Automotive: new frontier for mobile Linux

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Visited Warren, MI in 1992-1994

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Electronic and atomic structure of metastable phases of boron nitride using core-level photoabsorption

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Tracking General Motors' Evolving Technical Interests

Automotive: the Next Frontier for Mobile Linux

Audience: Intermediate Categories: General

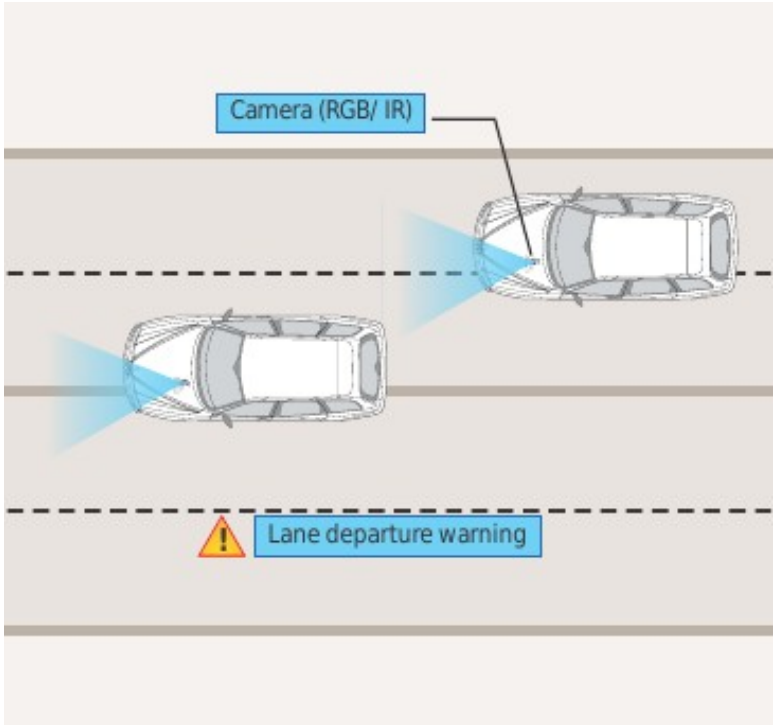
Speaker: Alison Chaiken

Desktop, laptop, phone, tablet . . . car! Which OS will dominate car "in-vehicle infotainment" systems: Windows, Android Linux, WebOS, GNU/Linux or a traditional embedded choice like Angstrom? What are the associated opportunities for app developers and systems programmers? The automotive business model diverges significantly from that of consumer electronics, giving plain GNU/Linux some advantages over Android. Who are the players in automotive Linux and what are their plans? What reference hardware is suitable for testing car apps? I'll show a simple IVI demo running on an x86 tablet.

Outline

- Evolving opportunities for IVI
- HW platforms for IVI development
- nOBDy, ExoPC and Pandaboard demos

What is “in-vehicle infotainment”?

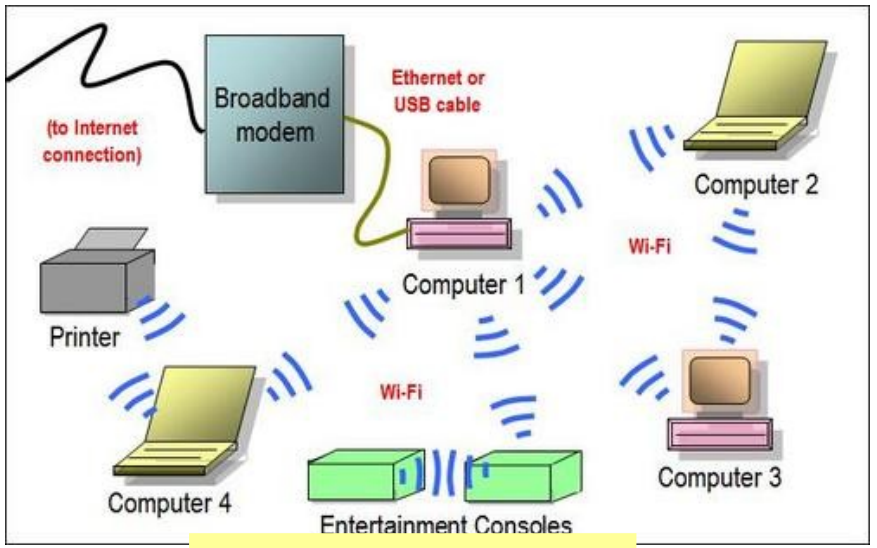


Courtesy Tata Consultancy Services

1st gen: available

2nd gen: pipeline

Opportunity: save energy through *ad hoc* networking

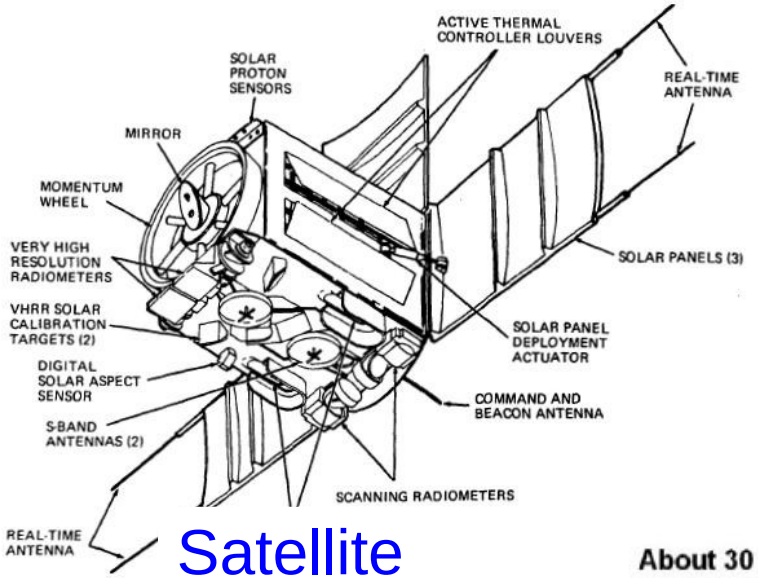


Use this . . .

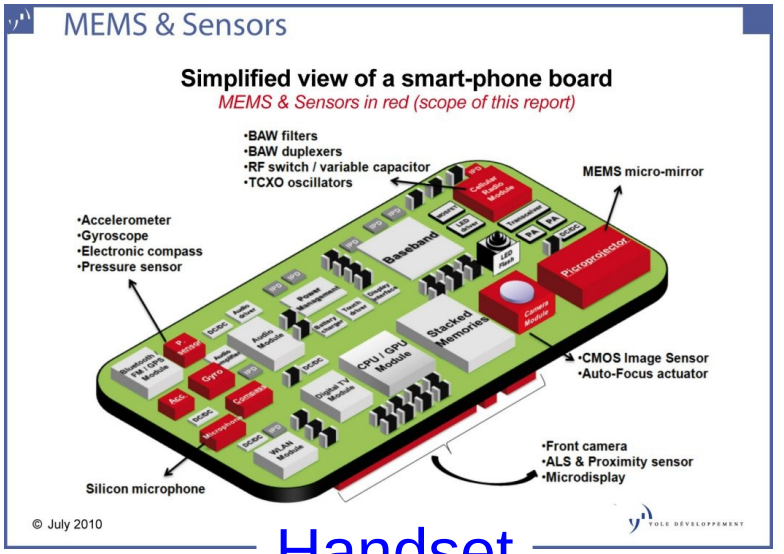
to save energy . . .

with cars, too: 802.11p WAVE.

