

PTV VISUM – BIG DATA IN TRANSPORT MODELLING

OCTOBER 2016

Data Hungry
Models

Getting
Started Faster

Big Data Use
Case:
Abu Dhabi

Demand Data

Real-time

OUR VISION

WE PLAN AND OPTIMISE

EVERYTHING WORLDWIDE WHICH

MOVES PEOPLE AND GOODS.



OVER 2,000 CLIENTS LOCATED IN 105 COUNTRIES



Key Clients

- Public Authorities (TfL, DfT, HE, West Midlands etc)
- Consultants (Aecom, Atkins, Arup, Jacobs, PBA, etc)
- Universities (Imperial, UCL, Napier, Newcastle)
- Public transport operators
- Road operators
- Airport operators
- Vehicle manufacturers
- Architects & Developers
- Research institutions

PTV VISION SOFTWARE SUITE



PTV VISUM

Network modelling – large scale, national, regional and local transport network developments and demand modelling



PTV VISSIM

Detailed microscopic modelling of individual vehicles covering all modes of transport – multi-modal micro-simulation



PTV VISWALK

Advanced microscopic pedestrian simulation, both inside and outside buildings



PTV VISTRO

A solution for all traffic analysis needs



PTV OPTIMA

Real-time traffic simulation model, based on offline strategic model (PTV Visum), fused with real-time data



