EoCoE Performance Benchmarking Methodology for Renewable Energy Applications

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Methodology

1. Hands-on performance workshops

A central feature of EoCoE has been the regular staging of application performance analysis workshops with a 1:1 tutor-client ratio. Jointly hosted with the POP CoE, these serve to:

- provide first contact point for project partners, external academic and commercial groups
- establish the baseline status of an application via a set metrics
- create long-term bilateral ‘code-teams’

2. Performance metric extraction (1 month)

During and immediately following the workshop, JUBE is deployed to compile, run and automatically extract a comprehensive set of 28 performance metrics for any application. These are obtained by coupling the application to performance tools such as Scalasca, Paraver and Darshan. This procedure guarantees reproducible results at different points in time and location with the same or improved code versions.

3. Code optimization and refactoring (2-12M)

Code-teams comprising members of developer groups and the EoCoE HPC staff continue to monitor the code progress over subsequent months as optimisation and refactoring efforts are undertaken. Enhancements mainly undertaken within the developer teams, but support can also be requested via EoCoE service page.

Results

Accelerating renewable energy applications

Significant time-to-solution improvements have been made to EoCoE applications in the first 18 months of operation, resulting in 50 Mcore-hours aggregate savings of compute-time. The chart shows actions such as optimisation and parallelisation (blue), exchange of I/O libraries (green), kernel refactoring (red) and rescheduling (weak scaling - dashed).

Impact

ESIAS: 1000-member super-ensemble for probabilistic solar & wind power forecasts

J. Berndt and H. Elbern, 11th European Conf. on Applied Climatology (ECAC), Trieste, 12–16 September (2016)

Metalwalls: all-atom modelling of supercapacitors up to device scales


ParFlow: high-resolution predictions of streamflow for hydropower management


Gysela: Multithreading optimisations reduce run times of ion turbulence computations by 25%

V. Girard et al., Comp. Phys. Commun. 207, 35 (2016)

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