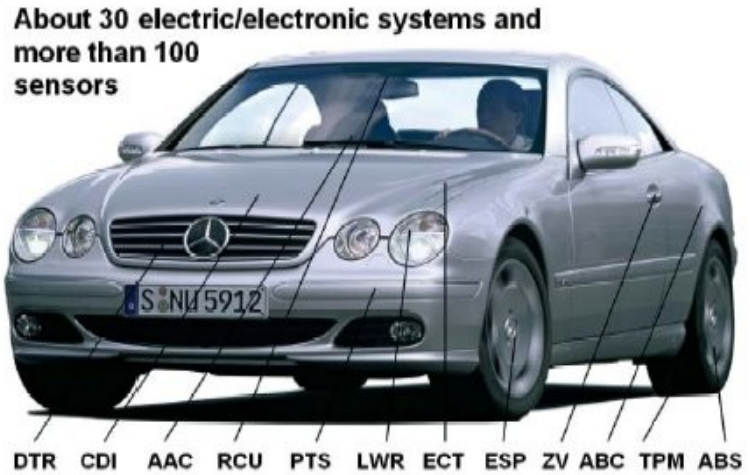
Opportunity: Mobile sensor platform data fusion/mining



Satellite



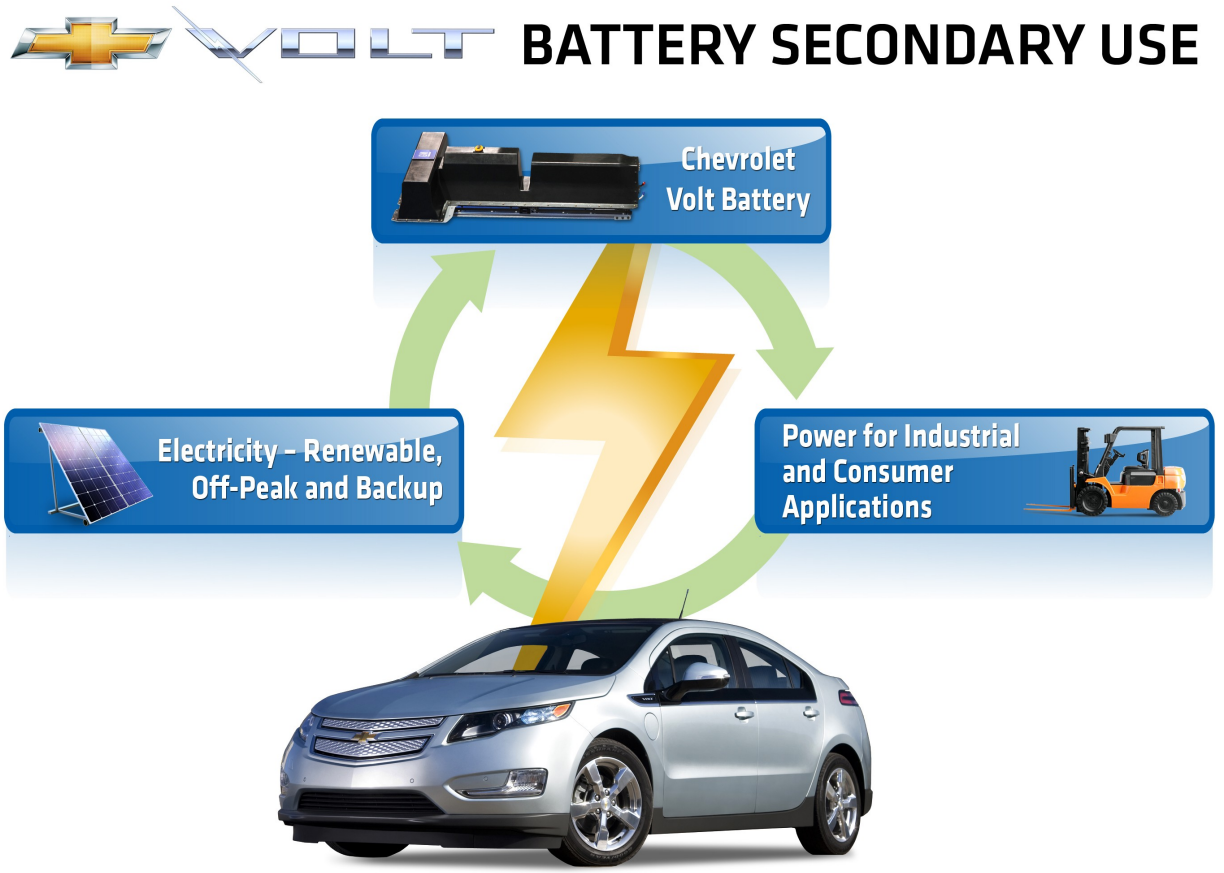
Handset



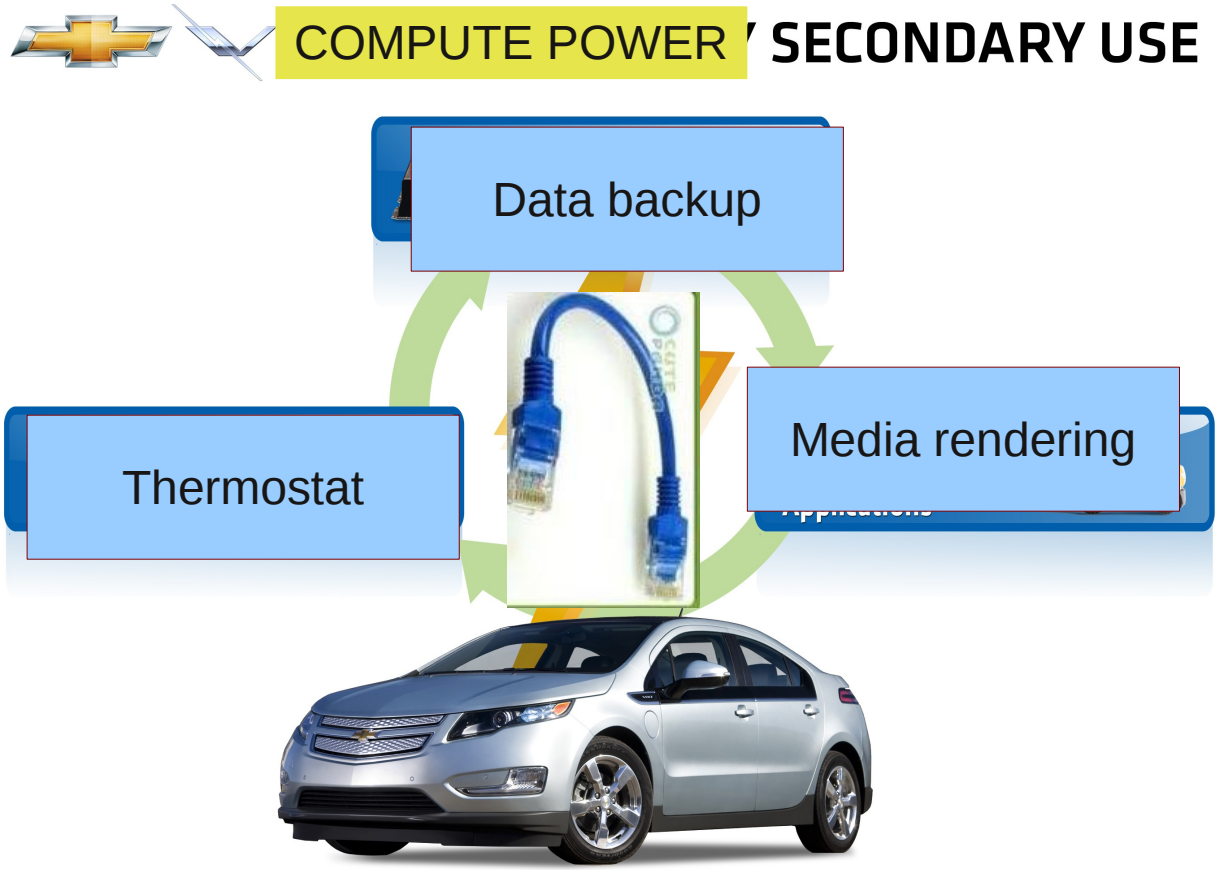
System	Abb.	Sensors			
Distronic	DTR	3	Common-rail diesel injection	CDI	11
Electron. controlled transmission	ECT	9	Automatic air condition	AAC	13
Roof control unit	RCU	7	Active body control	ABC	12
Antilock braking system	ABS	4	Tire pressure monitoring	TPM	11
Central locking system	ZV	3	Elektron. stability program	ESP	14
Dyn. beam levelling	LWR	6	Parktronic system	PTS	12

