Automotive: new frontier for mobile Linux

ICS demos:
booths 24
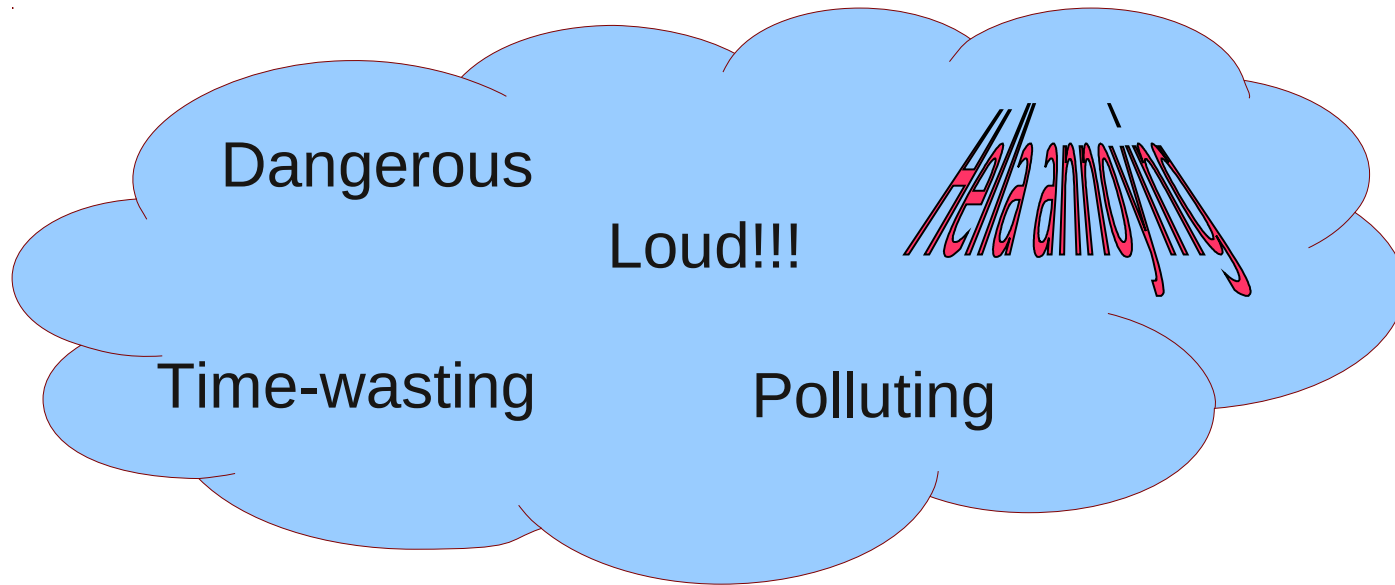and 67

Alison Chaiken
alchaiken@gmail.com
http://she-devel.com/

Contents

- Why automotive Linux matters

- What's different and what's hard

- Automotive open-source project survey

- Opportunities for developers and the community
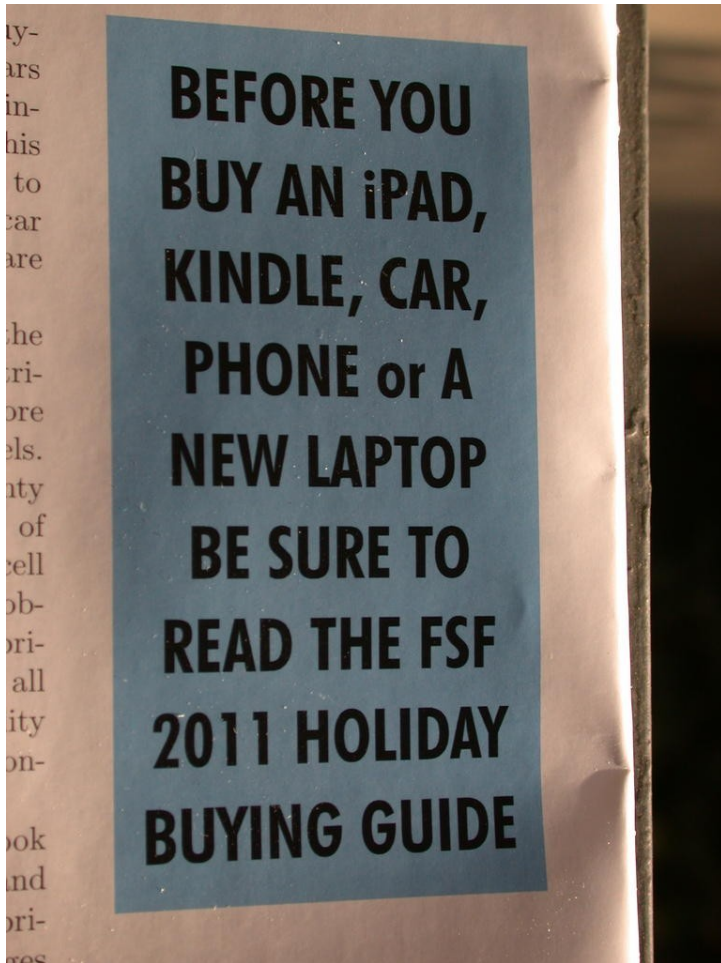
Our transportation system is

Dangerous

Loud!!!

Hella annoying

Time-wasting

Polluting

because

individuals had little power to change it …

until NOW.

