Evaluation and Implementation of On-Demand Module Loading in WebAssembly on Embedded Systems

Hochschule München is among the largest German universities of applied sciences, located at the heart of Munich, Germany. The working group "AEMY" focuses on safe, secure and smart systems. Our main working areas include RISC-V processor design, WebAssembly runtime development and open source chip design tools.

For our research group we are looking for a motivated student to evaluate and implement dynamic linking mechanisms for WebAssembly interpreters on microcontrollers.

WebAssembly is a modern, low-level, assembly-like language with a compact binary format designed for improved application performance in web browsers. Through its security features like sandboxing, it is a promising technology for a wide variety of applications. But it can also be used outside the browser. For example, on microcontrollers. In our labs in Munich and Bad Tölz, we are currently working on an ecosystem of efficient, practical WebAssembly runtimes and supporting tools for modern embedded systems.

Memory of embedded systems is always a critical limiting factor. One attempt to solve this problem could be minimizing the code flashed onto the controller by offloading not needed code onto a server and dynamically loading it during runtime. By being able to dynamically load and delete modules from the controller it might be possible to execute more complex programs using less flash memory.

The research direction is open, but the following points outline possible focus areas: - Investigate the current state of the art of dynamic linking in terms of WebAssembly - Evaluate linking strategies for libraries - Implement a demonstrator that shows how dynamic linking can work in WebAssembly - Analyze the memory savings and introduced execution overhead

If this topic sounds interesting to you, or if you've been inspired and have a suggestion for a related topic, feel free to reach out!

If you are interested, please get in touch:
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