

[Inici](#) > PROXIMA: Probabilistic real-time control of mixed-criticality multicore and manycore systems (PROXIMA)

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Description

In the next decade, EU industries developing Critical Real-Time Embedded Systems (CRTES) (safety, mission or business critical) will face a once-in-a-life-time disruptive challenge caused by the transition to multicore processors and the advent of manycores, tantamount to complex networked systems. This challenge brings the opportunity to integrate multiple applications onto the same hardware platform bringing significant advantages in performance, production costs, and reliability. It also brings a severe threat relating to a key problem of CRTES; the need to prove that all temporal constraints will be satisfied during operation. Current CRTES, based on relatively simple singlecore processors, are already extremely difficult to analyse for temporal behaviour, resulting in errors in operation costing EU industry billions each year. The advent of multicore and manycore platforms exacerbates this problem, rendering traditional temporal analysis techniques ineffectual. A new approach has been needed.

The PROXIMA thesis was that, the temporal behaviour of mixed-criticality CRTES executing on multicore and manycore platforms can be analysed effectively via innovative probabilistic techniques. PROXIMA defined new hardware and software architectural paradigms based on the concept of randomisation. It extended this approach across the hardware and software stack ensuring that the risks of temporal pathological cases are reduced to quantifiably small levels. On top of this, PROXIMA built a comprehensive suite of probabilistic analysis methods integrated into commercial design, development, and verification tools, complemented by appropriate arguments for certification. PROXIMA provided a complete infrastructure; harnessed the full potential of new processor resources, demonstrating and supporting effective temporal analysis, brought the probabilistic approach to a state of technological readiness, and primed multiple EU industry sectors in its use via a number of case studies.

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