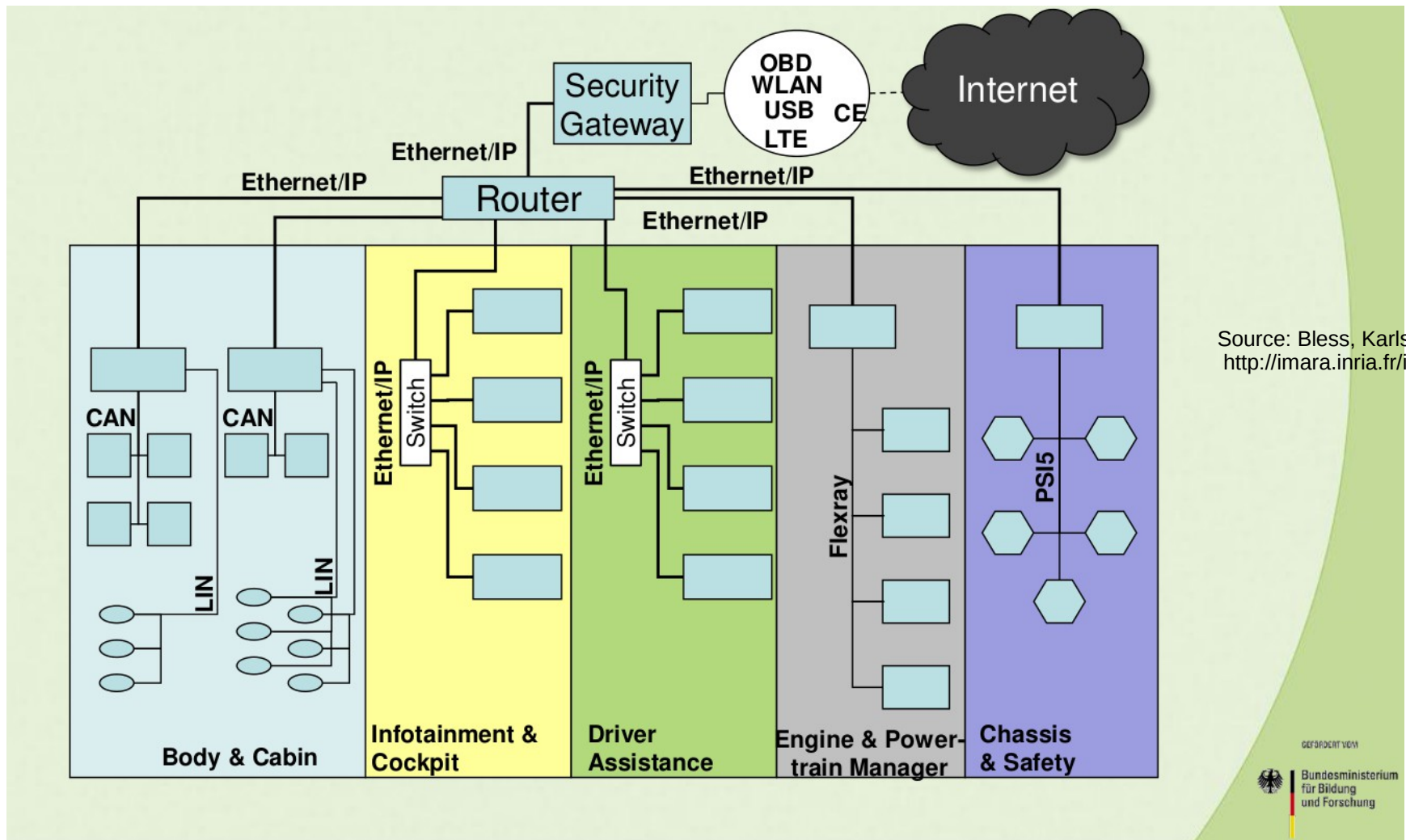
V2V and V2I: making use of real-time data



Courtesy ETSI.

Early-warning hazard alert system **pilots** already in U.S., **Germany**.

