

Success Story Mpacts

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Industrial HPC Course



SUCCESS STORY: OPTIMIZING INDUSTRIAL PARTICLE PROCESSES THROUGH SIMULATION

COMPANY: Mpacts

the simulation software Mpacts can simulate the behaviour of a large number of particles through machines enabling the improvement of the machine by testing designs in a software environment before actually having to build a physical machine. This way is much more time-efficient and cost-reducing

THE PROBLEM

Mpacts uses the Discrete Element Method (DEM) to understand, predict and solve industrial problems. To simulate a lot of particles, a lot of computational resources are needed. To perform simulations for clients the organization uses the VSC infrastructure.

SUCCESS STORY DETAILS

HPC provider: VSC

Country: Belgium

Link:

www.enccb.be/usmpacts

HPC PROBLEM DOMAIN

More particles can only be simulated in shorter time spans by making use of the parallel resources available. For 'shared memory' parallelism such as TBB or GP-GPU, the bottleneck for this type of simulation is typically memory bandwidth and memory latency. When switching to an MPI parallel acceleration, across multiple compute nodes, the main challenge becomes an efficient dynamic domain decomposition as the particles move across the simulated domain.

THE SOLUTION

- The software was made more efficient & thus faster:
VSC advice Mpacts: sort the particles so that particles close in (simulated) space are also close together in computer memory. This increases the likelihood for cache hits and decreases the overall memory bandwidth
- More computational resources were used:
Switching to MPI parallel acceleration
- Acceleration hardware (GPUs)

THE BENEFITS

VSC enables Mpacts to deliver results with 'industrial turnaround times' at a cost that scales only with how much actual simulation work is done