DiRAC Benchmarks

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April 11, 2022

1 DiAL: Data Intensive at Leicester

1.1 Overview[1]

The University of Leicester hosts one of five High Performance Computing (HPC) systems that forms part of the DiRAC service. The focus of the service is to support data intensive science problems in Theoretical Astrophysics and Particle Physics. The DIaL service provides:

- 400 dual-socket nodes with 36 2.3 GHz intel skylake cores, 192 GB RAM per node.

- 3 large memory nodes: 36 skylake cores, 1.5TB RAM per node.

- 1 large memory node with 144 skylake 3GHz cores, 6 TB RAM, supporting larger shared memory codes.

- EDR Infiniband Interconnect (2:1 blocking)

- 3.3 TB of Lustre parallel storage, supporting over 40GB/s read/write.

- 100 GB NVMEoFC storage - experimental data intensive file store with a theoretical peak read/write of 50GB/s.

- All nodes run linux CentOS 7 or RHEL 7

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[1]see https://www2.le.ac.uk/offices/itservices/ithelp/services/hpc/dirac/about

1.2 Benchmarks

1.2.1 Ramses

Ramses is a program to model astrophysical systems, featuring self-gravitating, magnetised, compressible, radiative fluid flows. It is based on the Adaptive Mesh Refinement (AMR) technique on a fully-threaded graded octree. [2]

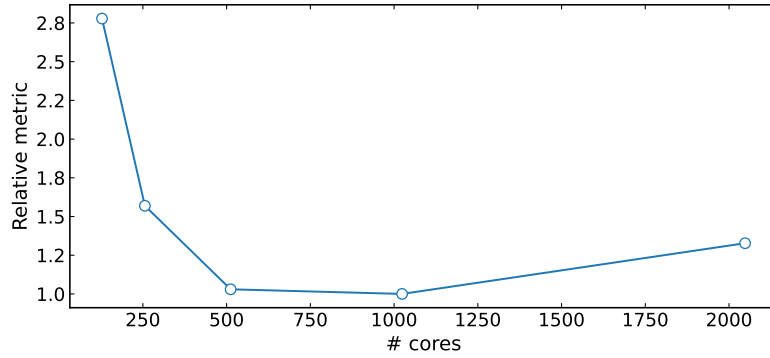Some outline of the specific system(s) used for the scaling benchmarks
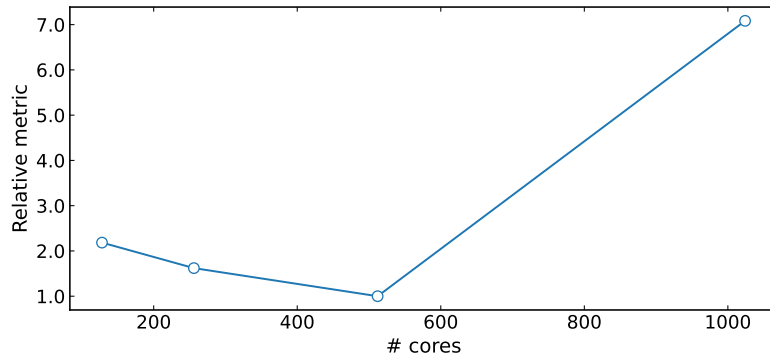

Figure 1: Ramses strong scaling benchmark.

Figure 2: Ramses weak scaling benchmark.

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[2]see https://bitbucket.org/rteyssie/ramses/src/master/

1.2.2 Sphng

Smoothed-particle hydrodynamics code used to simulate the mechanics of continuum media.

Some outline of the specific system(s) used for the scaling benchmarks
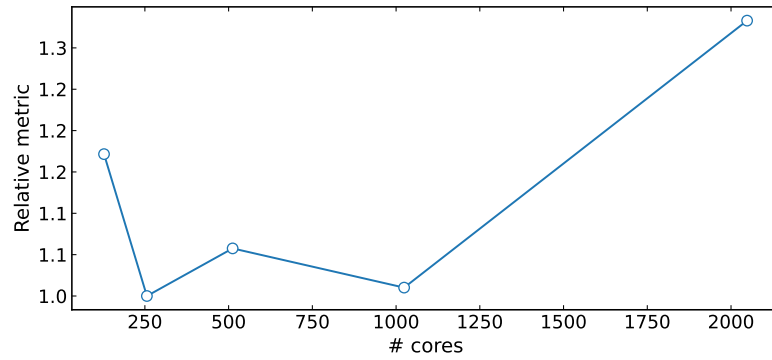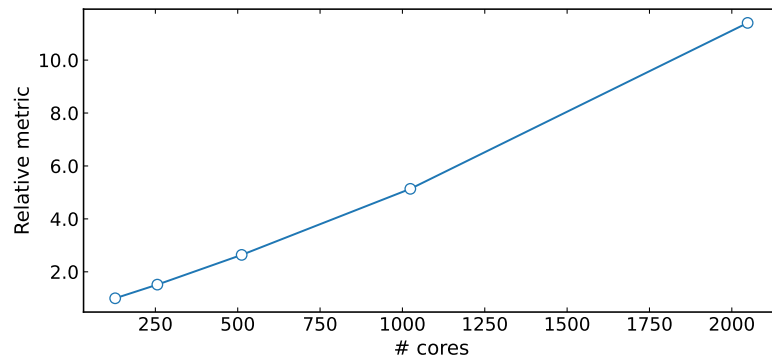

Figure 3: Sphng strong scaling benchmark.

Figure 4: Sphng weak scaling benchmark.

1.2.3   Trove

TROVE (Theoretical ROtational Vibrational Energies) is a suite of programs primarily designed for the calculation of molecular infrared line lists. [3]
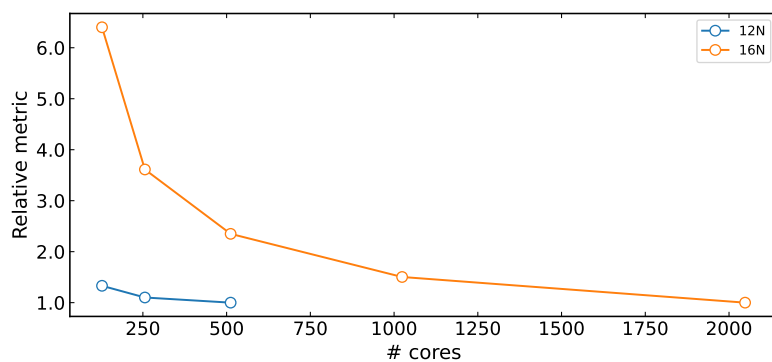

Figure 5: TROVE strong scaling benchmark.

[3]see https://github.com/Trovemaster/TROVE

1.3   Summary

TODO