Figure 1: Car functions and the respective sensors (source: based on DaimlerChrysler)

Familiar idea: car as load-levelling power storage

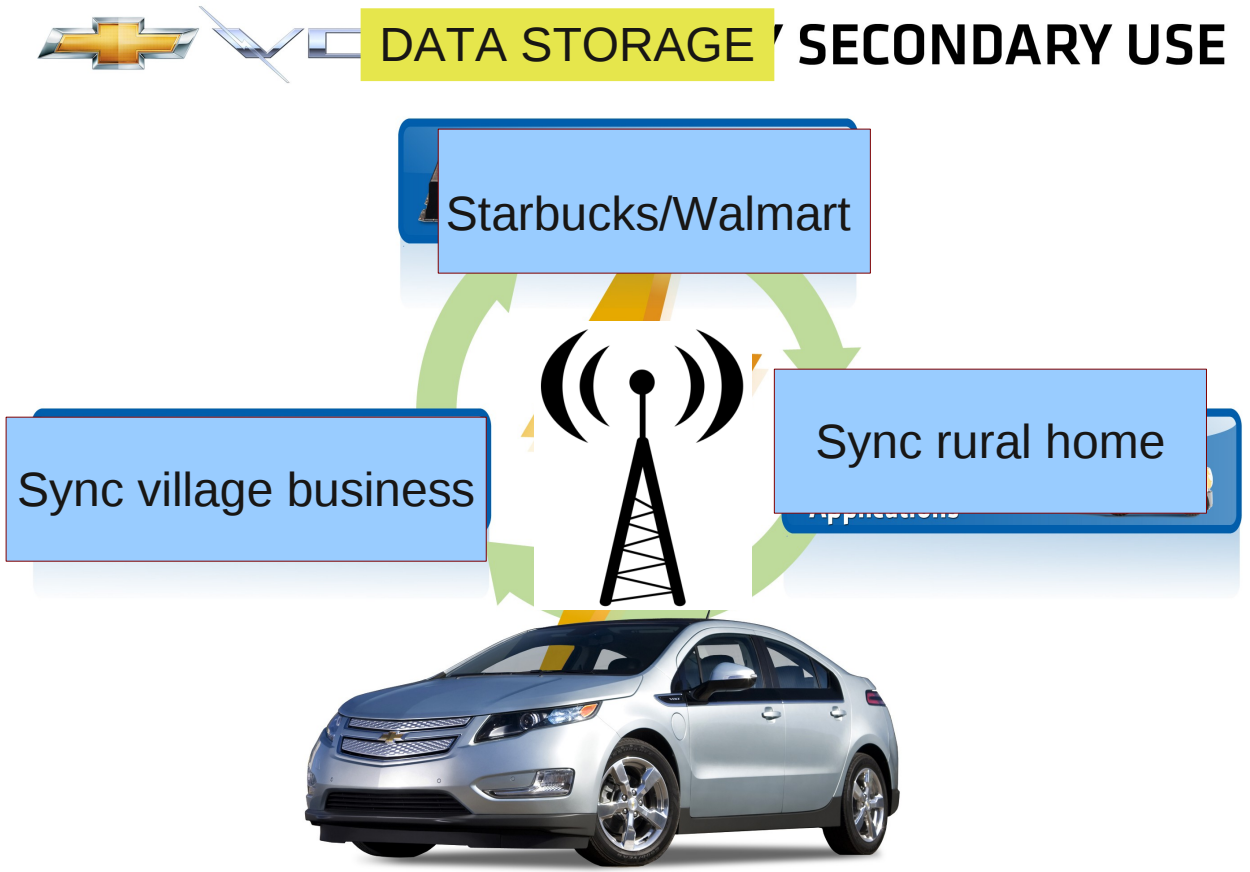


Extension: connected car can be main CPU for the home



Hot water heater, furnace and computer in garage . . .

Extension: From “sneakernet” to “tirenet”

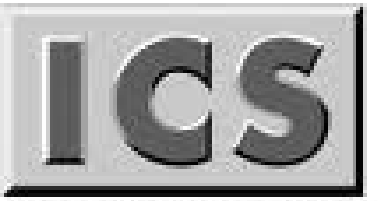


Napster:iTunes::Wardriving:Download as a Service

“Adjacent” business opportunities

- GM does not want to enter smart grid business.
  - ABB does.
- GM does not want to enter the home computer business.
  - A lot of Sili Valley startups do.
- GM does not want to enter the “tirenet” business.
  - Chinese, Indian partners do.