Exactly one political slide

BEFORE YOU BUY AN iPAD, KINDLE, CAR, PHONE or A NEW LAPTOP BE SURE TO READ THE FSF 2011 HOLIDAY BUYING GUIDE

June 23, 2011, 1:01 PM

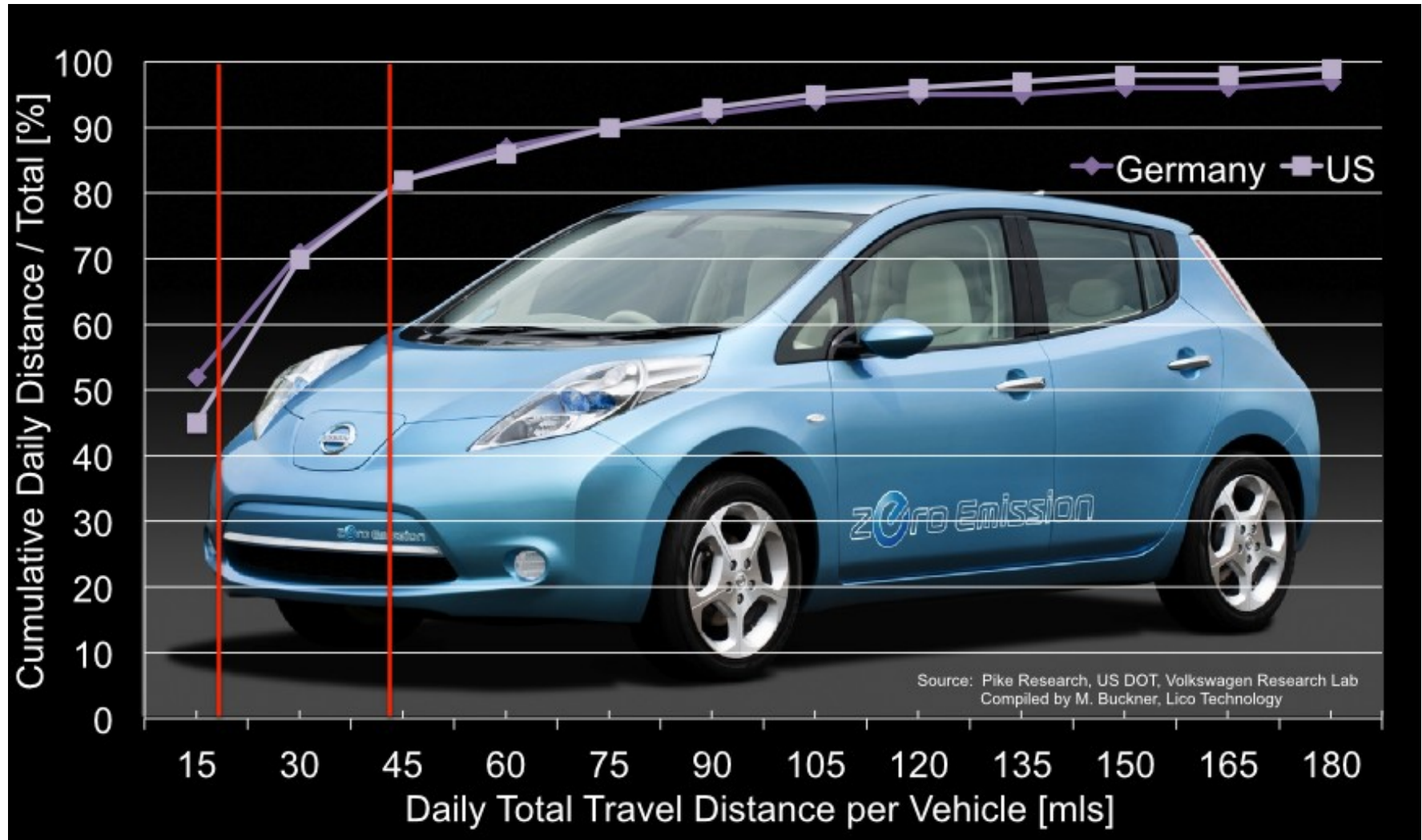'Aggravating' MyFord Touch Sends Ford Plummeting in J.D. Power Quality Survey

By CHERYL JENSEN

The MyFord Touch interface as seen on the 2011 Ford Edge.

New York Times, June 23 2011

"Range anxiety": a user perception problem

Let's help drivers better understand their needs.

Status of Automotive Linux

Manufacturer	Confirmed Operating system
Fiat-Chrysler Blue&Me (500, Delta), Kia Uvo	Microsoft Windows Embedded Automotive
Ford (all?)	MyTouch/Sync-Microsoft; OpenXC-Android
General Motors/Cadillac User Experience	MontaVista Linux
Geely (China); Hawtai (China)	Linux: Moblin (MeeGo-Tizen precursor)
Renault R-Link	Android
Honda (Accord, Odyssey, Pilot), Audi (A8L, Q5, A6), 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

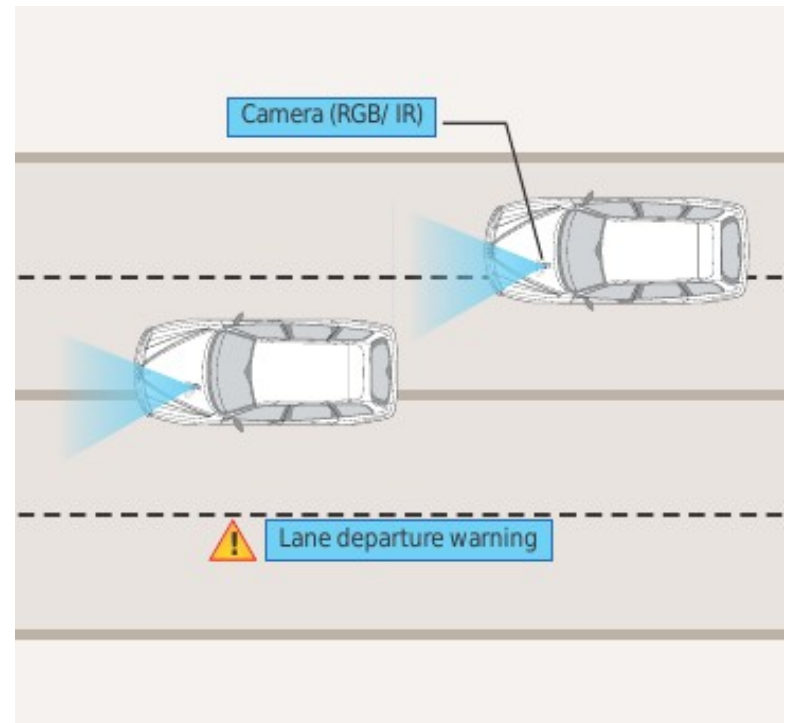# The GENIVI Alliance Membership (www.genivi.org)

OEMs

BMW Group · BMW · MINI · HONDA The Power of Dreams · HYUNDAI · JAGUAR · LAND ROVER · NISSAN · PSA PEUGEOT CITROËN · GM · RENAULT · SAIC MOTOR 上汽汽车

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Silicon

NXP · ARM · ROHM · freescale · SAMSUNG · intel · Renesas · ISSI · ST · MARVELL · MICREL · TEXAS INSTRUMENTS · NETLOGIC · Vitec · nVIDIA · XILINX

What is "in-vehicle infotainment"?

Courtesy Tata Consultancy Services

What "infotainment" calls to mind

What IVI could be

"Infotainment" 1st due to desire to monetize media sales

"91% of respondents said they would love to see a lane-change, blind-spot warning system …

83% said they would like in-vehicle technologies that would automatically call a tow truck …

Nearly ¾ said they'd like technology that would stop their car if the driver suffers a heart attack …

That's about as far from Angry Birds as you can get."

– Accenture survey data courtesy of GigaOm

Challenges for IVI

- Little-understood UI/UX

- Security: leave car in auto shop overnight

- Novel sensors, data buses and architectures

- Safety: not "kill -9" but kill dead!