PTV BALANCE

Online traffic signal adaptive network control – model-based



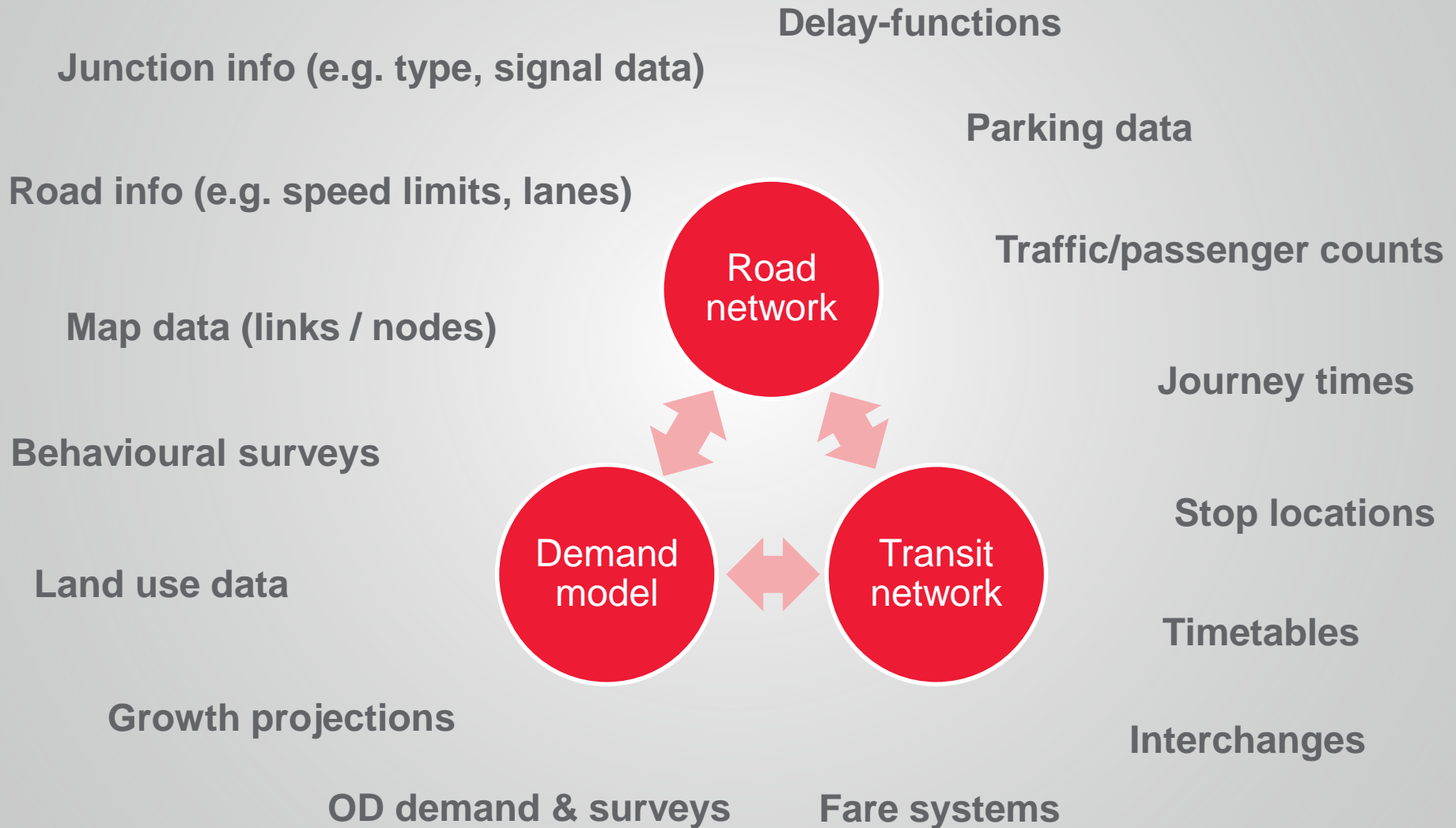
PTV SAFETY

Management tool for accident analysis prevention

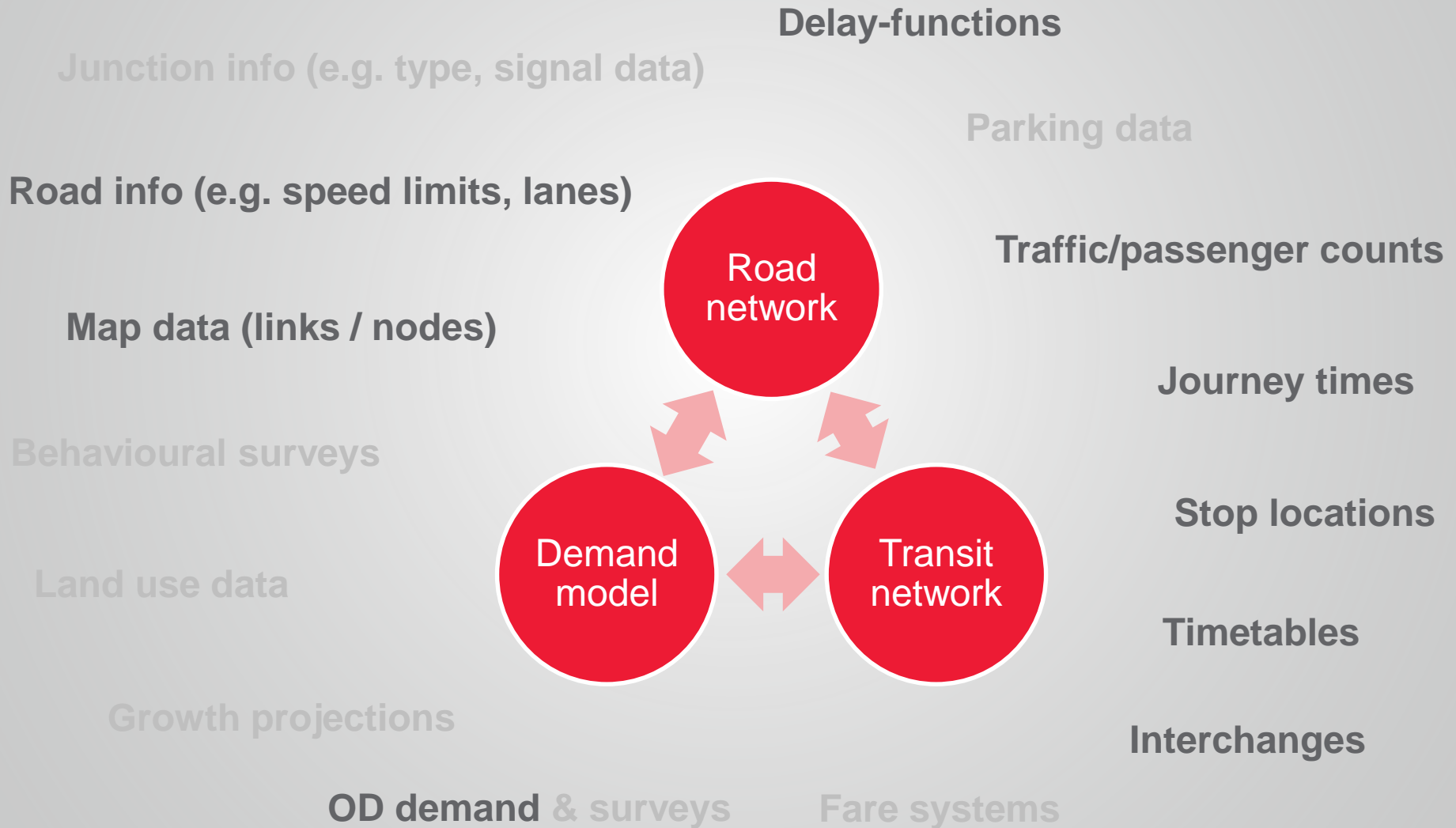


Interconnected

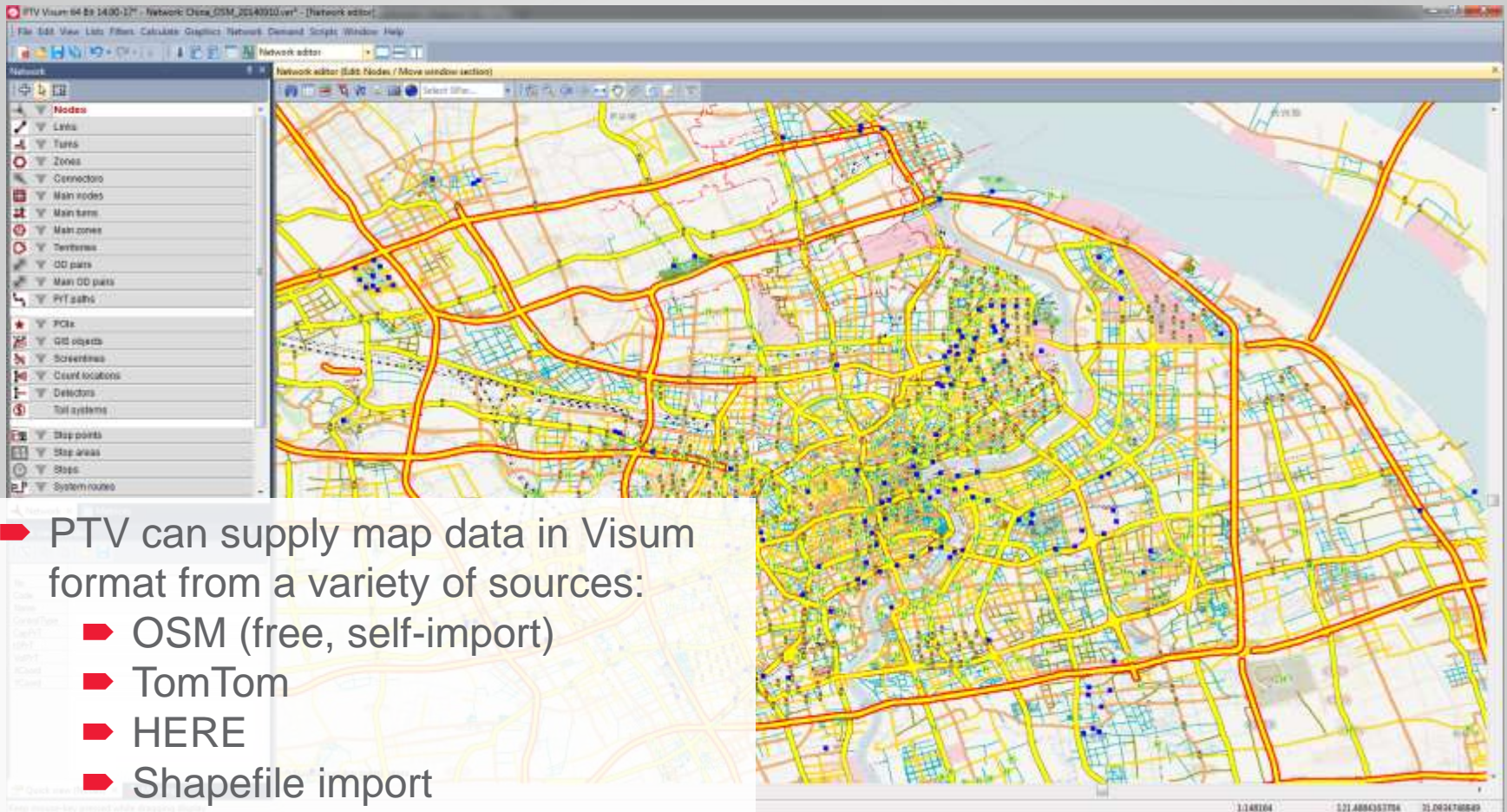
MODELS ARE DATA HUNGRY



GETTING STARTED FASTER



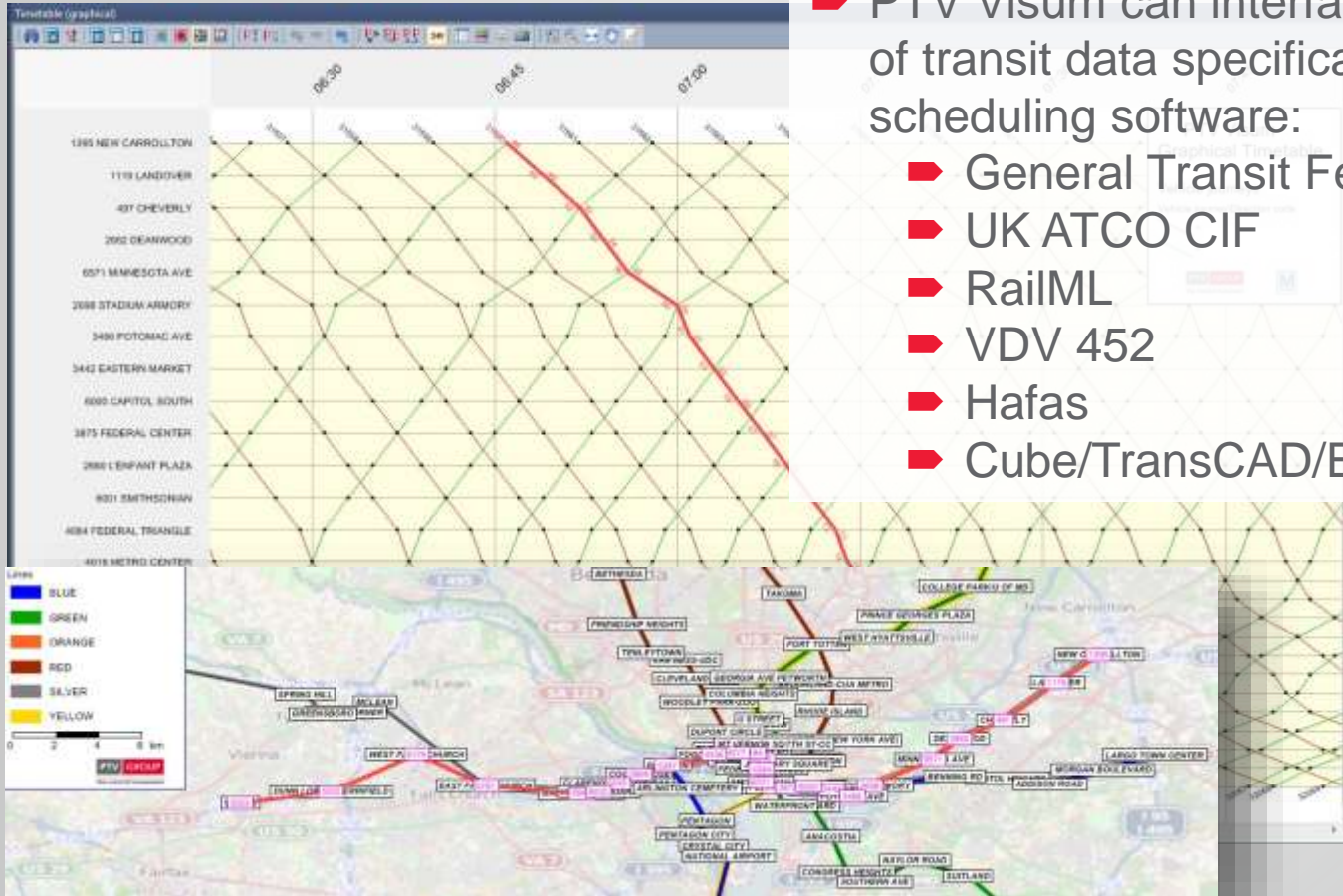
GETTING STARTED FASTER - MAPS



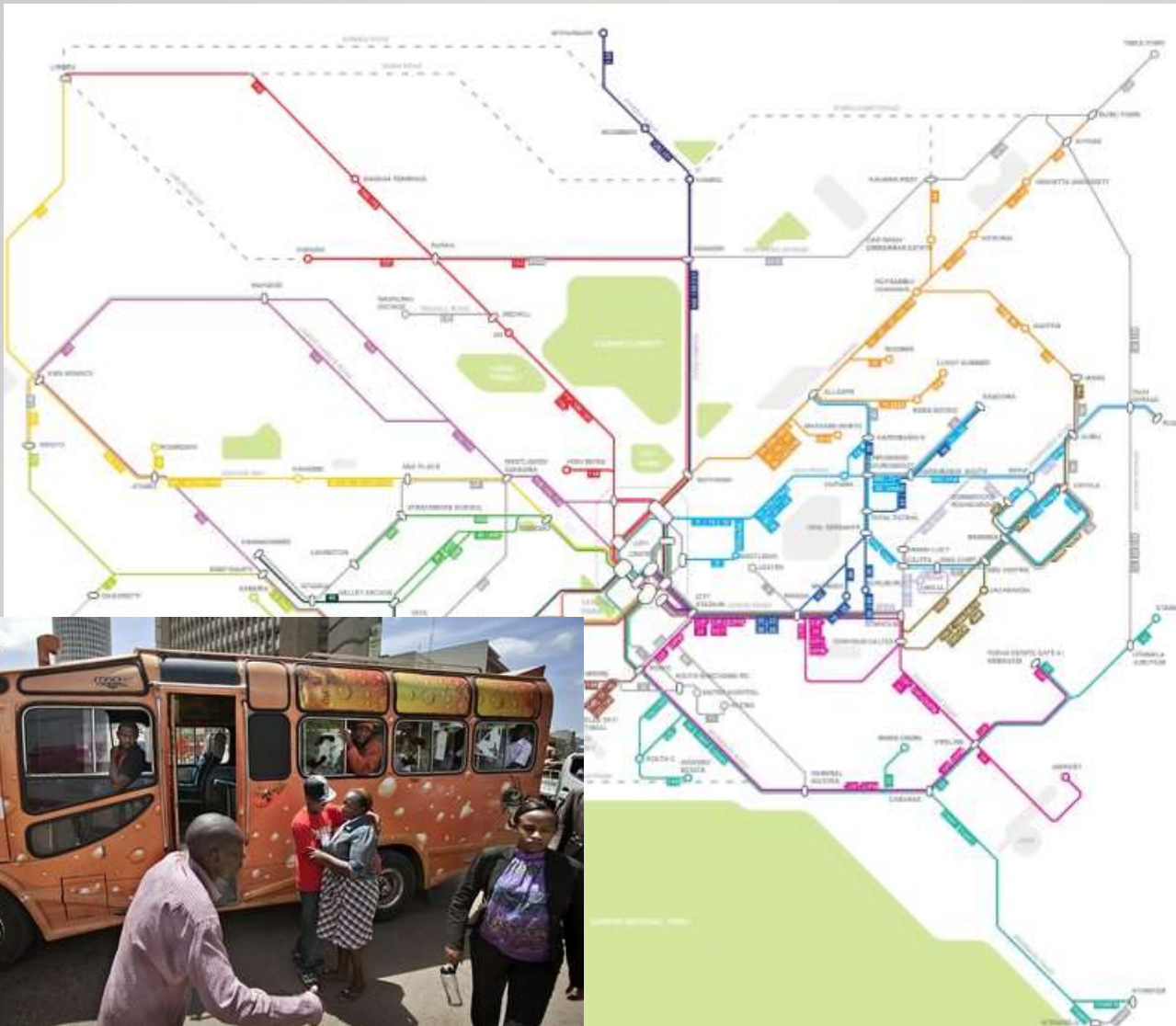
GETTING STARTED FASTER - TRANSIT

➤ PTV Visum can interface with a variety of transit data specifications and scheduling software:

- General Transit Feed Specification
- UK ATCO CIF
- RailML
- VDV 452
- Hafas
- Cube/TransCAD/EMME etc.



GETTING STARTED FASTER - TRANSIT



NAIROBI MATATU ROUTES

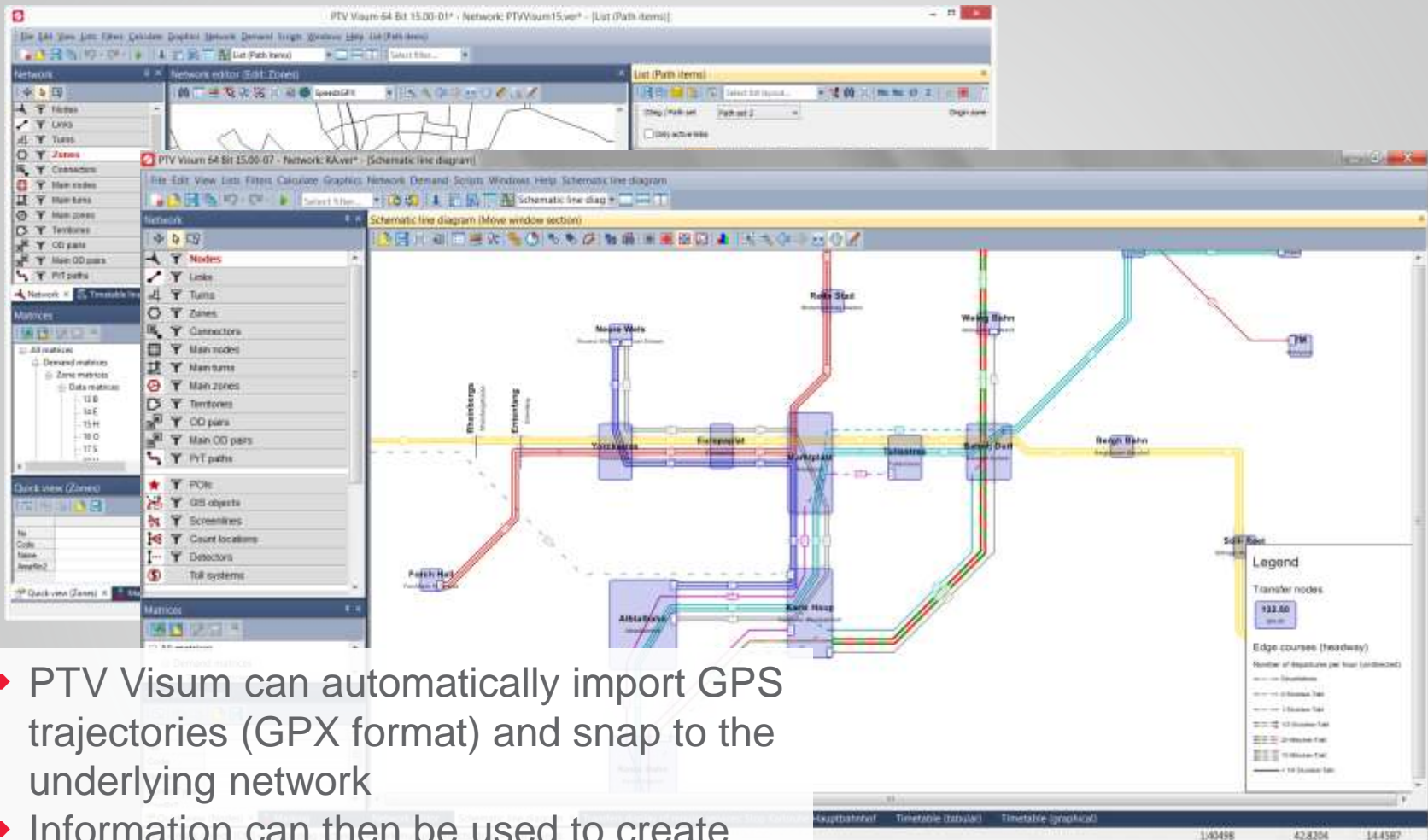
digitalmatatus



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 Civic Design Data Lab
 University of Nairobi
 Nairobi, Kenya
 2014

