Newsletter

October 2019

ICT-10-2016

COEMS

Continuous Observation of Embedded Multicore Systems

Welcome to the COEMS Newsletter.
Within the COEMS project the five players, University of Lübeck, Accemic Technologies, Thales Austria and Thales Romania, Høgskulen på Vestlandet and Airbus joined their forces to develop a novel continuous observation solution for embedded multicore systems.
We would like to inform you about our achievements, current developments and COEMS-related events in the near future.

The Next Step on Multicore Integration in Avionic Systems

As the work on the different COEMS work packages is progressing well, the COEMS technologies have been applied to an avionic test system. And to make it short: the vision of simultaneous online observation of a dual-core has become reality!

An avionic test application has been parallelized and executed on the two cores of a Xilinx Zynq system running Linux as operating system. Linux has been chosen as a worst-case scenario since it shows much more dynamics than a more deterministic typical avionic operating system. The behavior of the application was specified as a TeSSLa description and evaluated online by the COEMS observation hardware. The actual status of this evaluation is visualized on a separate PC. Figure 1 demonstrates the dynamically updated output of several TeSSLa events and functions. In Figure 2, an execution time histogram of a selected function is shown, which is also updated online.

The extensive power of the novel language TeSSLa allows very detailed but also higher level specification of the application behavior in the time and functional domains.

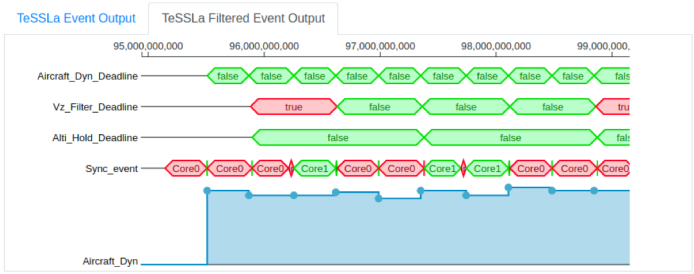

Figure 1: TeSSLa event evaluation

Hence, the evaluation covers only a few test cases that, together with the multicore observation hardware, already show very promising characteristics for the possible future certification of multicore systems, especially if they execute parallel applications. This is far beyond what current ideas on avionic multicore use and certification are proposing, e.g. in the position paper CAST-32a.

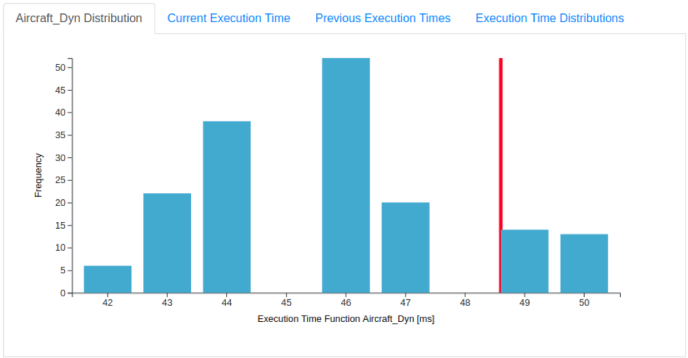

Figure 2: Online updated execution time distribution of a selected function

In summary, the current status of the COEMS project, close to its end, demonstrates a completely new approach for testing multicore applications. This is especially welcomed by the avionic domain which is lacking appropriate tools for certification of future parallel applications.

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 732016.

COEMS Tutorial @ FM Conference in Porto, 11.10.2019

We warmly invite you to participate in the COEMS project **tutorial on stream-based runtime verification** (SRV) at FM 2019 - the 3rd World Congress on Formal Methods, Porto.
After establishing the theoretical foundations we present software- and hardware-based implementations of SRV, compare them to other hardware-based RV-approaches and demonstrate how these technologies can be used to detect e.g. data races in cyber-physical systems.
Attendees from communities like embedded systems design, parallel systems and any other related topics are highly welcome.

