A Paravirtualized Android for Next Generation Interactive Automotive Systems

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Introduction
➢ Aim to support Next Generation Interactive Automotive Systems
  ➢ In-vehicle Infotainment (IVI) System
    ➢ Familiar UI, Navigation facility, HVAC control
    ➢ Multimedia audio and video playback
    ➢ Advanced Driver Assistant Services (ADAS)
      ➢ Lane detection, cruise control, etc.
➢ Our goal is an integrated single-board solution:
  ➢ Android as user-interface to configure vehicle features and settings
  ➢ A single-platform CAN-bus network concentrator

Quest RTOS + Android OS (for IVI)
Quest RTOS + Yocto Linux (for IC)

Software Architecture
System design is based on the Quest-V partitioning hypervisor.

Advantages
➢ Familiar and rich user-interface provided via Android
➢ Real-time and predictable I/O in Android
➢ Secure and isolated I/O for sensitive devices such as USB-CAN devices
➢ Modular software development by the car manufacturer and the Android developer community

Implementation
➢ Android paravirtualization required modification of 126 lines of kernel code.
➢ Physical Address Extension is supported in Quest-V for Android.
  ➢ 52-bits memory address
➢ Advanced Vector Extensions feature is allowed in Android guest for graphics acceleration.

Evaluation
Startup times:

<table>
<thead>
<tr>
<th></th>
<th>Vanilla Android</th>
<th>Paravirtualized Android in Quest-V</th>
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<tbody>
<tr>
<td>Booting Android</td>
<td>16.6 s</td>
<td>23.7 s</td>
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<tr>
<td>IVI App Startup time</td>
<td>49 s</td>
<td>59.2 s</td>
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I/O Performance:

Conclusions
An integrated single-board solution for next generation interactive automotive system is proposed based on the Quest-V hypervisor, with Android as the user-interface.

Reference: www.questos.org