Ph.D. in Information Technology: Thesis Defense

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online by Teams – at 11.00

Federico REGHENZANI – XXXII Cycle

"Beyond the Traditional Analyses and Resource Management in Real-Time Systems"

Advisor: Prof. **William Fornaciari**

Abstract:

Estimating the worst-case execution time in modern architecture is a non-trivial problem. The presence of complex hardware features, necessary to improve the computational power due to the single-core performance barrier, makes this estimation difficult or even impossible if traditional techniques are employed. Probabilistic real-time and, in particular, the measurement-based probabilistic timing analysis have been developed to overcome this issue. Measurement-based approaches are very appealing for the industrial world, because they enable to obtain a statistical estimation of the worst-case execution time by directly observing the execution time of the real system. Unfortunately, the current status of probabilistic real-time is far to be acceptable for certification purposes of safety-critical systems. In this thesis, both theoretical and experimental works, related to the PhD activities, are presented, with a special focus on the uncertainty estimation and the applicability of the probabilistic real-time techniques to real platforms. Both these problems have been studied, providing theoretical tools and experimental evaluations to advance probabilistic approaches towards a safe solution to the worst-case execution time estimation problem. The issues, which still limit the use of such techniques in industrial environment, are discussed and possible future research directions presented. In addition, unconventional exploitations of probabilistic real-time are proposed for mixed-criticality, high performance computing and energyconstrained systems. During all of these works, some software tools and datasets have been developed, released as open-source and described in this thesis.

PhD Committee

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