Expert security help is on the way



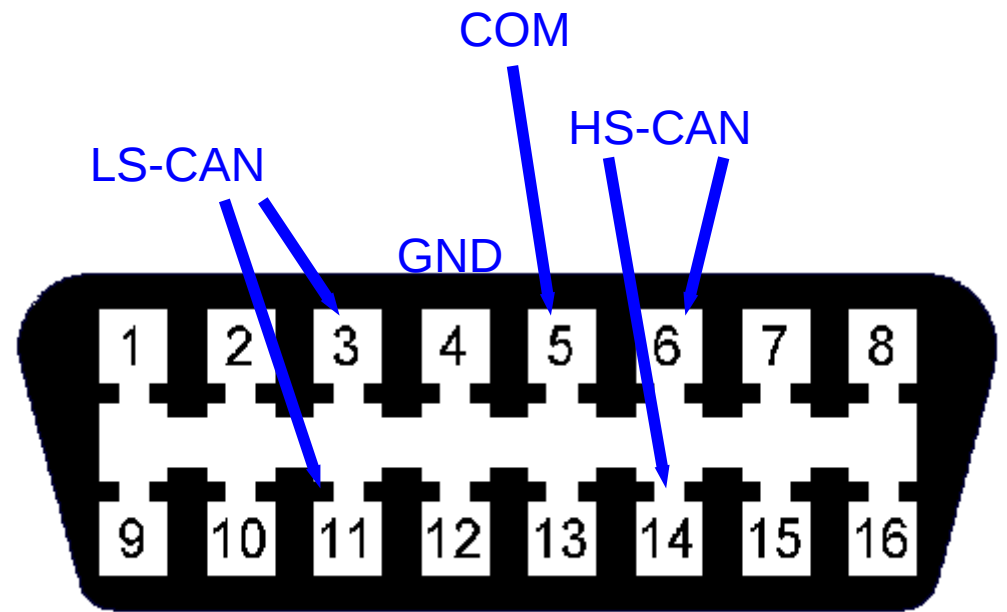
NOT automotive “patch Tuesday” & anti-virus software!

