MoTiON

And LoHAM

TRANSPORT FOR LONDON

EVERY JOURNEY MATTERS

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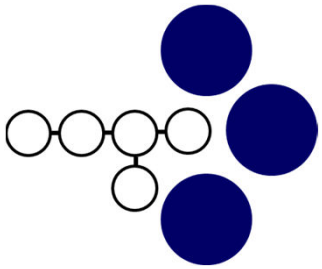

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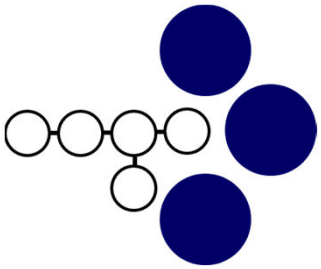
What is MoTiON?

MoTiON is TfL's a disaggregate tour based four-step demand model which integrates LoHAM, Railplan, Cynemon

MoTiON uses five demand modules to forecast trip change and mode shift



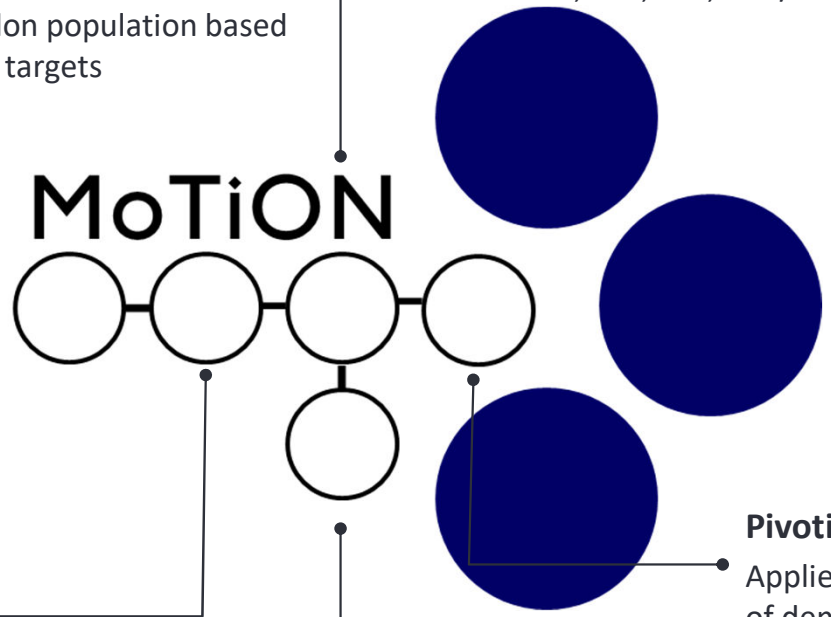
LoPopS

A population simulator that creates a future year London population based on demographic targets

Mode and destination choice

Forecasts the trip pattern by mode: Car, Rail, Bus, Taxi/Cav, Walk and Cycle

- Population
- Demographics
- Employment
- Economics
- Transport policy



- Total trips
- Mode share
- Travel times
- Crowding
- Congestion

Pivoting

Applies growth to the best available view of demand from EDMOND

Tour frequency

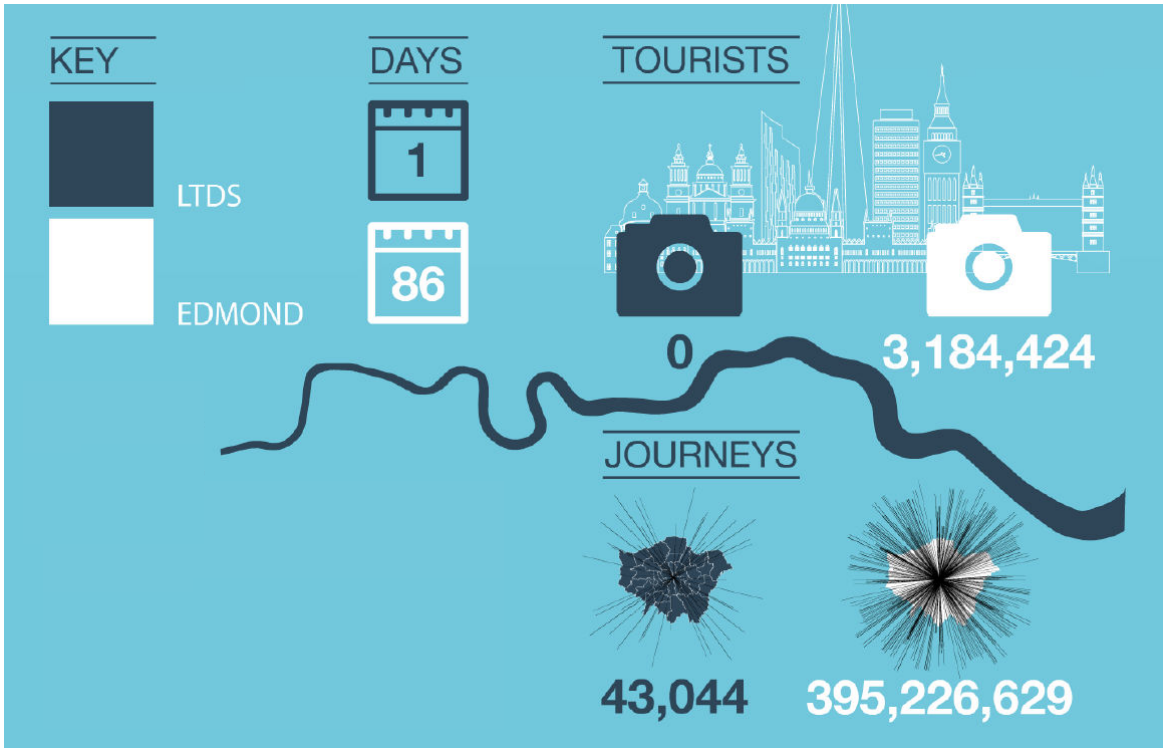
Based on population demographics we predict the number of tours by each purpose