Car is laboratory for new controls and displays

New UIs will debut in cars and migrate to other form factors.
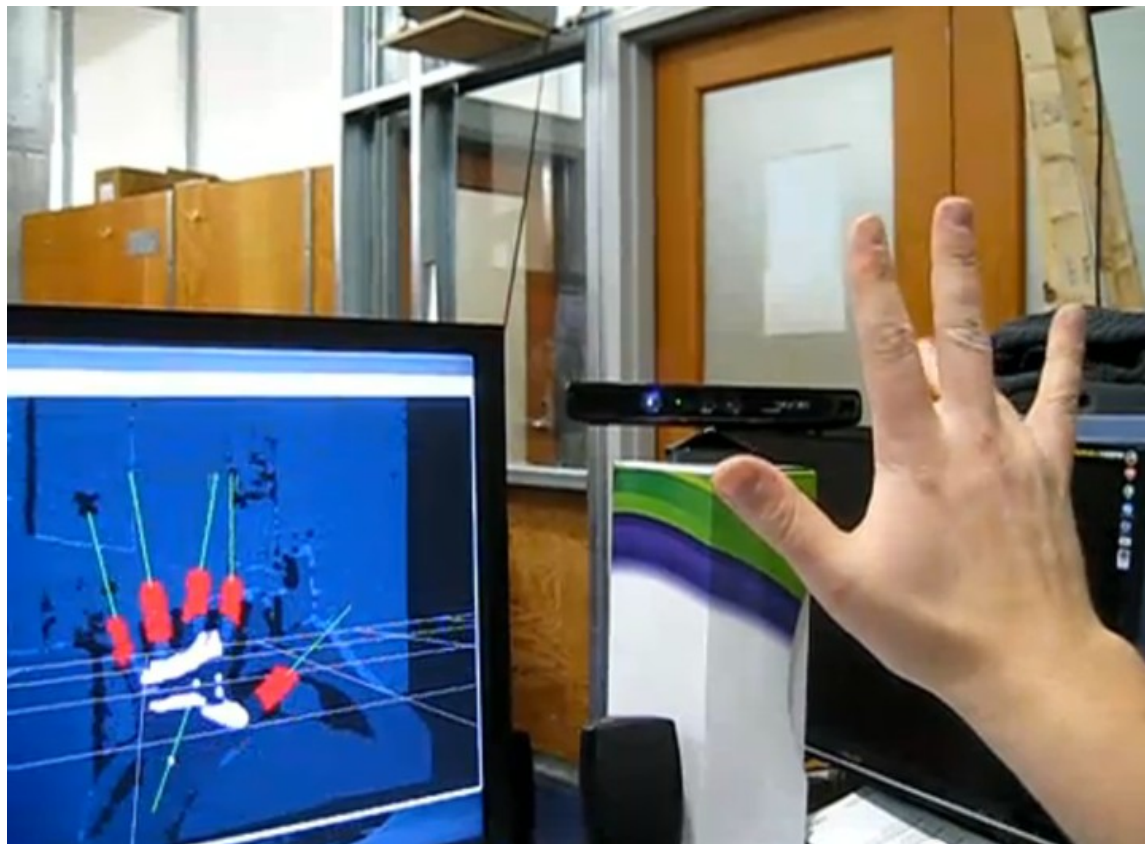
"Kinect piano"

Do we need a motion-sickness.css for passengers?

Cadillac User Experience: Linux by MontaVista

Status: limited developer pre-release, widely available Spring 2012

MontaVista's approach to security challenge

Seating Position 1

Seating Position 2

Seating Position 3

OEM Custom Apps

Stack

Custom Apps

Untrusted Apps

MV Linux Container

Android Apps

Android

HAL

MV Linux Container

HTML5 Apps

MontaVista Modii™ HTML5

MV Linux Container

SE Linux (NSA Security)

Multicore SoC (ARM, ATOM)
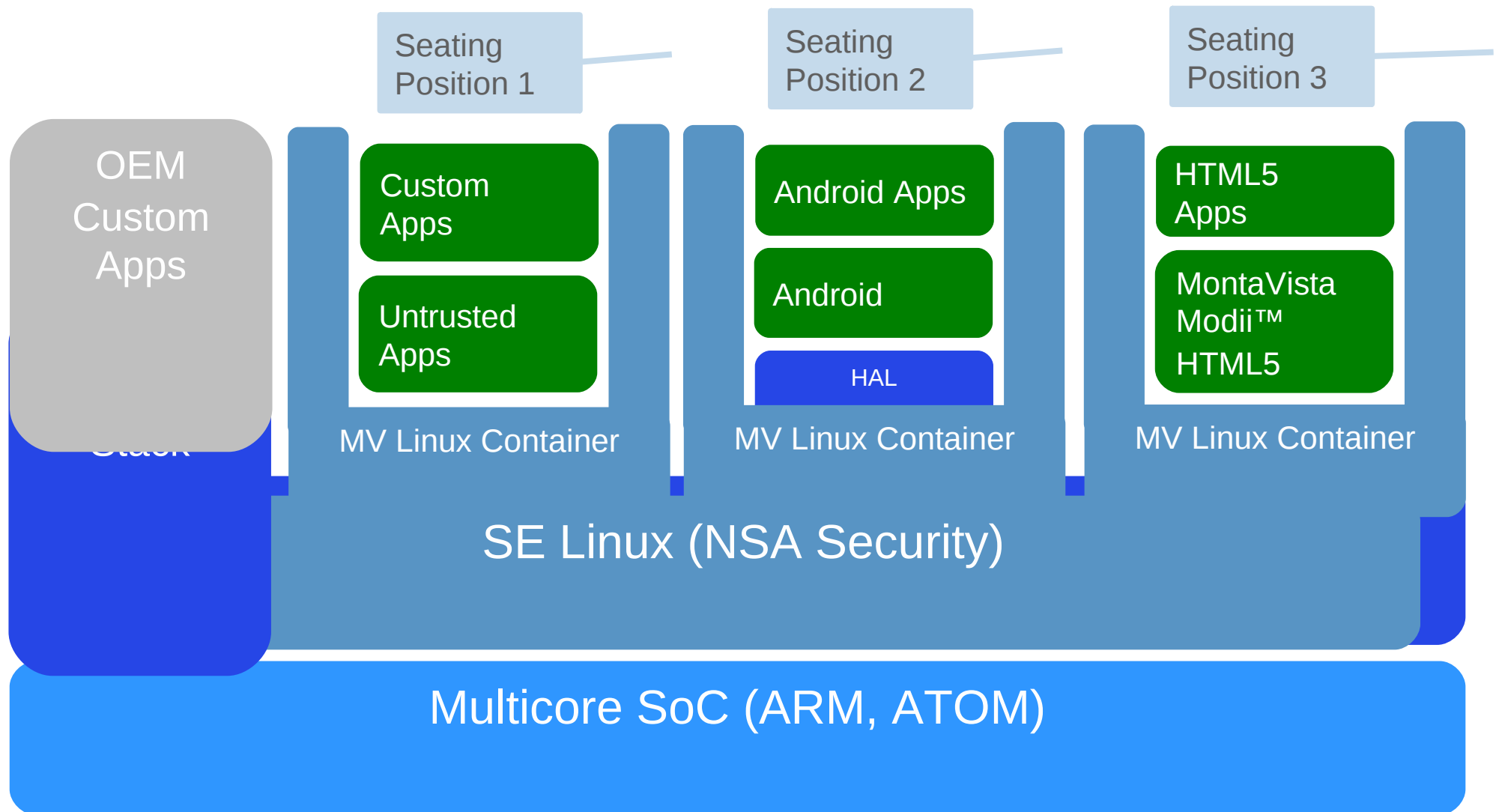
Excellent ELCE video by MontaVista: http://tinyurl.com/7emextu