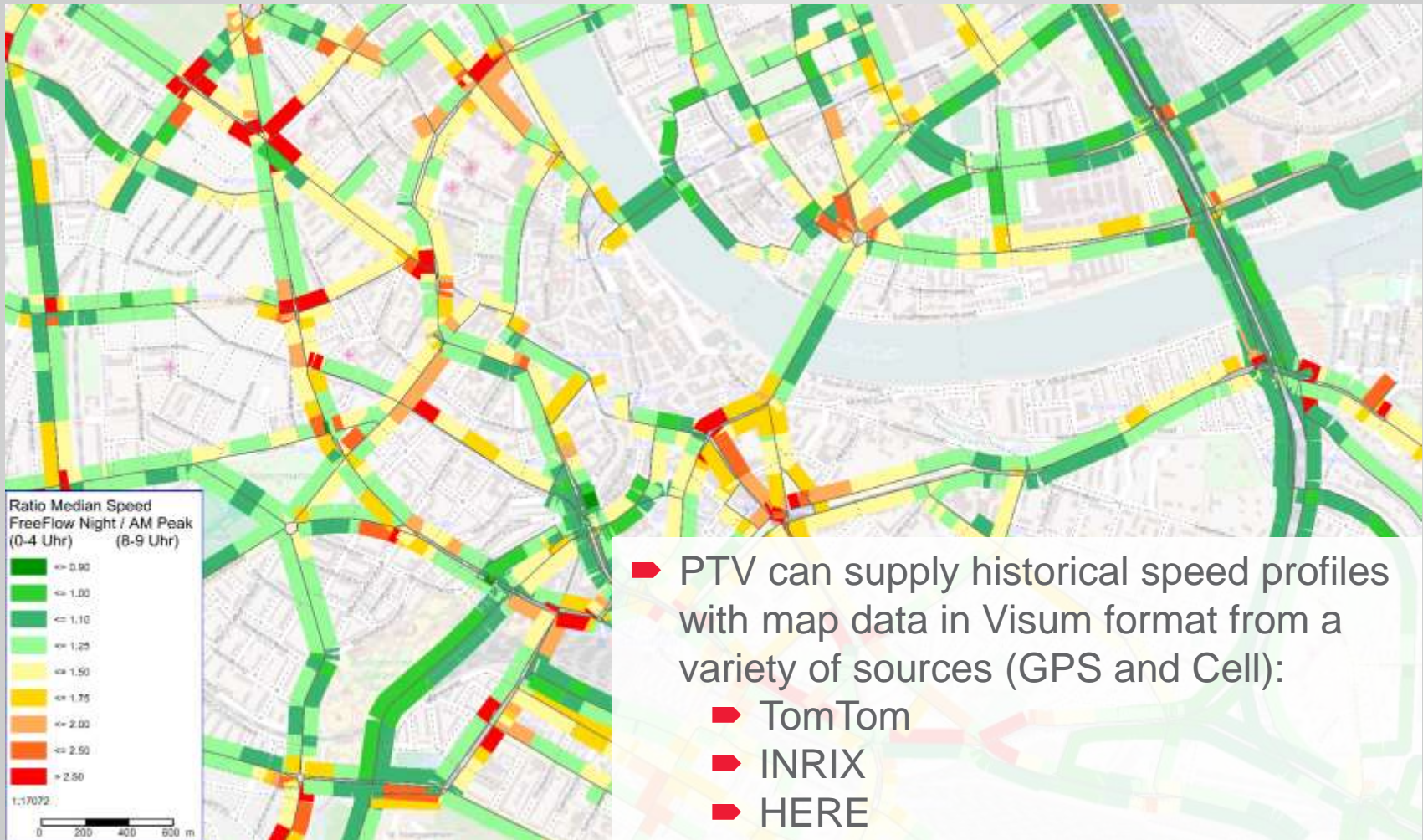


GETTING STARTED FASTER – GPS TRAJECTORIES

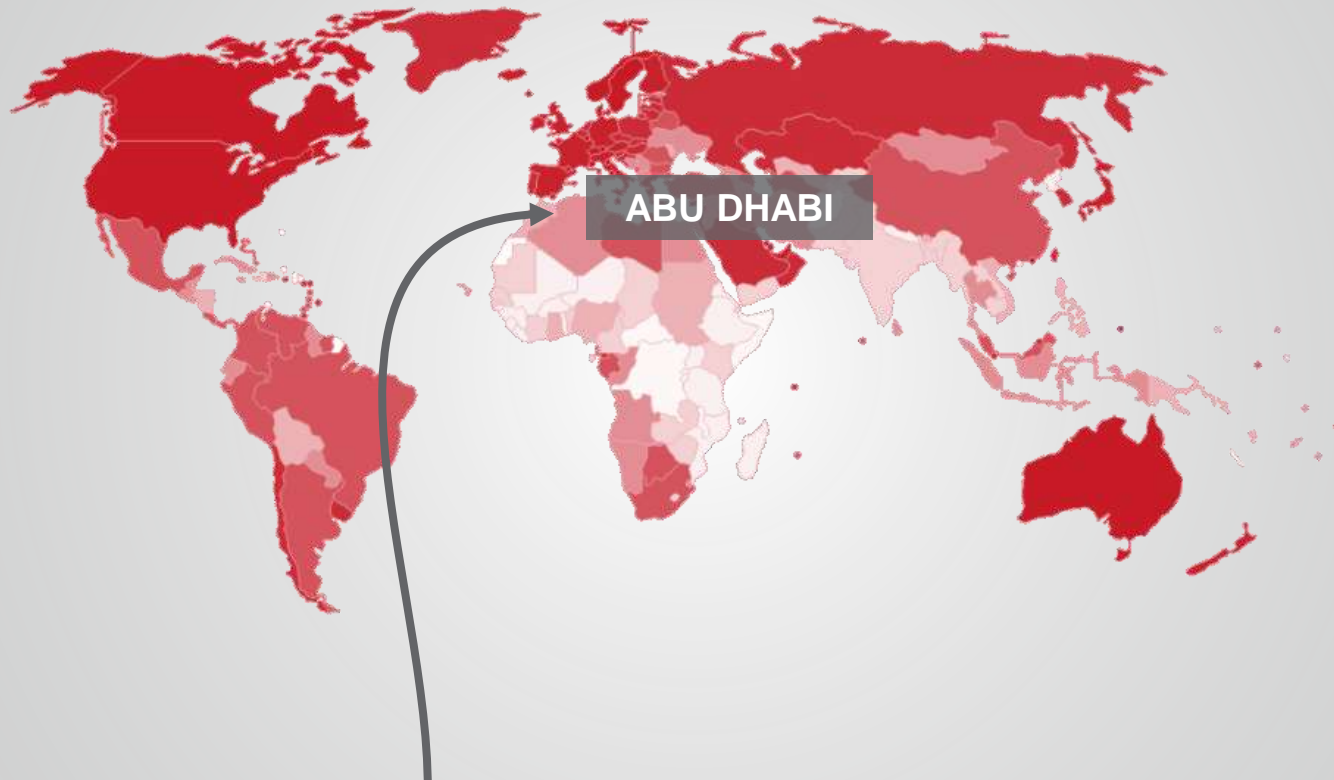


- ▶ PTV Visum can automatically import GPS trajectories (GPX format) and snap to the underlying network
- ▶ Information can then be used to create new network attributes such as speeds or elevation.

GETTING STARTED FASTER – SPEED PROFILES



BIG DATA USE CASE – ABU DHABI OPERATIONS MODEL



Policy and
Strategy

Data
Analytics &
Visualisation

Traffic
Engineering

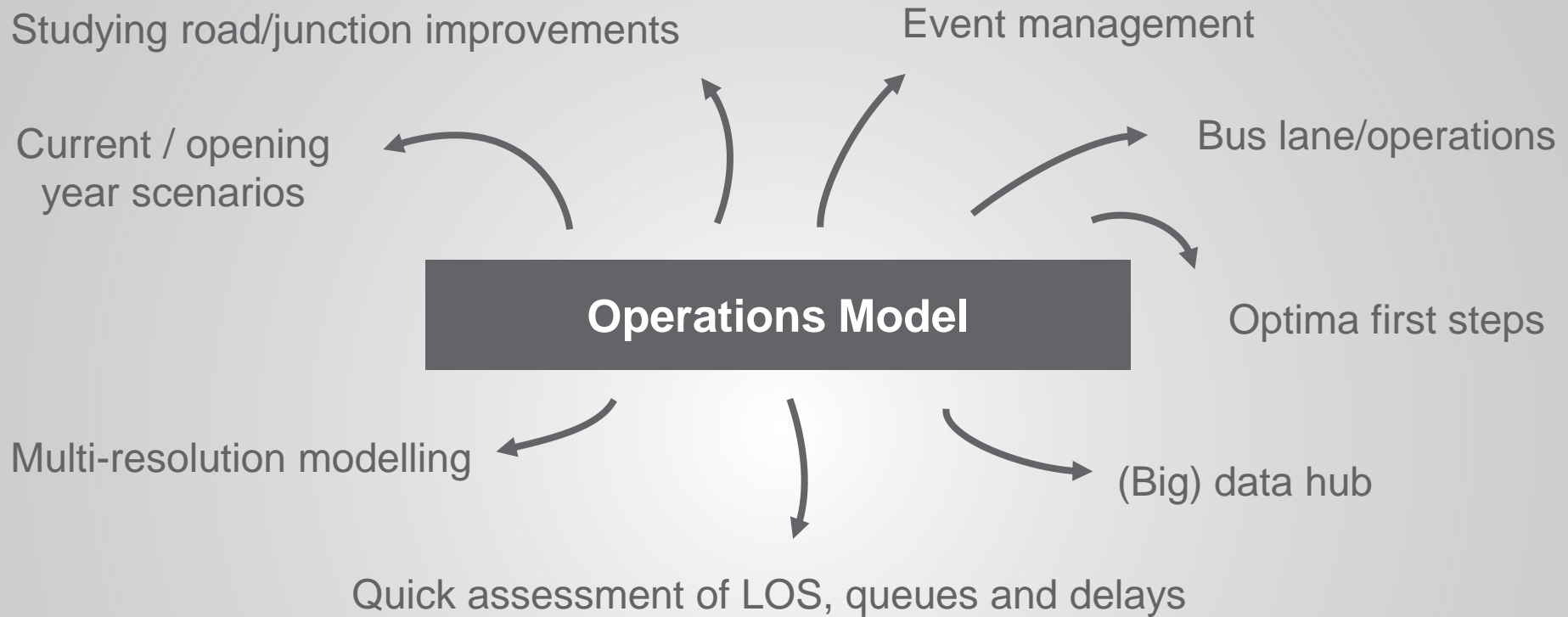
Freight

PT Planning
&
Optimisation

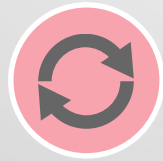
Revenue
Forecasting

Sustainability

BIG DATA USE CASE – ABU DHABI OPERATIONS MODEL



Junction modelling



Constant refresh



Shorter runtimes



Greater accuracy

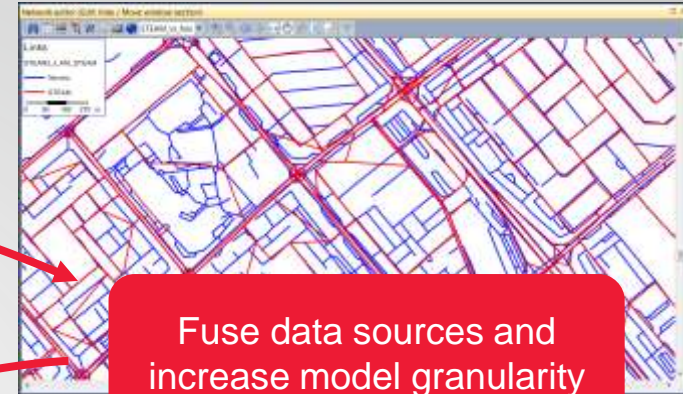


Export to microsimulation

BIG DATA USE CASE – ABU DHABI OPERATIONS MODEL

Extract data from Strategic Model

Network
Zoning system
Present-year forecast (2015) demand
Demand segmentation

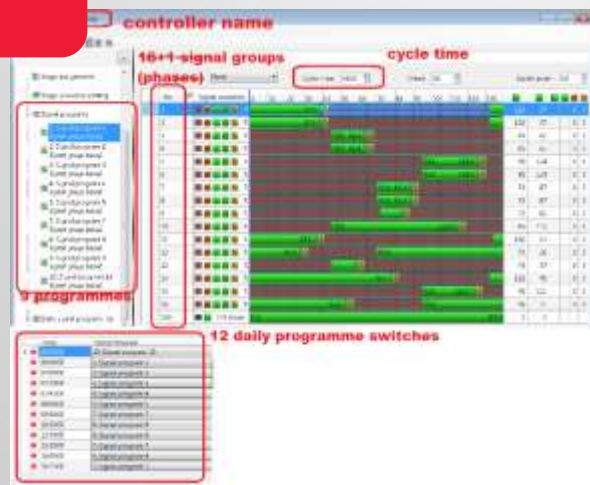


Fuse data sources and increase model granularity

Merge with HERE maps to get 'best of both'
Process observed data: radar/video/taxi GPS
Code junction geometries from satellite photography
Process signals from controller data
Import public transport supply

