

A Paravirtualized Android for Next Generation Interactive Automotive Systems

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Interactive Automotive Systems

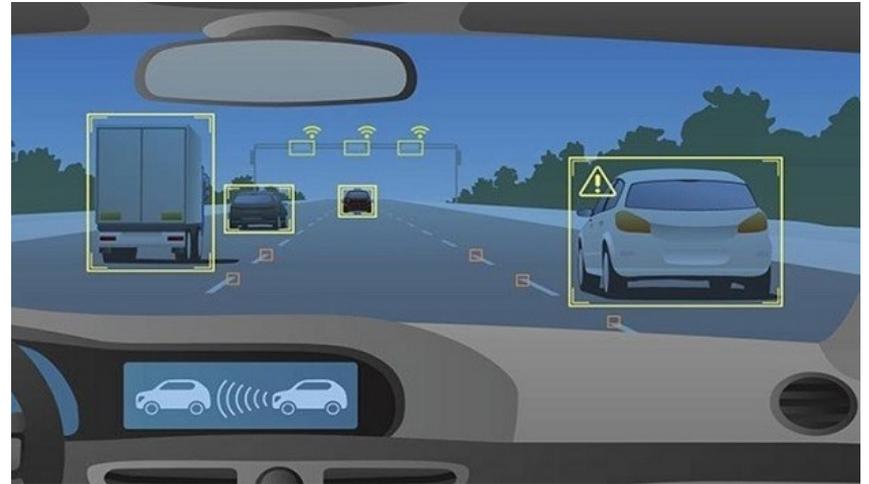


Interactive Automotive Systems



Interactive Automotive Systems + ADAS services

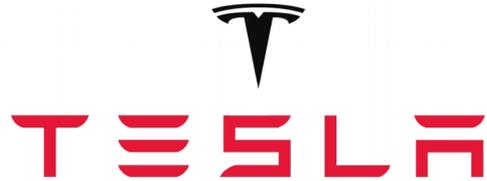
- ADAS Services
 - Lane detection
 - Cruise control
- Control ADAS configurations in real-time



Existing Interactive Automotive Systems

The logo for Ford SYNC 4 is displayed on a dark blue rectangular background. The text "Ford SYNC" is in white, with a registered trademark symbol (®) to the right of "SYNC". The number "4" is also in white and positioned to the right of "SYNC".

Ford SYNC[®] 4

The Tesla logo consists of a black stylized 'T' symbol with a horizontal bar at the top, positioned above the word "TESLA" in a red, sans-serif, all-caps font.

TESLA

The entune logo features the word "entune" in a lowercase, black, sans-serif font. The letter "e" at the end is colored red. A vertical line is positioned to the left of the "e".

entune

Existing Interactive Automotive Systems

Ford SYNC® 4



entune

BlackBerry | QNX

android auto



AUTOMOTIVE
GRADE LINUX

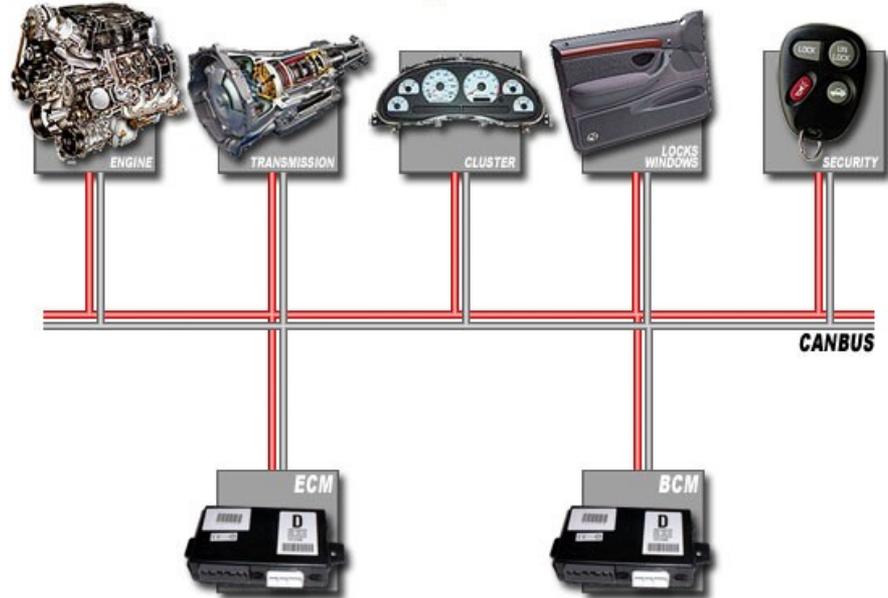
Advantages of Android in Automotive Systems