Ubuntu-IVI Remix

Unity2d Reference HMI	Ubuntu One	ISV Framework and Applications

Packages for Genivi Compliance
Ubuntu Core
Kernel and Drivers

IVI Reference Board	OEM Design

Ubuntu IVI Remix
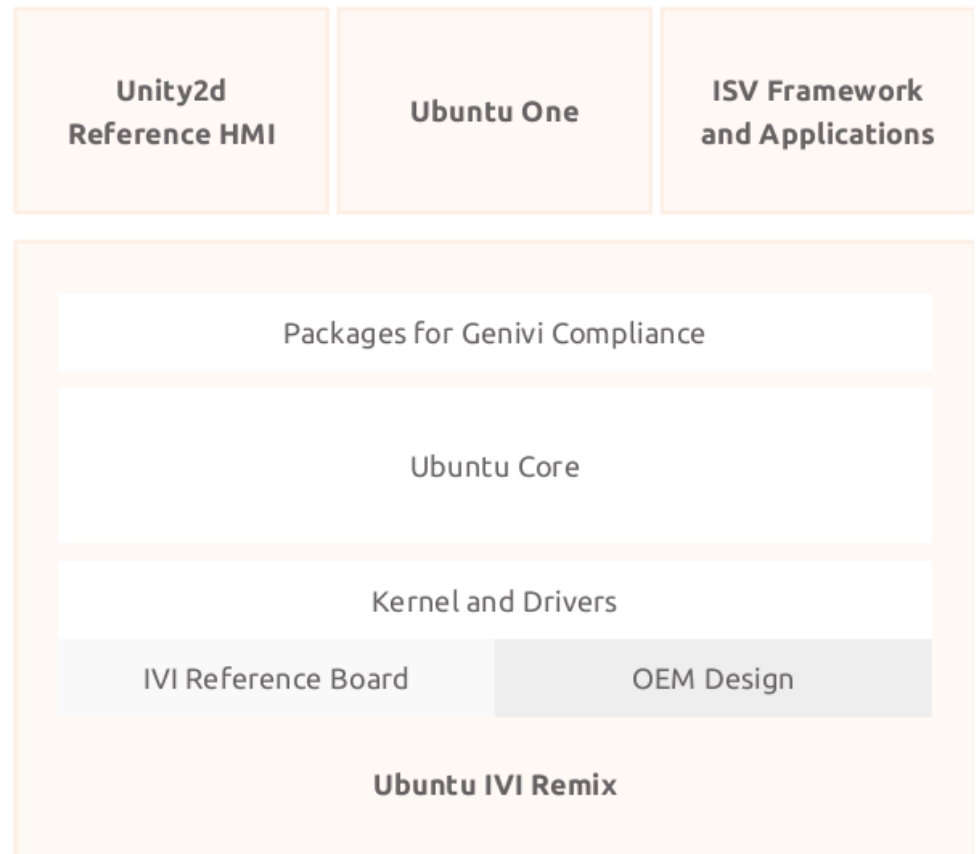
Generating a lot of vendor interest.

Renault's R-Link is first native Android

"application developers will progressively upgrade its content and offer more apps. They will be downloadable directly to the tablet inside the car or via 'My Renault' account thanks to the R-Link Store"

Renault debuts R-Link, an in-dash Android system with app market

By Zachary Lutz posted Dec 9th 2011 2:38PM

http://www.renault.com/en/innovation/plaisir-et-confort/pages/r-link.aspx

OBDGPSLogger Real-time Vehicle Diagnostics Capture Plot

There and Back Again: Lunch in El Segundo

Just going down to El Segundo for lunch, taking slightly different paths each way. By the airport, there's a large apparently blank bit; that's where I was in a tunnel and my GPS couldn't get a lock.

This trip was driving my Mini Cooper S.

Google Earth Screenshots

Developer Chunky_Ks
 (Gary Briggs)
will demo in Booth 48

Tripzero: How do I test this in my car?

- ~$40 scantools access vehicle data and controls

- nOBDy runs on any tablet/smartphone/laptop that supports Qt

http://sf2011.meego.com/program/sessions/vehicle-communications-meego

Tripzero: nOBDy is a GPL'ed plugin framework

Demo in Booth 48

DBus

nobdy

Bluetooth subscriber plugin

Bluetooth Provider plugin

nobdy

DBus
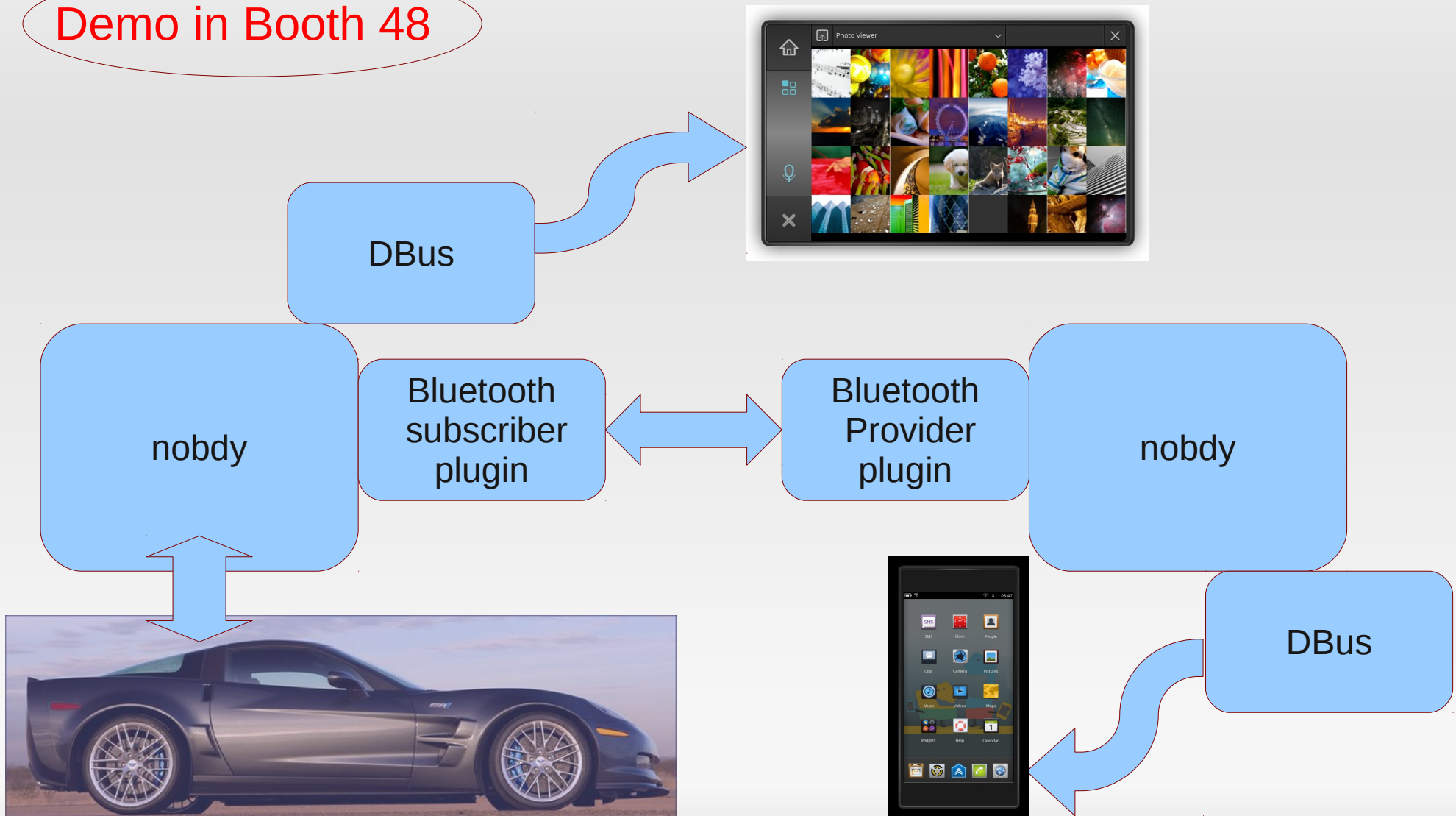
Docs: http://nobdy.wikia.com/wiki/Nobdy_Wiki