Parking

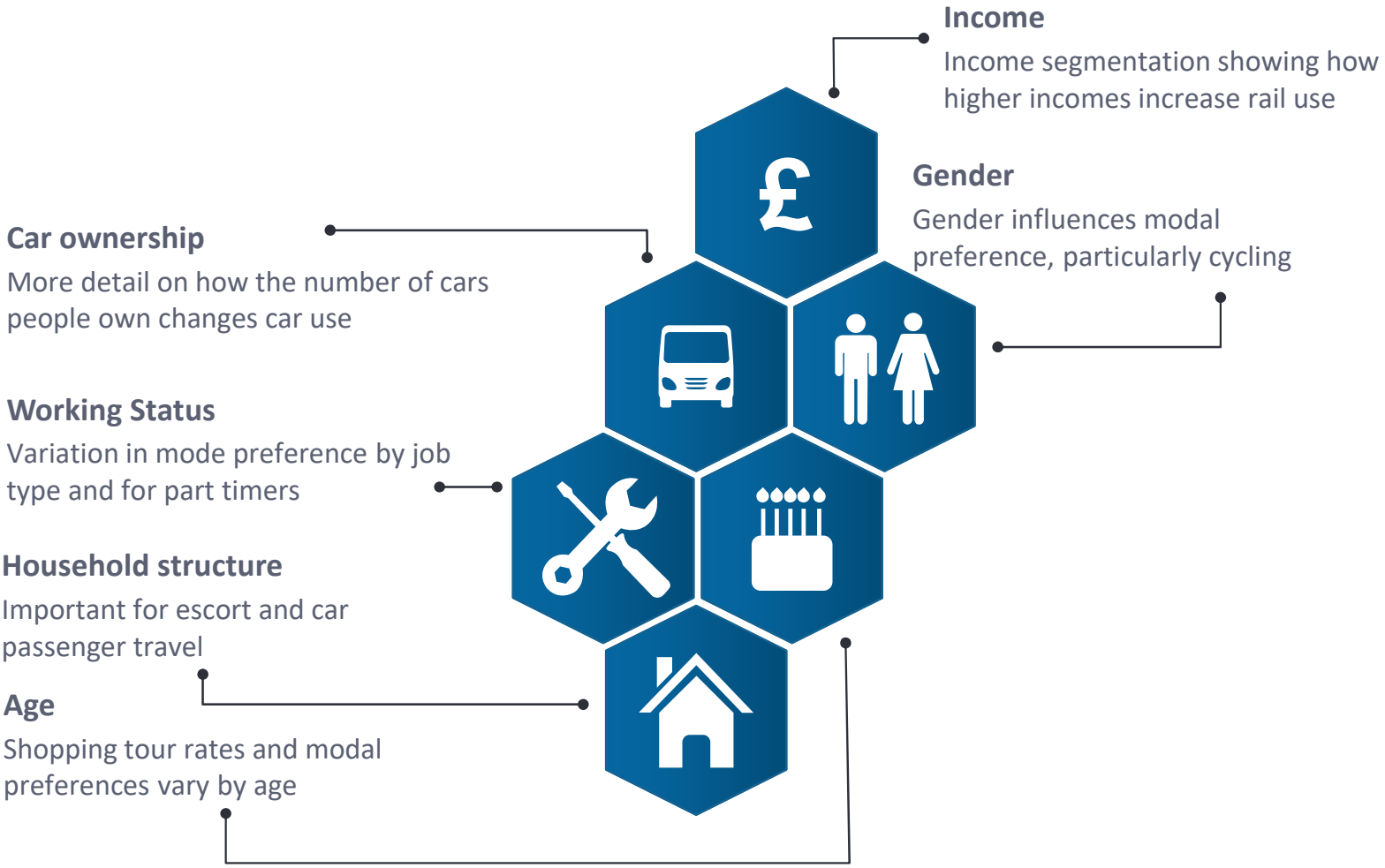
Applies constraint based on available capacity

MoTiON is built on insights from our data fusion project EDMOND. This is to be refreshed in 2023

