The Transport sub-model in SIMULACRA

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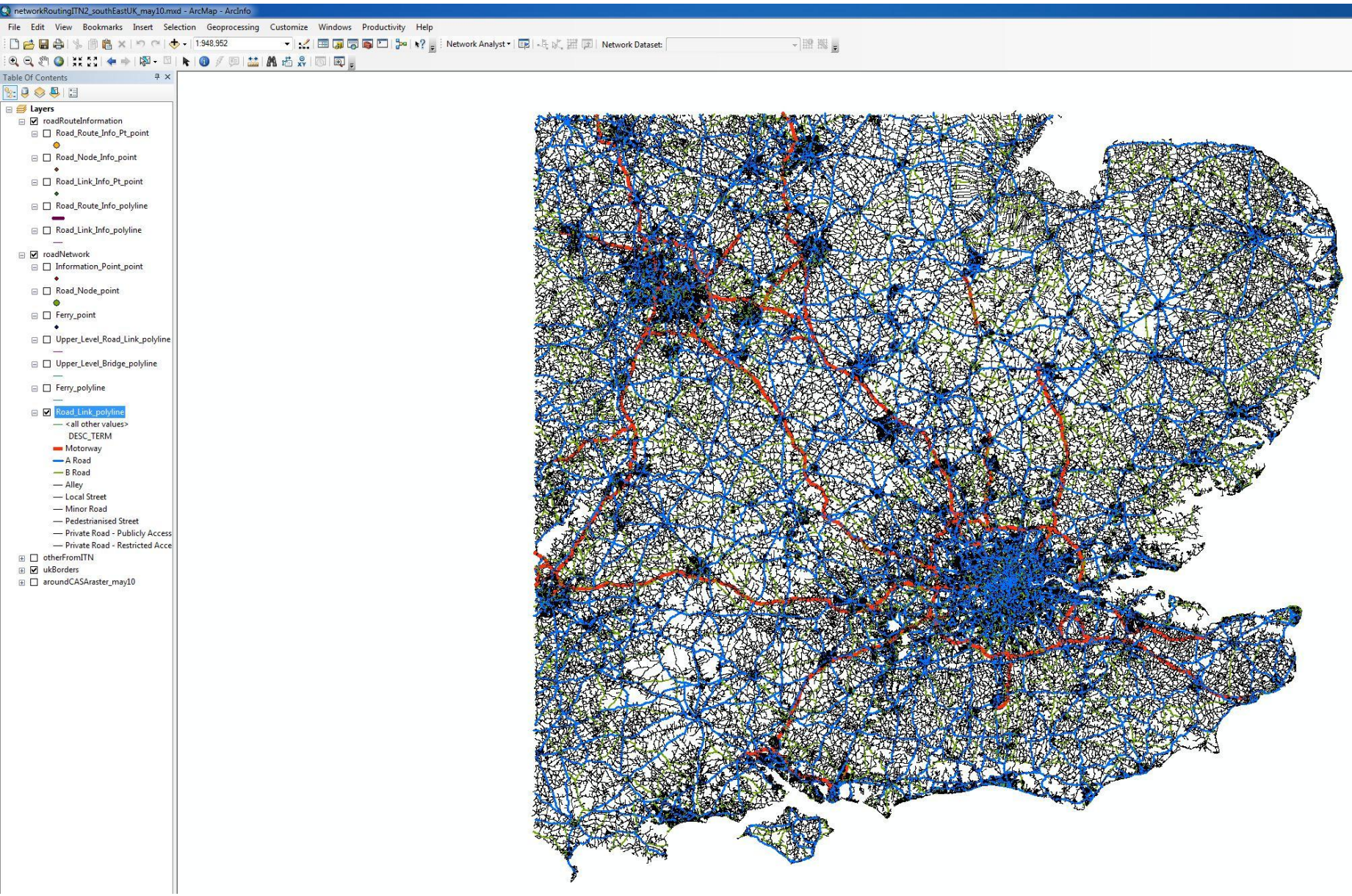
Talk layout