Bay Area IVI participants



New L.A. factory

Silicon Valley Automotive Open Source

Mountain View, CA

Founded Oct 10, 2011

Members	73
Group reviews	2
Upcoming Meetups	1
Past Meetups	1
Our calendar	

Organizers:
Alison Chaiken,
Amar Kona, Gary,
Ronald Bjork

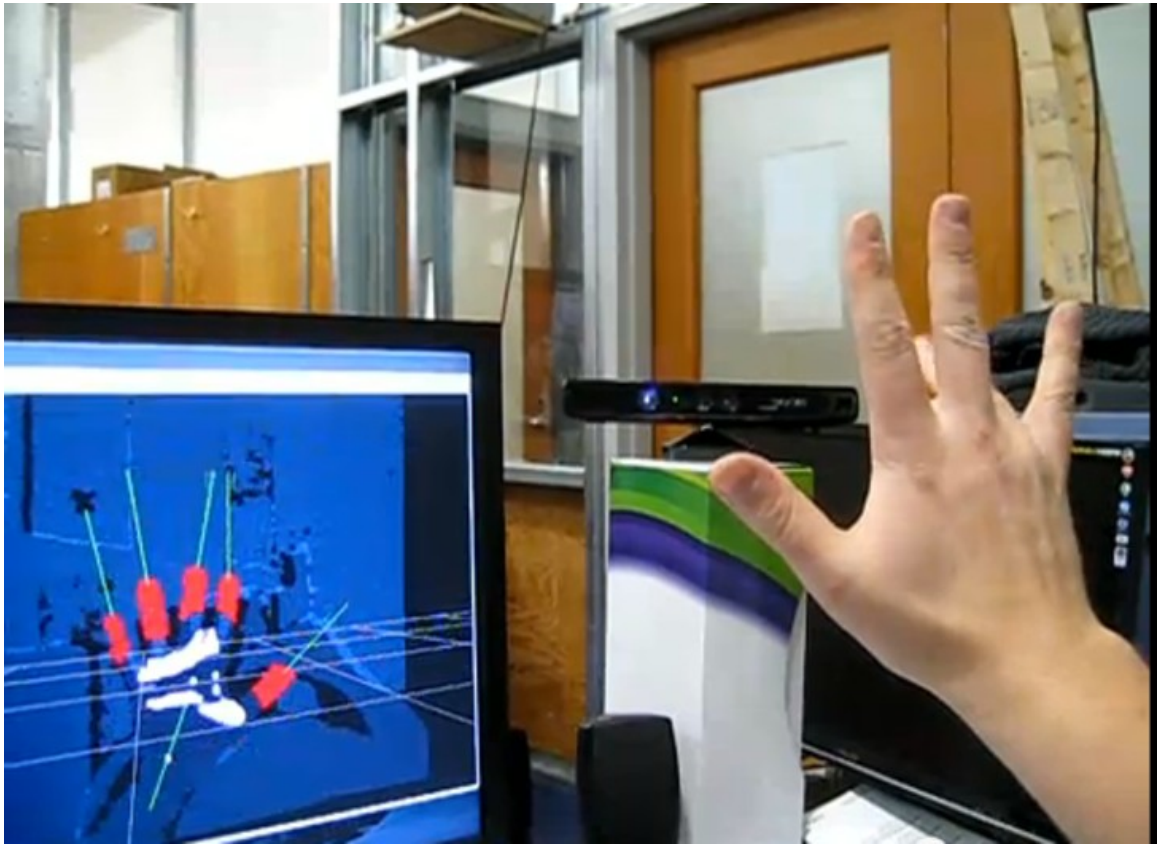
View The Leadership Team

Challenges for IVI

- Security in a multi-user, mobile, often unattended device
- Safety: not “kill -9” but kill dead!
- Novel hardware and architecture
- Not a phone or desktop: little-understood UI/UX

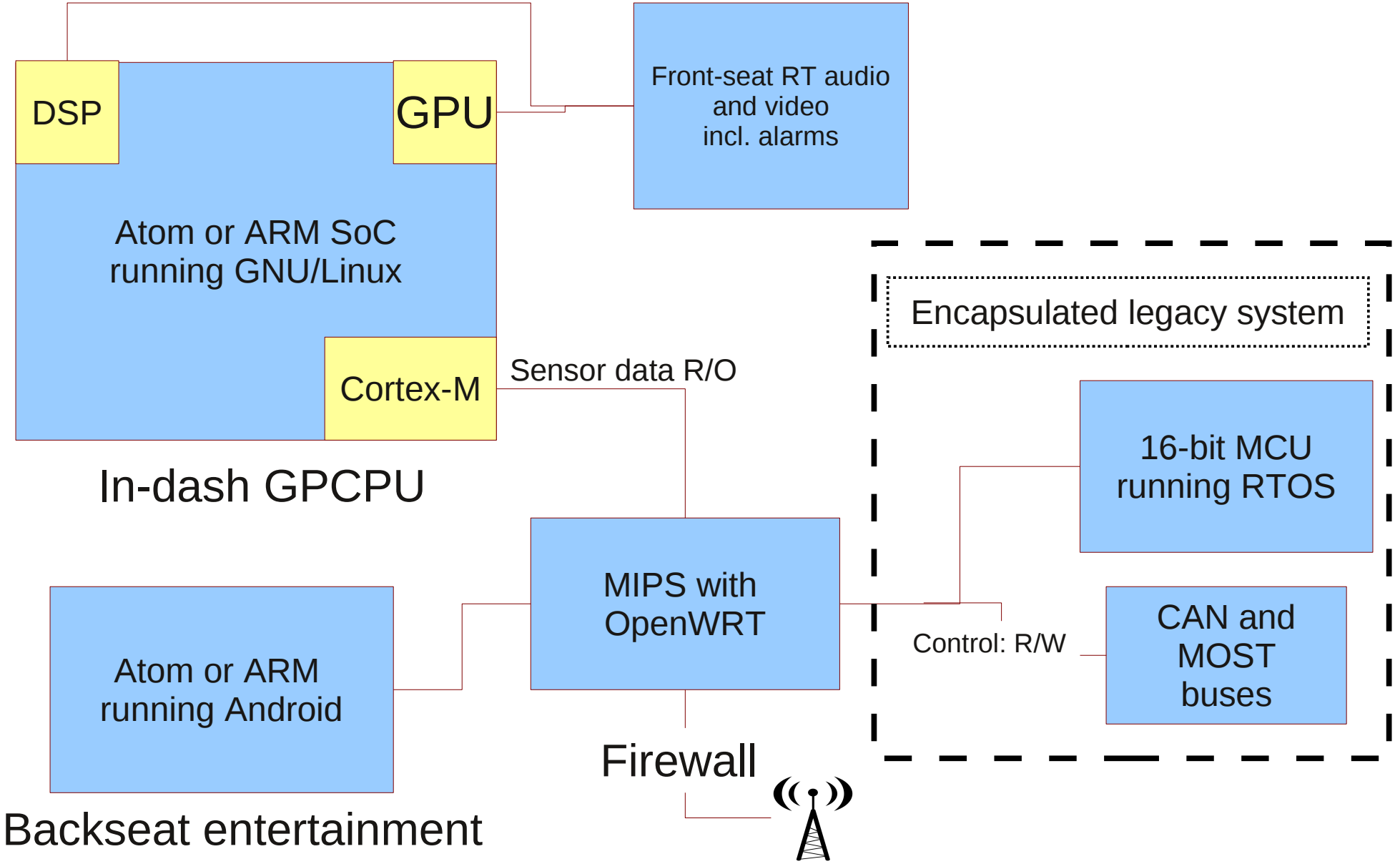
UI: What kind of controls?

- Touchscreen, video gesture, joystick, voice, haptic?



Kinect piano: https://www.youtube.com/watch?v=kf3G-DXqt6Y

Novel architecture trades parts count for security



Maybe Android from Open *Handset* Alliance?

- Inherently single user.
- Text ads required for Android Market?

- Open source, not open development.
- Amazon and B&N more ready to deal?

