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CFD SIMULATION ON ARM ARCHITECTURE; RUNNING OPENFOAM ON ISAMBARD

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Isambard is a new tier-2 (i.e. regional) supercomputer facility funded by the UK EPSRC as a technology demonstrator/evaluation platform using multiple chip architectures, but in particular focusing on ARM architecture. The core of the system is a Cray XC50 configuration supporting (when fully operational) 10,000 ARMv8 Cavium ThunderX2 32-core processors running at $>$ 2GHz. As a comparison, the machine also provides a range of other processors including x86 and Xeon Phi, within the same overall configuration and with the same software stack, thus providing researchers with a platform for benchmarking different codes with an "apples to apples" comparison of different processors.

Computational Fluid Dynamics (CFD) undoubtably represents the more computationally costly end of engineering simulation, requiring fast processing speed and making serious demands on memory, intercommunication speeds (for parallelisation) and even graphical visualisation. Over the last few years the open source CFD code OpenFOAM [1] has emerged as one of the most important CFD codes in the community, partly boosted by the financial issues of using a commercial code with a 'per core' license cost. Thus one of the key aims of the Isambard project is to provide, benchmark and optimise OpenFOAM use on the new configuration. In this paper we report on the porting and optimisation of OpenFOAM-v1712 and foam-extend on the new platform. Preliminary results [2] indicate a substantial increase in speed on ARM, with a 2$\times$ speed increase on a single ARM socket compared to Intel Broadwell, using the OpenFOAM "motorbike" test case. We will present further benchmark results on a variety of industrial cases and physical modelling, together with speedup data showing the performance of the code in parallel.

REFERENCES

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