Network representation

Calculating the routes

Coupling transport demand and transport supply

Conclusions and next steps


networkRoutingITN2_southEastUK_may10.mxd - ArcMap - ArcInfo
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Productivity Help
1:948,952
Network Analyst
Network Dataset:
Table Of Contents
Layers
roadRouteInformation
Road_Route_Info_Pt_point
Road_Node_Info_point
Road_Link_Info_Pt_point
Road_Route_Info_polyline
Road_Link_Info_polyline
roadNetwork
Information_Point_point
Road_Node_point
Ferry_point
Upper_Level_Road_Link_polyline
Upper_Level_Bridge_polyline
Ferry_polyline
Road_Link_polyline
<all other values>
DESC_TERM
Motorway
A Road
B Road
Alley
Local Street
Minor Road
Pedestrianised Street
Private Road - Publicly Access
Private Road - Restricted Acce
otherFromITN
ukBorders
aroundCASAraster_may10

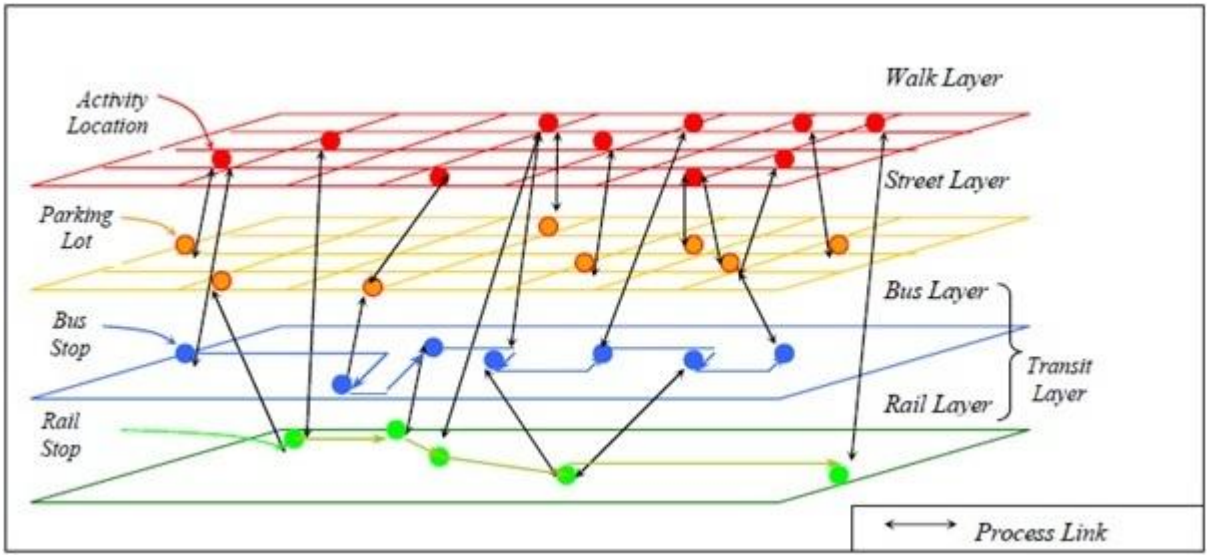
Network Representation

Modes of transport to be included in SIMULACRA:

- ❑ Street layer
  - ITN from Ordnance Survey
- ❑ Walk layer
  - Produced from street layer
  - (Ordnance Survey to release the Urban Paths Theme for ITN)
- ❑ Cycle layer
  - Produced from street layer
- ❑ Bus layer
  - Data available from NPTG (National Public Transport Gazetteer)
    - ➢ NaPTAN (National Public Transport Access Node)
    - ➢ TransXChange database
- ❑ Train layer
- ❑ Tube layer

Network structure

- Access/exit points to each modal network
- Connections between the different modal access/exit points.
  - E.g.: activity location – parking location; activity location – bus stop; parking location – train stop; etc.