2011 Linux Kernel Summit: no need to choose?

Many of the changes in the Android kernel have been blocked from merging into the mainline, but Android shipped it anyway, and it now has many millions of users. . . . how we should treat the Android code?

Linus took the microphone and stated that, simply, code that actually is used is the code that is actually worth something. The Android code is certainly being used . . . when code has millions of users, we have to say "yes" to it.

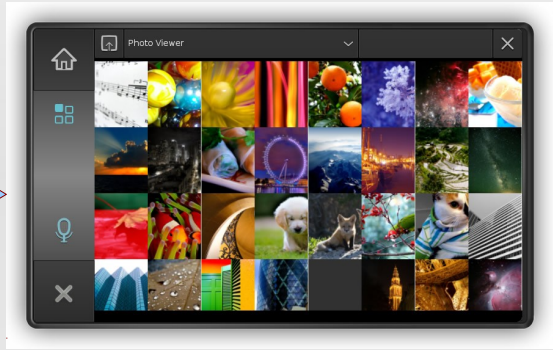
Abridged from https://lwn.net/Articles/464298/

MeeGo IVI 1.2 Home Screen

Intel: Tizen-IVI will have large overlap with MeeGo.

Tripzero: Handset/Tablet + meego ivi

In the near future...



DBus

nobdy

Bluetooth subscriber plugin

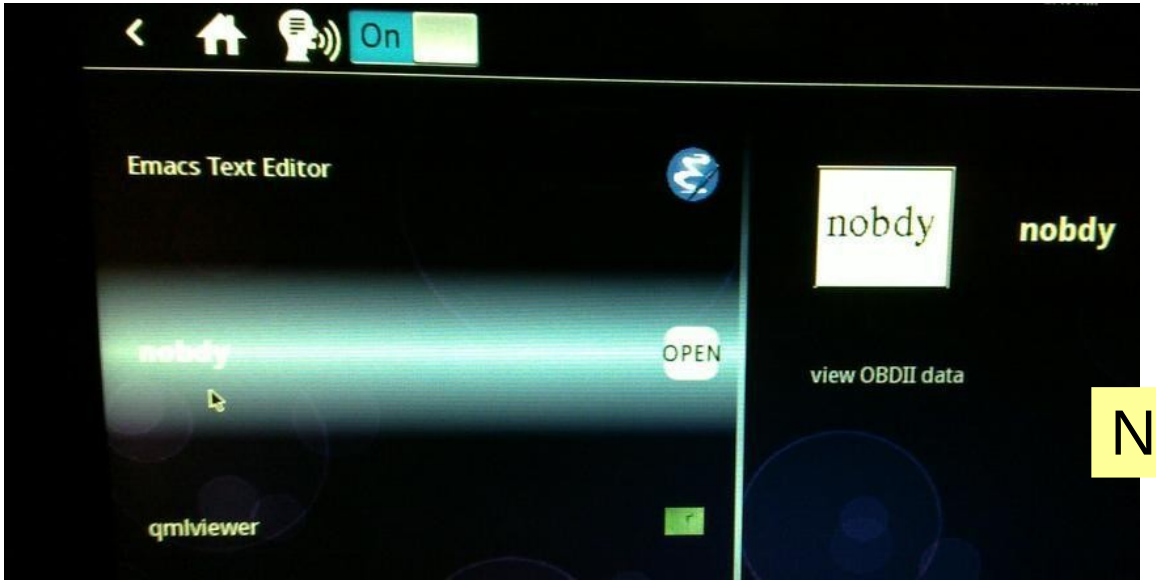
Bluetooth Provider plugin

nobdy

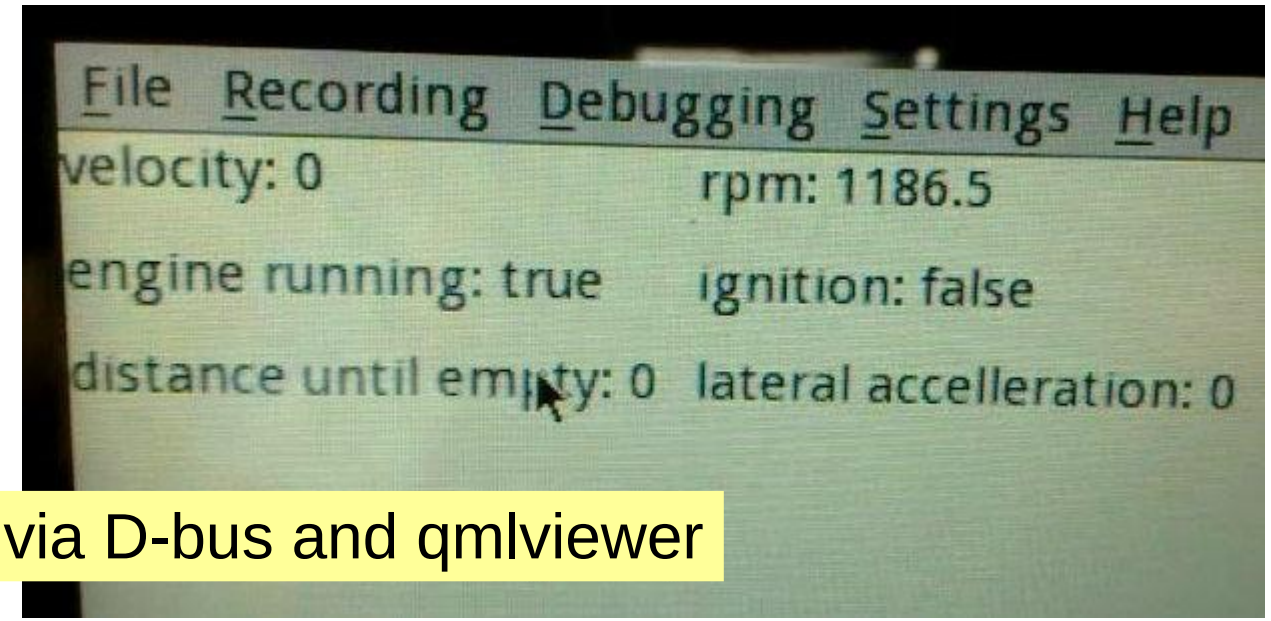
DBus

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

Nobdy on (unsupported) ExoPC Atom Slate and OMAP4 Pandaboard

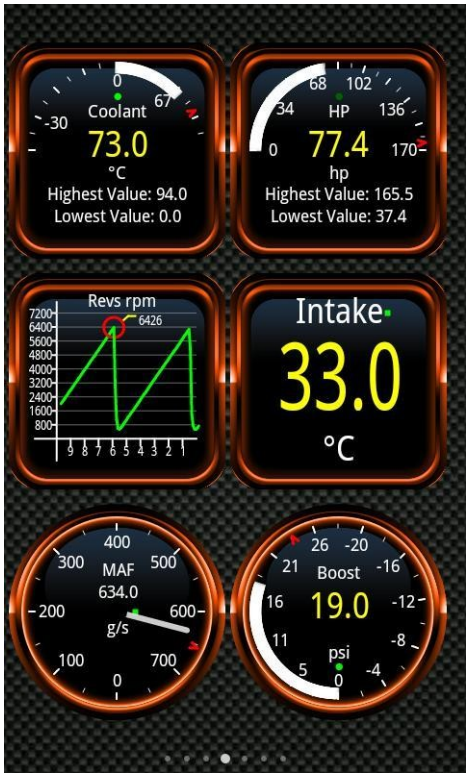


Nobdy in scrollwheel menu

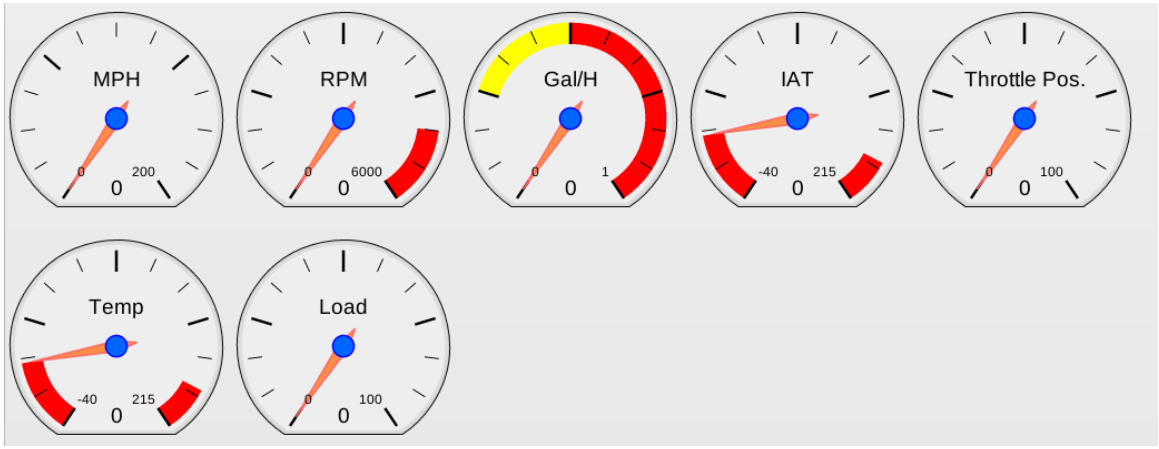


Live data stream via D-bus and qmlviewer

Linux OBDII Software



Torque from Android Market
(not open source)



New nobdy Qjson UI from tripzero

