Automotive: new frontier for mobile Linux

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Advertisement: who wants to bus-pool to **SCALE**?

Katy's shuttle bus
100-Member auto SW alliance endorses Linux

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

Bay Area IVI participants

New L.A. factory
Outline

• Automotive software systems: IVI

• Major IVI projects and platforms

• HW platforms for IVI development

• nOBDy and ExoPC demos
What is “in-vehicle infotainment”?

What “infotainment” calls to mind

What IVI could be

Courtesy Tata Consultancy Services
3 potential novel auto apps

- Saving fuel with *ad hoc* convoys
Opportunity: save energy through *ad hoc* networking

Use this . . . to save energy . . .

with cars, too: 802.11p WAVE.
3 potential novel auto apps

- Saving fuel with *ad hoc* convoys
- Car as mobile data collection platform
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Opportunity: Mobile sensor platform data fusion/mining

Satellite

Handset

Figure 1: Car functions and the respective sensors (source: based on DaimlerChrysler)
3 potential novel auto apps

- Saving fuel with *ad hoc* convoys
- Car as mobile data collection platform
- Car as giant portable CPU and battery
Inserting smarts into big dumb docking stations

Dock the Atrix . . .

. . . or dock the car?

Cars can tether and sync rural businesses and homes?
4 challenges for IVI

- Security in a multi-user, mobile, often unattended device
Challenge 1: security

Backseat kids changing nav system's destination . . . mechanic at body shop installs malware.
4 challenges for IVI

- Security in a multi-user, mobile, often unattended device

- Safety: not “kill -9” but kill dead!
Challenge 2: safety

Driver gets alarms and has read-only access to many parameters.

Prevent entertainment system from hogging resources (incl. Driver!).
4 challenges for IVI

- Security in a multi-user, mobile, often unattended device
- Safety of a complex system with power to kill
- **Unique HW: device drivers!?!**
Challenge 3: HW needs

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

Not just RT audio, but RT video too!
4 challenges for IVI

- Security in a multi-user, mobile, often unattended device
- Safety: not “kill -9” but kill dead!
- Unique hardware: device drivers?!
- Not a phone or desktop: little-understood UI/UX
Game-like Controls, Real Cars?

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

Maybe what we want is Android . . .

from the Open *Handset* Alliance?
Why consider MeeGo? (or Tizen)?

Closer to traditional GNU/Linux distro than Android.
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
- Split-screen video
- Speech recognition
- Speech synthesis
- Acoustic echo cancellation
- Noise suppression
- OTA software updating
- Tethered device indexing
- Phone synchronization
- Multi-user support

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

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

Many automotive players, few public announcements.
MeeGo IVI 1.2 Home Screen

Intended to be reskinned, not as a shipping product.
Example: tripzero's nobdy OBDII/CAN scanner

OBD-II connector on left of steering wheel

Scan tool (USB to OBDII) available from Amazon, etc. about $35
Tripzero: How do I test this in my car?

- Elm-compatible scantool
- Any tablet/smartphone/laptop that runs meego

http://sf2011.meego.com/program/sessions/vehicle-communications-meego
Tripzero: Handset/Tablet + meego ivi

In the near future...

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

Nobdy in scrollwheel menu

Live data stream via D-bus and qmlviewer
Goal for nOBDy

Open-source **ICS IVI demo** by Justin Noel
Summary

- Linux opportunities at all levels: HW, accessories, embedded, platform, apps, entrepreneurs and big companies.

- Finding HW for development remains a problem.

- Many local companies are participating =>> jobs.

- 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 IVI Audio Architecture

 Courtesy Laci Jalics, Delphi.
How about MeeGo?

MeeGo = lightweight GNU/Linux with a Qt face.
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 graphics driver.
MeeGo Hardware Adaptation Process

- Update from wrong repo
- Hand-craft extlinux.conf
- Maybe not that kernel
- Use installer defaults
- Multi-hour "zypper up"