Build automation tools

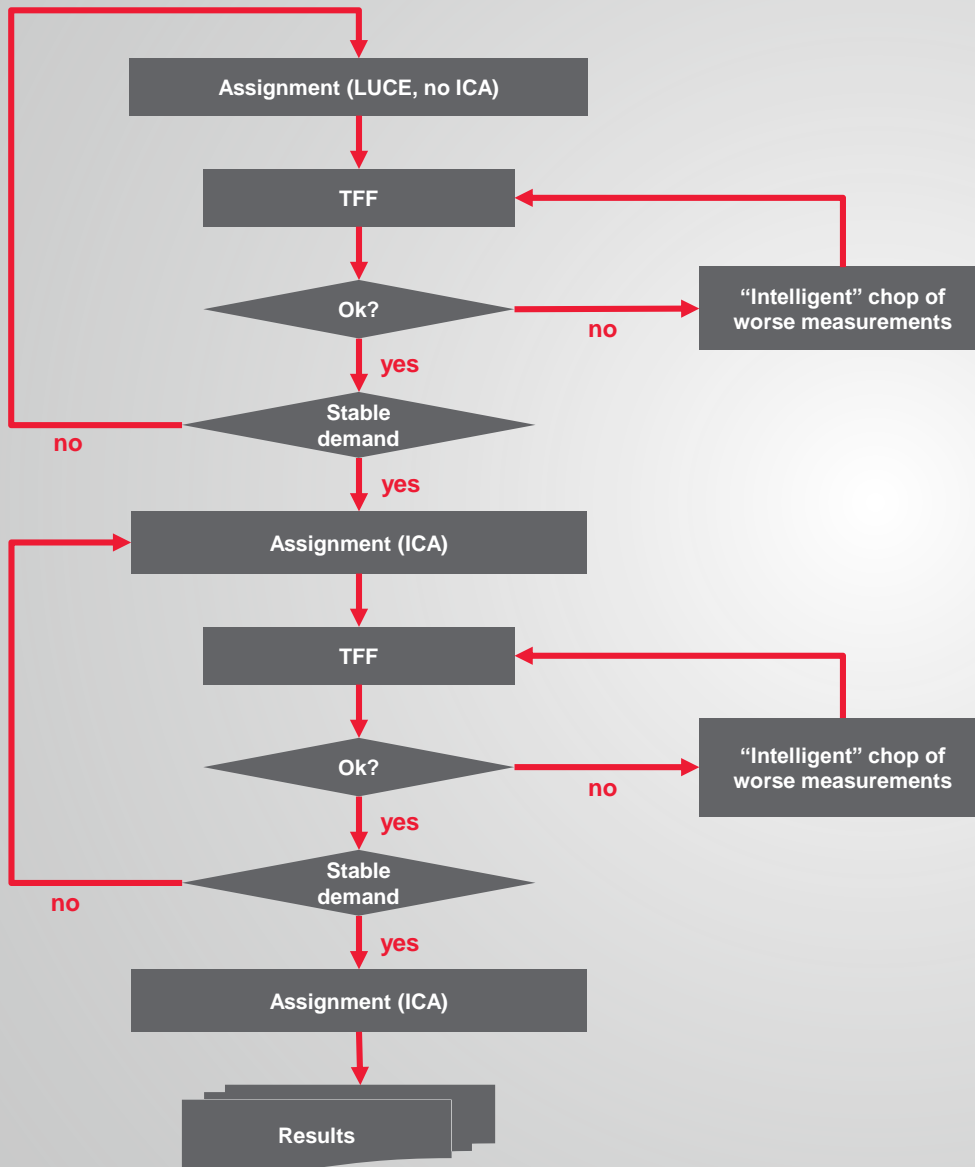
Network matcher
Signal plan converter
Count extractor
TFF-engine*



Calibrate

Harmonise data from different sources
TFF-engine*
Vissim export

BIG DATA USE CASE – ABU DHABI OPERATIONS MODEL



Stage 1: Matrix estimation to adjust demand to better match observed counts, without junction modelling and therefore based on 'demand' flows.

→ *Faster*

→ *Good approx. before starting calibration with junction modelling*

Stage 2: As above, now with junction modelling incorporated in to the assignment.

→ *Added complexity of queueing and flow metering, i.e. can increase flow downstream by unlocking congestion*

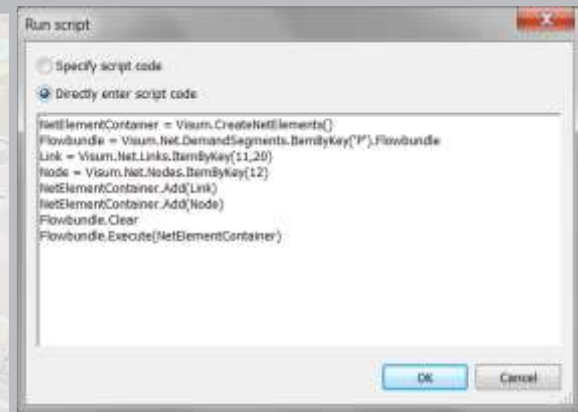
→ *Intelligent chopping examines conflicts and 'self heals'*

→ *Completely automated process*

BIG DATA USE CASE – ABU DHABI OPERATIONS MODEL

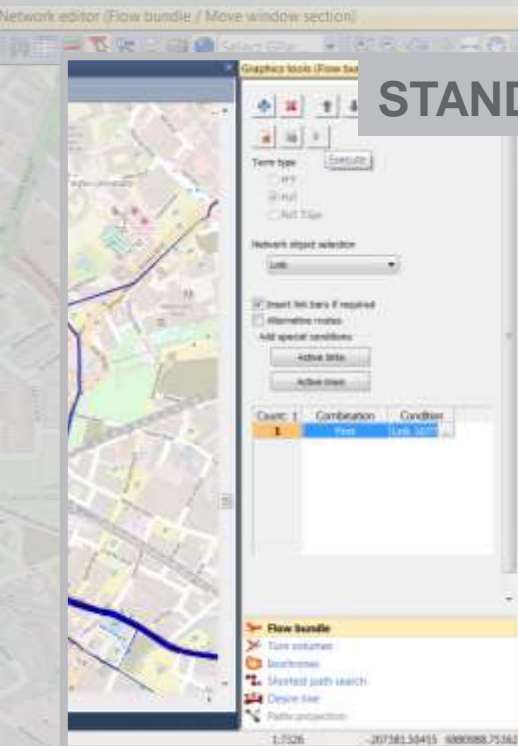
STANDARD FUNCTIONS AVAILABLE THROUGH GUI

WRITE PYTHON / VB SCRIPT DIRECTLY WITHIN VISUM



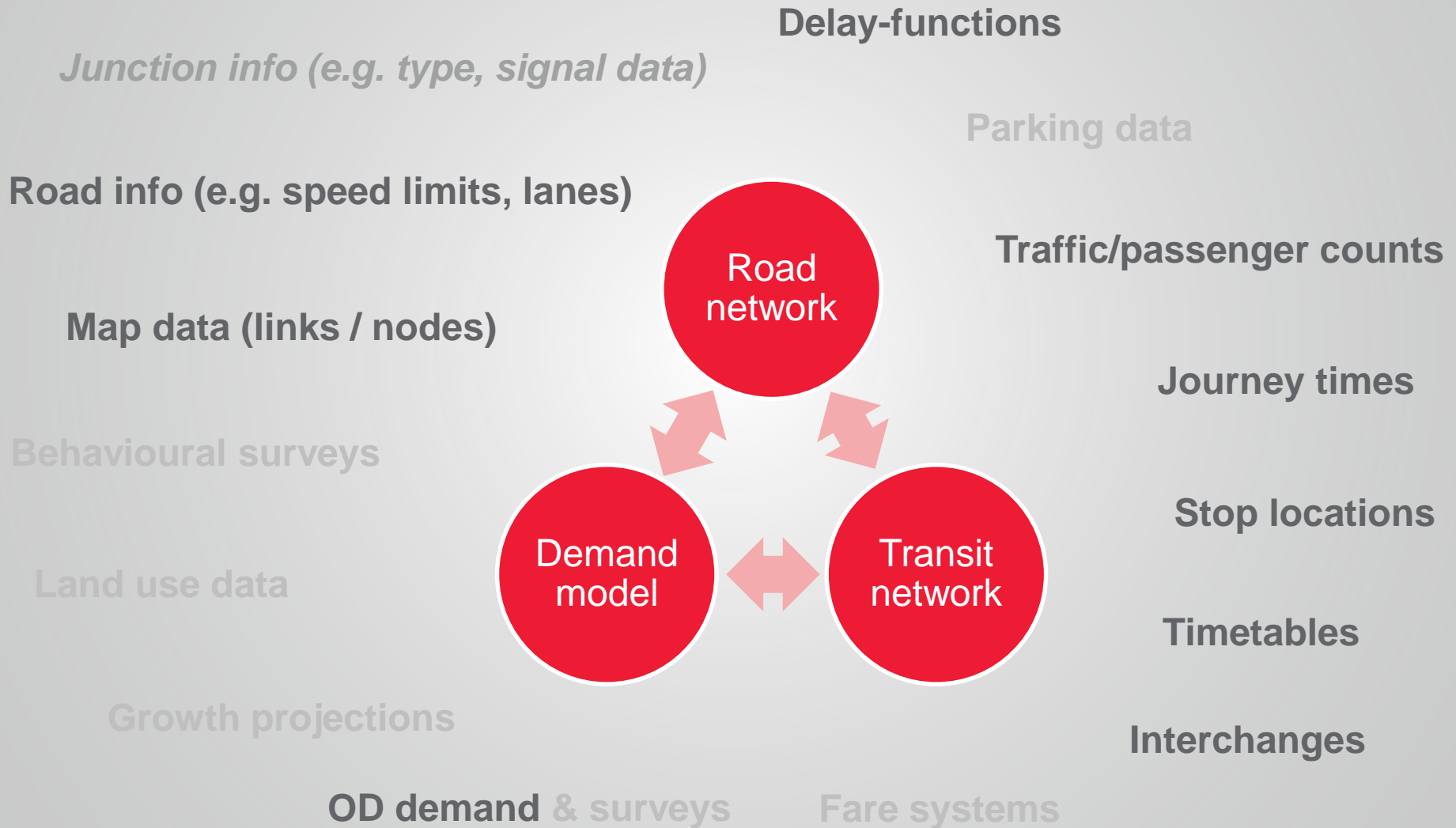
RUN PYTHON / VB SCRIPT FROM EXTERNAL FILES

CONTROL VISUM USING VBA

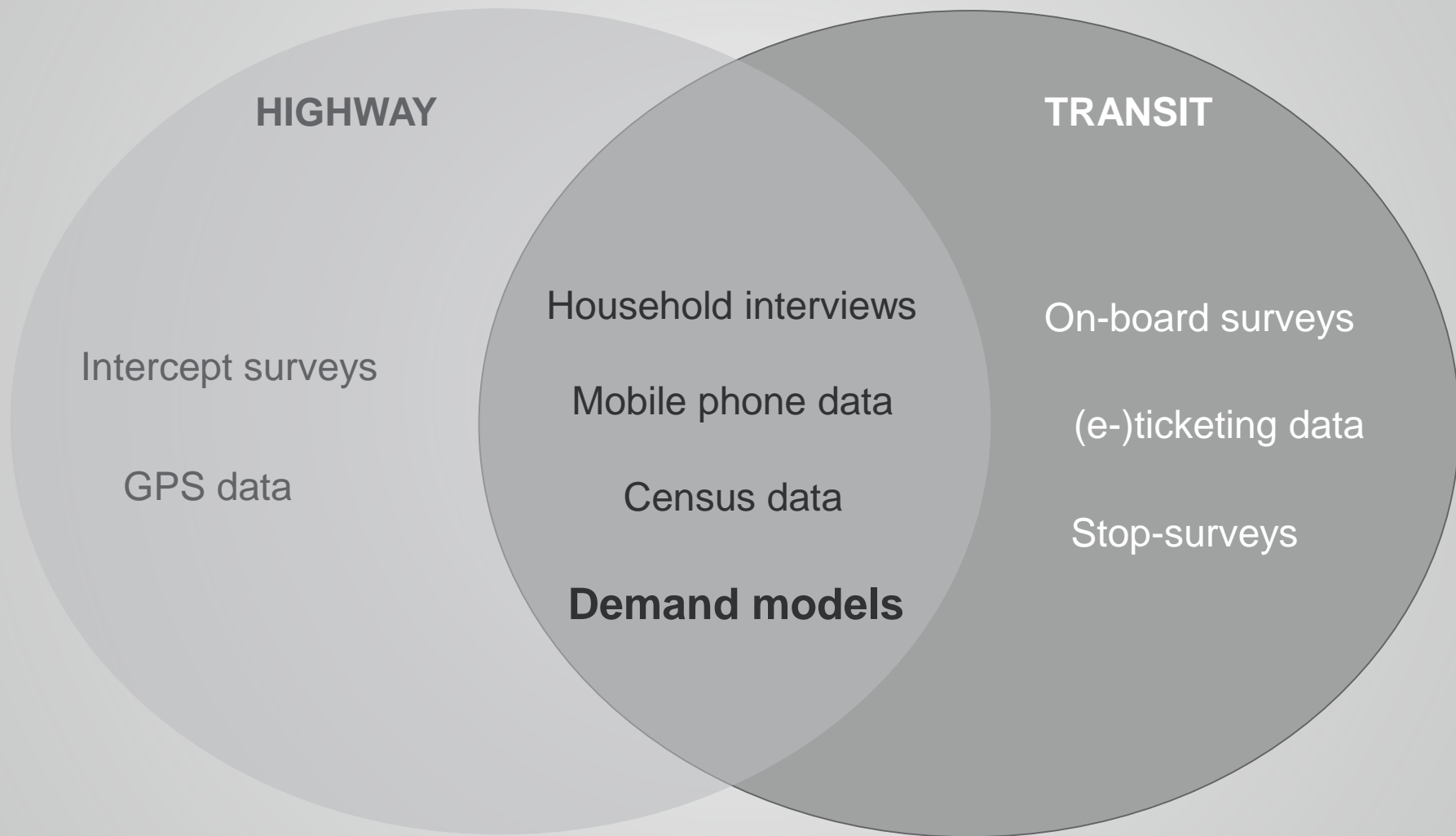


Name	Date modified	Type	
AddNetReadExample.py	01/09/2014 12:17	PY File	
BuildNetwork.py	01/09/2014 12:17	PY File	4 KB
CreateConnectorLinks.py	01/09/2014 12:17	PY File	3 KB
FlowbundleAnalysis.py	01/09/2014 12:17	PY File	2 KB
ForEach_Node.py	01/09/2014 12:17	PY File	2 KB