ICS IVI demo by Justin Noel

Goal: real-time mileage display for ICE vehicles

- Real-time display in Prius:
  - Is an important factor in its popularity;
  - Illustrates the user empowerment of timely data
- Real-time mileage is just the beginning of what data-mining can accomplish.
- Killer app: “What's the cheapest gas within 1 mile of the freeway between me and an empty tank? Between me and my destination?”

Summary

- Linux opportunities at all levels: HW, accessories, embedded, platform, apps, entrepreneurs and big companies.
- Finding HW for development remains a problem: iKar PC? IMX53 Quickstart?
- *Many* local companies and developers want to play.
- Prediction: automotive is where Linux will show most growth.

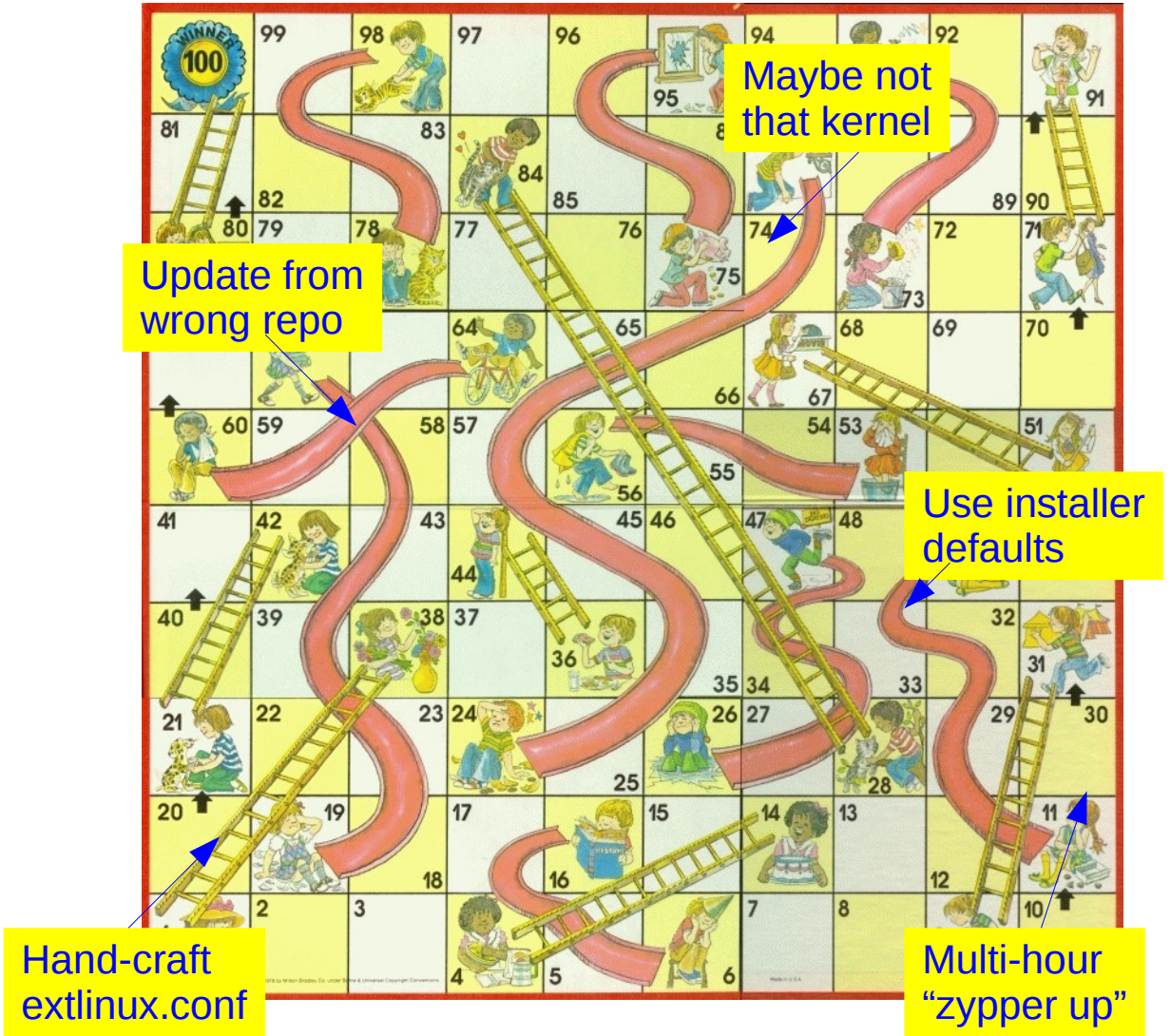
Resources 1: Hardware platforms for IVI

- ARM set-top box: Trimslice, $219 with Arch or MeeGo.
- ARM board: FreeScale i.MX QuickStart, $149 w/ Ubuntu.
- Atom/x86 slate: Ciara ExoPC Vibe, $699 w/ Windows.
- Atom/x86 board: Intel Black Sands, $149 w/ reg, Android, Ubuntu or MeeGo.
- ARM boards: T.I. BeagleBoard ($149), PandaBoard ($179), Ubuntu or Android.
- Multiple displays and controls needed.
- Touch, voice, video, joystick, haptic devices and drivers?
- GPS dongles, CAN daughter cards . . .