- Android Automotive OS
 - ~~Android Auto~~
- Running Android natively on a vehicle's interactive system



Limitations of Existing Automotive Systems

No Real-time I/O



**CAN Bus
Network**

Limitations of Existing Automotive Systems

CYBER NEWS

IVI Systems in Volkswagen, Audi Vulnerable to Remote Hacking

by Milena Dimitrova | May 14, 2018 | 0 Comments | Audi, car vulnerability, Volkswagen, vulnerability

Not guarded enough from security attacks



[International Conference on Detection of Intrusions and Malware, and Vulnerability Assessment](#)

..... DIMVA 2017: [Detection of Intrusions and Malware, and Vulnerability Assessment](#) pp 185-206 | [Cite as](#)

A Stealth, Selective, Link-Layer Denial-of-Service Attack Against Automotive Networks

Requirements of a Next Generation Interactive Automotive Systems

Familiar, straightforward and rich user-interface

Ability to develop custom apps

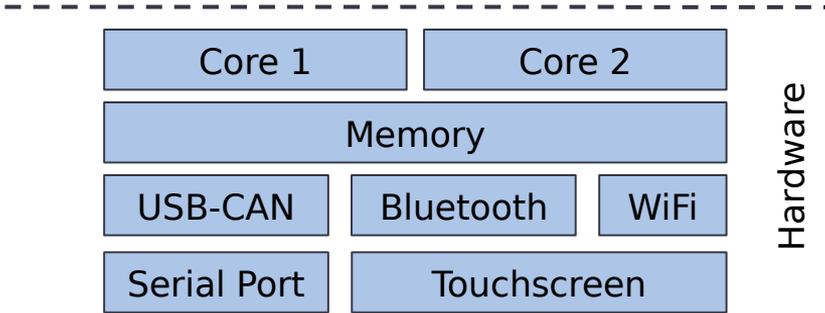
Real-time, predictable and secure I/O

Minimal hardware complexity

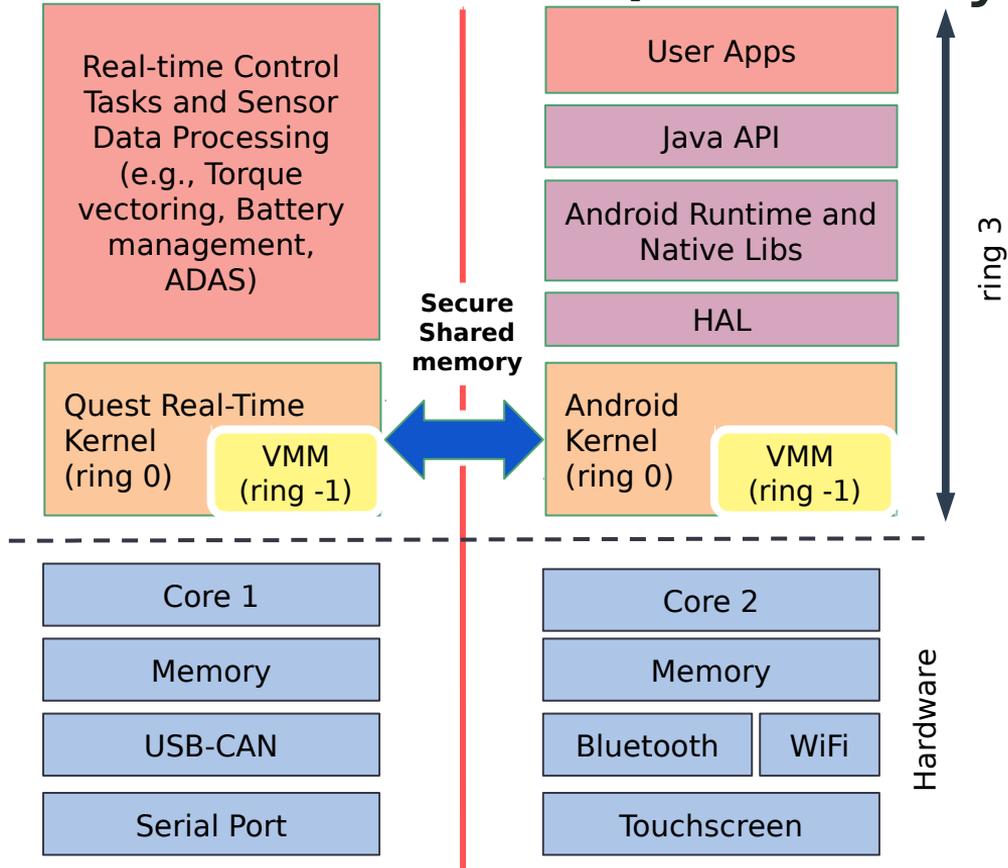
Our Solution:

A Paravirtualized Android in
Quest-V Hypervisor

Paravirtualized Android in Quest-V Hypervisor

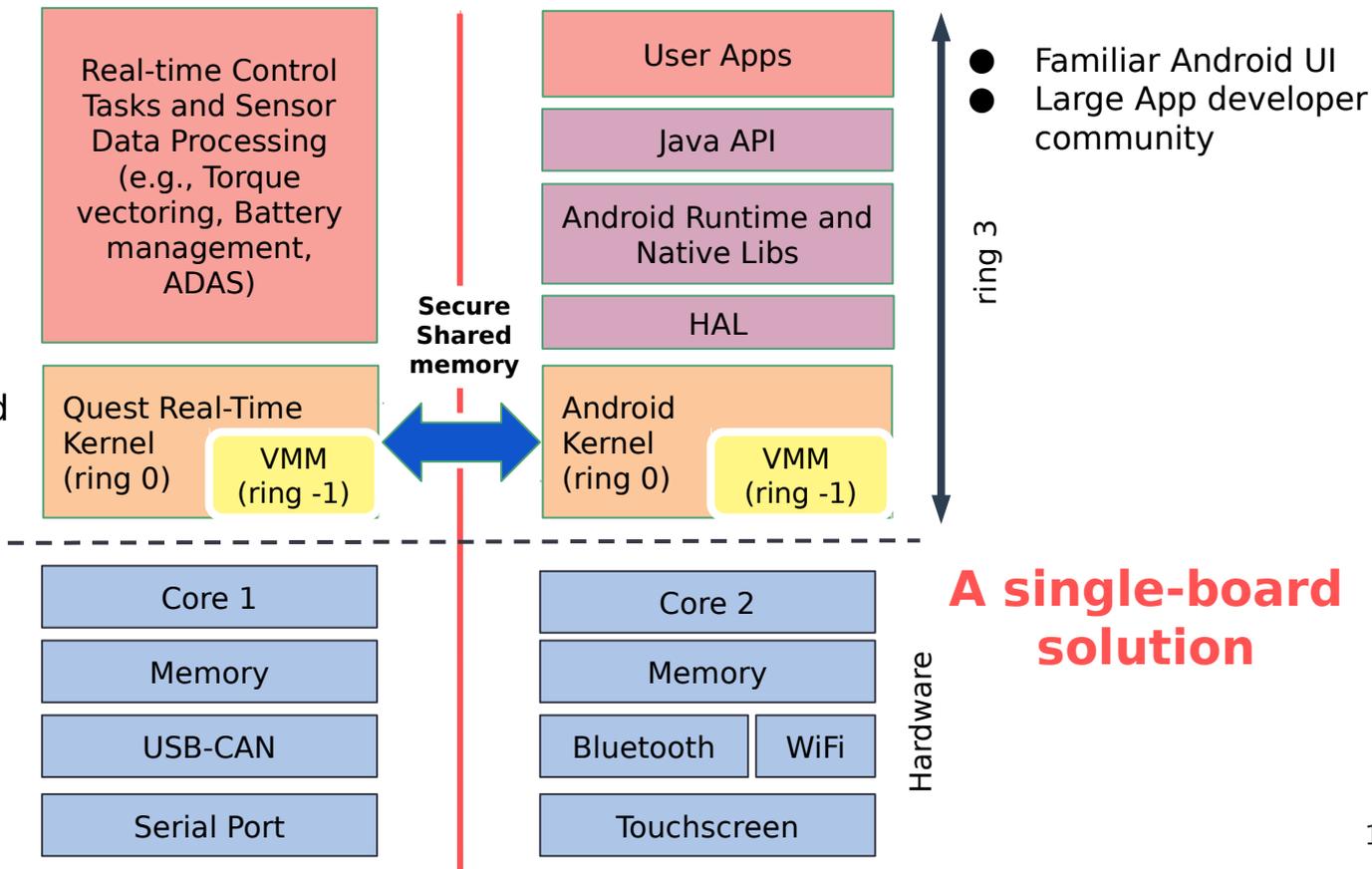


Paravirtualized Android in Quest-V Hypervisor