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

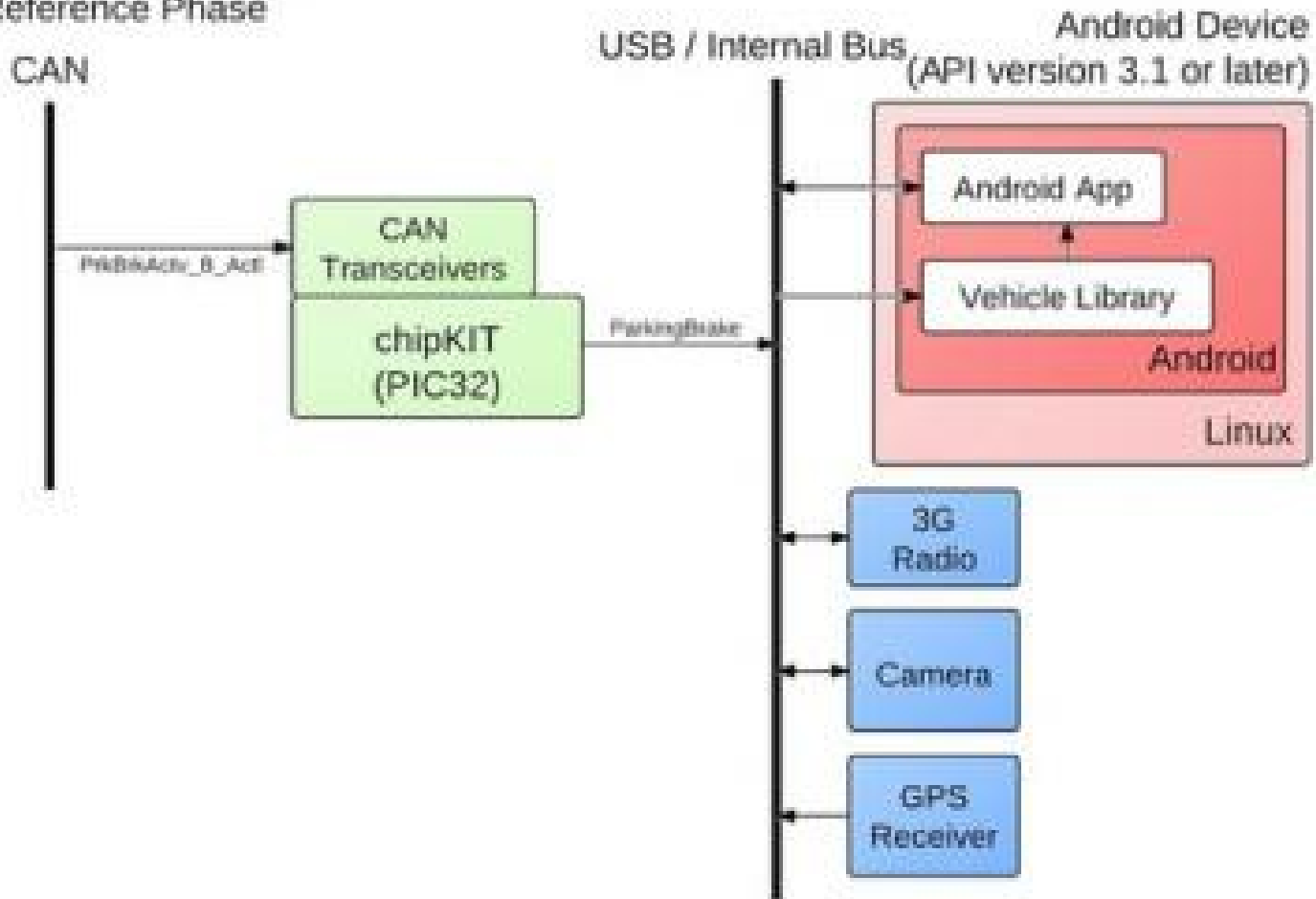
How to select a scantool

- 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.

