

6SigmaDCX Release 11 Solver

Continually Improving CFD Solver Performance

6SigmaDCX is a computational fluid dynamics (CFD) simulation tool that provides increased levels of productivity for data center design, troubleshooting and operation. Release 11 features improvements to the computational fluid dynamics (CFD) engine, used to model airflow inside the data center, as well as 6SigmaAccess – a new tool that can be used to simplify IT deployments.

Our Fastest Solver Yet

Simulation solve times in 6SigmaRoom can be dramatically reduced by taking advantage of powerful multi-core processors. Multi-core (“parallel”) solving in 6SigmaRoom divides the simulation work-load across processor cores, and can even utilise multiple computers in high-performance clusters. This enables you to get simulation results faster - without having to manually simplify your model or compromise its accuracy. Release 11 has seen significant improvements to parallel solving, meaning faster solves than ever before.

The time taken to solve a model and the computing resources required depends on the complexity of the model. Factors include the model size, convergence rate, grid count and number of objects. For instance, a small room with simple control system and simplified cabinets is likely to solve more quickly than a large one with complex pressure control and thousands of servers.

Generally, more-complex models gain greater benefit from solving with a higher number of cores.

Understanding solver performance for typical model types helps when trying to gauge the absolute and relative time you could save with any model. Several models of different types are analysed below to compare the relative speed-up for a range of core counts.

The 6SigmaRoom solve process consists of several steps, from generating the grid at the start, running CFD calculations and reassembling data at the end. However, running the CFD calculations is what takes most of the time, and so the solver performance data here refers only to the time taken to complete this step. The tests were performed on compute nodes with two 8-core Intel Xeon E5-2667 E3 CPUs, and 112GB RAM. Multiple compute nodes were used, connected together with InfiniBand.

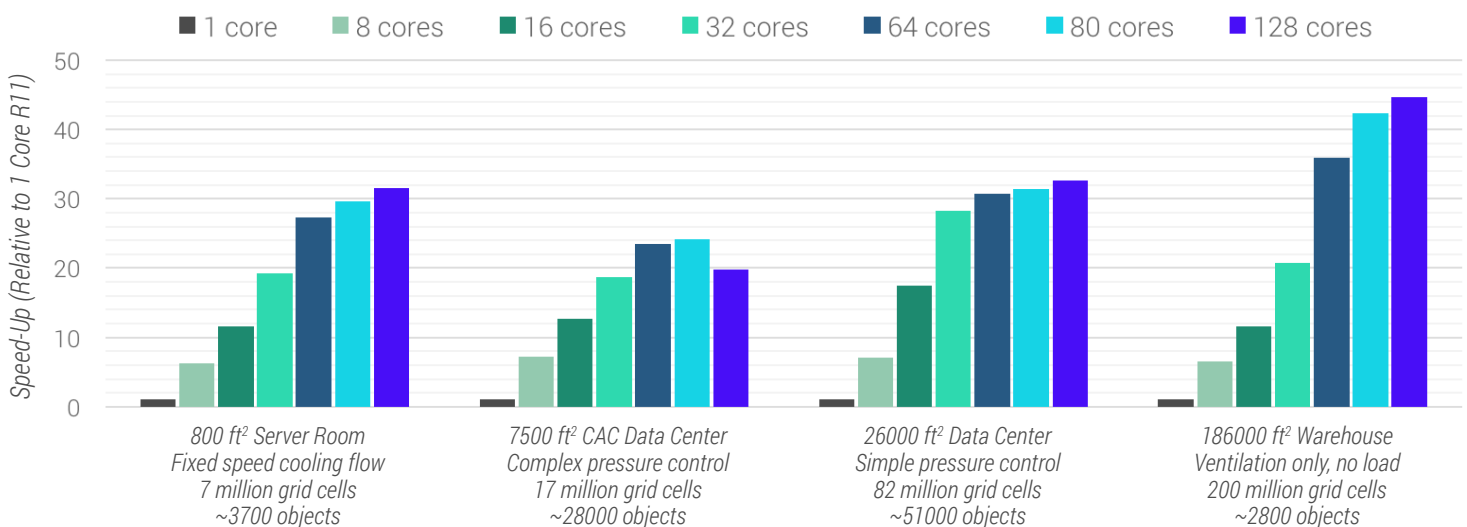


Figure 1: Solve speed increase with core count for four test models (higher is better).

Results

As seen in Figure 2, when solving the biggest case in our benchmark (200 million grid cells), using 128 cores reduced solve time by 98% compared to 1 core.

