Developing Automotive Linux

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Hyperlinks in blue.
Who's using Linux in cars?
The GENIVI Alliance Membership (www.genivi.org)
Automotive Grade Linux participants
## Current Public Status of Automotive Linux

<table>
<thead>
<tr>
<th>OEM</th>
<th>Confirmed Operating system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiat-Chrysler Blue&amp;Me (500, Delta), Kia Uvo</td>
<td>Microsoft Windows Embedded Automotive</td>
</tr>
<tr>
<td>Ford (pre-2016)</td>
<td>MyTouch/Sync-Microsoft; OpenXC-Android</td>
</tr>
<tr>
<td>General Motors, Tesla, Volvo, Geely, BMW (2016+), Infiniti (Q50)</td>
<td>GENIVI Linux</td>
</tr>
<tr>
<td>Renault R-Link</td>
<td><em>native</em> Android Linux</td>
</tr>
<tr>
<td>Jaguar Land-Rover, Toyota</td>
<td>Tizen/Automotive Grade Linux</td>
</tr>
<tr>
<td>Honda (older Accord, Odyssey, Pilot), Audi (A8L, Q5, A6), BMW (older 7-series and M models), Chrysler, Daewoo, GM (OnStar), Hyundai, Porsche, Renault (SM7), Mercedes (S- and C-class), Ford (2016+)</td>
<td>QNX</td>
</tr>
</tbody>
</table>

Oversimplified: each vehicle runs more than one OS.
Automotive computing mixes mission-critical and “infotainment”

Microcontrollers typically run AUTOSAR rather than general-purpose OS.
How is Android deployed on automotive platforms?
The GENIVI Alliance Will Offer an Android Auto™ Interface

January 12, 2015  by John Day

Automotive Software Developers Will Have an Open Interface to Google’s Latest Android Auto Technology.

The GENIVI® Alliance plans to deliver an open interface to Android Auto to further enable automakers with open solutions for their infotainment products.

GENIVI will fund the development and will release the code for the interface with an open source license, hosted at http://projects.genivi.org. Deployment of Android Auto will require a licensing arrangement with Google.
Common automotive Android deployments

Based on a slide by Felix Baum, Mentor Graphics.
Linux containers and hypervisors

- LXC is
  - similar to BSD jails and Solaris zones.
  - the basis for widely popular Docker.
- LXC requires guests to share a Linux kernel but not platform SW.
- Hypervisor guests can run different kernels.
- Hypervisor securely manages interguest comms and device access.
Alternative developer-friendly ways to get started with automotive Android
CES 2015: Parrot RNB6 aftermarket Android head unit

Parrot RNB6 (project code name) is an exceptional Android 2-DIN Infotainment Navigation System. Developed with safety in mind, this revolutionary head-unit leverages Parrot’s extensive expertise in head-unit conception, voice recognition, Android operating system (Lollipop 5.0) and wireless technology to offer a smarter, safer and more innovative driving experience.
OpenXC Platform

OpenXC is an open source hardware and software platform that lets you extend your vehicle with custom applications and pluggable modules.

Includes encrypted proprietary vehicle data from Ford and Chrysler.
Resources

- GENIVI (mailing lists, package downloads)
- Automotive Grade Linux (mailing lists, images, downloads)
- Baserock (free installable images)
- Android in LXC container how-to
- OpenXC platform (github, hardware for purchase)
- More automotive software slides
- Mentor Embedded automotive solutions
Summary

- Android Auto (and Apple CarPlay) are must-haves for automakers.

- Android deployment takes a variety of forms.

- Android will not boot “on the metal” in most vehicles.

- Android and Linux still struggle against incumbent QNX.
Another view of automotive networks