http://formalmethods2019.inesctec.pt/?page_id=84

https://www.coems.eu/dissemination/srv-tutorial-2019

Agenda

09:00 Practical Demonstration
(Daniel Thoma, University of Lübeck, Germany)
10:00 Coffee Break
10:30 Introduction to Runtime Verification
(César Sánchez, IMDEA Software Institute, Spain)
11:15 Introduction to TeSSLa - Temporal Stream-based Specification Language
(Hannes Kallwies, University of Lübeck)
12:00 Lunch Break
14:00 TeSSLa in Practice
(Malte Schmitz, University of Lübeck)
15:30 Coffee Break
16:00 In-depth Applications: Data Races
(Volker Stolz, Høgskulen på Vestlandet, Norway)
17:00 Future Prospect
(Martin Leucker, University of Lübeck)

Papers & Talks

Faustin Ahishakiye presented *"Non-intrusive MC/DC Measurement Based on Traces"*, by Faustin Ahishakiye, Svetlana Jakšić, Felix D. Lange, Malte Schmitz, Volker Stolz, Daniel Thoma at TASE - the 13th Intl. Symposium on Theoretical Aspects of Software Engineering which took place from July 29 to August 1, 2019 in Guilin, China.

http://www.se.gxnu.edu.cn/tase2019/

Martin Leucker gave a talk on *"TeSSLa - from monitoring to control"* at the mini-workshop STINT Collaboration Universities of Gothenburg and Buenos Aires on August 26, 2019 in Gothenburg, Sweden.

www.cse.chalmers.se/~gersch/STINT-workshop.html

Thomas Preusser demonstrated the COEMS solution in: *"The CEDARtools Platform -- Massive External Memory with High Bandwidth and Low Latency under Fine-Granular Random Access Patterns"* at the International Conference on Field-Programmable Logic and Applications which took place from September 9 to 13, 2019 at the Universitat Politècnica de Catalunya (UPC) in Barcelona, Spain

COEMS setup at the FPL conference

https://fpl2019.bsc.es/

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Upcoming

Malte Schmitz will present:
Martin Leucker, César Sánchez, Torben Scheffel, Malte Schmitz and Daniel Thoma: *„Runtime Verification for Timed Event Streams with Partial Information“*
on October 10, at RV 2019 - the International Conference on Runtime Verification which will be held from October 8 to 11, 2019 in Porto, Portugal.

https://www.react.uni-saarland.de/rv2019/

In the course of the FM 2019 - the 3rd World Congress on Formal Methods which will take place in Porto, Portugal from October 7 to 11, COEMS will be presented in a tutorial on stream-based runtime verification by Martin Leuker, César Sánchez, Malte Schmitz, Volker Stolz and Daniel Thoma at on October 11 – see agenda on page 2.

http://formalmethods2019.inesctec.pt

In the course of the Dagstuhl-Seminar 19432 *„Analysis of Autonomous Mobile Collectives in Complex Physical Environments“* TeSSLa will be proved in a challenge from October 21 to 23 in Dagstuhl / Wadern, Germany.

https://www.dagstuhl.de/19432

Thomas Preusser and Albert Schulz will present the COEMS solution in a talk on November 21 in the course of Echtzeit 2019 which will take place in Boppard, Germany from November 21 and 22, 2019.

https://www.real-time.de/echtzeit.html

COEMS will be presented in a workshop on December 3 in the course of iFM - the 15th International Conference on Integrated Formal Methods which will take place in Bergen, Norway from December 2 to 6, 2019.

http://ifm2019.hvl.no

Alexander Weiss will present the COEMS solution in a talk on December 5 in the course of ESE Kongress - the Embedded Software Engineering Congress which will take place in Sindelfingen, Germany from December 2 to 6, 2019.

https://ese-kongress.de/frontend/index.php

At the Embedded World 2020 the COEMS solution will be presented at the Embedded4you booth from February 25 to 27, 2020 in Nürnberg, Germany.

https://www.embedded-world.de/en

https://www.embedded4you.com/

For more information about the project please visit the COEMS website:

www.coems.eu

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Consortium:

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AIRBUS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 732016.