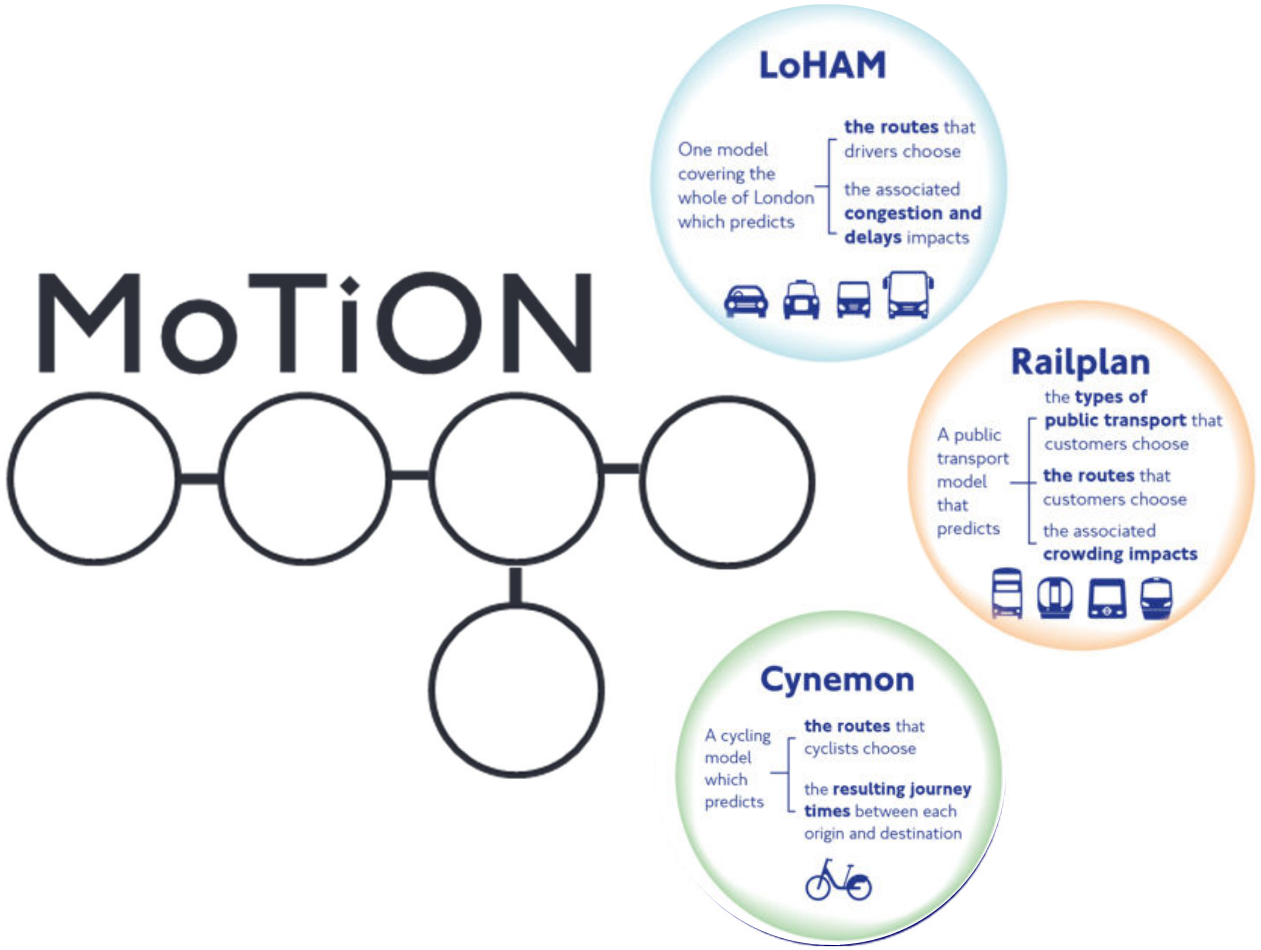
MoTiON uses existing data sources such as household surveys (LTDS) but is also built off new digital data. Project EDMOND achieved a step change in demand data and was the first project to harness the power of big data for transport demand analysis in a complex global city



A richer segmentation informs travel choice behaviour considering a wide range of personal characteristics



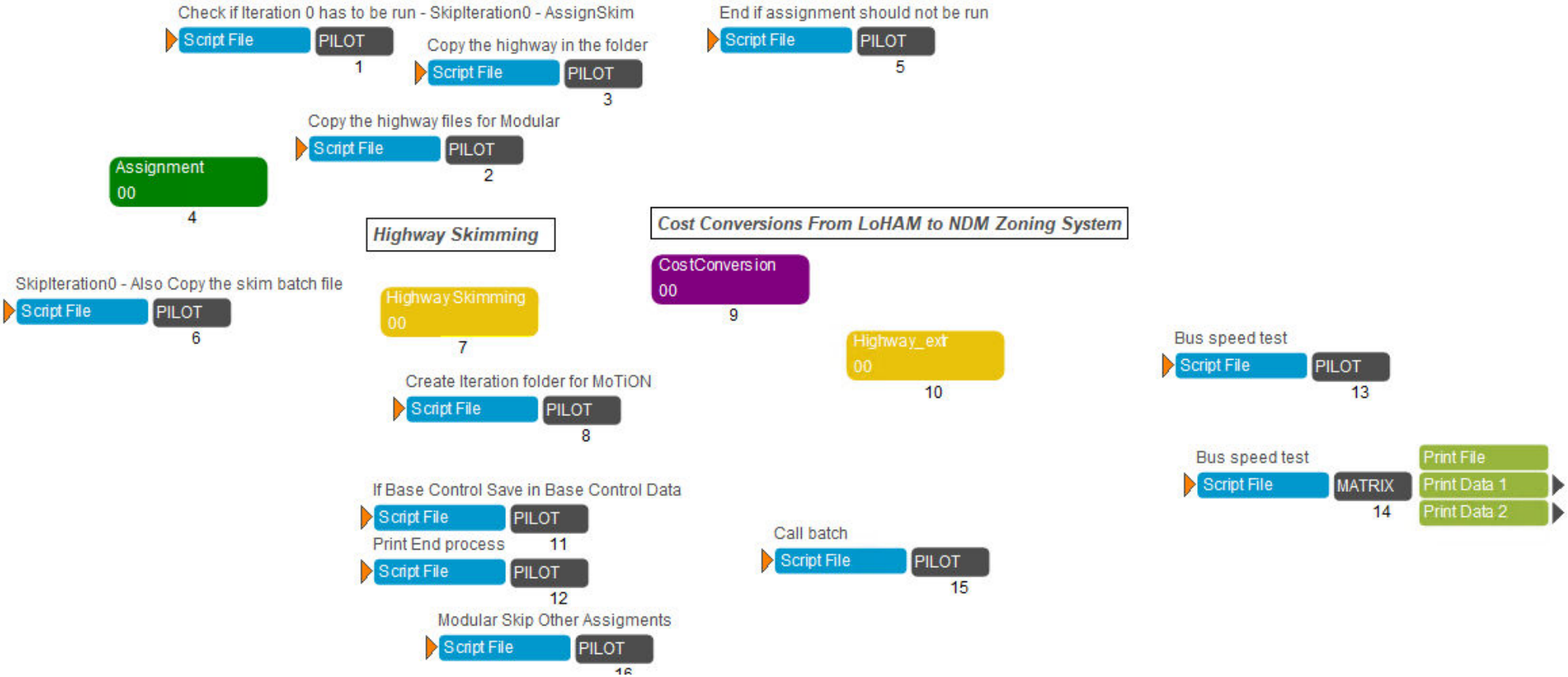
MoTiON overcomes commercial risks and delivers efficiency with integrated assignments



