Informatik-Kolloquium

Forschungsprojekt
von Sven Friedrich

Freitag, den 06.08.2021, 14:00 Uhr,

BigBlueButton https://webconf.tu-clausthal.de/b/umu-2ey-ekt.

"Symmetric Multiprocessing for L4Re on ARM Architecture using RUST"

Real time systems are characterized with guarantees for timing constraints, such as task execution or interrupt response. This is highly relevant for safety critical Cyber Physical Systems (CPS). In airborne applications failure in fulfilling timing constraints may put human lives at risk. Beyond Real-Time Operating Systems (RTOS) that provided deterministically bounded small jitter, to prevent cascading failure propagation, methods sought after to isolate the applications of a system. The common approach is the utilization of embedded virtualization. The L4Re separation kernel is one example which can host multiple, isolated applications. Regarding the isolation, two aspects are crucial: temporal and spatial isolation. By segregating the execution environments in time (CPU cycles) and in space (Memory) from each other, this is achieved. As a result, errors of one application do not effect the rest of the system, improving its robustness and fault tolerance.

With the stagnation of Moore's law, there is an increasing interest in multi-core processors to scale the compute power. Even in embedded environments, there is an upsurge in utilization of multi-core systems. Thereby synchronous multiprocessing is gaining more relevance, also for safety critical systems. However, the implementation of parallel code is more complicated sequential code, therefore more error prone.

There is an increasing interest in real-time safety-critical systems industry for modern systems programming language Rust, due to its safety features like thread-safety and memory-safety. It even is claimed as the first ever language to be practically usable while offering both control and safety.

Our goal in this research is to enable synchronous multiprocessing using Rust for L4Re on a multicore ARM platform. This involves bootstrapping the Rust compiler for L4Re on ARM as well as integrating already present libraries, offering L4Re functionalities to the programmer.

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