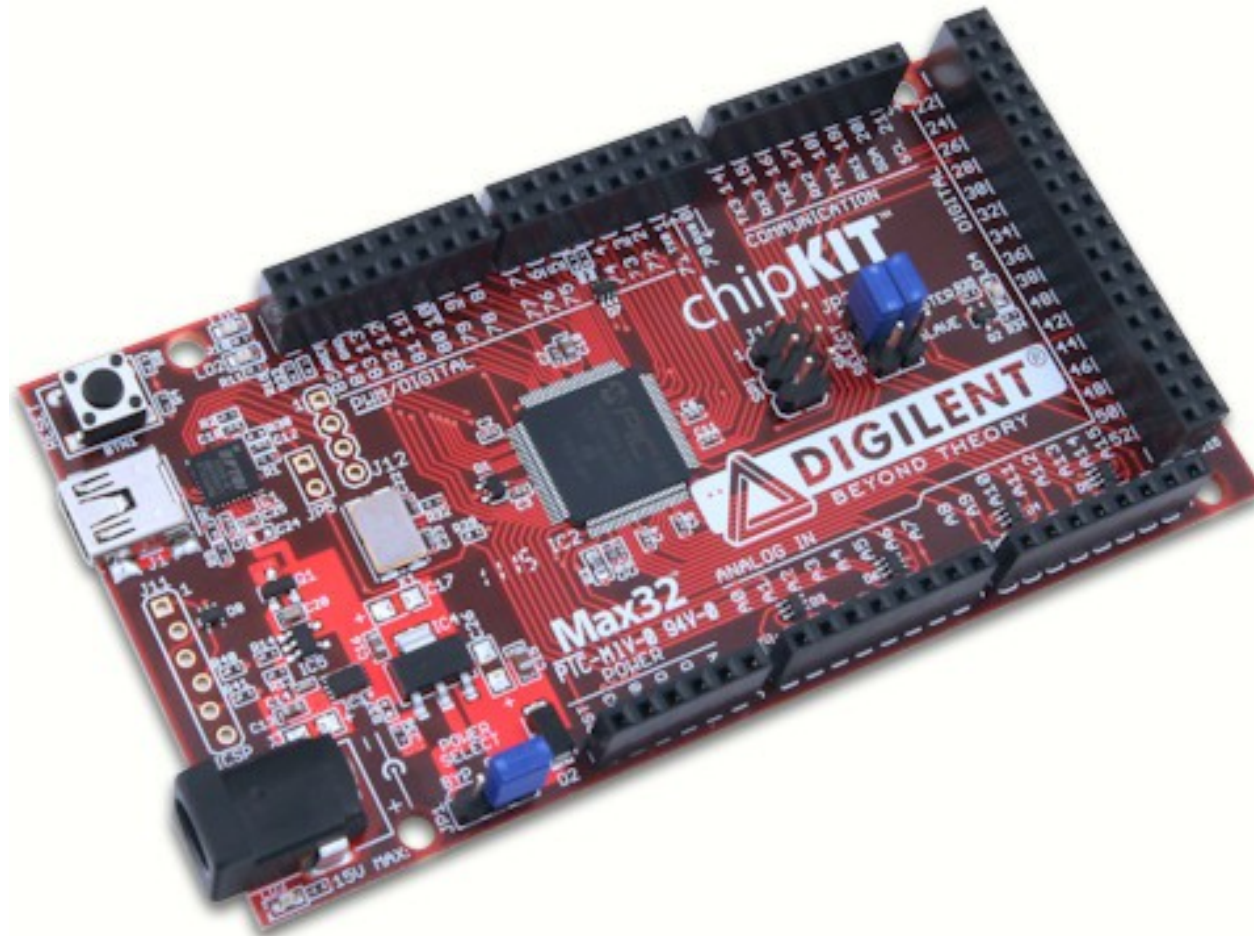
Ford's Android-Based OpenXC Platform

OpenXC Architecture

Reference Phase



chipKIT Max32™ Prototyping Platform



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