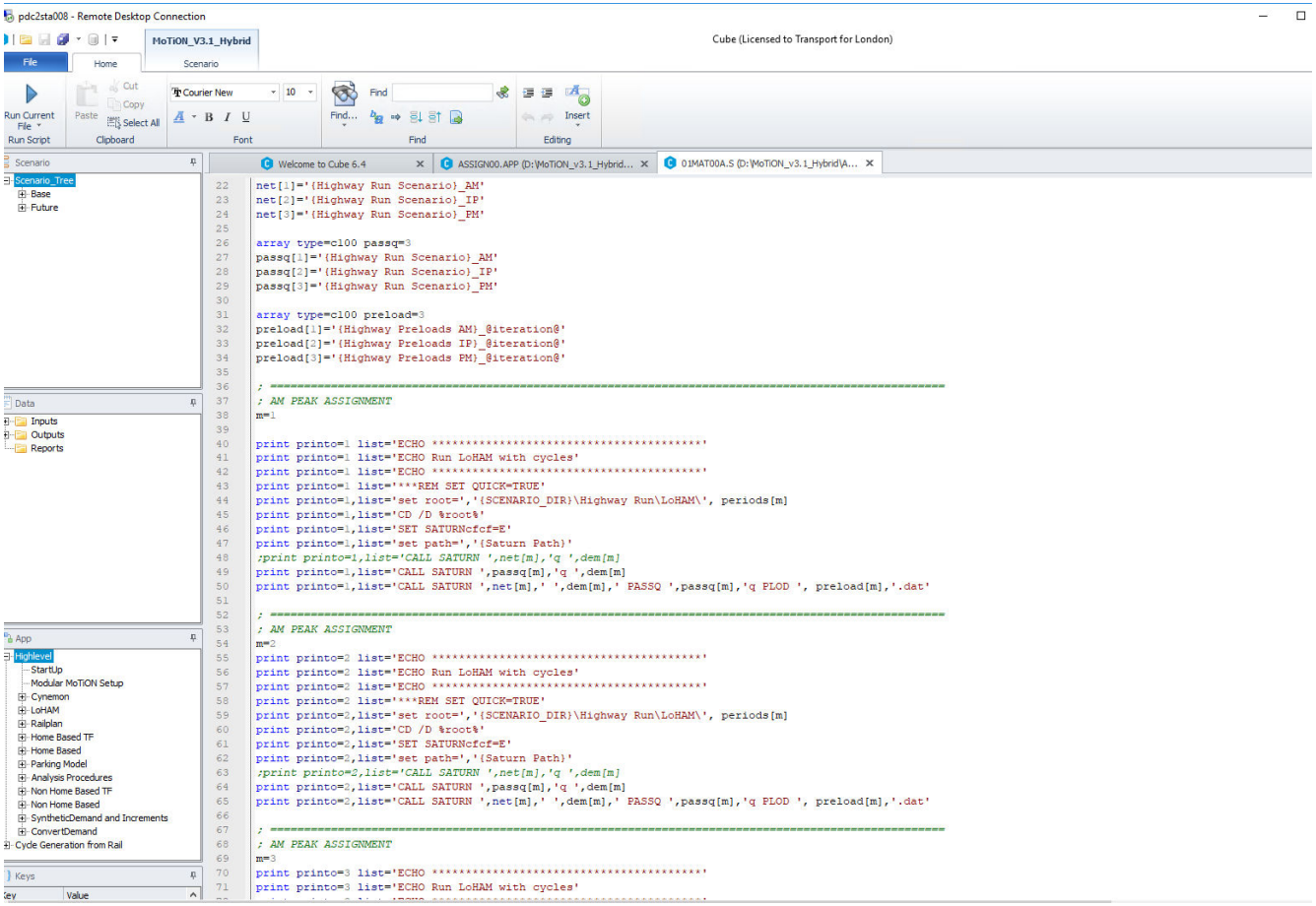
How does LoHAM Fit in?

