Transforming traffic modelling with Atkins

Hartree Centre
Science & Technology Facilities Council

In a pioneering collaboration funded by Highways England and Atkins, the STFC Hartree® Centre's expertise is ensuring that key simulation software can meet the intense demands of a £15 billion road construction and improvement programme.

Challenge

Highways England has invested in five new Regional Transport Models (RTMs), which use Atkins-distributed traffic modelling software SATURN[1] to help predict the economic impact of the extensive road network investments up to 2020 and beyond. Performing simulations of the size and sophistication needed to better understand investment certainty can result in long runtimes – a major obstacle to the transport modelling industry. Highways England and Atkins have therefore initiated the UK's first major traffic modelling collaboration spanning public and private sectors – the Transport Systems Catapult (TSC), University of Sheffield and Hartree Centre – to answer a crucial question: can traffic modelling software use Graphics Processing Unit (GPU) technology to take advantage of massively parallel data processing and achieve a step-change in model runtimes?

Solution

To enable traffic modelling to exploit GPUs – which offer huge runtime benefits over traditional Central Processing Unit (CPU) technology – the software's SATALL traffic assignment process was rebuilt around different algorithms. The collaborative team then undertook the integration and testing of the new GPU based process to enable scaling (and spreading of workloads) over multiple GPU cores. The Hartree Centre's experience in software development for high performance computing (HPC) environments played a pivotal role in updating the code, and recompiling and developing the interface between the new SATGPU process and the rest of the SATURN software. This ensured the code was GPU-compatible, efficient and also helped to future-proof SATURN.

Benefits

The enhanced, energy-efficient software runs up to 30 times faster than the standard version of SATURN and up to 5 times faster than the CPU-based multi-core version – with potential to increase speeds still further. A scenario simulation using multi-core that would take up to a week to run can now be completed in less than 24 hours, meaning a greater number of more complex simulations can be carried out to provide greater investment certainty, and that bigger problems can be solved without a time penalty. These are the first steps to more efficient traffic modelling, with potential for greater realism through the exploitation of contemporary 'big data'. Ultimately this project will help to maximise benefits and minimise disruption from necessary investment in the road network.

"The Hartree Centre was instrumental in our securing a big reduction in SATURN runtimes – an achievement with the potential to benefit the whole traffic modelling community."

– Richard Bradley, Intelligent Mobility Team, Atkins

[1]Simulation and Assignment of Traffic to Urban Road Networks

Work with us

We collaborate with industrial clients and research partners on projects that create insights and value using high performance computing, big data analytics, simulation and modelling.

By combining our world-class facilities with access to our specialists and computational scientists, we can enable your organisation to produce better outcomes, products and services more quickly and cost-effectively than through conventional R&D workflows.

With our partners we are developing the next generation of supercomputing architectures and software, combining existing best practice with innovation to deliver faster, cooler and more sustainable solutions capable of meeting the challenges of data intensive computing.

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