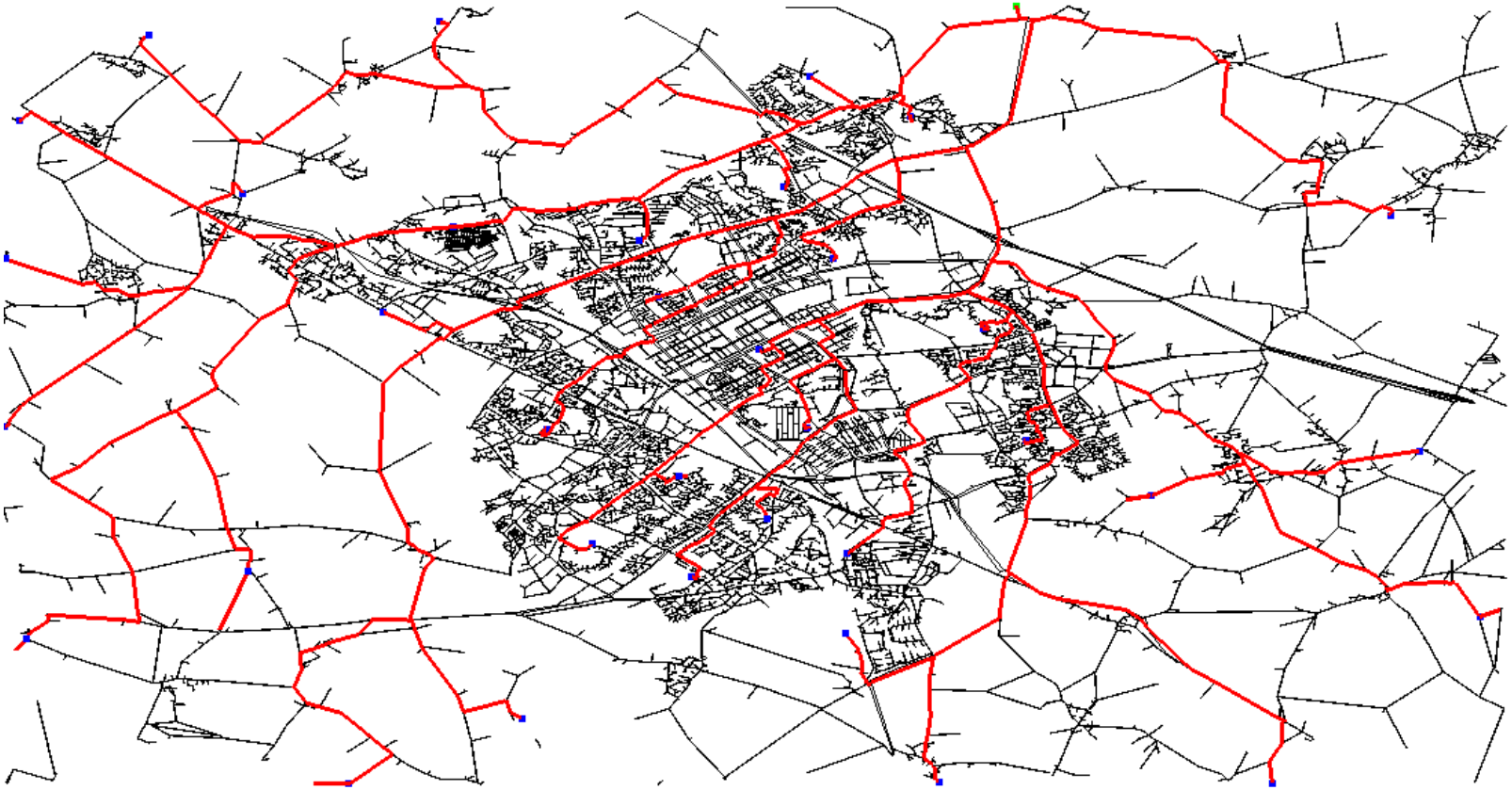


Calculating the routes

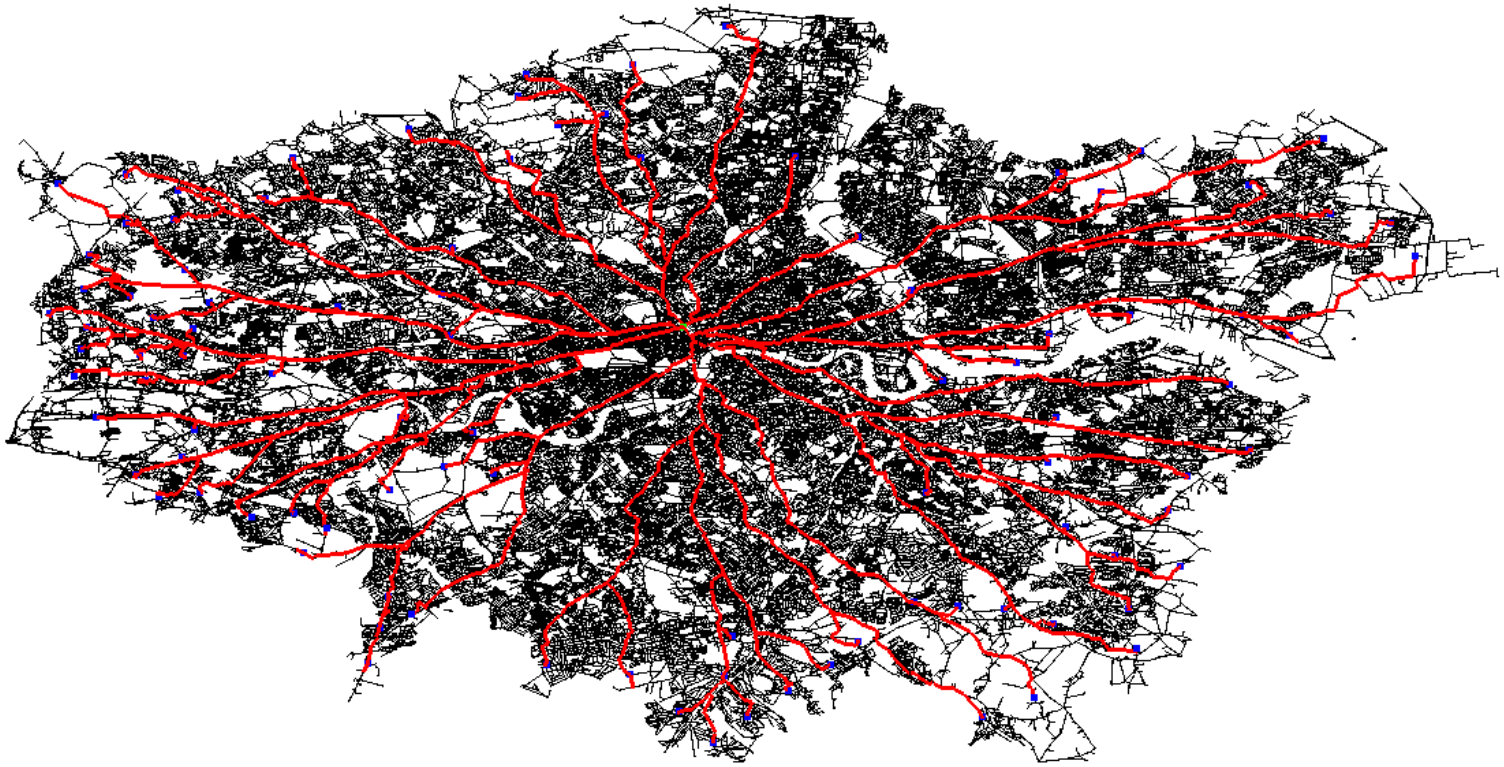
Two main issues when dealing with the generation of the shortest path for the actors in the model

- ❑ Speed
  - Dijkstra implemented in most LUTM models
  - I have currently implemented A* and Dijkstra in the model.
- ❑ Multimodal routing
  - First bi-modal routes (e.g. walk-drive-walk; walk-bus-walk or walk-train-walk)
  - We are interested in producing routes including more than two transport layers such as walk-drive-walk-train-walk.