LoHAM is used by MoTiON to feed highway skims to the demand model with changed demand being fed back through a feedback loop

LoHAM is the highway supply model for MoTiON. Any changes in assignment and skims feed through to the demand model



MoTION writes a batch file to a text file which is then run to assign and skim



There are key interactions with the other assignment models that are key for understanding the use of street space

Bus coding

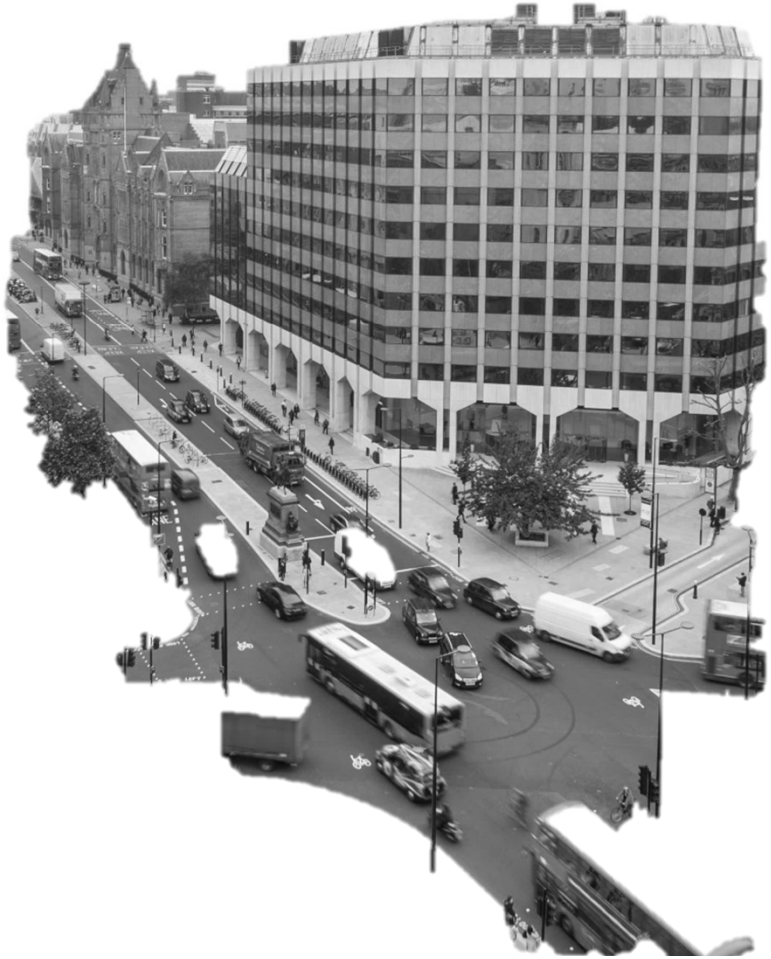
The number and routes of buses are converted into SATURN code for use in LoHAM

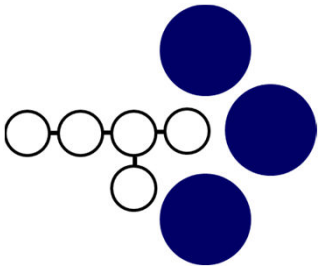
Cycle Pre-load

The number of cycles on the road are fed into LoHAM using a pre-load

Bus speeds

Bus speeds are affected by changes in the highway model conditions compared to a base year





What challenges were faced

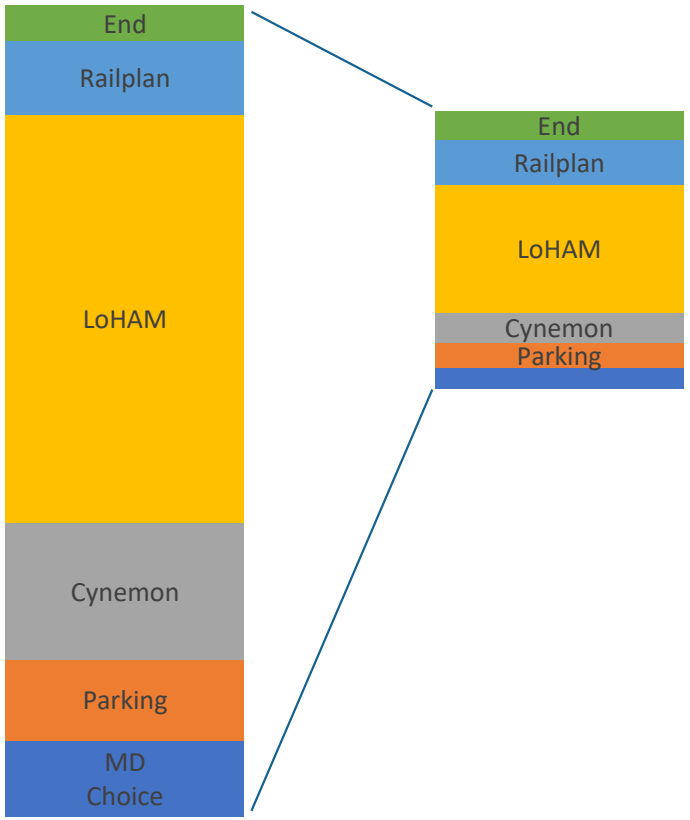
Run times and space provided a major challenge initially and there’s still work to do

MoTiON runs over 3x faster than it did originally after optimising software and hardware

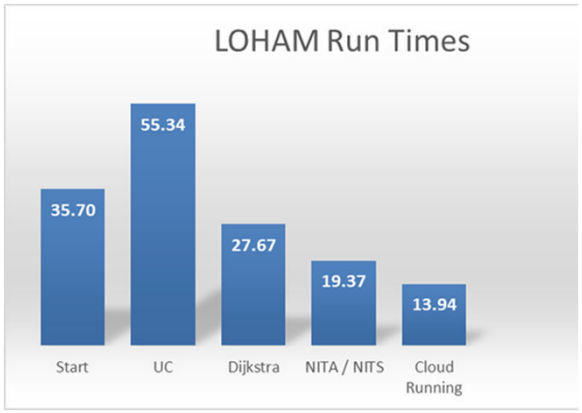
In 2020 there was a dramatic reduction in run times from 2 weeks to 7 days.