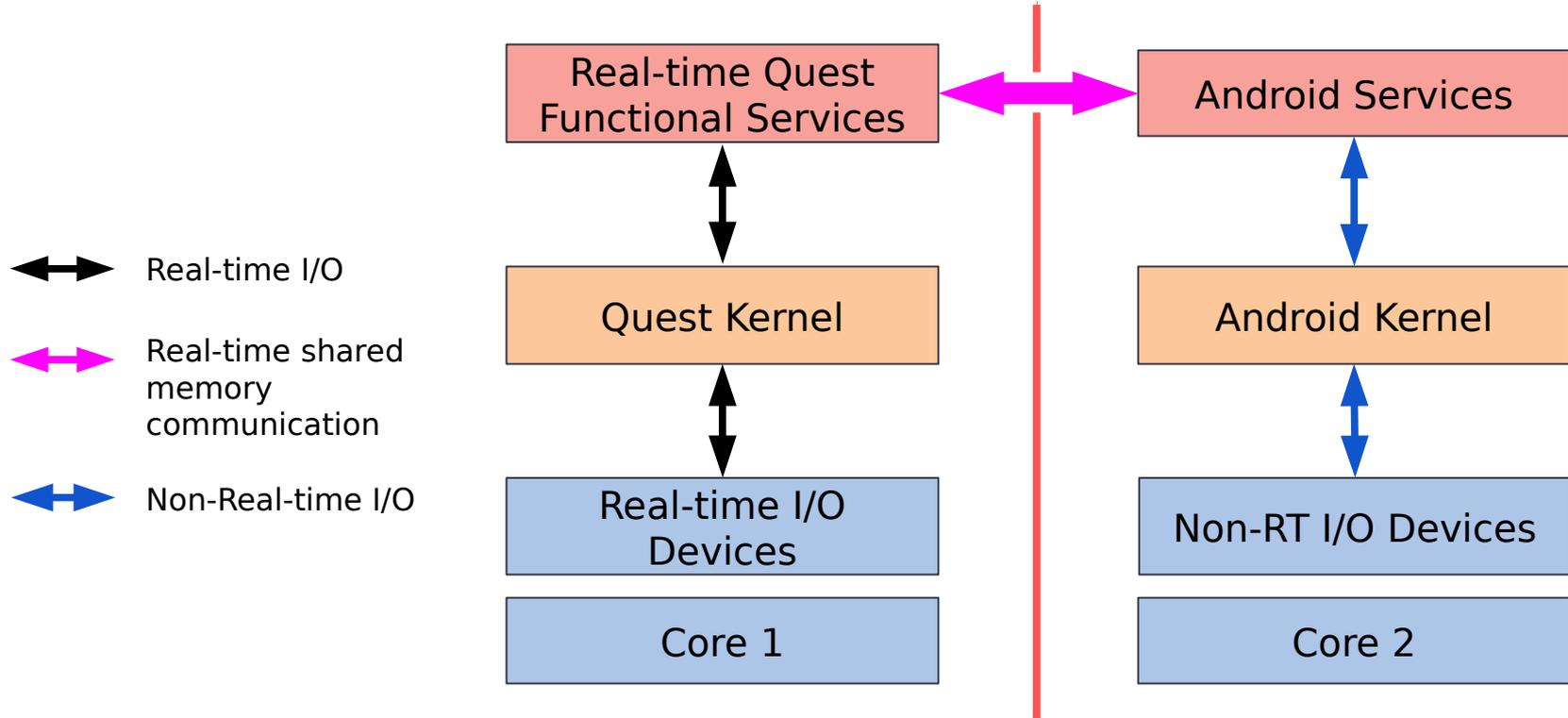


Advantages of Paravirtualized Android in Quest-V

- Real-time and predictable I/O in Quest
- Secure I/O data transfer through shared memory between Android and Quest