GETTING STARTED FASTER



DEMAND DATA

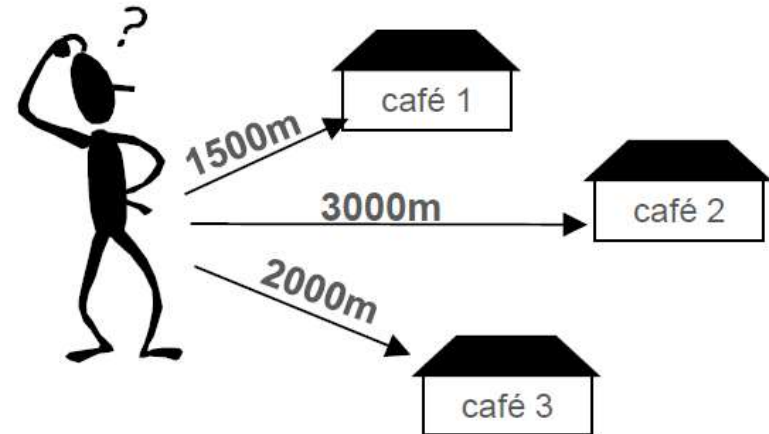


DEMAND DATA – DEMAND MODELS

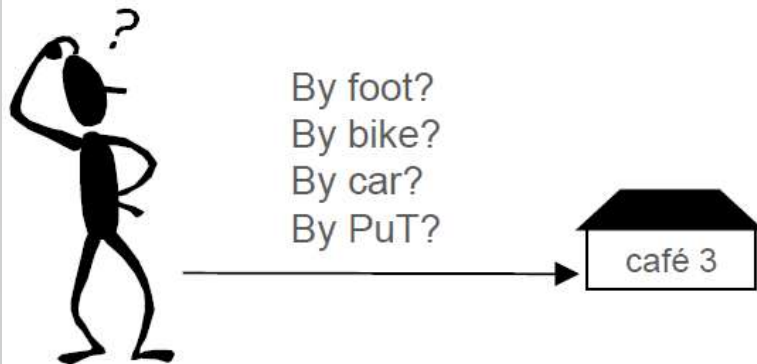
Demand for activities ?



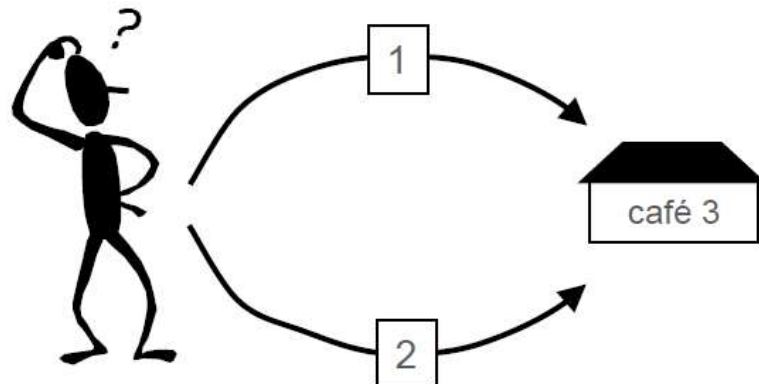
Which destination ?



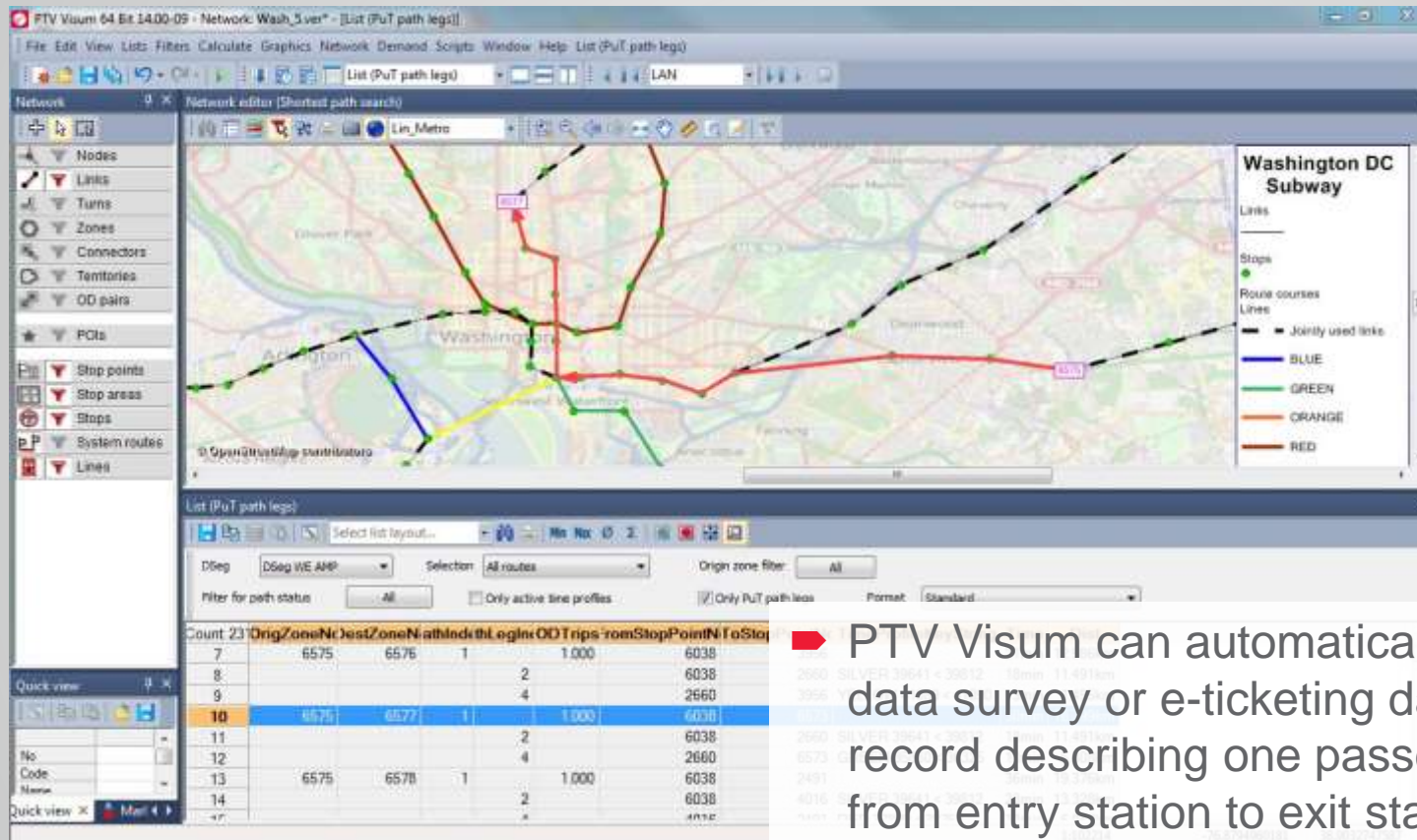
Which mode ?



Which route ?

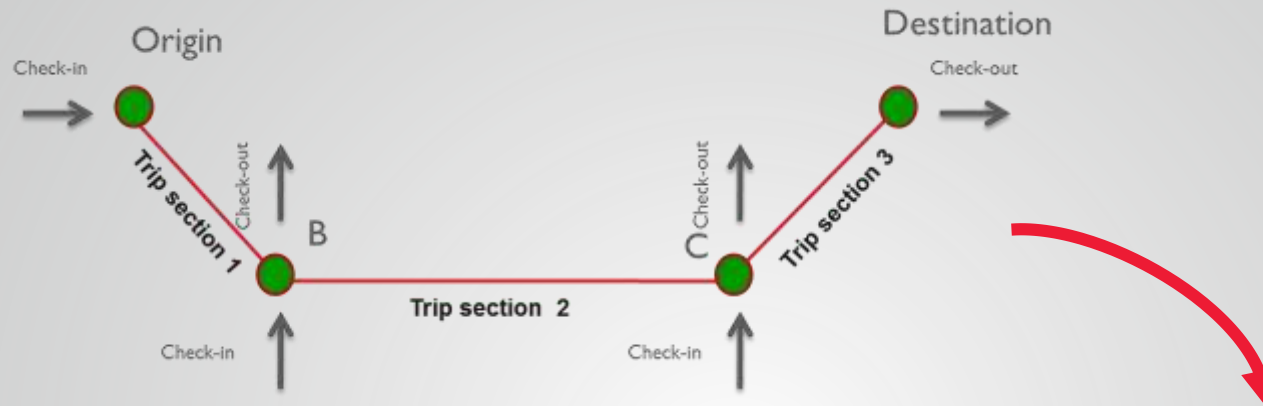


DEMAND DATA – TRANSIT TRAJECTORIES

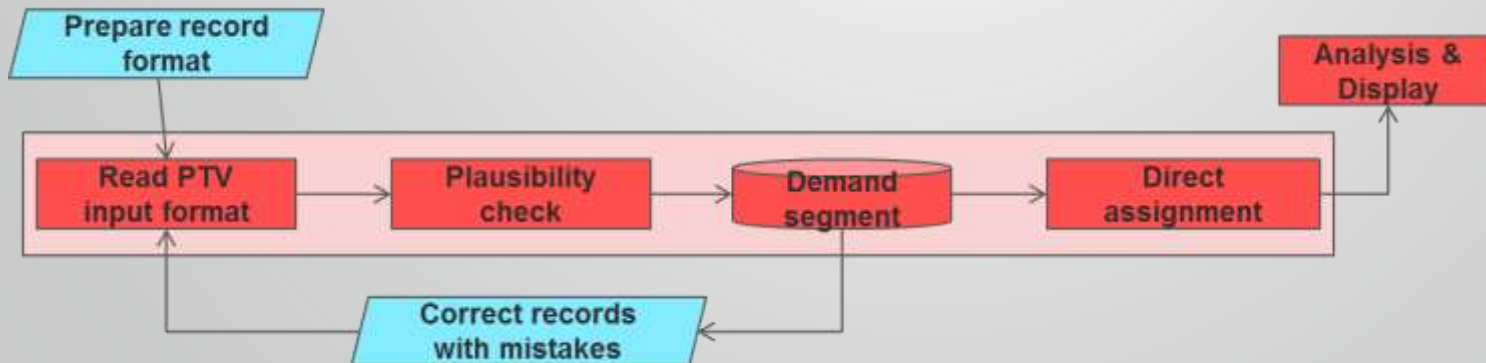


- ▶ PTV Visum can automatically import raw data survey or e-ticketing data, each record describing one passenger trip from entry station to exit station
- ▶ Reconstructs the trip in detail within the network (so-called direct assignment)