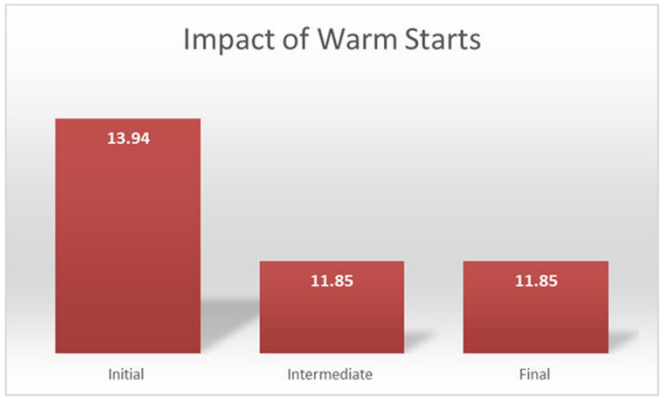
Every part of the model was optimised including LoHAM.

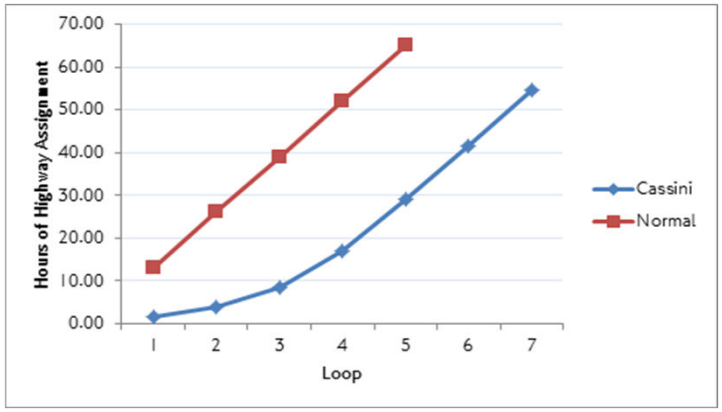
This is still much longer than a typical demand model and we hope to improve this in the future.



LoHAM improvements focused on improving convergence, optimising parameters and utilising multi-core







A series of improvements reduced LoHAM run times down*

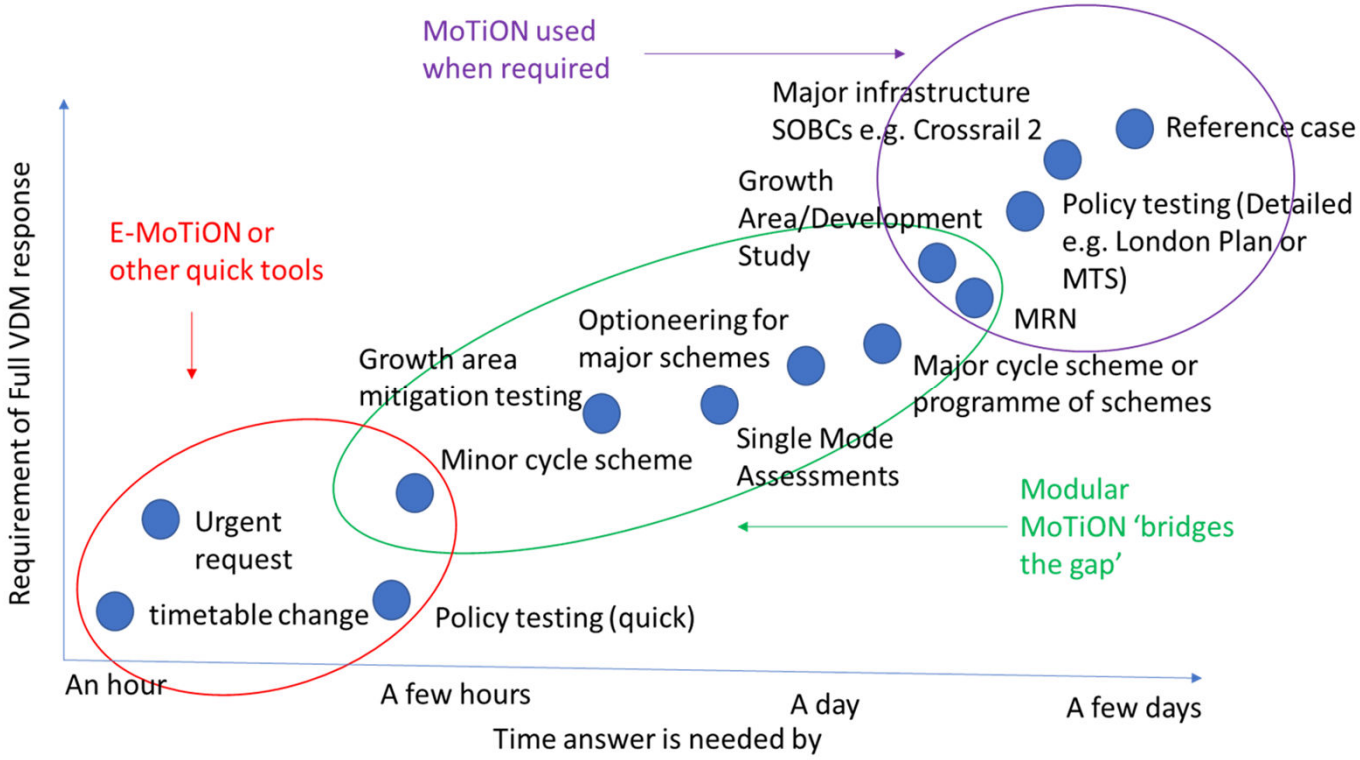
Warm starts help improve the model run times in intermediate and final iterations