Resources 2

- IVI wiki: http://wiki.meego.com/In-vehicle
- Official site: http://meego.com/downloads/releases/1.2/meego-v1.2-in-vehicle-infotainment-ivi
- Mailing list archive: http://lists.meego.com/pipermail/meego-ivi
- Mp3car.com
- #linuxice and #meego-ivi IRC on freenode.net
- nOBDy: wiki.openice.org/index.php?title=Nobdy
- My notes and instructions
  - on ExoPC: http://wiki.meego.com/MeeGo_IVI_on_ExoPC
  - on Pandaboard: http://wiki.meego.com/Hardware-accelerated_graphics_on_Pandaboard_using_MeeGo

MeeGo Hardware Adaptation Process



MeeGo-IVI on Atom and ARM Demo HW

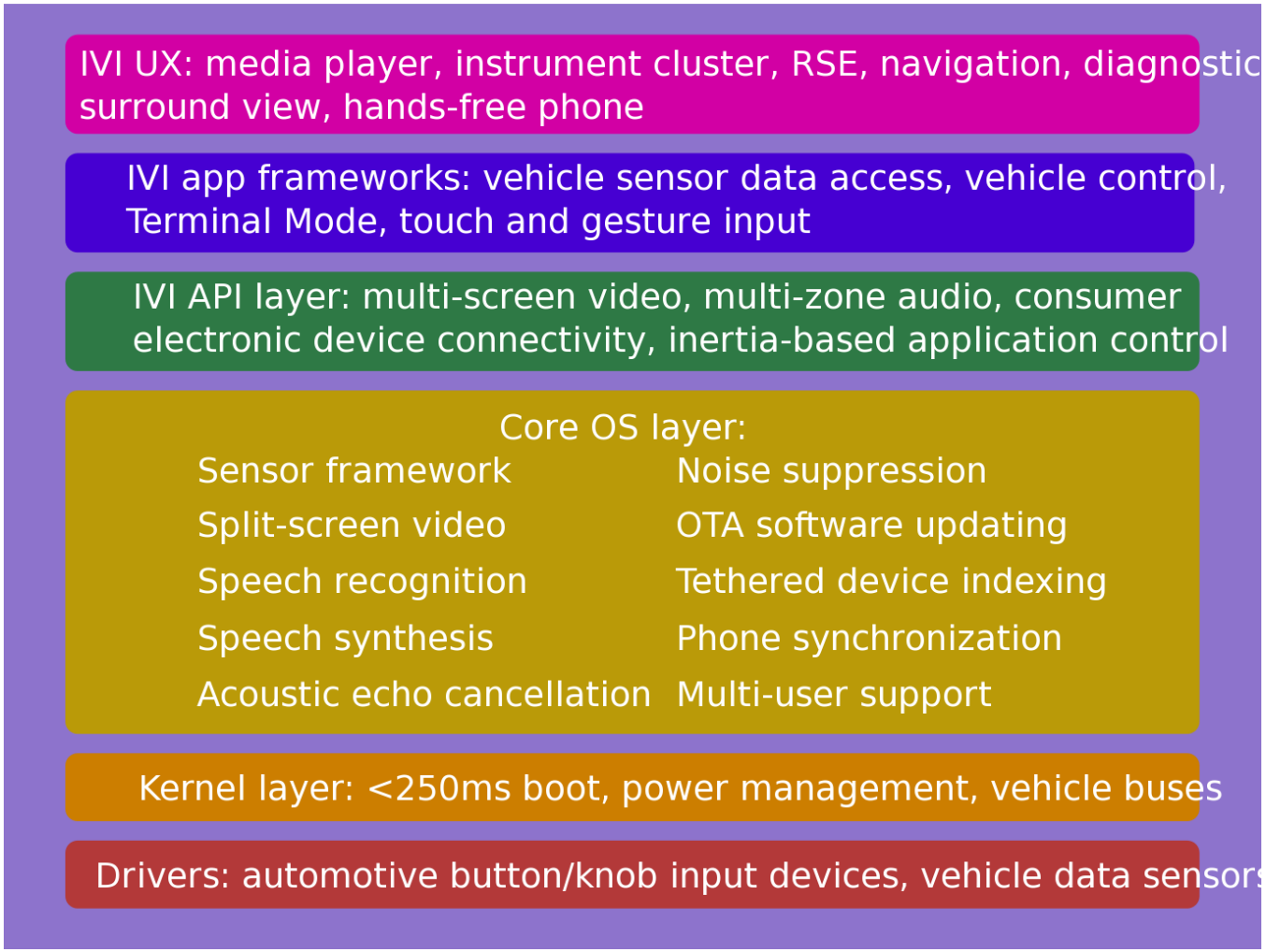
- No SW support for HW available to small-medium businesses.
- Running IVI on ExoPC requires a mash-up of “Tablet Preview” and IVI UXes.
- Meego-ivi repos support EMGD graphics only
  - “zypper update” auto-overwrites drivers and X11 SO libraries.
- Stopped work on ARM-based Pandaboard due to missing hardfp PowerVR driver.

Hardware/Driver Challenge

CAN bus, MOST bus, wheel rotation sensors, oil level . . .

Not just RT audio, but RT video too!

