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Improved UTMC through GPU-Accelerated Microscopic Road Network Simulation

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High-performance simulation for UTMC

- Based on real-time data
- Minimise human intervention
- Predictive City-Scale Simulation requires:
  - **Many Simulations**
  - Permutations, replications, parameters
- Performance is crucial

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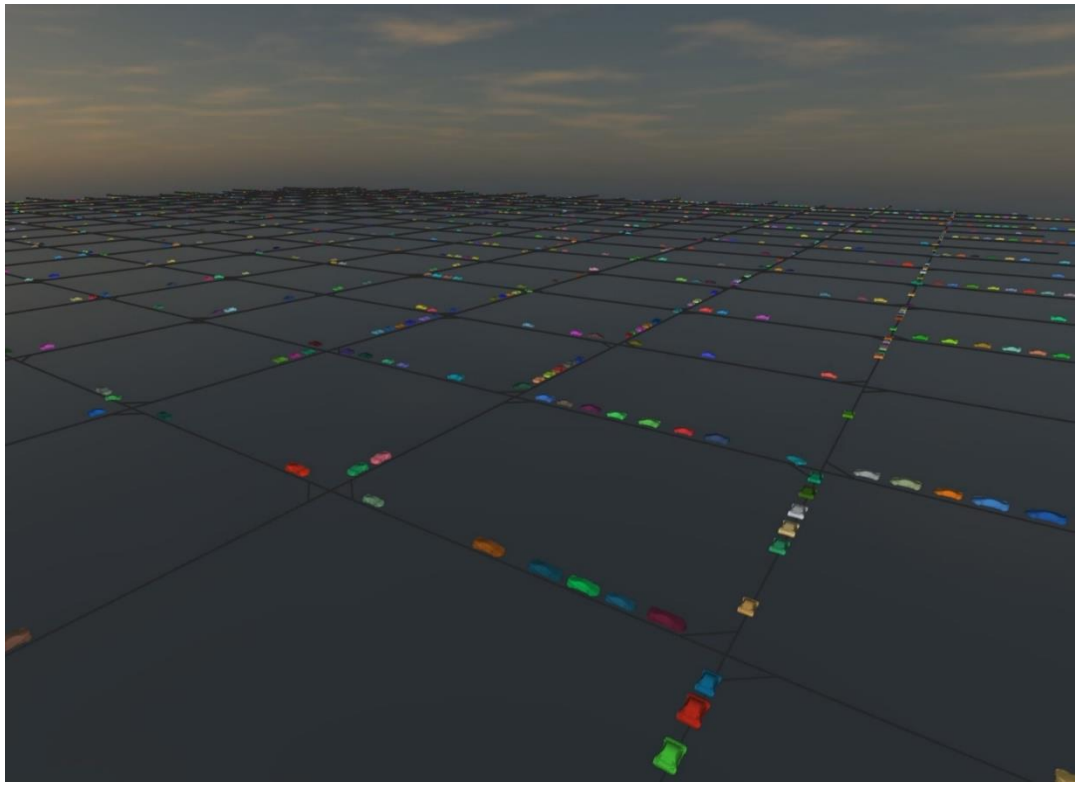
ATKINS SATURN Aimsun

What have we done so far?

- Demonstrated a step-change in transport simulation performance and scalability
- Macrosimulation
  - Collaboration with Atkins on SATGPU
  - 12x faster for regional-scale models (so far)
- Microsimulation
  - PoC for DfT collaborating with Aimsun
  - Up to 40x faster than commercial tools



