

Several Benchmarks for Heat Transfer Problems in COMSOL Multiphysics®

Sofya S. Titarenko¹, Andrew McCaig

1. University of Leeds, School of Earth and Environment, Leeds, United Kingdom

Introduction: Nowadays all branches in modern science and industry tend to solve ever complicating problems. As the result the computational time increases considerably and it become very important to reduce the processing time and use available resources more efficiently. Parallelizing problem proves itself as efficient way to overcome the described problem. In the poster we compare different methods of parallelization and show what can work the best for COMSOL software.

Computational Methods: For benchmarks we used very simple conductive heat transfer problem in the square with constant T on the top and bottom and no heat flux through the boundaries. The mesh we used is uniform.

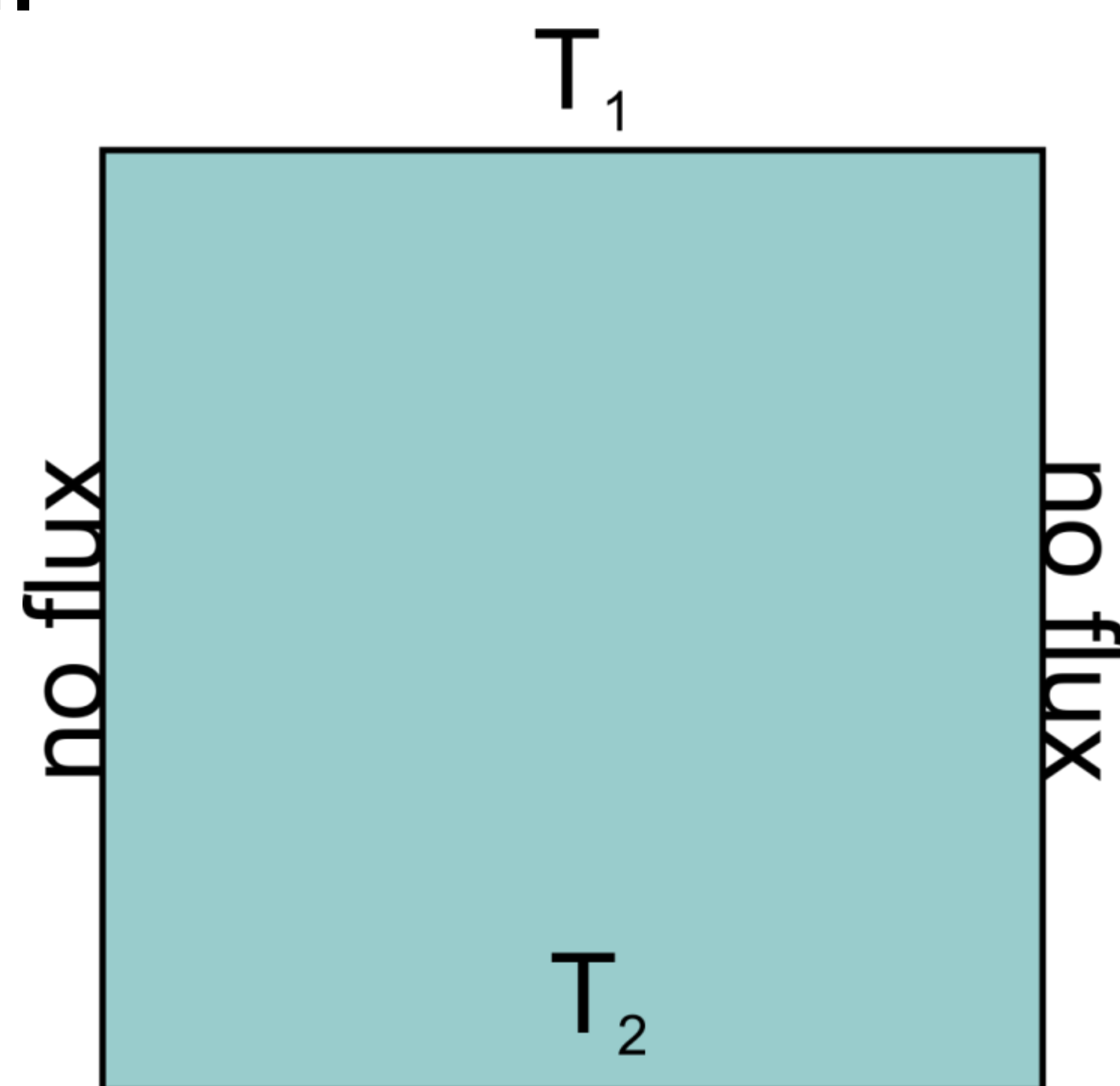


Figure 1. The problem used for benchmarks

Hardware	Specification
Dell poweredge	2x Intel Xeon CPU E5-2667 (2.90GHz, 6 cores), memory (6x8Gb, 1600MHz)
Dell server (1 node)	2x Intel Xeon CPU E5520 (2.26GHz, 4 cores), memory (24Gb, 1066MHz)
Dell workstation	2x Intel Xeon CPU E5607 (2.26GHz, 8 cores), memory(12Gb, 1066MHz)
Core i7 workstation	1x Intel Core i7-3930K CPU (3.80GHz, 6 cores), Memory(32Gb, 1600MHz)