OpenXC project: AODPK (Android) CAN scanner

Ford and Bug Labs explore open innovation and crowd sourced, community-driven development
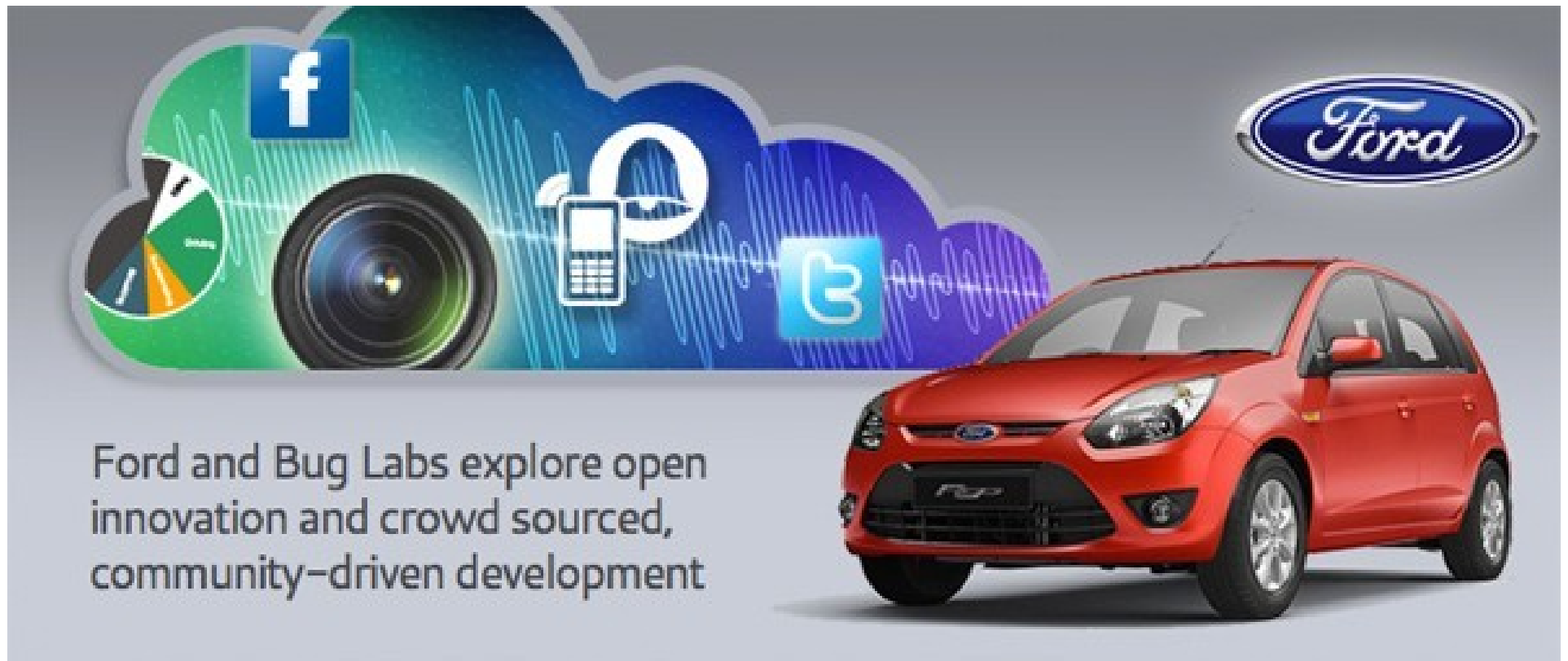
Status: limited developer pre-release

What can we contribute?

- App that autosubmits your destination information from car nav system to casual carpooling website

- "Where's the cheapest gas within a mile of the highway between here and where my tank will be empty?"

- "Bump" pairing with friends' vehicles to enable proximity alerts

- IRC, identica, diaspora, PGP integration

How to get involved

- Work on an automotive or intelligent transport open source project

- Develop for one of the car manufacturer's new app stores

- Buy a car that runs Linux

- Ask car dealers what OS the car runs, and say you would prefer Linux

- "Linux Inside" bumper stickers? Penguin swallowing an MS logo?

Summary: don't let this moment pass!

