Efficient Open Compiler Environment for Semantically Annotated Parallel Development

The movement towards heterogeneous multi-core architectures is a fundamental shift in the computer science landscape and in particular in the programming models. The strengths and capabilities of programming models are thereby directly dependant on the underlying compiler. Most common compilers are still centred on sequential machines and focus on specific hardware models, thus impacting on performance and portability. Due to the high complexity of modern compilers, it is almost impossible to adapt the optimisation strategies for dedicated use cases, as the compilers are generally built to serve the widest scope of use, as possible. In particular in High Performance Computing, however, it is desirable to optimise support for specific domains individually to receive the best results possible.

The ECOUSS project enables developers and providers to adjust the compilation behaviour to their specific domain needs by providing two dedicated tools: AnyDSL and NOISE. With the AnyDSL extension, he can generate his own powerful semantic extensions that can automate typical operations and even specify own data types on the same level as the code itself. AnyDSL thereby allows transformation of these extensions into different complex algorithms depending on context of use and destination platform. With the NOISE compiler it is possible to ensure that the right optimisation and transformation strategies are applied.

Together, this allows easy development of highly specialised and platform-optimised code, and enables specialised developers to quickly realise highly efficient domain specific extensions.

ECOUSS brings experts from compiler construction and High Performance Computing together:
- Höchstleistungsrechenzentrum Stuttgart (HLRS), Germany
- Universität des Saarlandes, Intel Visual Computing Institut, Germany
- Deutsches Forschungszentrum für Künstliche Intelligenz GmbH, Germany
- Technische Universität Dresden, Germany
- Cray Computer Deutschland GmbH, Germany
- Realtime Technology (RTT), Germany
- Böhringer Ingelheim GmbH & Co. KG, Germany

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