



# 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

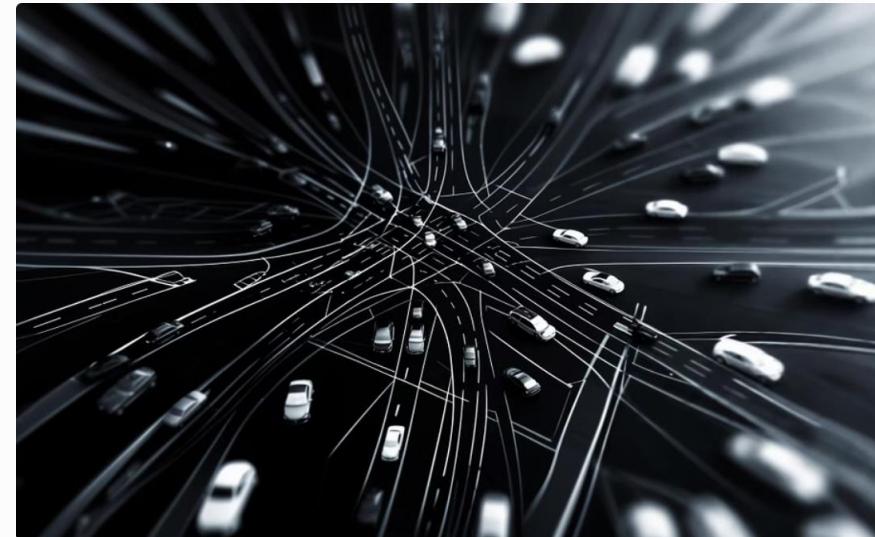
HPC processes vast sensor and GPS data streams in real time to simulate city-wide traffic flows. This enables planners to forecast jams and dynamically adjust signals or reroute vehicles.

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.

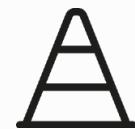


## Film & Entertainment

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.