Contradiction of Separation through Virtualization and Inter Virtual Machine Communication in Automotive Scenarios

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Introduction

• New features, Rising complexity
• Different ECUs for
  – Safety critical features
  – Non-safety critical features
• Hardware layering to composite graphical content
• New approaches use Virtualization to run multiple Operation Systems concurrently
  => Multi-OS
Automotive Context

• Digital cluster instruments
• Apps for In-Vehicle-Infotainment-Systems (IVIS)
• IVIS connected to Internet

Source: http://heise.de/-2151053 – Audi TT mit virtuellem Cockpit
Source: Volvo
Motivation

• Reducing
  – number of ECUs
  – bus cabling
  – weight, energy, space
  – expensive hardware (e.g. housing, power supply)
  – Development costs and time

• Enables
  – high speed data transfer (e.g. shared memory)
  – Use of Apps from other OSs
OS Virtualization

- Two types of virtualization
Clear Separation

- Dedicated devices/resources
- Applications/Functions clearly separated
- No interconnections required by design
Sharing Resources/Devices

- Dedicate hardware to certain OSs

Separated vs. Interconnection
Interconnections

- Uni- or bidirectional
- Between different layers of different OSs
Requirements

• Animations in different Apps on different OSs
  – E.g. Transitions / Merging

• Exchange of States

• Pop-Ups / Important Messages

• Regulations (e.g. no Movies while driving)
Minimalistic Approach

• Is it possible to limit interconnections?
  – E.g. one-way / read-only / write-only access to SHM

• How to limit interconnections?
  – Protocols?

• What kind of data is used?
  – E.g. plain pixel data vs. complex protocols
Conclusion

• Interconnections are inevitable for specific requirements
• Connections can be categorized based on layers
• Approaches to minimize interconnections need further research
• Toolchain and Development tools might be the key to the solution
Thank you