BeagleBone from TI



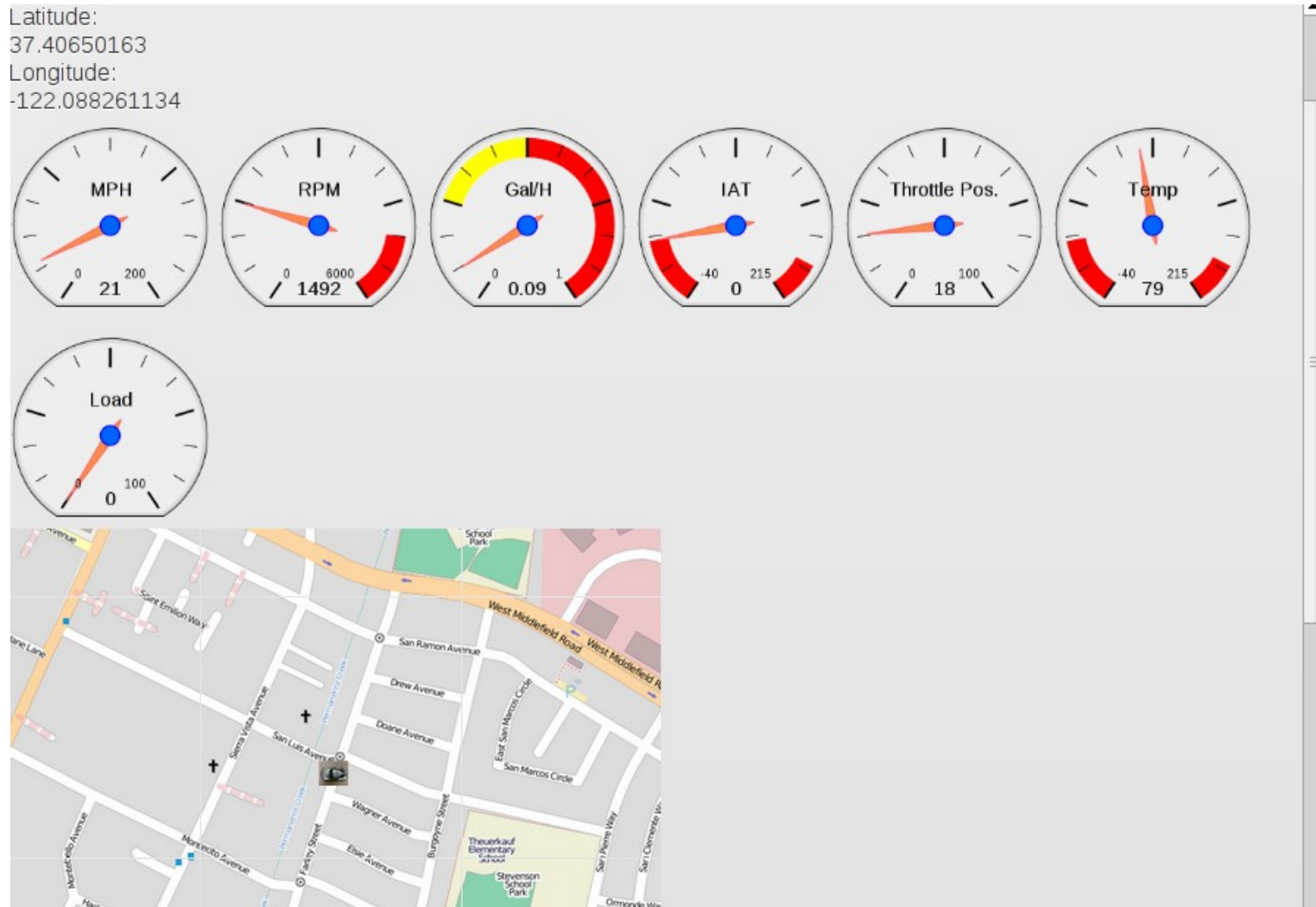
\$89, widely available

CAN “cape” for BeagleBone

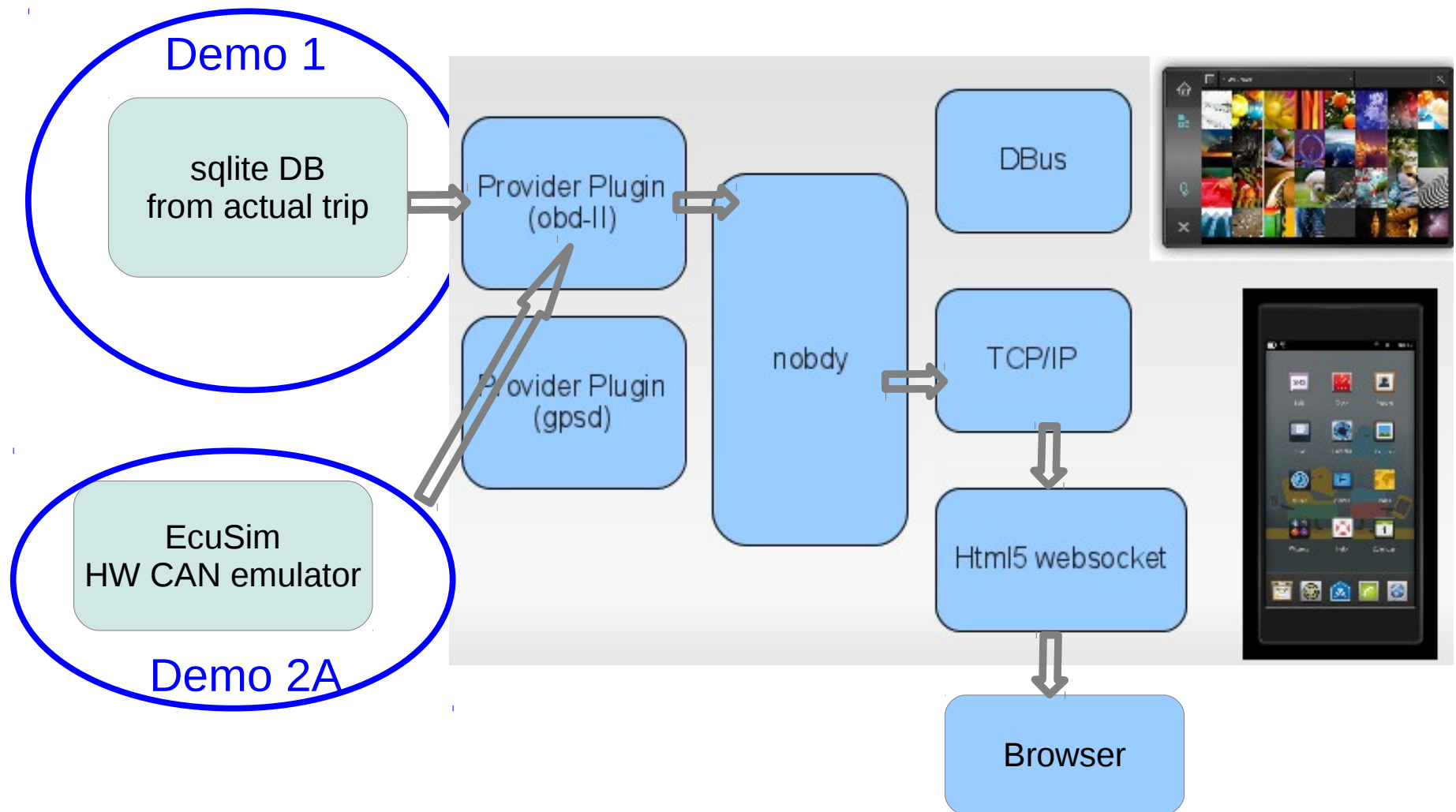


Runs [QCanObserver](#) based on Qt
€79, available via mail-order