Table 1. Specification of hardware been used

Results: The graphs bellow show how run time depends on the number of degrees of freedom (NDF) for different hardware. It shows workstations work better for COMSOL software then clusters.

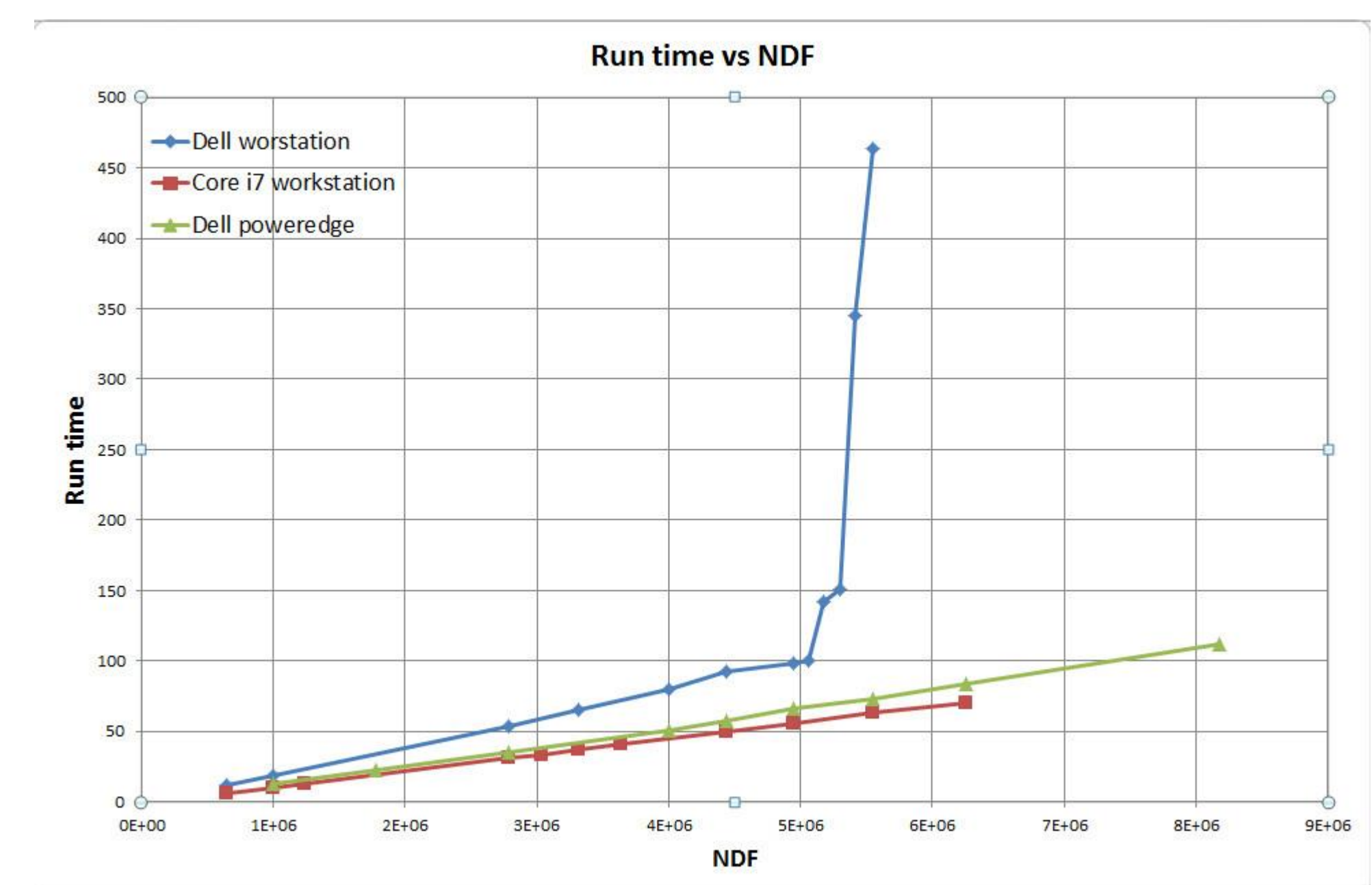


Figure 2. Performance on workstations.