Whilst not implemented at launch the potential for Cassini was clear

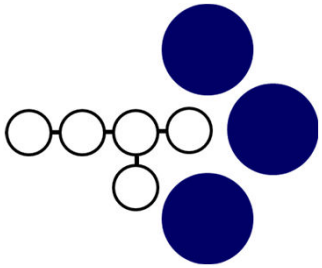
*In 2022 TfL implemented CELESTE+LUCIEN which have been reported to provide 45% faster runtimes than Dijkstra. This hasn't been tested for LoHAM

TfL have also developed a ‘Modular’ MoTiON appropriate for certain studies with dramatically reduced run times

We build models to ensure they have maximum benefit to the user. If the question has ‘gone’ by the time the answer has arrived. The model is no good



The pandemic has also highlighted the importance of considering uncertainty



Agglomeration
A resurgent and prosperous London which has retained and developed world leading status in finance and technology.

Green Innovation
London has successfully reinvented itself as a global centre for climate mitigation and adaptation technologies.

Rebalancing
Lost opportunity and competitiveness for London in a challenging global context.

Instability
London has battled through constant headwinds of global and natural adversity.

Hybrid Forecast
Represents a plausible future in which rates of trip making remain similar to current levels for the long term

Forecasts

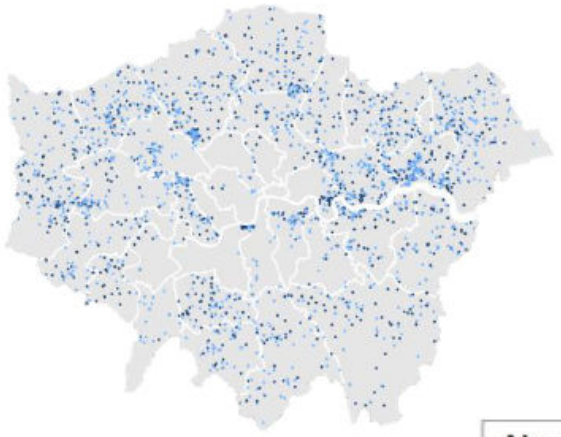
Fully modelled multi-modal forecasts

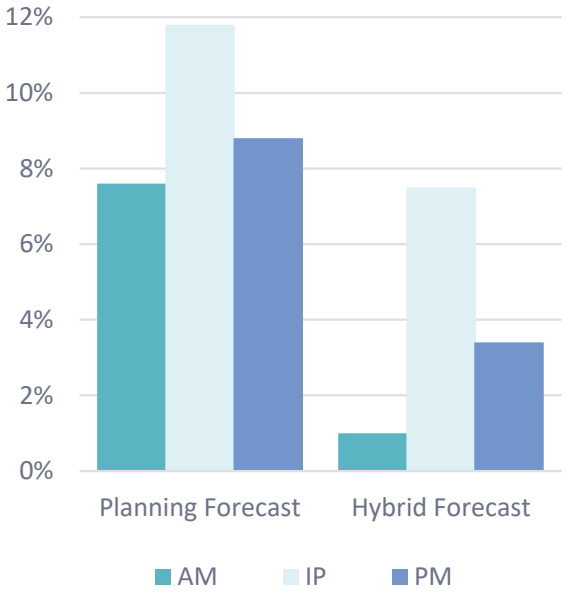
Planning Forecast
Represents an alternative plausible future in which, over time, travel behaviour and London's growth revert to be similar to pre-pandemic

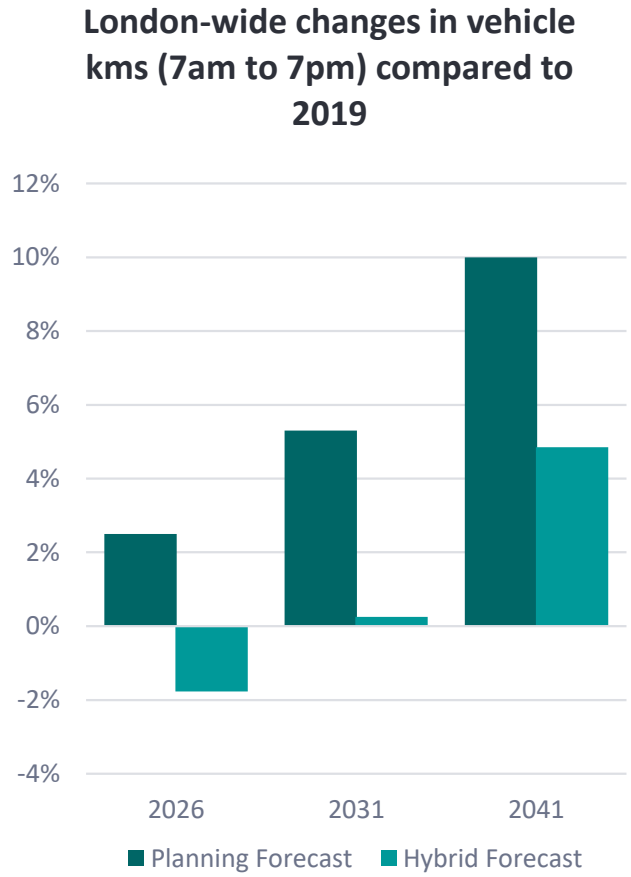
What are MoTiON and LoHAM used for?