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

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

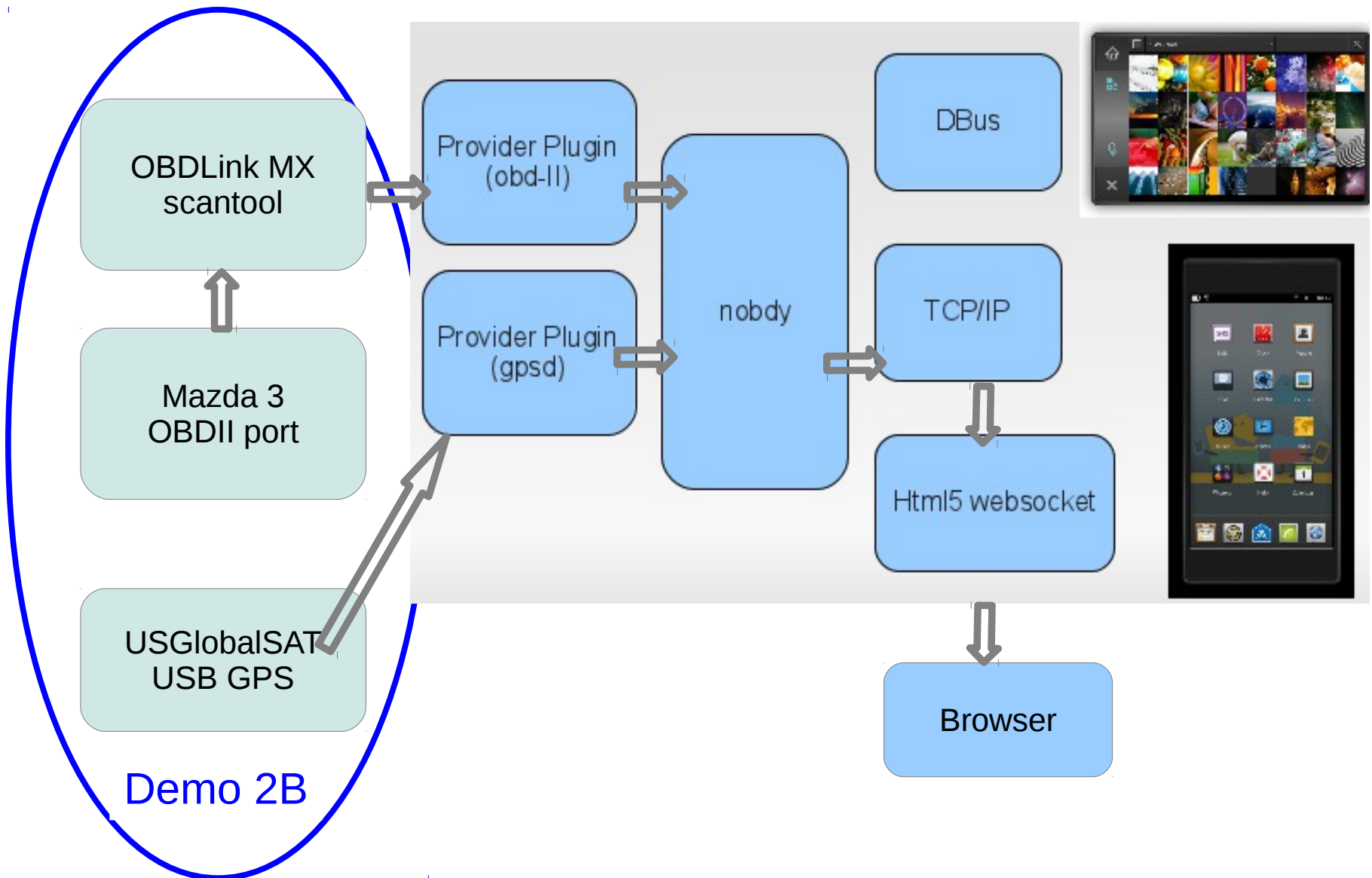
Linux Foundation members: Toyota, Pelagicore, Symbio, Tieto.