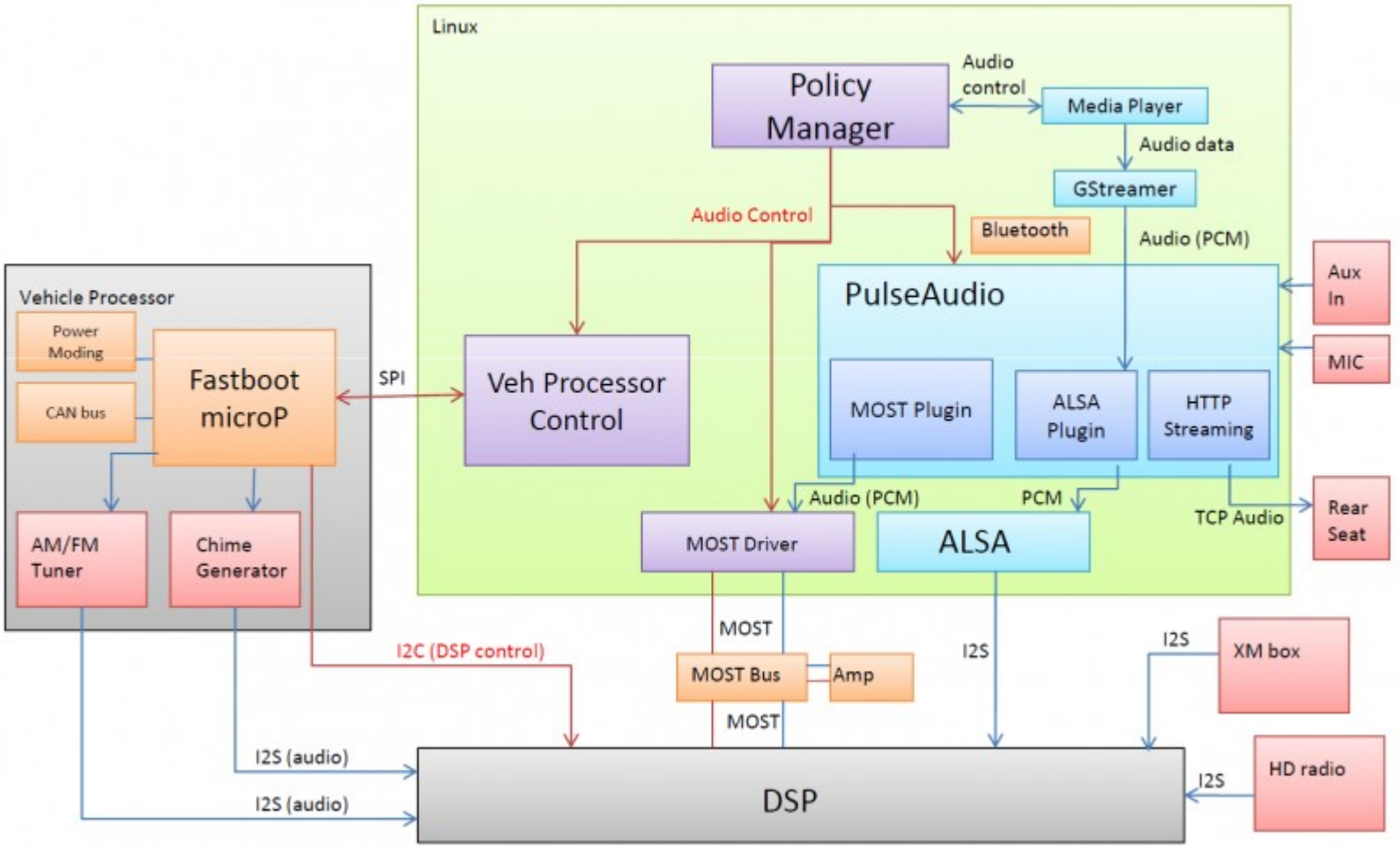
IVI UX Additional Features: MeeGo/Tizen



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

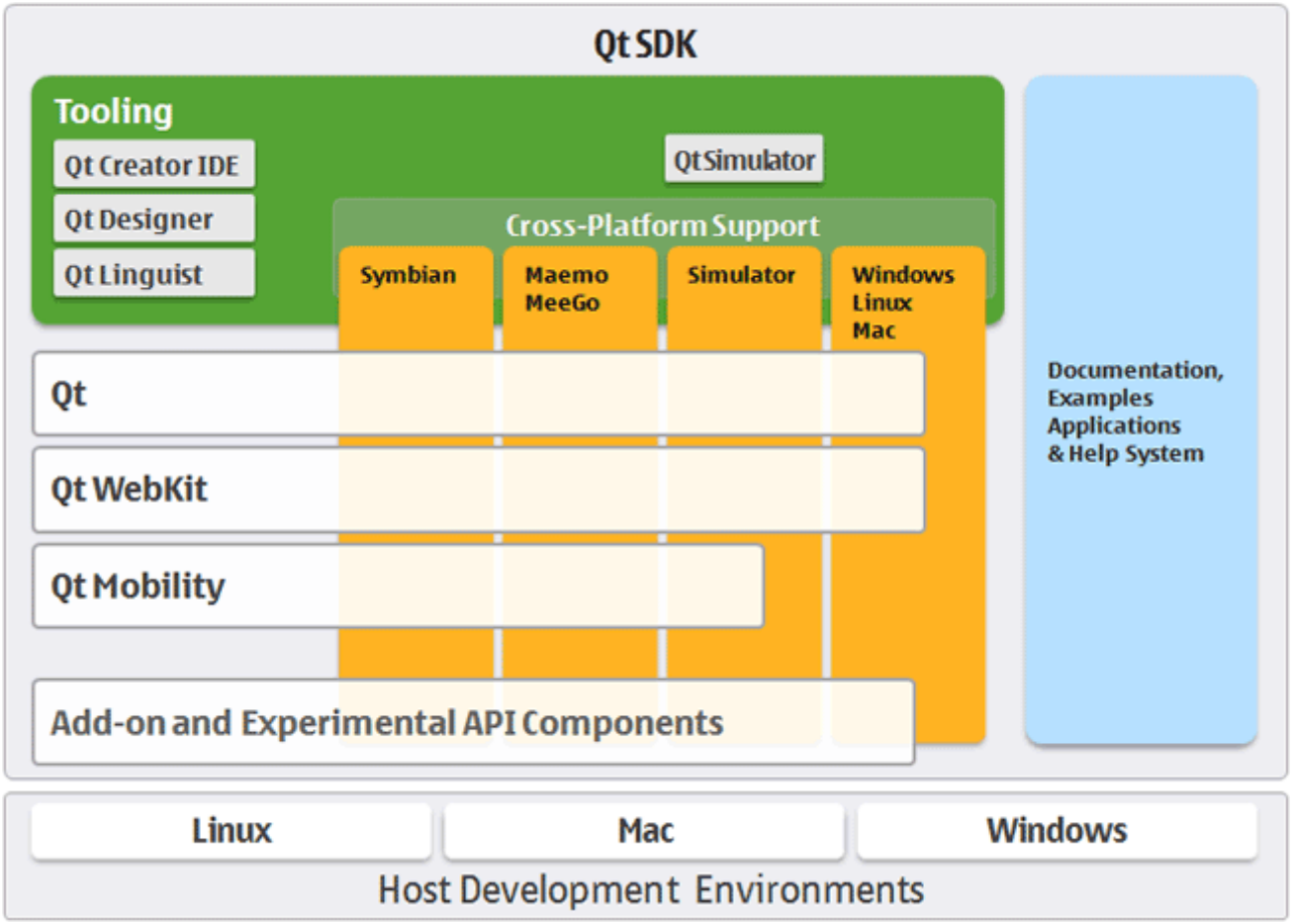
Many automotive players, few public announcements.

MeeGo IVI Audio Architecture



Courtesy Laci Jalics, Delphi.

How about MeeGo?



MeeGo = lightweight GNU/Linux with a Qt face.

100-Member auto SW alliance endorses Linux

3 August 2011, 13:38

« previous | next »

First four GENIVI compliant solutions approved

The GENIVI alliance for In-Vehicle Infotainment has announced a new compliance programme for member companies and the first four companies to offer approved compliant solutions: Canonical's Ubuntu IVI Remix, Mentor Graphics' Embedded IVI Base Platform, MontaVista's Automotive Technology Platform and Wind River's Platform for Infotainment.

All of the approved solutions run on Intel Atom and ARM architectures, except for MontaVista's

GENIVI is promulgating Linux standards for auto space.

Security: Linux isn't ready either

Microsoft Windows Automotive

Backseat kids changing nav system's destination . . .
mechanic at body shop installs malware.

Safety:UI Design Space is Little Understood

What information does the driver need?

Prevent entertainment system from hogging resources (incl. Driver!).