MoTiON and LoHAM are used to understand the impact of policies and schemes on highway demand, journey times and streets utilisation

MoTiON helps to understand growth by mode and environmental impacts from increase in car travel







MoTiON and LoHAM are used to make the case for streets schemes

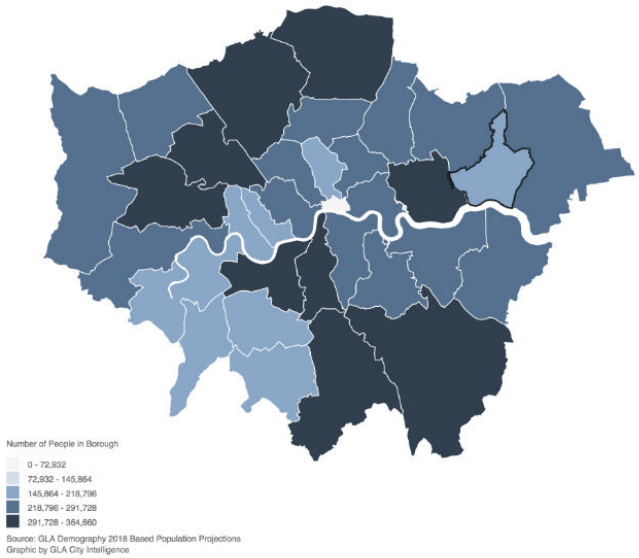
Repairing & building new river crossings to reduce traffic, delay and inefficient travel

Major Road Network bids to improve the journey time and reliability by car

Schemes that improve safety as well as improve traffic flow

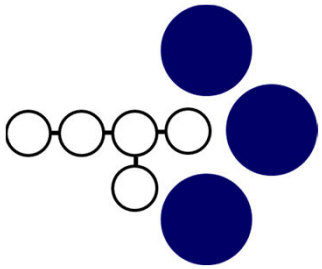
MoTiON and LoHAM are used to encourage good growth and mitigate for additional demand

Helping boroughs with evidence for their local plans



Understanding the impact of major developments in London

Understanding overall growth and subsequent parking policy in the London Plan



What is next?

There are still improvements to be made in run times and general efficiency as well as taking advantage of improvements planned for SATURN

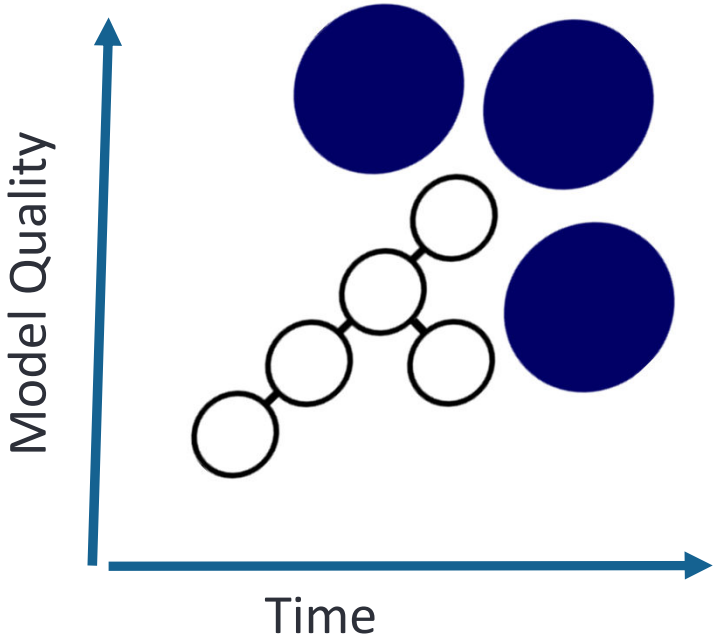
There are options to improve run times and interactions between LoHAM and MoTiON

There are some key improvements that can help MoTiON and LOHAM.

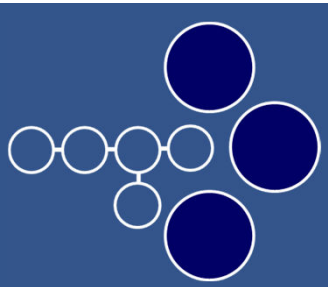
- We intend to add flexibility in the number of LoHAM user classes.
- We intend to work with Atkins to incorporate any new features.
- We intend to review run times particularly the Cassini approach
- We intend to extend the bus speed feedback to link level.

As LoHAM improves so does MoTiON and both models benefit

Through the years LoHAMs functionality, coding, convergence has improved as well as SATURNs ability to solve transport problems. This will continue and continue to provide benefit to users of both models



Thank you



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