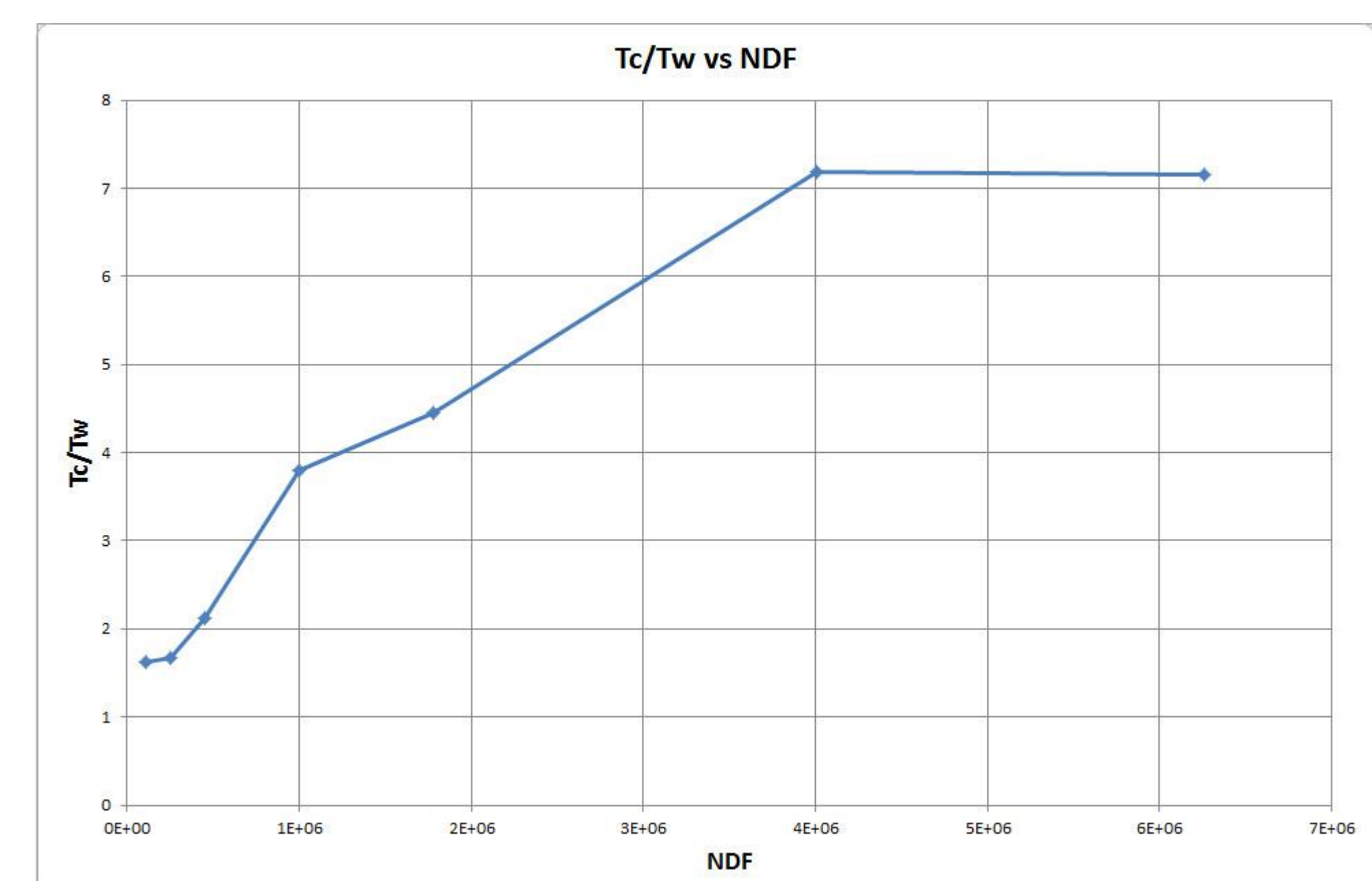


Figure 3. Performance on the cluster and workstation.

T_c is the running time on the Dell server (1 node);
 T_w is the running time on the Core i7 workstation.

Conclusions: Running COMSOL is more efficient on workstations than on clusters. Intel Core i7 CPU seems to work better than the Intel Xeon CPU.

References:

- <http://www.intel.co.uk/content/www/uk/en/processors/core/core-i7-processor.html>
- <http://www.intel.com/content/www/us/en/processors/xeon/xeon-processor-5000-sequence.html>