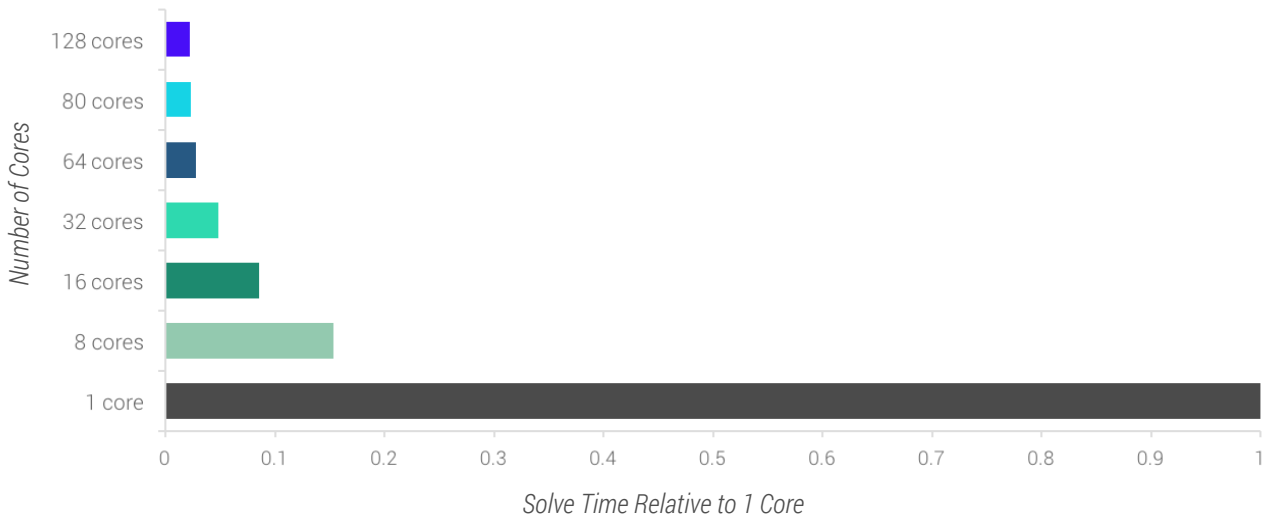


Figure 2: 200 million grid cell warehouse model. Relative solve time per iteration.

Better than Release 10

Release 11 has seen dramatic improvements in parallel solving, with solve speeds improving by up to a factor of 2.5 when compared with high core count solves in Release 10.

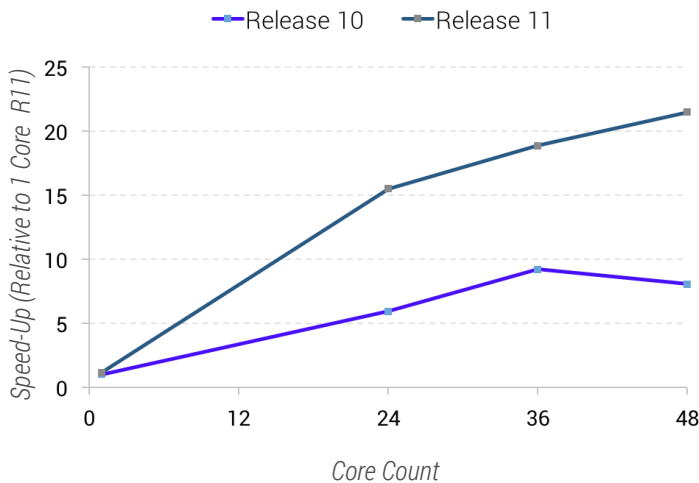


Figure 3: Improvement in solve time between Release 10 and Release 11.

Hyperthreading

Utilizing hyperthreaded cores offers no improvement, and in fact increases the solve time when compared with running at the optimum number of physical cores.

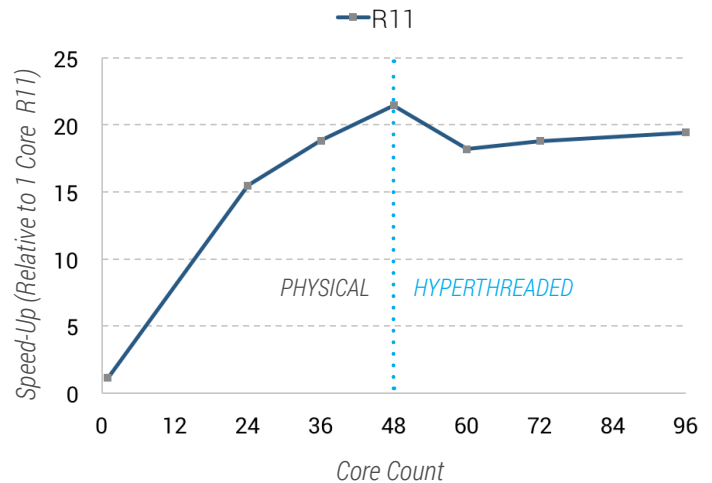


Figure 4: Solver slows down when utilizing hyperthreaded cores.

6Sigma **DCX11**

Please get in touch with support@futurefacilities.com if you would like to learn more about how you can take advantage of 6SigmaRoom's powerful parallel solver. If you don't have convenient access to a powerful computer, you can give cloud solving a go. Our partner Rescale provides integrated cloud solving with 6SigmaDC (www.Rescale.com).