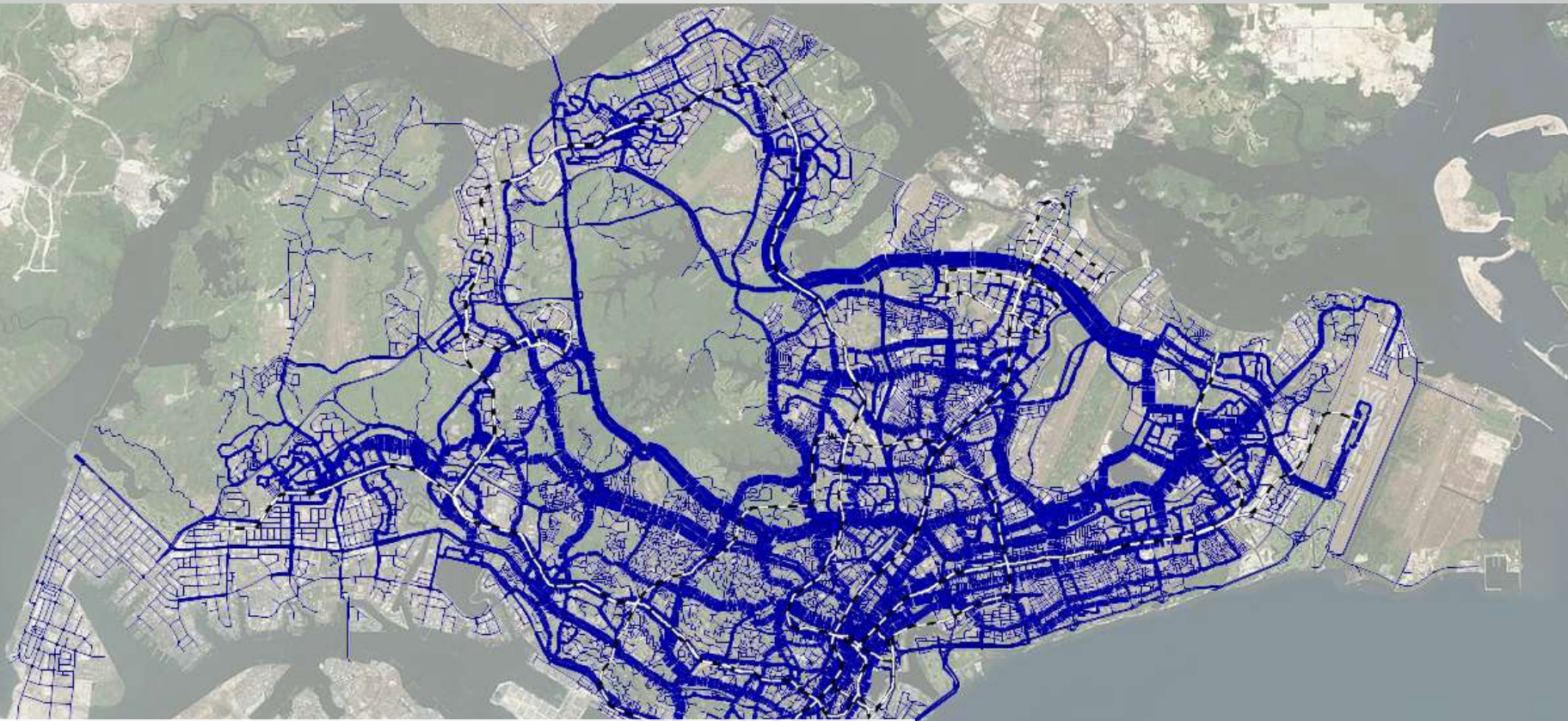
DEMAND DATA – TRANSIT TRAJECTORIES



SPUTripLegID	PathLegIndex	Type/Time	OOTrips	TSVSCODE	LineName	DirectionCode	LineRouteName	InoutStopID	BoardStopID	BoardStopDepTime	BoardStopDepDay	FromStopNo	ToStopNo
* Complete set													
11	1 E		5 5	S21	R			9 908		06:17:00		1 908	2549
11	2 N		5 5	S1	R			2 2549		06:39:00		1 2549	2553
* Incomplete set													
13	1 E		6	S1				908		06:44:00		1 908	780
15	1 E		7	S11				908		06:46:00		1 908	2550
15	2 T		7 5					2550		06:46:00		1 2550	1438
17	1 E		6	S2				908		06:48:00		1 908	2553
17	2 T		6 5					2553		06:48:00		1 2553	4719
19	1 E		7	S21				908		06:51:00		1 908	3541

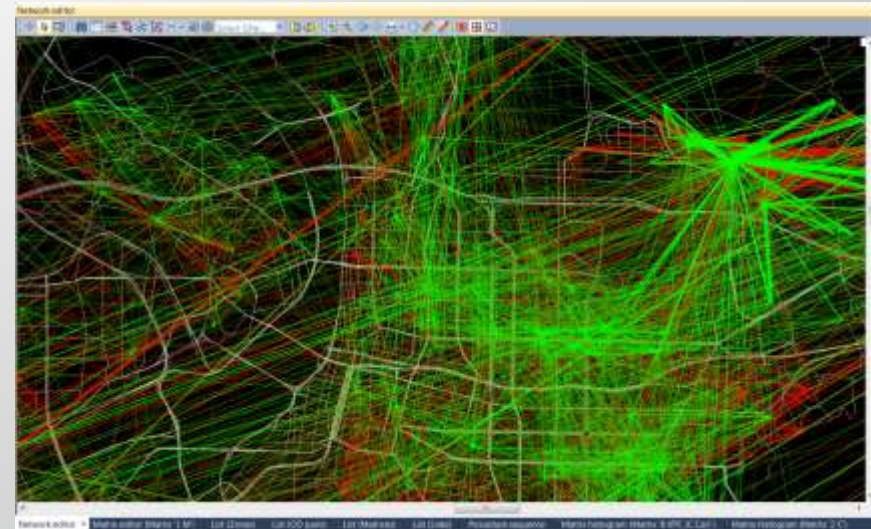
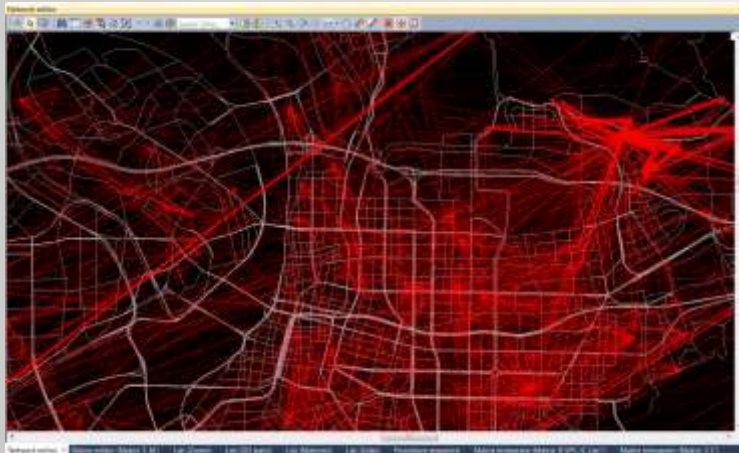
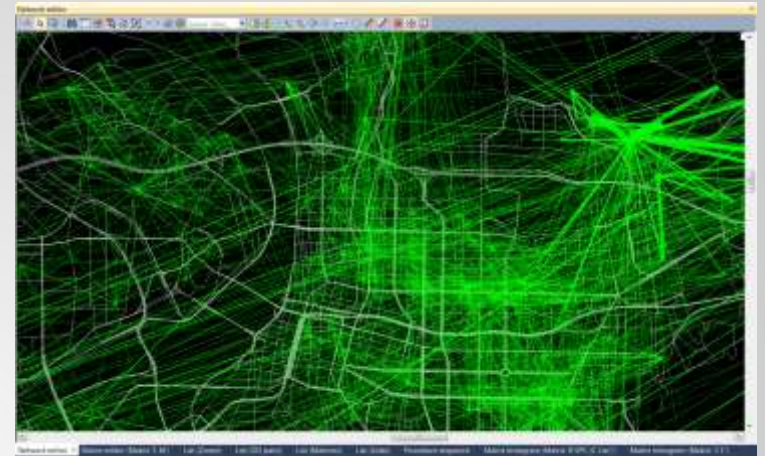
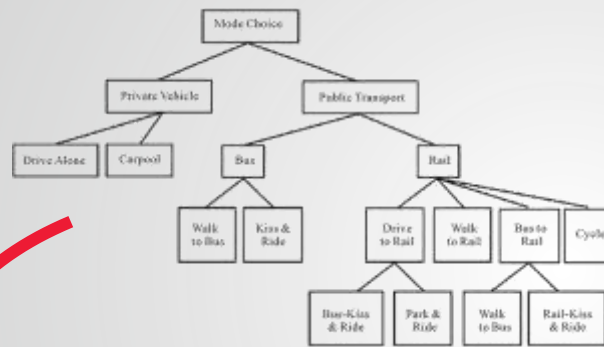


DEMAND DATA – TRANSIT TRAJECTORIES



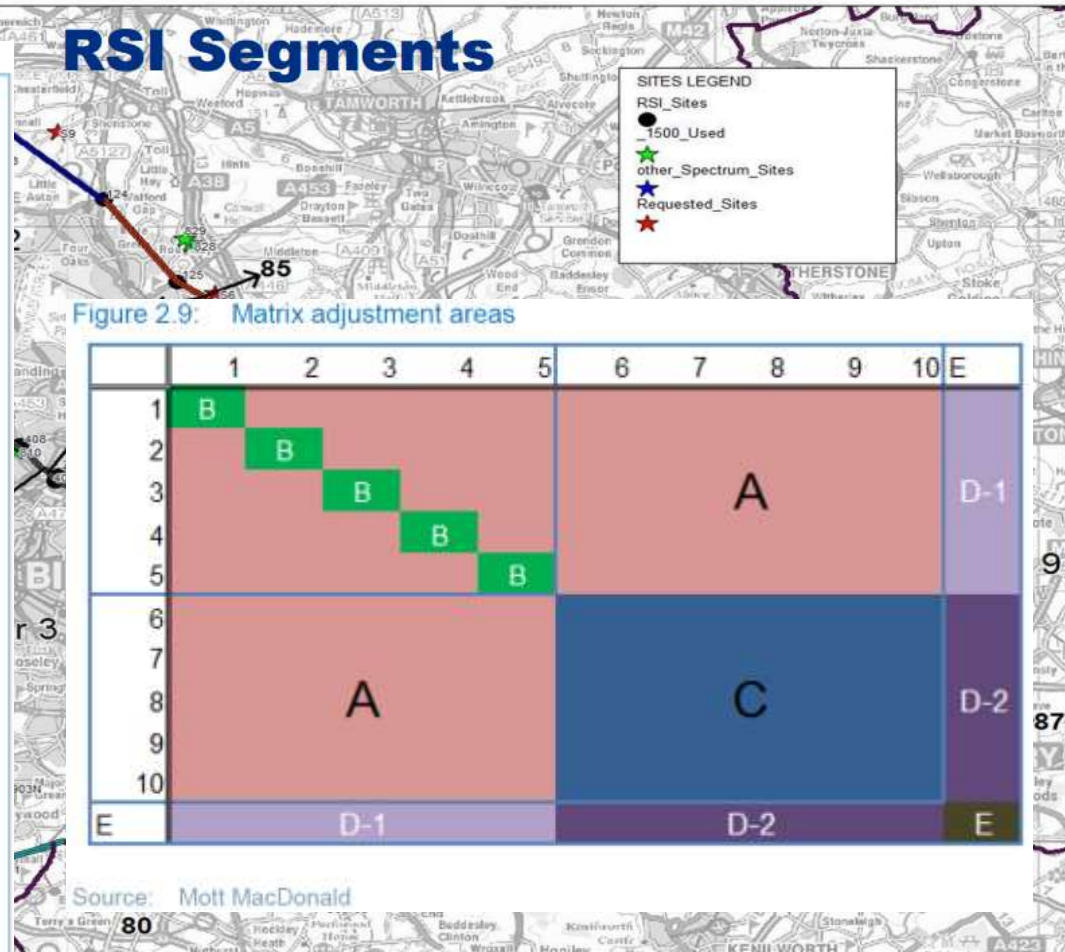
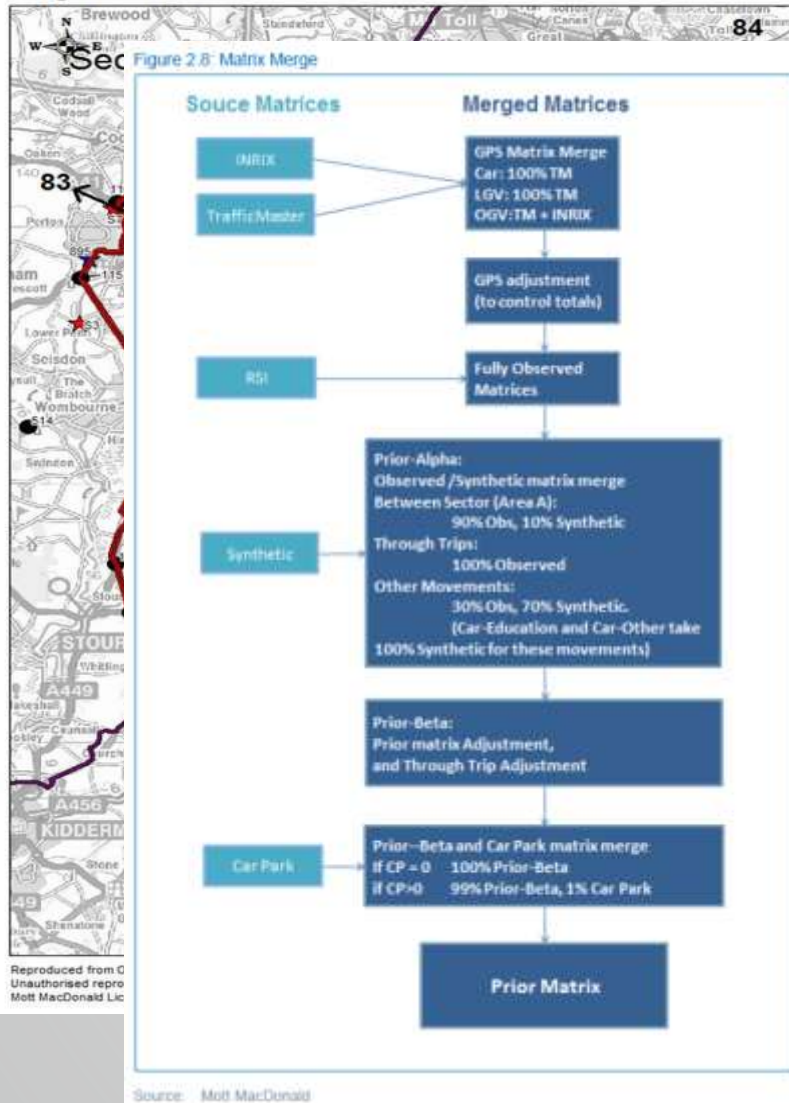
- Project to mine smartcard database for:
 - Deriving bus network
 - Identifying bus bunching/scheduling issues
 - Understanding passenger behaviour
 - Analysing bus capacity utilisation