Timing Predictable I/O in Android

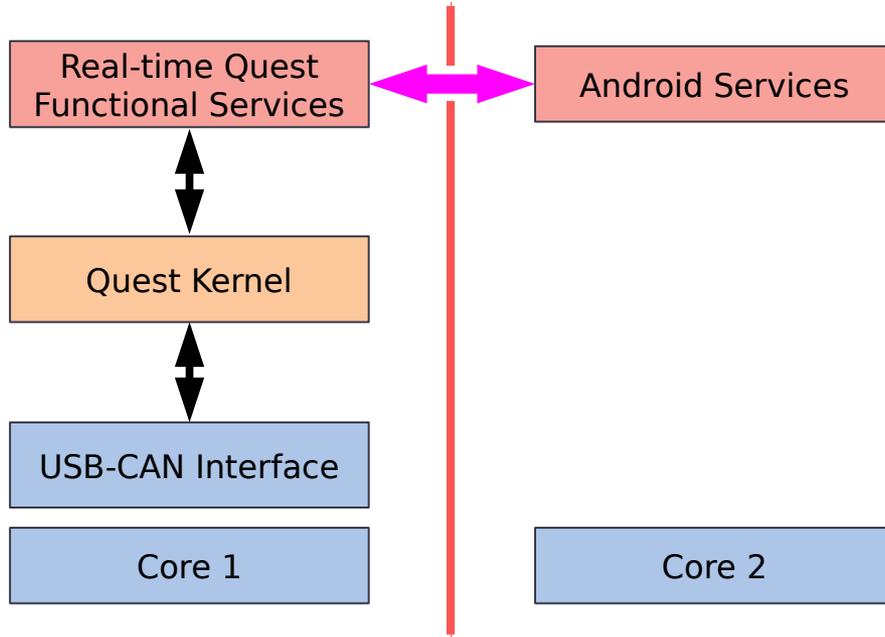


Promising Preliminary Evaluation - Cold Startup Time

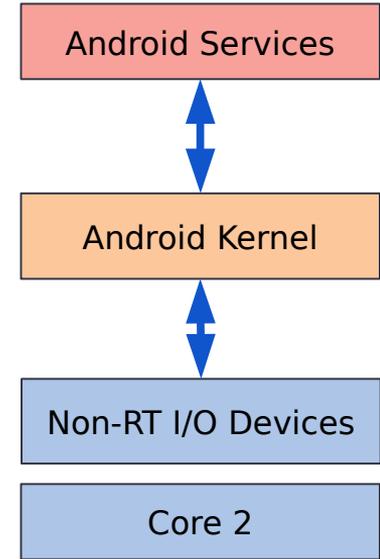
Startup times

	Vanilla Android	Paravirtualized Android in Quest-V
Booting Android	16.6 s	23.7 s
IVI (HVAC) App Startup	49 s	59.2 s

Timing Predictable I/O in Android

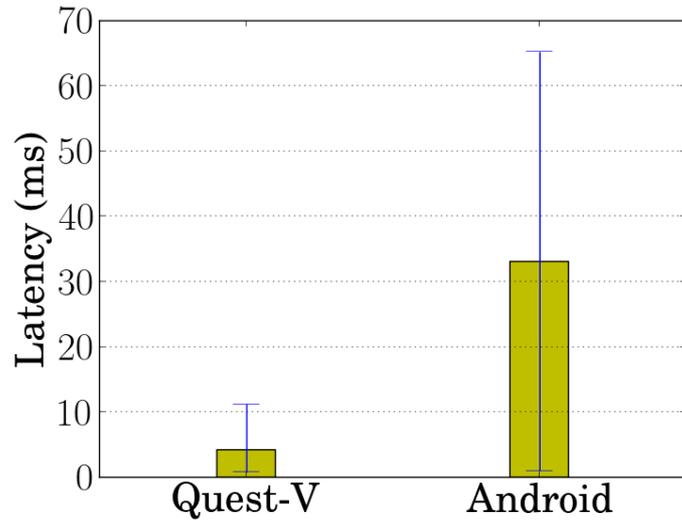


I/O using Paravirtualized
Android in **Quest-V**

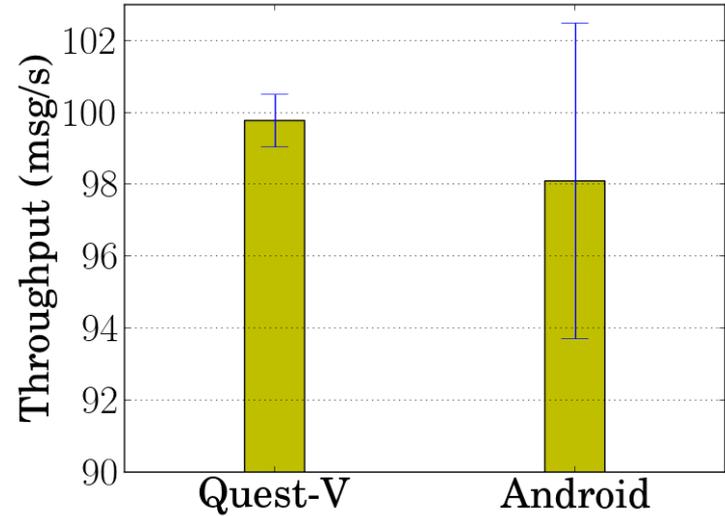


I/O using vanilla
Android

Promising Preliminary Evaluation - I/O Performance



**Synchronous USB-CAN I/O
Latency**



**Synchronous USB-CAN I/O
Throughput**

Future Work

- Supporting Automotive APIs for Quest-V design
- Communication timing requirements
- Secure communication interface
- Power Management

Thank you!
Questions?