Public awareness / Media attention

You are here **X**

Opportunity to create new standards

Biz lock-in; regulatory lock-down

Technology Trigger | Peak of Inflated Expectations | Trough of Disillusionment | Slope of Enlightenment | Plateau of Productivity
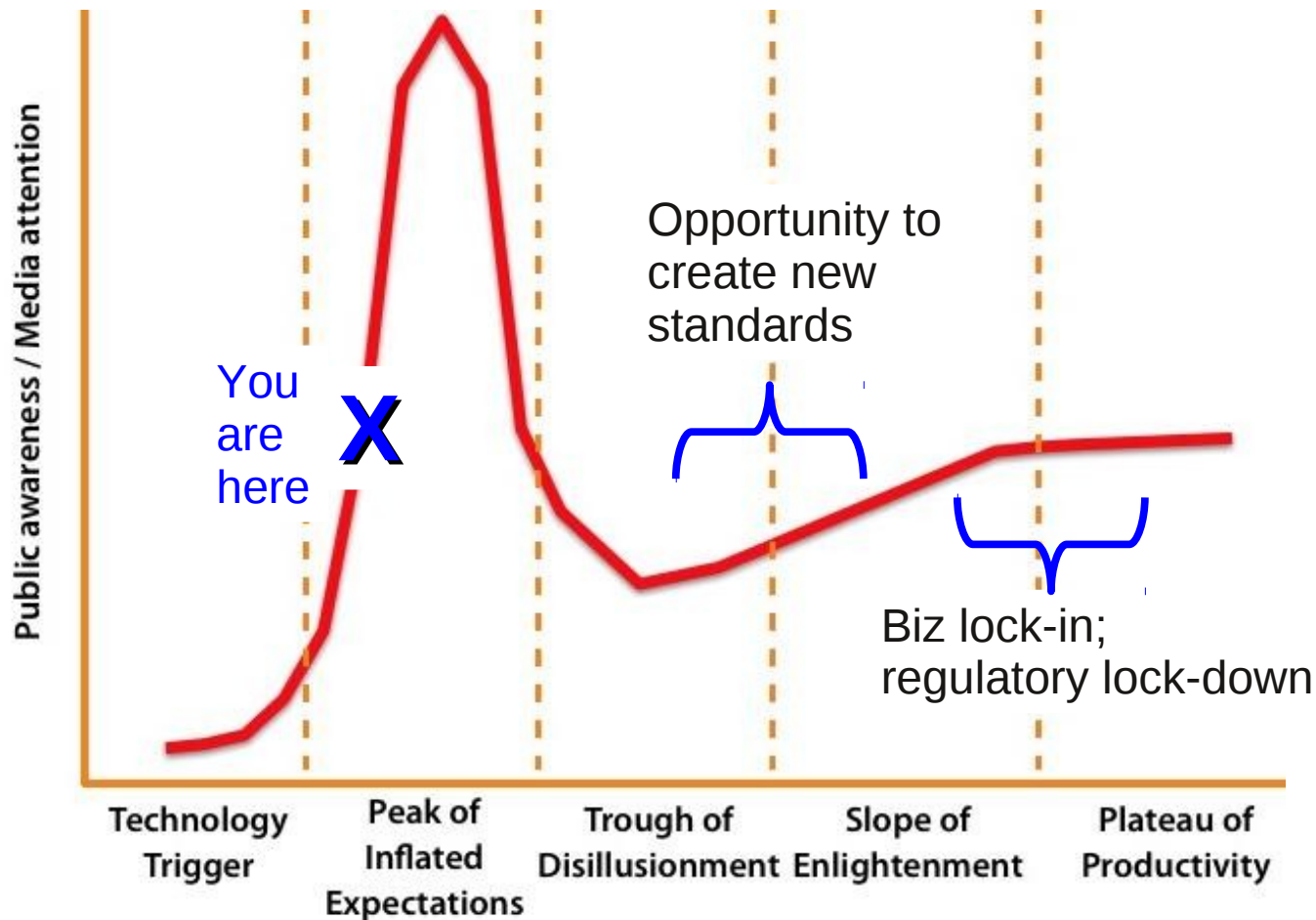
Thanks to Intel and Texas Instruments for HW donations.

Trades parts count for security?

DSP

GPU

Front-seat RT audio
and video
incl. alarms

Atom or ARM SoC
running GNU/Linux

Encapsulated legacy system

Cortex-M

Sensor data R/O

In-dash GPCPU

16-bit MCU
running RTOS

MIPS with
OpenWRT

Atom or ARM
running Android

Control: R/W

CAN and
MOST
buses

Firewall

Backseat entertainment
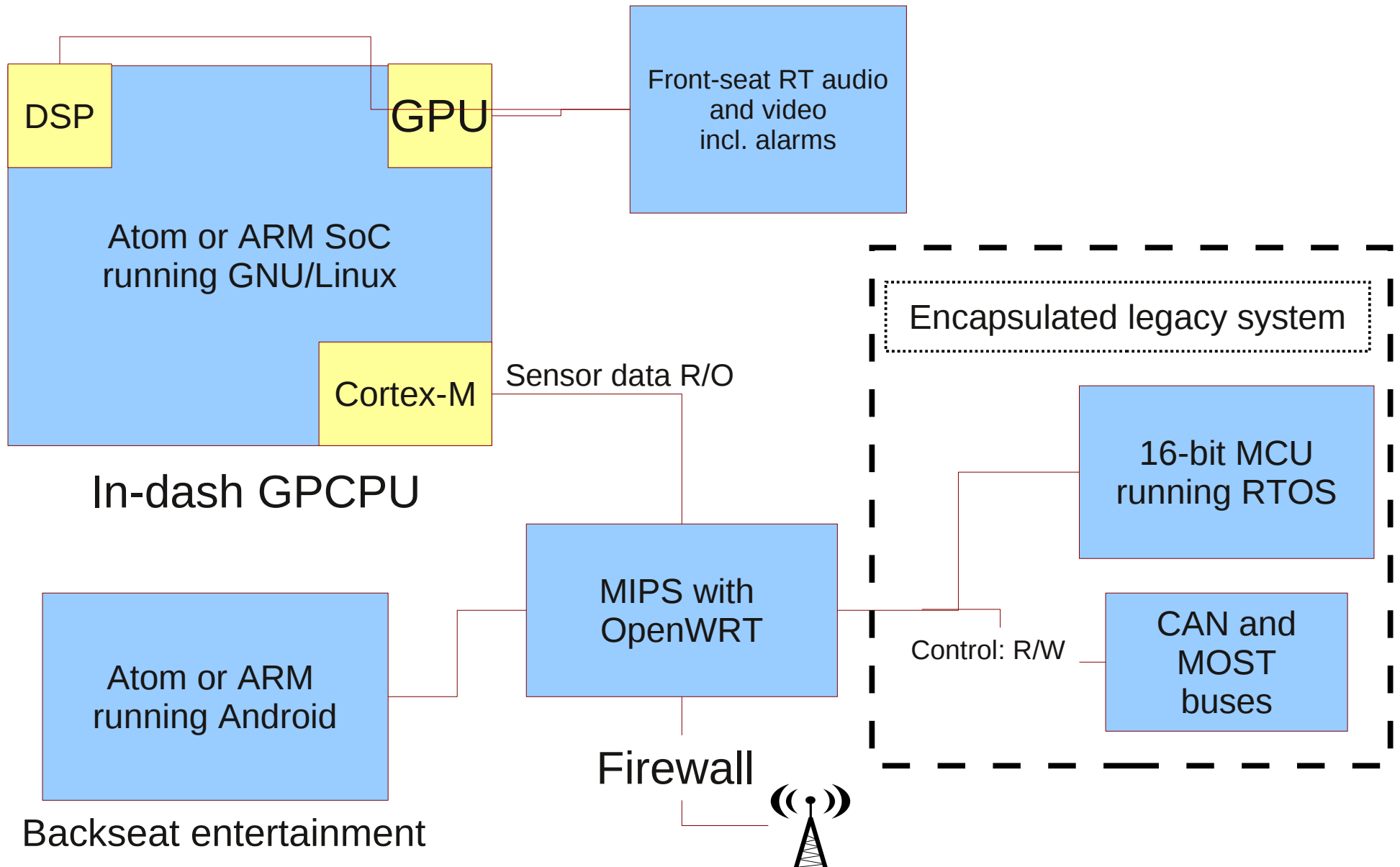
Problem: what IVI HW should devs use?

- ARM dominates, but Atom strong in IVI.

- Atom HW with CAN bus and GPS is costly: use dongles.

- ARM boards (e.g. BeagleBoard) cheaper.

- Multiple displays and controls needed.

- Touch, voice, video gesture, joystick?