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?



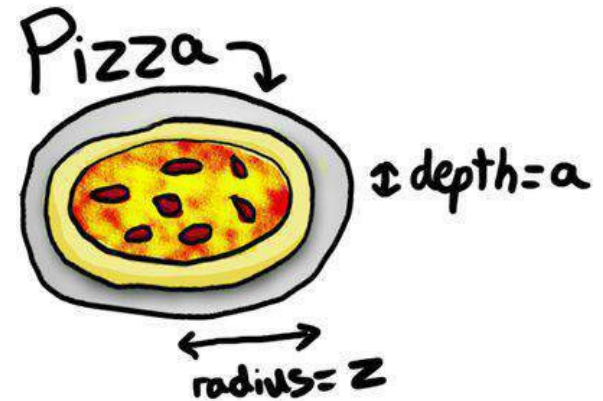
source: Engadget Mobile

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.

Fueling the Ecosystem: what do developers want?

Stereotype:

1. Free beer
2. Free food
3. Free t-shirts



$$\text{Volume} = \pi \cdot z \cdot z \cdot a$$

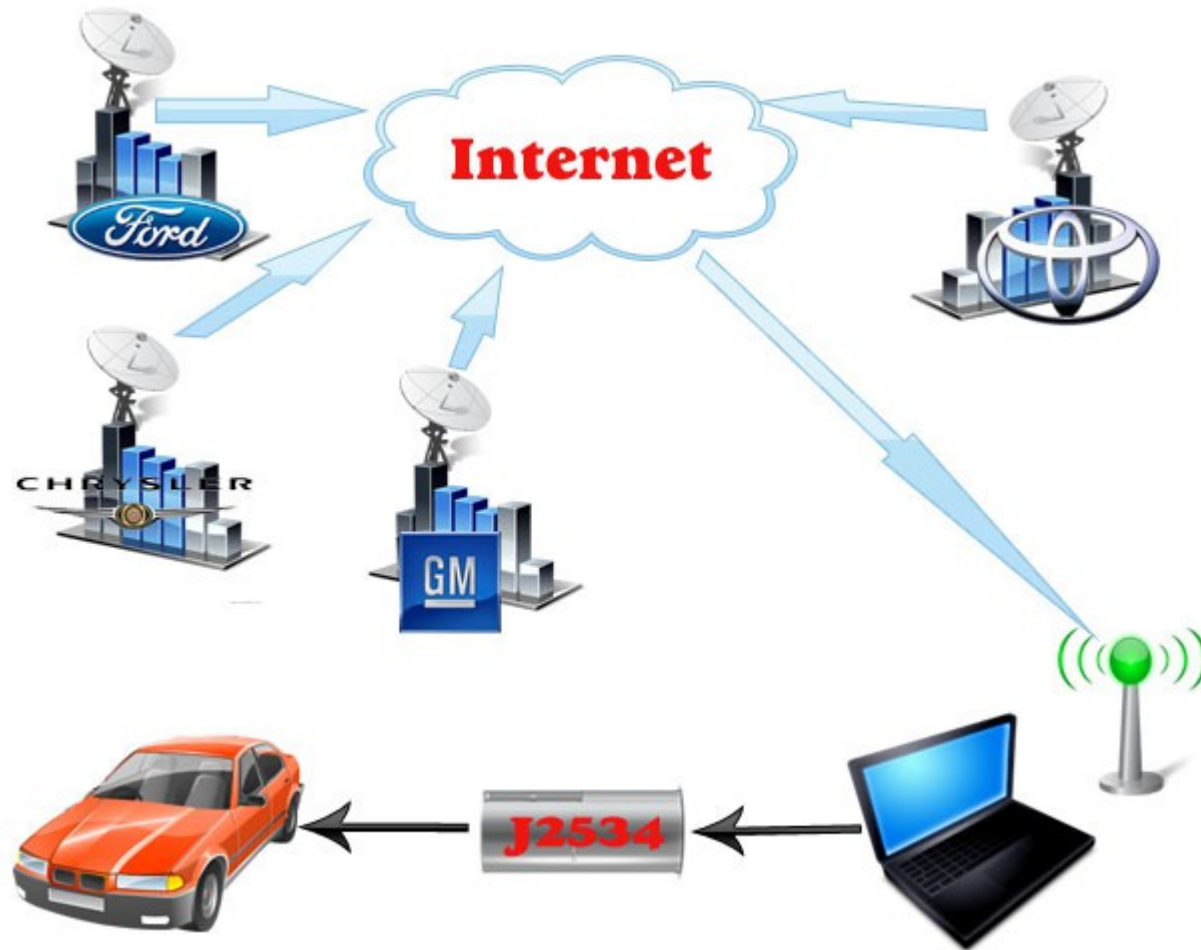
How do we reach developers?