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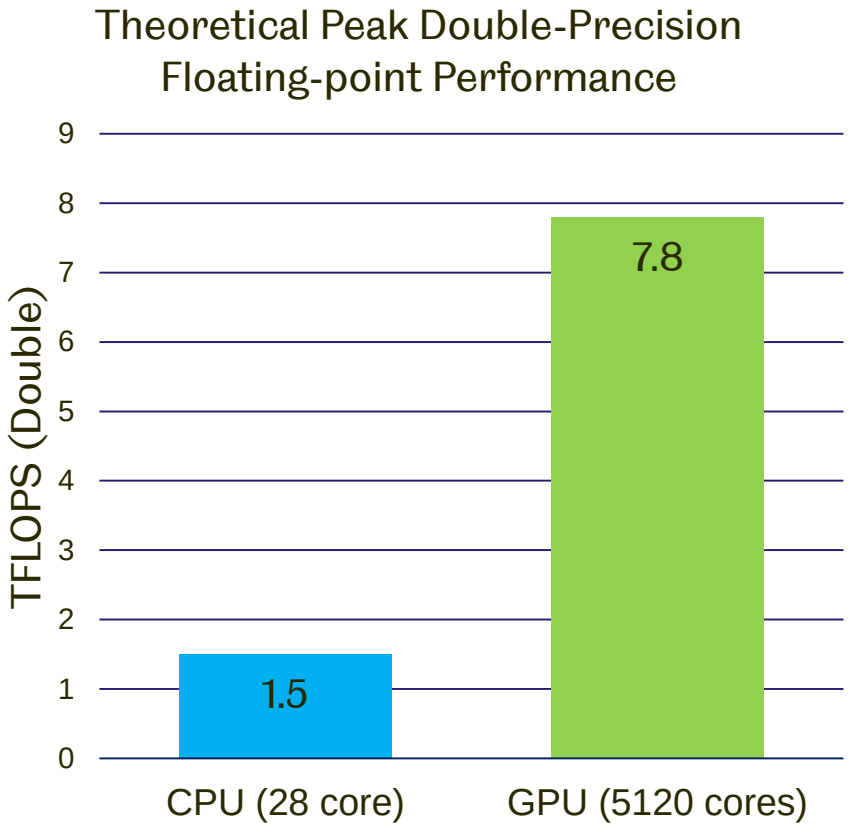
How have we achieved this?

- Graphics Processing Units (GPUs)
- Massively parallel co-processors
  - Thousands of processing cores
  - High levels of Performance
- **Difficult to access performance**



