

A tool for the generation of Roofline plots

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Master's Thesis

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1. Project Description

The Roofline model promises to be an easy to understand tool capable to give programmers insights on potential optimizations within their applications. To our knowledge there is no tool available that is able to generate such a roofline plot for user provided applications. In this project we would like to tackle this shortcoming and create such a tool that, given a program is available in library form, will measure its operational intensity and performance on a user defined x86 platform. The tool will enable the generation of roofline plots for that platform and place the measured results accordingly. This should enable the user of the tool to gain faster insights into the performance behavior of his application and potentially show up room for improvements.

2. Specific Goals

- Review the related work
- Create a tool that is able to fulfill the following tasks
 - Instrumentation of the performance hardware counter of x86 platforms
 - Usage of the gathered information to create the roofline model for the specified hardware
 - Generation of “ceilings” in the model for different hardware features on the platform (e.g. SIMD)
 - Measurement of operational intensity given any library function
 - Measurement of performance given any library function
 - Management of measurement results and the ability to compose multiple results into one roofline plot
- Maintainability and extendibility of the tool should receive high priority

3. Deliverables

- The source code of the tool
- A digital and two printed exemplars of the master thesis containing a detailed description of the problem, an overview of related work and existing approaches, a description of the tool that was built, and evaluation of results.

4. Organization

- Ruedi will have weekly meetings with his advisors in which progress and occasional problems will be discussed.
- A workspace in the IFW building will be provided for the duration of the Master Thesis.