- *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

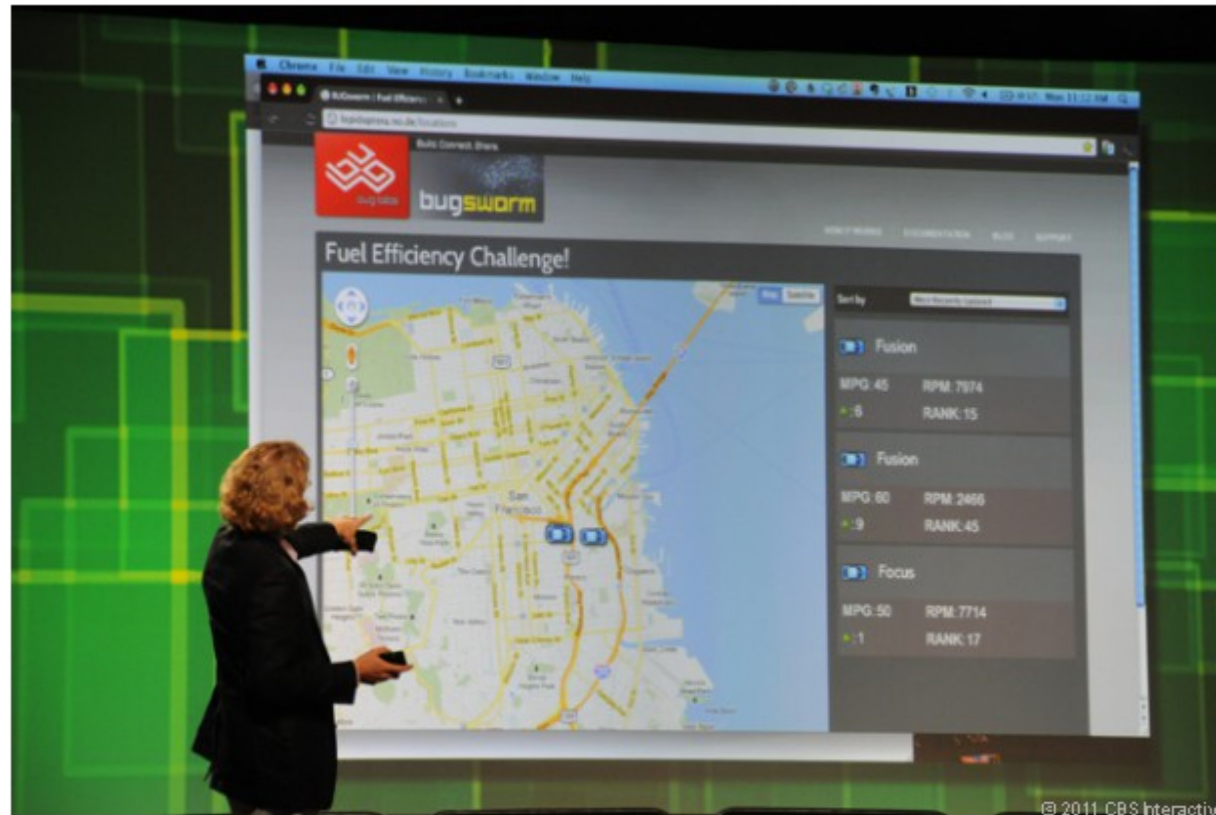
NHTSA moves to ban phone use in moving vehicles



source: distraction.gov

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.

<http://www.dallasgasprices.com/index.aspx?area=Allen>

I'm using the Google's Distance Matrix API.

<http://code.google.com/apis/maps/documentation/distancematrix/>

Data-mining

**Real-time
CAN-bus**

