



Special issue: Emerging trends in real-time embedded systems: from Microkernel architecture to control system analysis and IoT frameworks

Cong Liu¹

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This special issue proudly presents extended versions of three distinguished papers from the 28th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA 2022). Selected as Best Paper Candidates at RTCSA 2022, these three papers represent the pinnacle of scholarly achievement in their field. We extended an invitation to the authors to submit an enhanced version of their papers for this special edition. Each submission underwent a thorough peer-review process, ensuring the highest standards of academic quality. The culmination of this process is the three exceptional papers featured in this edition.

The first paper, “Priority-Based Concurrency and Shared Resource Access Mechanisms for Nested Intercomponent Requests in CAMkES” by Marion Sudvarg, Zhuoran Sun, Ao Li, Chris Gill, and Ning Zhang, presents a novel library for the CAMkES component architecture. This library enriches the seL4 microkernel with capabilities such as concurrent request handling, priority metadata propagation, and sophisticated locking mechanisms. It enables comprehensive end-to-end timing prioritization in real-time systems and has been evaluated on Intel x86 and ARM platforms.

The second paper, “Statistical Verification of Autonomous System Controllers Under Timing Uncertainties” by Bineet Ghosh, Clara Hobbs, Shengjie Xu, Don Smith, James H. Anderson, P. S. Thiagarajan, and Benjamin Berg, introduces a groundbreaking Bayesian hypothesis testing approach. This method offers statistical assurances for control system behavior amidst timing uncertainties, delivering more precise and scalable deviation estimates from nominal behavior compared to conventional reachability analysis in diverse hardware settings.

The third paper, “ChamellIoT: A Tightly- and Loosely-Coupled Hardware-Assisted OS Framework for Low-End IoT Devices” by Miguel Silva, Tiago Gomes, Mongkol

✉ Cong Liu
congl@ucr.edu

¹ Riverside, USA

Ekpanyapong, Adriano Tavares, and Sandro Pinto, unveils ChamellIoT. This hardware operating system framework, designed for reconfigurable IoT devices, leverages the RISC-V ISA. It significantly diminishes latency and boosts performance in IoT environments, offering compatibility with well-known operating systems such as RIOT, Zephyr, and FreeRTOS.

We trust that you will find this special issue enlightening and informative.

Guest Editor: Cong Liu

“Cong Liu” <congl@ucr.edu>

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