

# WCET Computation of Safety-Critical Avionics Programs: Challenges, Achievements and Perspectives (Invited Talk)

Jean Souyris<sup>1</sup>

1 AIRBUS  
316 route de Bayonne, 31060 Toulouse cedex 03, France  
jean.souyris@airbus.com

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## Abstract

Time-critical avionics software products must compute their output in due time. If it is not the case, the safety of the avionics systems to which they belong might be affected. Consequently, the Worst Case Execution Time of the tasks of such programs must be computed safely, i.e., they must not be under-estimated. Since computing the exact WCET of a real-size software product task is not possible (undecidability), “safe WCET” means over-estimated WCET. Here we have an industrial issue in the sense that too over-estimating the WCET leads to a waste of CPU power. Hence, the computation a safe and precise WCET is the big challenge. Solutions to that problem cannot only rely on the technique for computing the WCET. Indeed, both hardware and software must be designed to be as deterministic as possible. For its Flight controls software products, Airbus has always been applying these principles but, since the A380, the use of more complex processors required to move from a technique based on measurements to a new one based on static analysis by Abstract Interpretation. Another kind of avionics applications are the so-called High-performance avionics software products, which are significantly less affected by - rare - delays in the computation of their outputs. In this case, the need for a “safe WCET” is less strong, hence opening the door to different other ways of computing it. In this context, the aim of the talk is to present the challenge of computing WCET in Airbus’s industrial context, the achievements in this field and the evocation of some trends and perspectives.

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