DEMAND DATA – GPS TRAJECTORIES



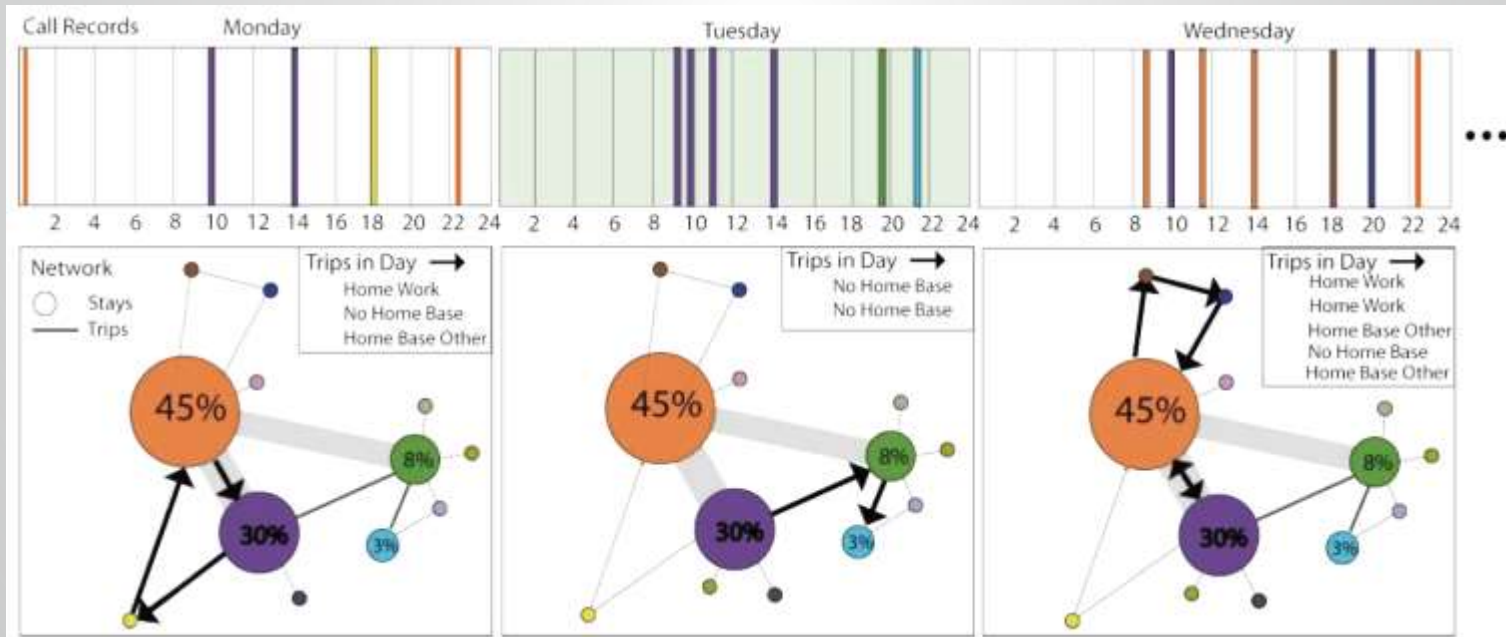
DEMAND DATA – GPS TRAJECTORIES

Segments with ATCs



DEMAND DATA – MOBILE PHONE TRAJECTORIES

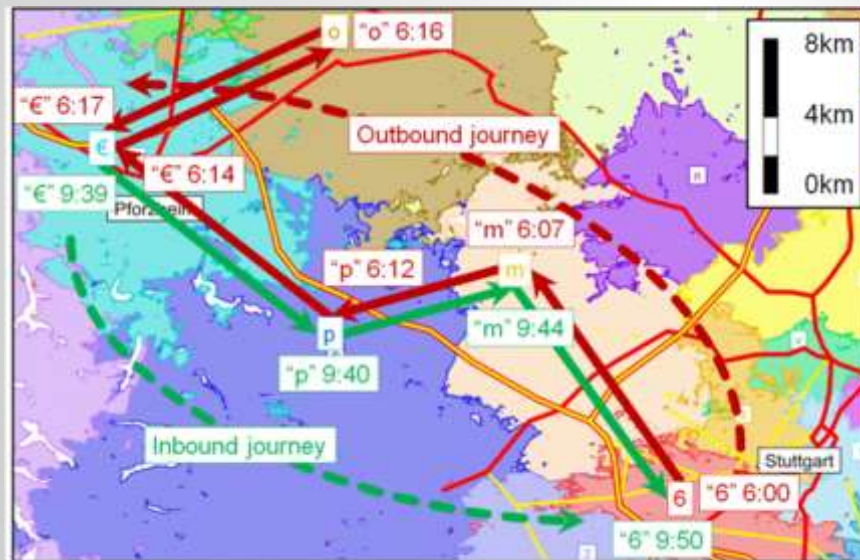
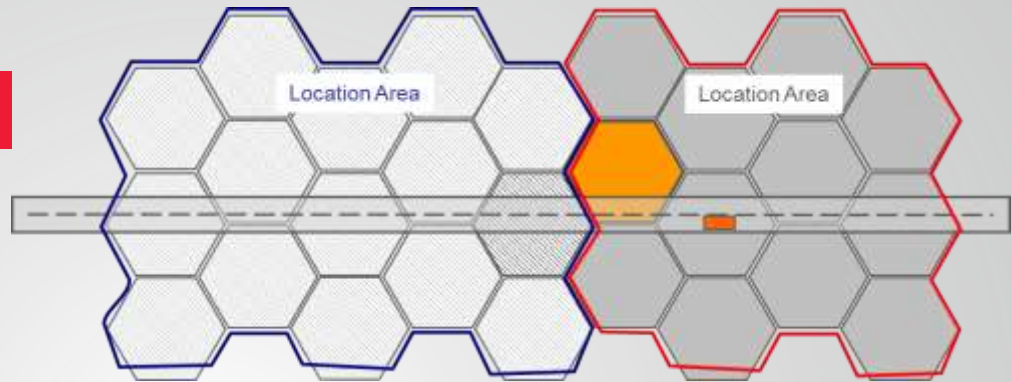
ACTIVE (call, text, data)



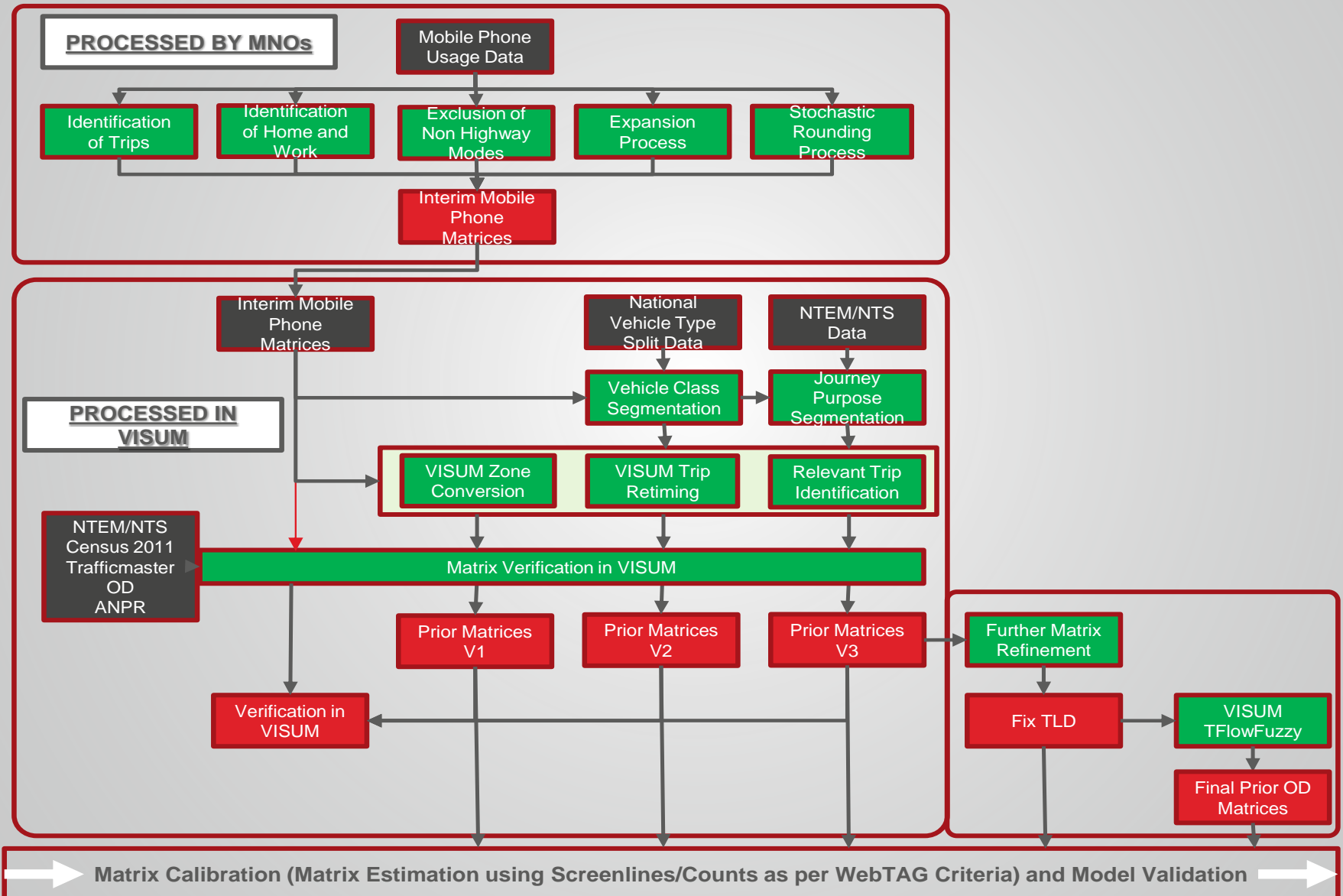
Analyzing cell phone location data for urban travel: current methods, limitations and opportunities. Çolak, Alexander, Alvim, Mehndiretta, González, 2014

DEMAND DATA – MOBILE PHONE TRAJECTORIES

PASSIVE (standby)



