



HPC for Smart City Traffic Management

Harnessing High-Performance Computing empowers cities to predict and reduce traffic congestion through fast, detailed simulations of urban mobility.



What Is High-Performance Computing (HPC)?

HPC uses supercomputers with hundreds of times the power of a PC and parallel processing to tackle huge, complex problems. Clusters of linked nodes work simultaneously for rapid results.

Common HPC tasks include climate modelling, genomics, and real-time analytics — far beyond the reach of everyday computers.



Predicting Traffic Congestion with HPC

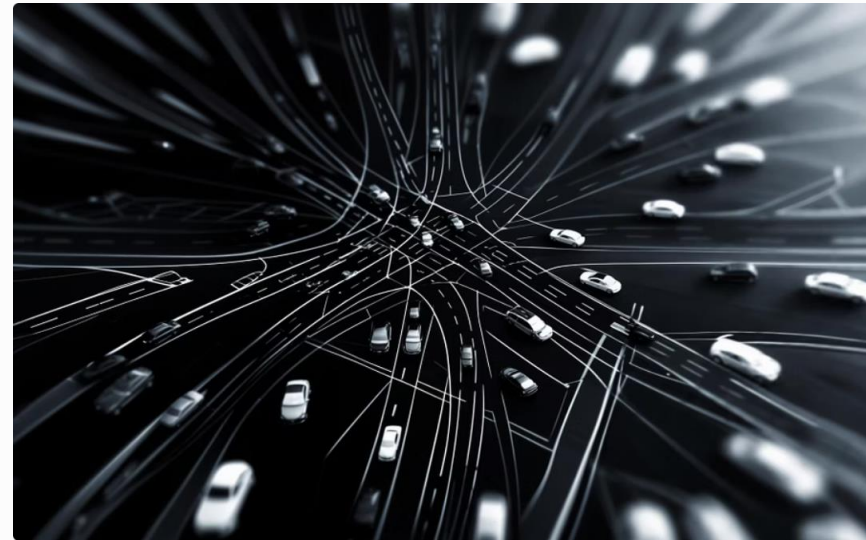
HPC processes vast sensor and GPS data streams in real time to simulate city-wide traffic flows. This enables planners to forecast jams and dynamically adjust signals or reroute vehicles.

Such HPC-driven controls significantly cut congestion and save billions of gallons of fuel compared to static systems.

How HPC Traffic Modelling Works



Live data from sensors, cameras, GPS, and weather builds a detailed city traffic model, capturing demand profiles.



Supercomputer clusters simulate microscopic vehicle flow using parallel CPU/GPU cores for high-speed analysis.



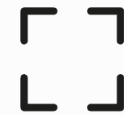
Outputs include congestion heatmaps and optimized signal timings, delivered rapidly for real-time traffic control.

Key Advantages of HPC in Traffic Prediction



Massive Speedup

Simulations finish in minutes—vs hours or days on regular machines—enabling quick decision-making.



Scalability

Capable of modelling millions of vehicles and thousands of sensors simultaneously at whole-city scale.



Improved Accuracy

Supports detailed, complex models for precise congestion forecasting.



Real-Time Planning

Allows dynamic rerunning of simulations with fresh data for adaptive traffic management.

Broader HPC Applications Across Fields



Weather Forecasting

Runs complex climate models offering fast, accurate atmospheric predictions for urban planning.



Genomics & Healthcare

Processes whole genomes rapidly accelerating disease research and personalised medicine.



Film & Entertainment

Renders CGI for blockbuster movies using massive computational power to create stunning visuals.



Key Takeaways & Next Steps



Transformative Traffic Management

HPC is transformative for smart city traffic management, enabling detailed real-time simulations and dynamic control.



Speed & Scalability

Its speed and scalability support complex models that improve accuracy and cut congestion effectively.



Strategic Investment

City planners should invest in HPC infrastructure and integrate live urban data streams to maximise benefits.



Broader Applications

Broader HPC applications reveal vast potential to optimise multiple city functions beyond traffic.

Embracing HPC-driven smart technologies is essential to building efficient, sustainable cities for the future.