Verification d'ordonnanceurs multicoeur pour le noyau Linux

Verification of multicore scheduler in the Linux kernel

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Résumé du projet de recherche (Langue 1)

Recent research and bug reports have shown that work conservation, the property that a core is idle only if no other core is overloaded, is not guaranteed by Linux's CFS or FreeBSD's ULE multicore schedulers. Indeed, multicore schedulers are challenging to specify and to optimize: they must operate under stringent performance requirements, while handling very large numbers of concurrent operations on threads. The Whisper team at Inria has been developing a domain specific language approach, Ipanema [1], for the design of multicore schedulers. From a policy written in the DSL, the compiler first generates efficient C code for execution as a Linux kernel module, and second WhyML code, the ML-like imperative language supported by the state-of-the-art Why3 program verification platform. The WhyML code is used with Why3 to prove that the algorithm represented by the scheduling policy is work conserving. In the current state of our work, we assume that the compiler can be trusted and generates correct C code. The goal of this PhD remove this limitation by checking properties at the level of the C code generated by the compiler. We will consider two complementary approaches: abstraction interpretation in cooperation with the Antique Inria team and program proving using SMT solvers. This position targets a student having an experience in Linux kernel programming, and also a strong interest in software verification. [1] Provable Multicore Schedulers with Ipanema: Application to Work Conservation. To appear in EuroSys 2020. April 27-30, 2020 | Heraklion, Crete, Greece