DEMAND DATA – MOBILE PHONE USE CASE



DEMAND DATA – MOBILE PHONE DATA SUMMARY

Pros

- Incredibly rich
- Multi-modal

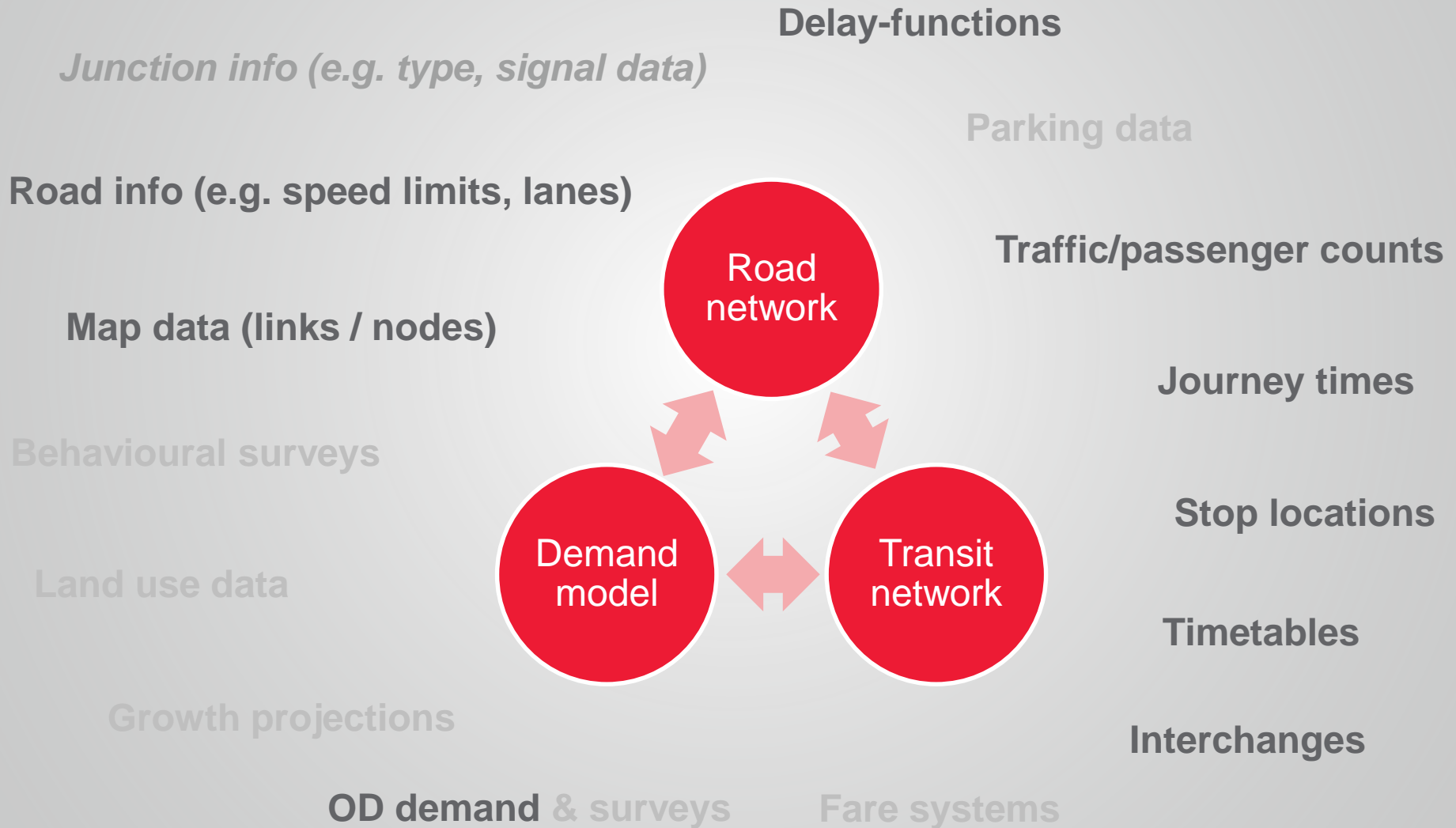
Cons

- Lack of population segmentation
- Lack of short-distance trips

Conclusion

- Greatly improves OD matrices for many modes, as with GPS
- Demand models still required, at least for now, but RSIs could become obsolete
- Network operator involvement required to process raw data in to usable OD matrices
- Modeller needs to understand and accept the assumptions made

GETTING STARTED FASTER



REAL-TIME DATA

TomTom

Welcome, Lane Peter (Log out)

Traffic Flow Viewer

Product Selection > Traffic Flow Viewer

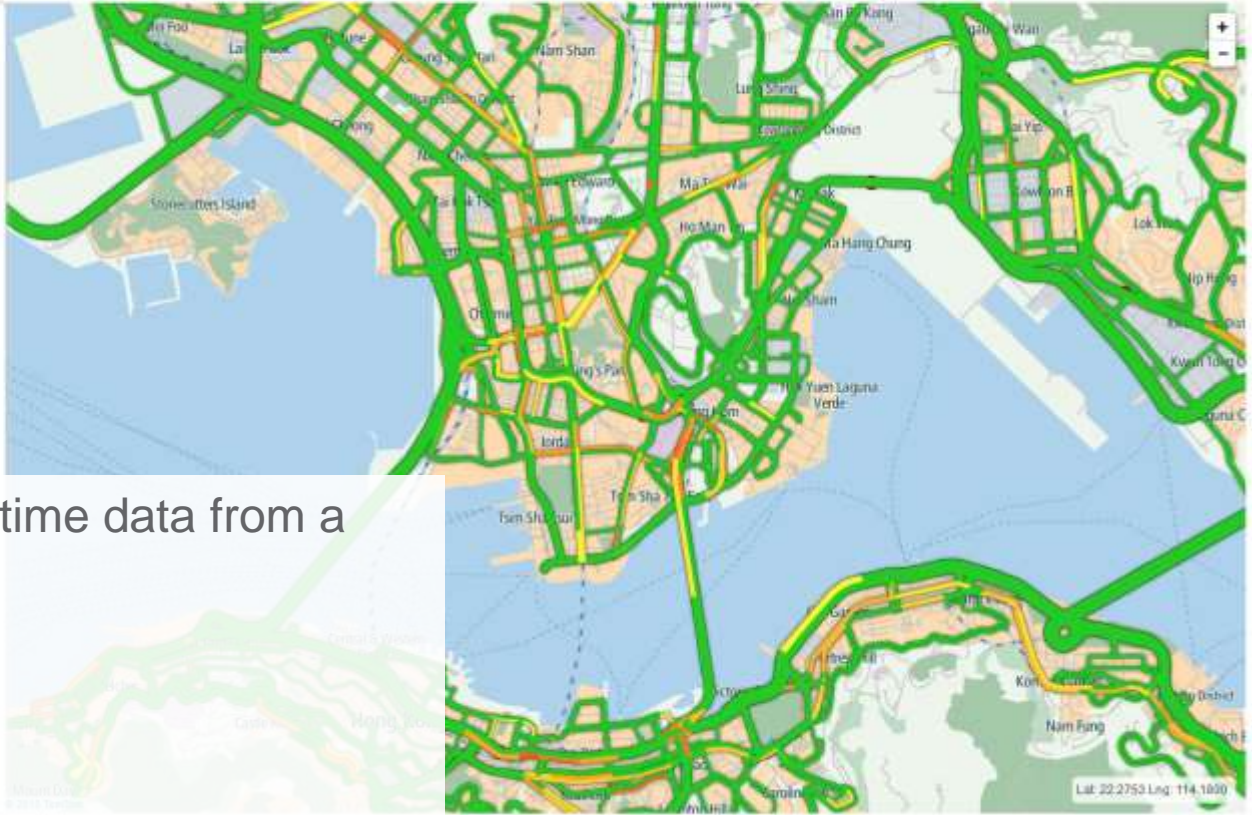
Traffic Flow Viewer Dashboard

Location:

Color: Relative Speed / Absolute speed
(Unit: Km/h / Mph)

Monitor Location

Select a road link to monitor within the bounding box



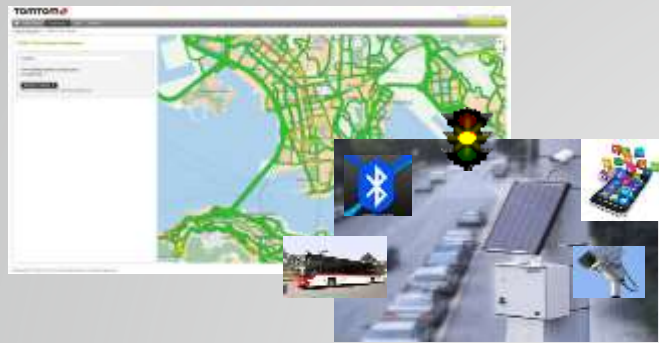
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➤ PTV can supply real time data from a variety of sources:

- TomTom
- INRIX
- HERE
- Coyote

REAL-TIME FORECAST



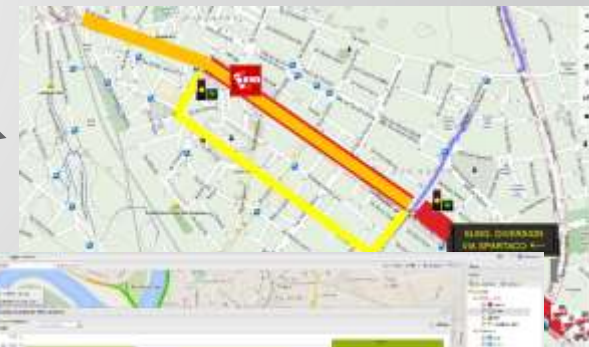
PTV OPTIMA



DATA AMPLIFIER

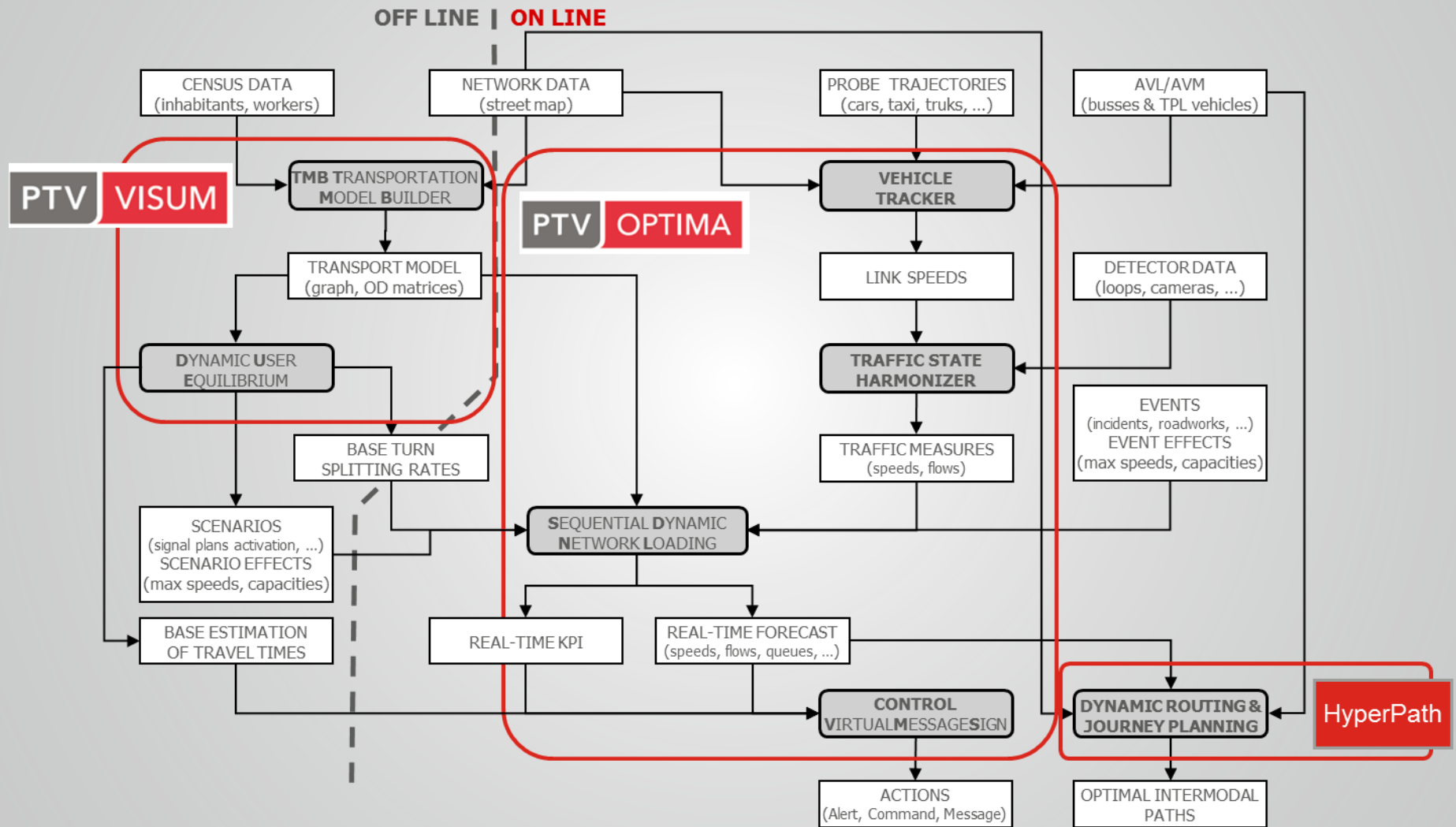


DATA HUB



DECISION SUPPORT

REAL-TIME MODELLING



360° SMARTPHONE APPS



CYCLING – LONDON CYCLE SUPERHIGHWAYS

<https://www.youtube.com/watch?v=Thyy2-J-BFw>



USEFUL LINKS

- PTV Vision Website

<http://vision-traffic.ptvgroup.com/en-uk/products/>

- PTV Vision Youtube Site

<https://www.youtube.com/user/ptvvision>

- PTV Vision Webinars and Tutorials

<http://vision-traffic.ptvgroup.com/en-uk/community/webinars/>

- Trial licences can be downloaded directly from:

<http://vision-traffic.ptvgroup.com/en-us/products/ptv-vissim/>

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PTV GROUP

the mind of movement