GeCoS is a C compiler infrastructure written in Java and leveraging on Model Driven Engineering software design principles and integrated within Eclipse IDE.

GeCoS is targeted to Application Specific Processors (ASIPs) design and Custom Hardware Accelerator Synthesis. It supports bit-accurate C++ datatypes ( Mentor Graphics Algorithmic C).

GeCoS can be used as a Source to Source compiler or as a standalone flow with a complete retargetable compiler back-end and support for hardware microtask synthesis.

Features:
- Robust C/C++ Front End relying on Eclipse CDT supporting Mentor Graphics AC Types
- Bundled with a set of intermediate representations: CDFG, DAG, Scop[1], HCDG[2]
- Easily extensible intermediate representation thanks to Eclipse MDE framework
- Powerfull syntactic Pattern matching engine based on Tom/Gom[3]
- Compilation driven by scripts, #pragma, and/or Domain Specific Languages

GeCoS - S2S4HLS
Source to Source for High Level Synthesis* of compute intensive kernels

S2S4HLS features:
- Expose parallelism
- Reduce local memory size
- Improve Memory access locality
- Generate HLS Friendly Code

Standard transformations:
- Unroll, inlining, scalarization,...

Complete Polyhedral Flow:
- Array Dataflow Analysis [1]
- Code Generation (Cloog [4])

HLS Backend Optimizations
- Aggressive strength reduction
- Loop coalescing
- HLS aware control generation

GeCoS - LoMiTa
Ultra Low-Power Micro-Tasking

- HLS tools not well suited for control intensive processing
- ASIP flows do not provide enough hardware specialization.
- LoMita = HLS + ASIP for custom hardware controllers

- Used as a substitute for micro-controllers for highly power constrained WSN nodes
- May also save the use of a full featured soft-core in an FPGA

We use specific instruction patterns that often found in low level (ex : device driver) source code.

- LoMita performs wordlength design space exploration (4, 16bits) to explore the best trade-off between area/energy/speed

- The target datapath is trimmed down so as to be specialized to the task at hand.

References:
[1] F. Bastien, Static Analysis of Scalar and Array References, Feb 2005

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