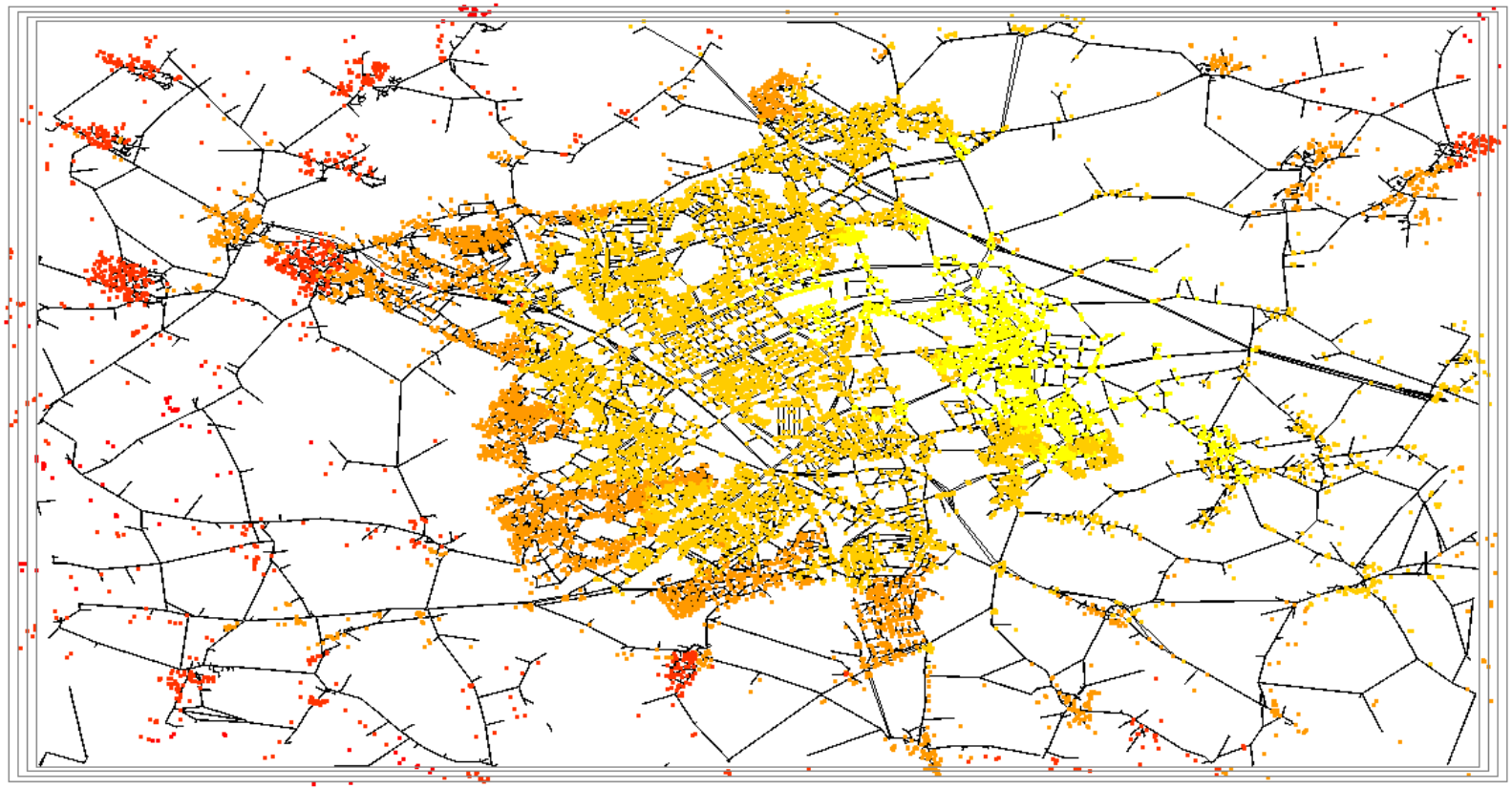
Shortest path from one Activity Location (Sherington ward centroid) to the rest of the ALs in the Milton Keynes network