Smog check connector = access to vehicle sensors
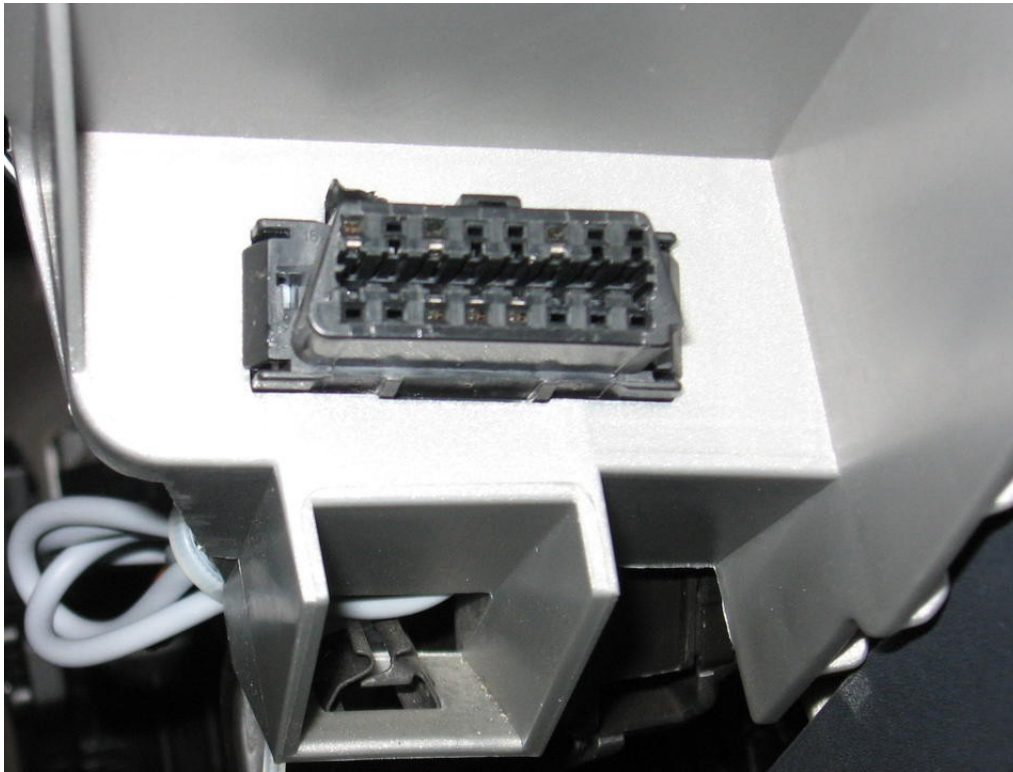
OBD-II connector on left of steering wheel sees dozens of ECUs, sensors and controls via serial bus

GFDL

Features of nOBDy

- Based on Qt toolkit and QML (Qt Modelling Language) – Booths 24 (Qt) and 67 (ICS)

- TCP, Bluetooth, D-Bus support

- Websocket/HTML5 browser interface based on JQuery Mobile

- Provides communications interface to CAN (Controller Area Network) vehicle data bus

- GPLv2, source on gitorious

- Based on libobd, OBDGPSLogger and gpsd projects

- Available as .deb and (soon) RPM packages

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Cadillac User Experience based on MontaVista
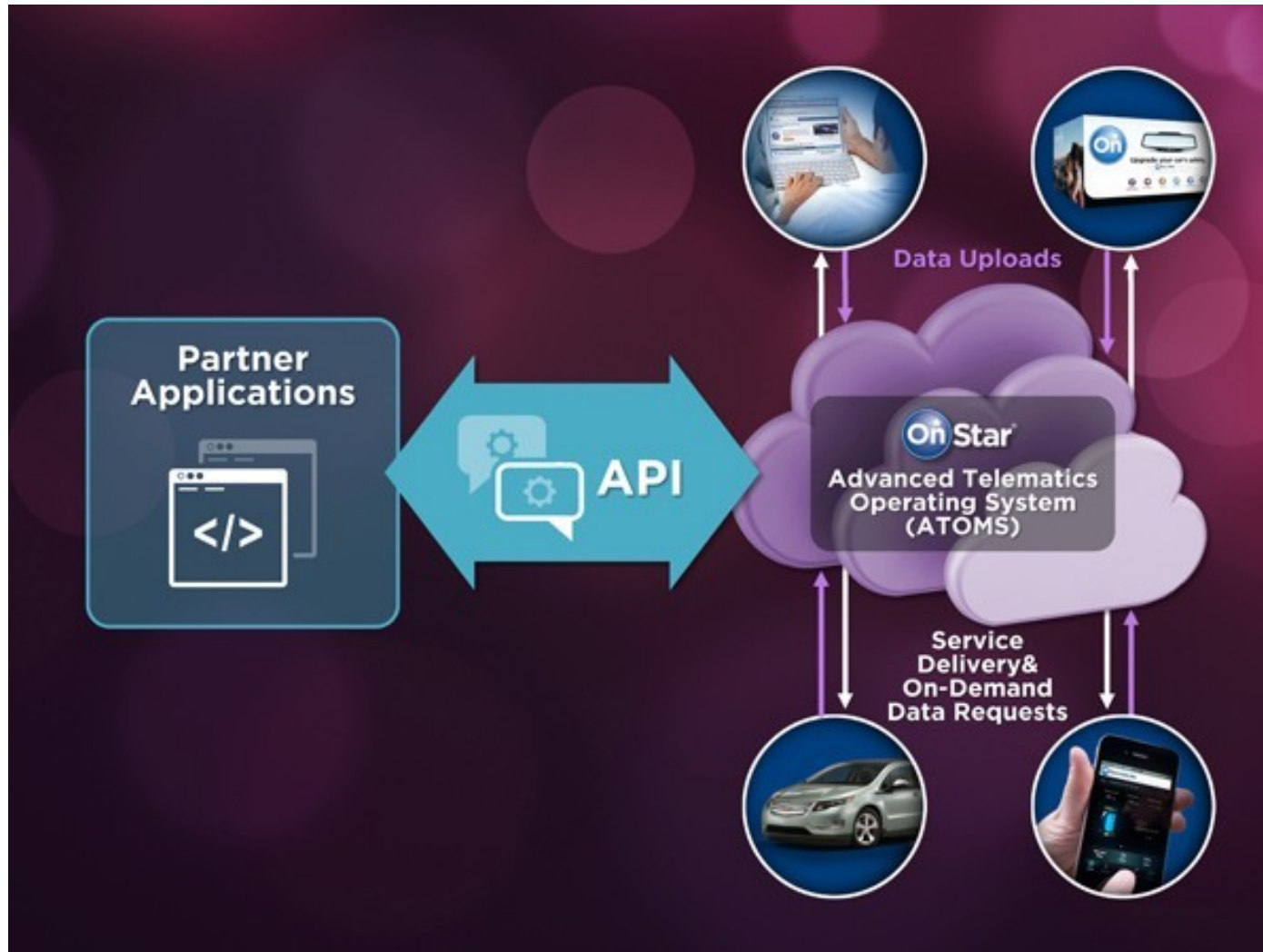
Status: SDK expected, Spring 2012

