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Technical Report

SDN for Dynamic Reservations on Real-Time Networks

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SDN for Dynamic Reservations on Real-Time Networks

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Abstract

Recent growing frameworks such as the IoT, IIoT, Cloud/Fog/Edge computing, CPS, etc, bring the networking platforms on which they rely to the spotlight, as first class citizens of an increasingly software-dependent landscape. As a result, networks play an increasingly central role in supporting the needed system-wide properties. In particular, we have been working to provide openness and adaptivity together with timeliness guarantees. This combination seems fundamental to support inherently dynamic applications in a resource efficient way, covering not only the cases of systems of systems, systems with variable number of users, components or resources but also systems that undergo frequent live maintenance and even reconfiguration during their lifetime. Examples range from autonomous vehicles to collaborative robotics, remote interactions, fog/edge computing, flexible manufacturing, etc. We postulate that combining openness and adaptivity with guaranteed timeliness can only be achieved with an adequate communication abstraction supported on adequate protocols. To this end, we have been proposing channel reservation-based communication as a means to provide scalable and open latency-constrained communication and thus enable a more efficient system design. In this talk we will show our recent work in using Software-Defined Networking (SDN) to provide standard interfaces for traffic flexibility. We proposed extending the SDN OpenFlow protocol with adequate services to take advantage of flexible real-time communication protocols and thus provide standard interfaces for flexible real-time reservations, too. We call it the Real-Time OpenFlow framework (RTOF). We end describing and assessing a prototype implementation based on the HaRTES Ethernet switches.

SDN for Dynamic Reservations on Real-Time Networks

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Abstract

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Category Invited Talk

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Short bio. Luis Almeida graduated in Electronics and Telecommunications Eng. in 1988 and received a Ph.D. in Electrical Eng. in 1999, both from the University of Aveiro in Portugal. He is currently an associate professor in the Electrical and Computer Engineering Department of the University of Porto (UP), Portugal, and Vice-Director of the CISTER research unit at UP where he coordinates the Distributed and Real-Time Embedded Systems (DaRTES) lab. Among several appointments, he is Vice-Chair of the IEEE Technical Committee on Real-Time Systems (chair after 2020), Program and General Chair of the IEEE Real-Time Systems Symposium (2011-2012 respectively) and Trustee of the RoboCup Federation (2008-2016) including Vice-President (2011-2013). His research interests revolve around real-time networks for distributed industrial/embedded systems including for teams of mobile robots.



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