Development of a Framework for Reduced Hardware Description Language for CIRCT

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 project DI-OSVISE we are looking for a motivated student to assist on the development of a Reduced Hardware Description Language for CIRCT.

Circuit IR Compilers and Tools (CIRCT) is a Multi-Level Intermediate Representation (MLIR) Framework based hardware compiler. It is a relatively new tool which offers a new approach to translate hardware descriptions into various formats needed in the hardware design flow. It leverages design principles common in traditional software compilers and reuses the infrastructure of MLIR. This allows for multiple front-ends to coexist. Examples of input languages include SystemVerilog, Python and Chisel. Each of those hardware description/construction languages was designed independently of CIRCT.

Your tasks will be centered around a new hardware description language. The language goals are to offer a simple and minimal functionality and target CIRCT's internal structures. The work may include: - Implementation of the parser - Implementation of compiler tool - Design and implement test infrastructure - Create tutorial for HDL implementation in CIRCT - Document CIRCT dialects used by new HDL - Add verification support to HDL - Create IP examples with Verilog output

With this work you will learn the internals of an LLVM/MLIR based compiler. This is a compiler widely used in the industry, for example for RISC-V but also for custom AI accelerators. You will also learn the difference of hardware description language and programming languages.

If this topic is interesting to you and you want to learn more about it, or got inspired and have a suggestion for a similar topic, feel free to reach out! It is also possible

to cover this topic by a bachelor's or master's thesis.

If you are interested, please get in touch:
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Find more on our website:
`https://aemy.cs.hm.edu`