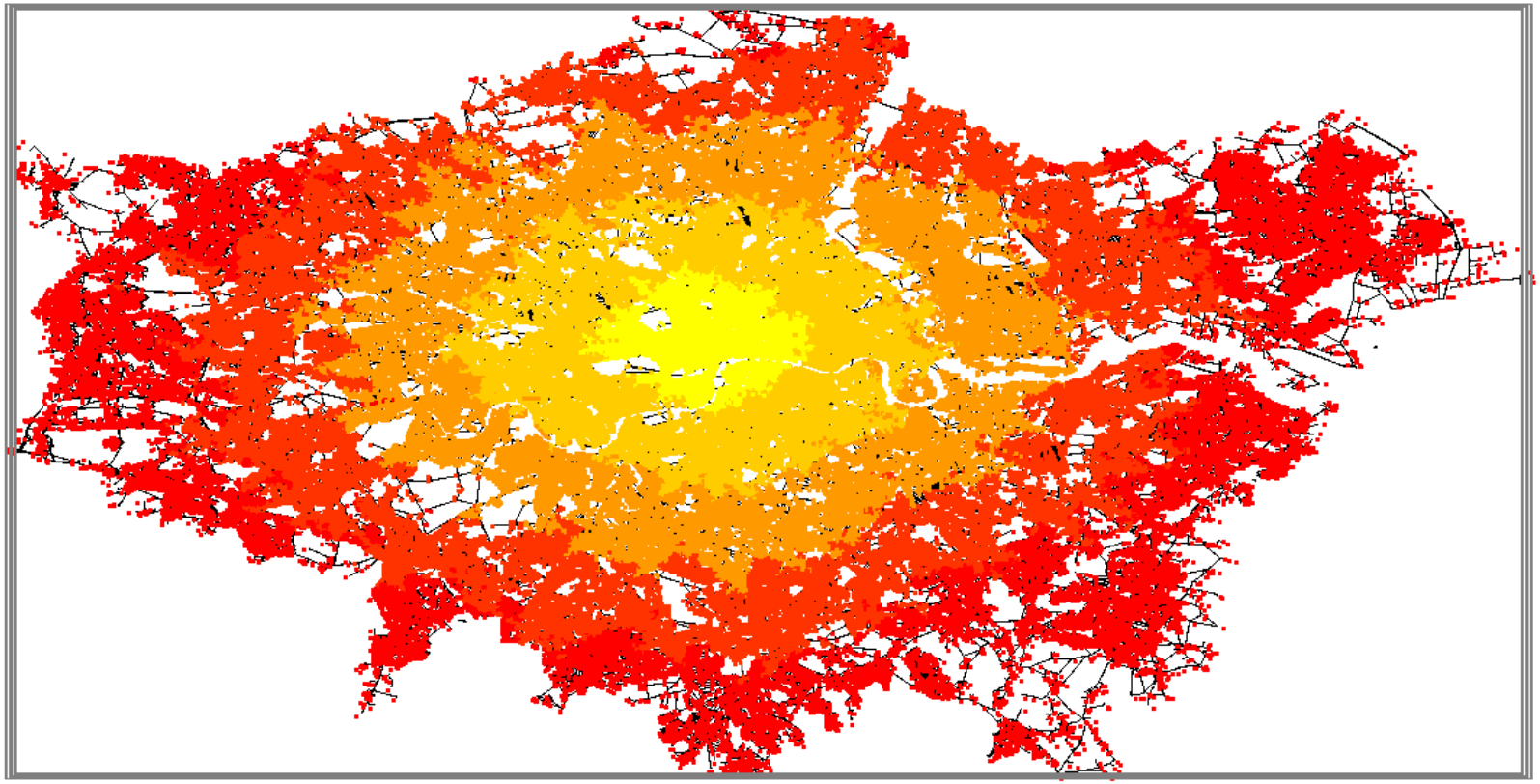
Shortest path from one Activity Location (Bloomsbury ward centroid) to a 100 random ALs in the Greater London Authority network



Travel map from node near the M1 J14 to the rest of the Milton Keynes network



Travel map from node near Torrington Place to the rest of the Greater London Authority network



Coupling transport demand vs transport supply

Most Land Use Transport models use the traditional four step model in order to estimate traffic flows in road networks. The four steps of the model are:

- ❑ Trip generation within a zone
- ❑ Trip distribution between origin and destination zones
- ❑ Mode choice
- ❑ Trip assignment of the trips to the network

Trip assignment of the trips to the network

- Static Traffic Assignment (deterministic approach)
  - Based on the use of link performance functions to calculate time delays on the same link
  - This process is done iteratively until some stopping criterion is met (e.g. a Wardropian user equilibrium approach: no user can improve his/her trip travel time by unilaterally changing routes)
- Dynamic Traffic Assignment (stochastic approach)
  - Generation of microscopic interactions for all vehicles in the road network (Microsimulation)
  - Uses the time delays generated by the Microsimulation to recalculate the travellers' routes

Static Traffic Assignment vs Dynamic Traffic Assignment

	STA	DTA
Queue spillbacks to other links	(-)	(+)
Uniqueness of the solution	(+)	(-)
Execution time	(+)	(-)
Data requirements	(+)	(-)

- To start with, the Static Traffic Assignment will be implemented

Conclusions and next steps

- A network structure for the SIMULACRA network has been presented.
  - The network structure can integrate various modal layers
  - A series of databases have been identified to define these layers
  - The rest of the modal layers are yet to be defined
- A routing algorithm to address trip requests using two modal layers has been implemented.
  - The current method needs to be developed further to include other modal layers for the same trip request
- The traditional four step model has been presented.
  - The last model step (traffic assignment) has been emphasized as there are important implications of choosing one over the other
  - Decisions will be made using performance results