Back-end "cloud programming" in IVI
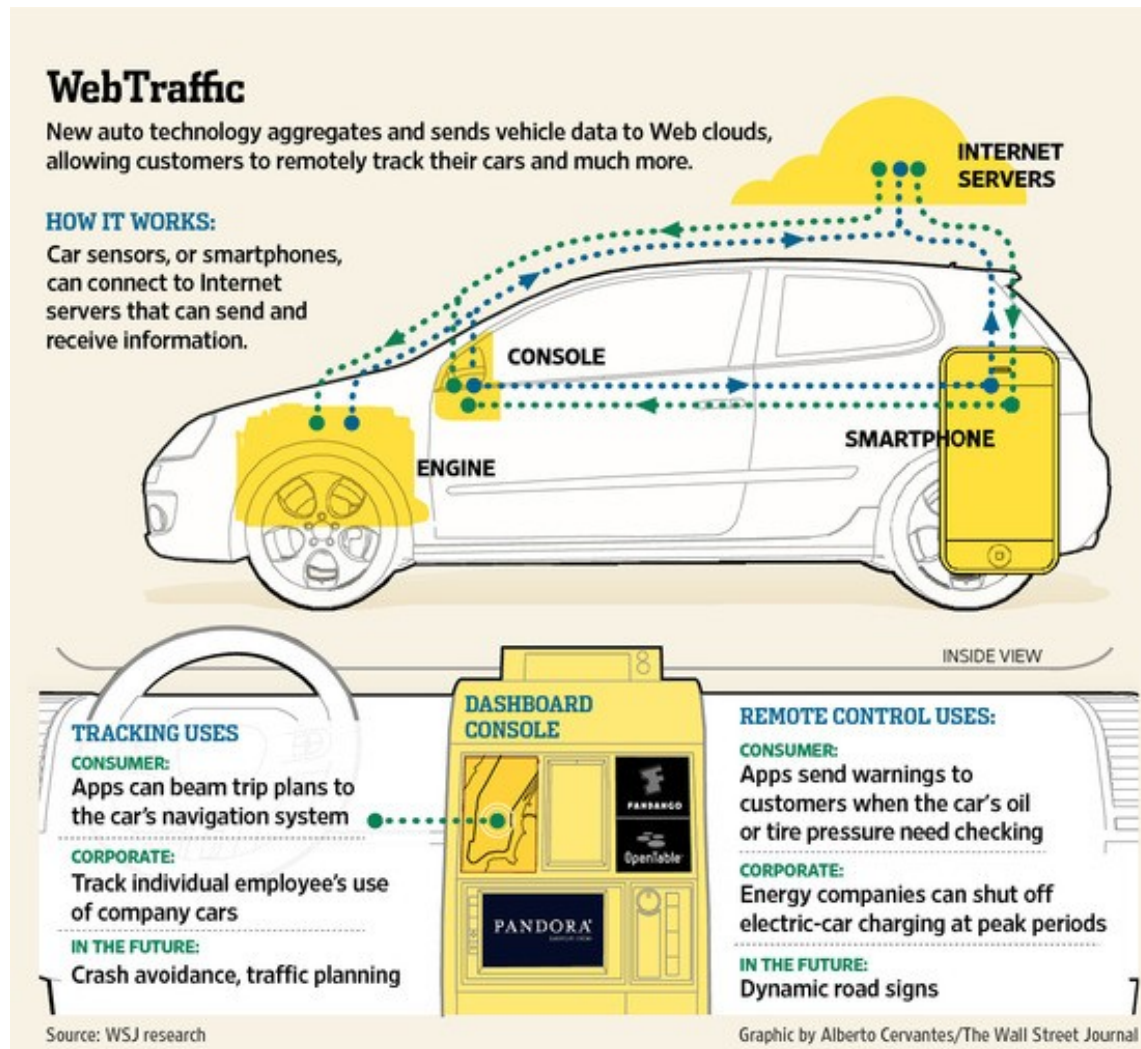
nOBDy's stack

Your Qt, QML or Javascript application here!		

nOBDy plugin framework		

QML	JQuery	HTML5
Qt	OpenLayers	OBDGPSLogger
OpenStreetMap	gpsd	libobd

Linux kernel and device drivers

New plugins that talk TCP can be written in any language.

IVI UX Additional Features

IVI UX: media player, instrument cluster, RSE, navigation, diagnostic surround view, hands-free phone

IVI app frameworks: vehicle sensor data access, vehicle control, Terminal Mode, touch and gesture input

IVI API layer: multi-screen video, multi-zone audio, consumer electronic device connectivity, inertia-based application control

Core OS layer:

Sensor framework	Noise suppression
Split-screen video	OTA software updating
Speech recognition	Tethered device indexing
Speech synthesis	Phone synchronization
Acoustic echo cancellation	Multi-user support

Kernel layer: <250ms boot, power management, vehicle buses

Drivers: automotive button/knob input devices, vehicle data sensors

Courtesy
Nathan P. Willis,
http://tinyurl.com/3m4loer

How to get involved: community projects

- NOBDy wiki:

  http://nobdy.wikia.com/wiki/Nobdy_Wiki

- OBDGPSLogger: http://icculus.org/obdgpslogger/

- LibOBD:

  http://libobd.wikia.com/wiki/Libobd_Wiki

- OBDref: https://github.com/canurabus/obdref

- Mp3car: http://www.mp3car.com/

How to get involved: corporate-backed FLOSS

- OpenXC: http://openxcplatform.com/

- Ubuntu IVI Remix:
  http://linux.softpedia.com/progDownload/Ubuntu-IVI-Remix-Download-78078.html

- Renault R-Link (Android):
  http://www.renault.com/en/innovation/plaisir-et-confort/pages/r-link.aspx

- Bosch-ETAS Busmaster: https://github.com/rbei-etas/busmaster

Opportunity: save energy through *ad hoc* networking
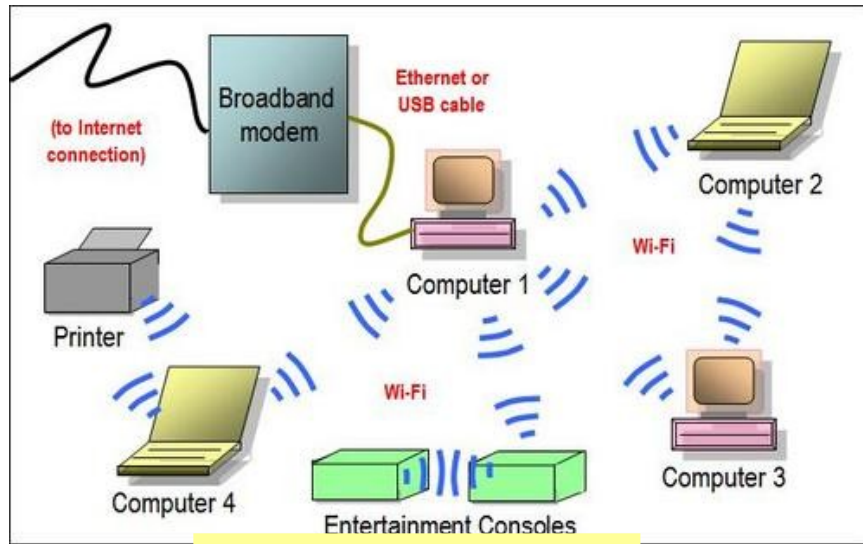
Use this . . .

to save energy . . .

with cars, too: 802.11p WAVE.