Accelerating Automotive Ethernet validation by leveraging Synopsys Virtualizer with TraceCompass

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Overview

• What is Automotive Ethernet?
• Role of Virtual Prototyping
• Synopsys Virtualizer
• Challenges in debugging and current solutions
• TraceCompass
• Integrating TraceCompass with Virtualizer
• Experiments and Results
• Conclusions
Automotive Ethernet
Role of Virtual Prototyping

• Pre-silicon, Software Development
• Front-load Test Development
Role of Virtual Prototyping

- Pre-silicon, Software Development
- Front-load Test Development

- Accelerate test cycles in regression
- Anytime, anywhere availability
Role of Virtual Prototyping

• Pre-silicon, Software Development
• Front-load Test Development

• Accelerate test cycles in regression
• Anytime, anywhere availability

• Increase fault & coverage testing
Synopsys Virtualizer™

Virtualizer Tools
Tools for Virtual
VDK console, Platform level debug, SW analysis

Multicore Synchronized SW Debugging
- Green Hills
- pls
- Lauterbach Development Tools
- eclipse

Virtual Platform
- Interfaces to 3rd party debug tools
- Interfaces to 3rd party tools
- MCU Cores, Memory and Peripherals models

Synchronized Co-Simulation with
- Simulink
- CANoe
- SaberRD

Virtual MCU

Virtual IO

Powerful Scripting Frameworks for complex Debugging, Analysis, Fault Injection and Stimulus

Virtualizer Tools

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Synopsys Virtualizer™

Virtualizer Tools
Tools for Virtual Platform level debugging

Software Development
Multicore Synchronized Debugging

Virtual Platform
MCU Cores, Memory and Peripherals models

ECU System Integration and Testing.

Functional Safety
(Fault and Coverage Testing)

Virtualizer Tools
Powerful support for complex Debugging, Analysis, Fault Injection and Stimulus

Synchronized Co-Simulation with
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Challenges in debugging and current solutions

• Challenges
  – Huge amount of ethernet traffic
  – Missing holistic view of Ethernet transactions
  – Manual mapping of ethernet transactions with other hardware and software events
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• Current solutions
  – Virtualizer
    ✓ pcap capture with timestamping
    ✓ analyze ethernet and platform events
    ✗ analyze ethernet traffic
  – Wireshark
    ✓ analyze single pcap
    ✗ analyze multiple pcap
    ✗ correlate other platform events
  – TraceCompass
    ✓ analyze multiple pcap
    ✗ correlate other platform events
TraceCompass

Network Tracing

• Visualize multiple pcap files
• Time-Synchronous analysis views
  – Pcap Trace Viewer, TimeChart
  – Histogram, State System Explorer
• Other statistical analysis views and options
  – Stream List, Statistics, Filters, Colors, merge pcap traces into single view

Reference Link
Integrating TraceCompass with Virtualizer

- Combines the TraceCompass multi-node pcap analysis capabilities with Virtualizer’s tracing analysis
- User interactions with TraceCompass views synchronized with Virtualizer views
Experiments and Results

• An Automotive Ethernet scenario
  – Typical Automotive platform with 4x Virtual ECUs connected via Ethernet Switch
  – ping executed across ECUs and analyzed successfully using the integrated solution
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• Ethernet packet loss analysis in an Automotive platform using AUTOSAR
  – 2x ECUs and external interface connected to host ethernet adapter
  – packet losses observed for a VLAN application
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Experiments and Results

• Ethernet packet loss analysis in an Automotive platform using AUTOSAR
  – Manual analysis v/s integrated solution analysis compared
  – Significant time saved in reaching to the root cause of the issue
Experiments and Results

- Software Bug analysis for faster debug
  - stmmac bug analysis speedup using integrated solution

- Enhanced Scheduling Traffic (EST) visualization for Time Sensitive Networking
Conclusions

• Successful holistic visualization of ethernet transactions in Virtual Platform
• Expedite ethernet software debugging and analysis
• Leveraging TraceCompass with Virtualizer is valuable to accelerate Automotive Ethernet validation
• TraceCompass’ network protocol support can be extended for broader usage
Questions