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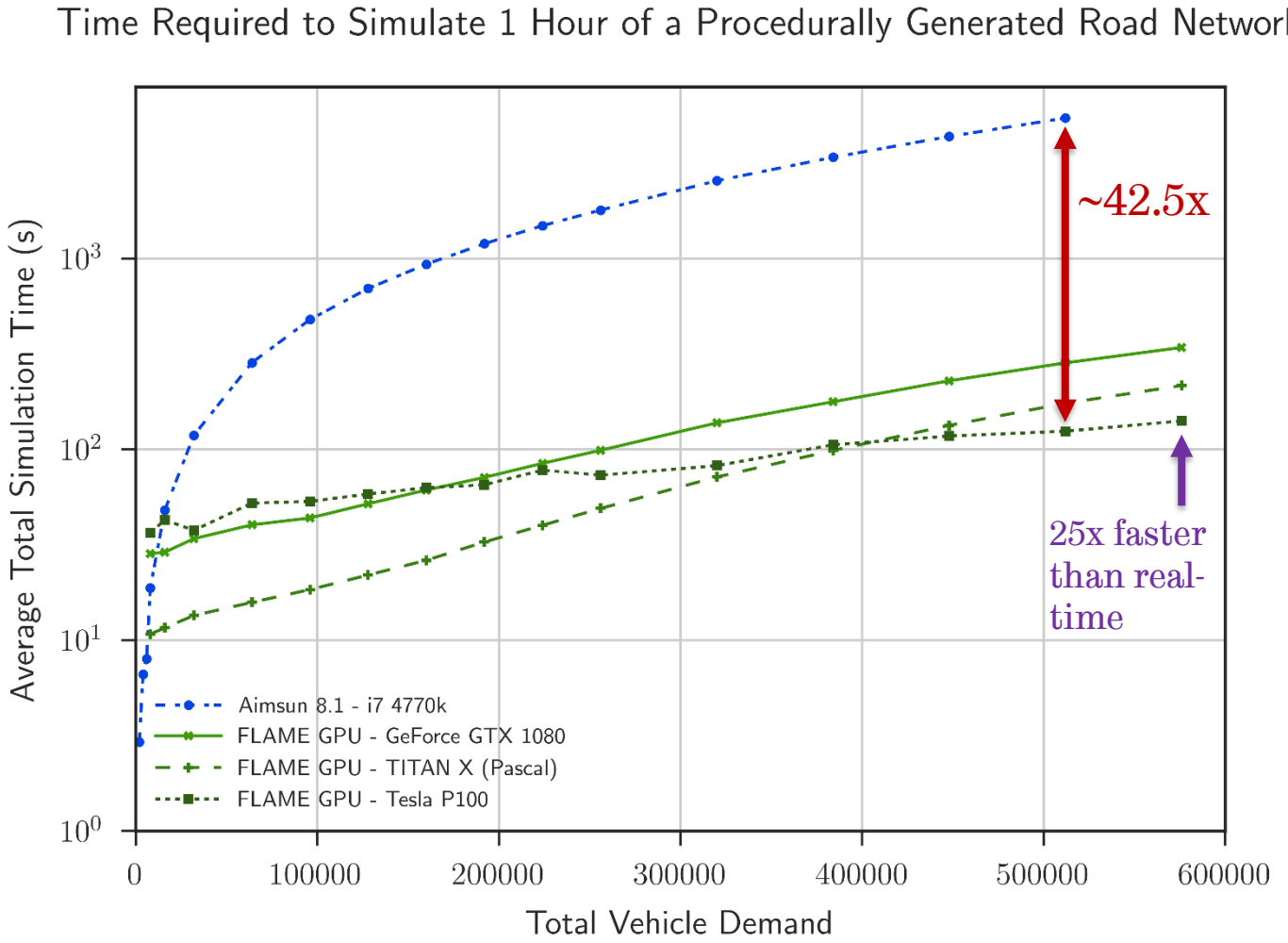
GPU Accelerated Micro-simulation

- Collaboration with Aimsun
- Implemented and cross-validated a *subset* of Aimsun models and features
- Benchmarked on artificial model
- Up to **40x faster** than Aimsun 8.1
- 576,000 vehicles at 25x faster than real time.



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Our Proposal

- Compliment UTMC tools by optimising control strategies through GPU accelerated microsimulation
- Option 1) Real-time simulation to predict the output of control strategies
- Option 2) Train a machine learning system using both real-world data and vast amounts of predictive data

Any Questions?

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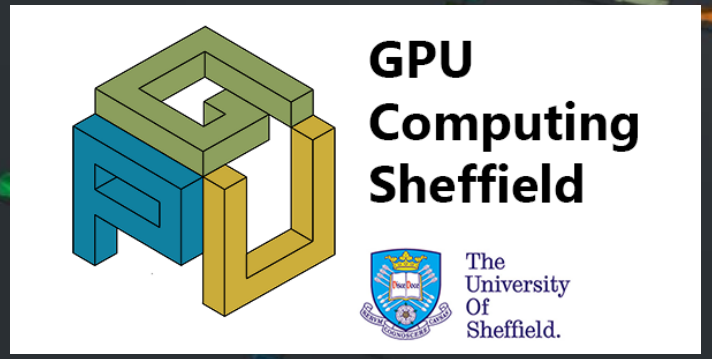
http://gpucomputing.shef.ac.uk



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CPU Microsimulation Performance Scaling

- Aimsun 8.1
- 1 hour simulation of 25,000 vehicles
- No performance improvement beyond 6 physical cores
- Additional CPU cores offer diminishing returns