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TRANSPORT MODELLING AND SIMULATION WITH PTV VISION SOFTWARE

Chris Davis
CIHT
24.04.2019

www.ptvgroup.com


WE PLAN
AND OPTIMISE
EVERYTHING
THAT MOVES PEOPLE
AND GOODS
WORLDWIDE.
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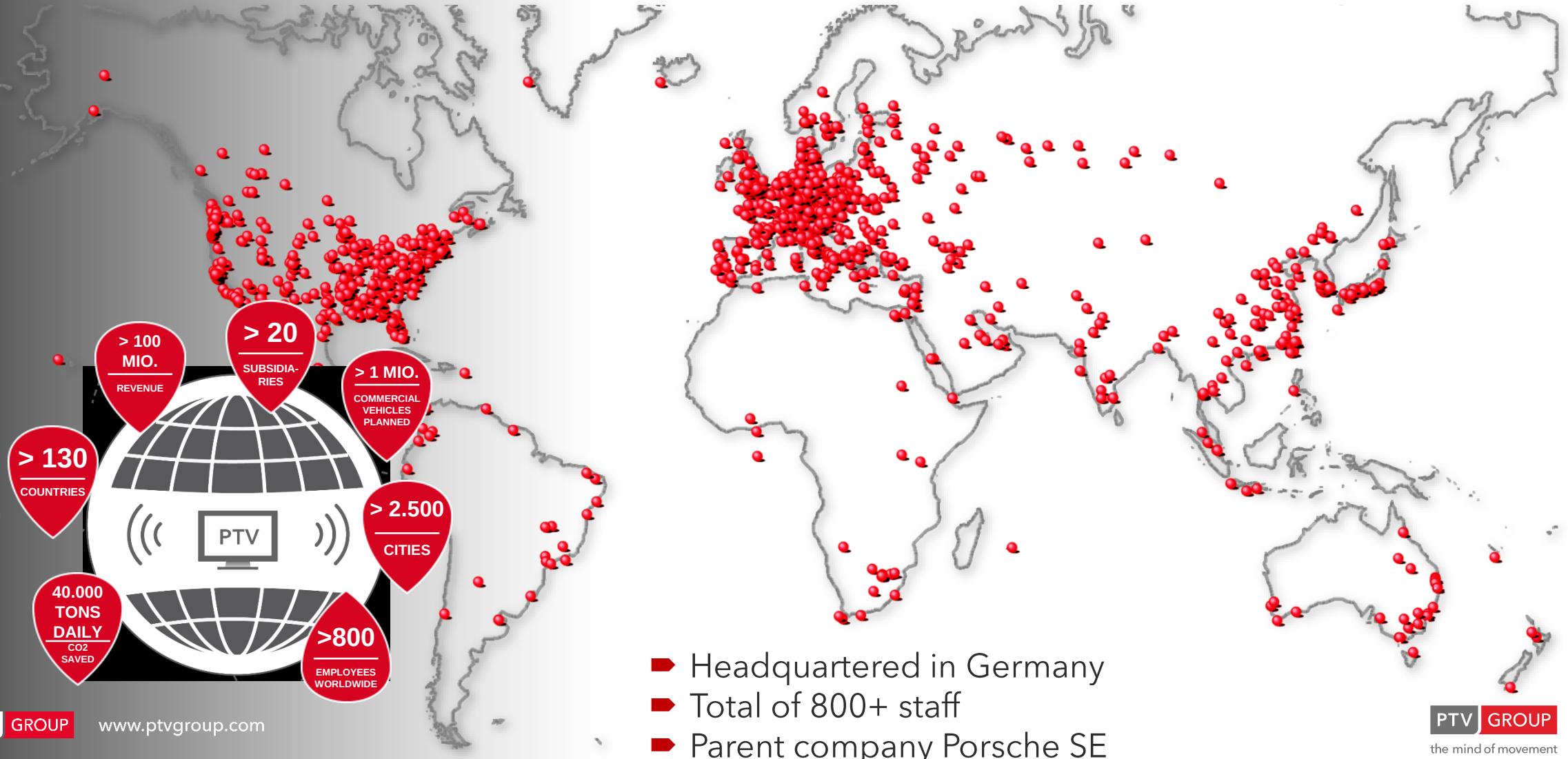
PTV Group – Global Reach



- Headquartered in Germany
- Total of 800+ staff
- Parent company Porsche SE

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PTV UK Ltd - Logistics

- Based in Birmingham
- Total of 35 staff

Plan and Optimise transport routes – anytime, anywhere.
Even smaller vehicle fleets can save 7-15% of their costs with software-assisted planning.
Our professional truck navigation solution gets drivers to their destination quickly and safely as the route is calculated specifically for their respective vehicle type.

What's more, you can use our notification service to actively stay informed of the estimated time of arrival (ETA) of your transport in real-time. You can also share this information with every link in the transport chain. We offer you the right solutions for efficient, advanced and environmentally-friendly transport logistics.

PTV UK Ltd - Traffic

- Offices in Birmingham & London
- Total of 10 staff
- All from transport consultancy background

Look after our Vision suite of software:

PTV Vissim
PTV Visum
PTV Viswalk
PTV Vistro
PTV Optima
PTV Balance and
PTV Vistad

Vision Software - Offline

PTV VISUM

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

PTV VISSIM

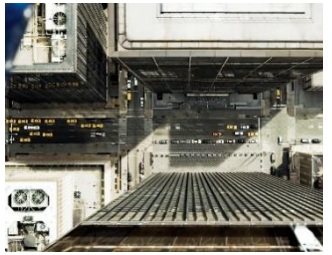
Detailed microscopic modelling of individual vehicles covering all modes of transport – multi-modal micro-simulation

PTV VISWALK

Advanced microscopic pedestrian simulation, both inside and outside buildings

PTV VISTRO

Traffic impact analysis and signal timing optimisation



Vision Software - Realtime

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 VISTAD

Qualitative collection and validation
of accident data

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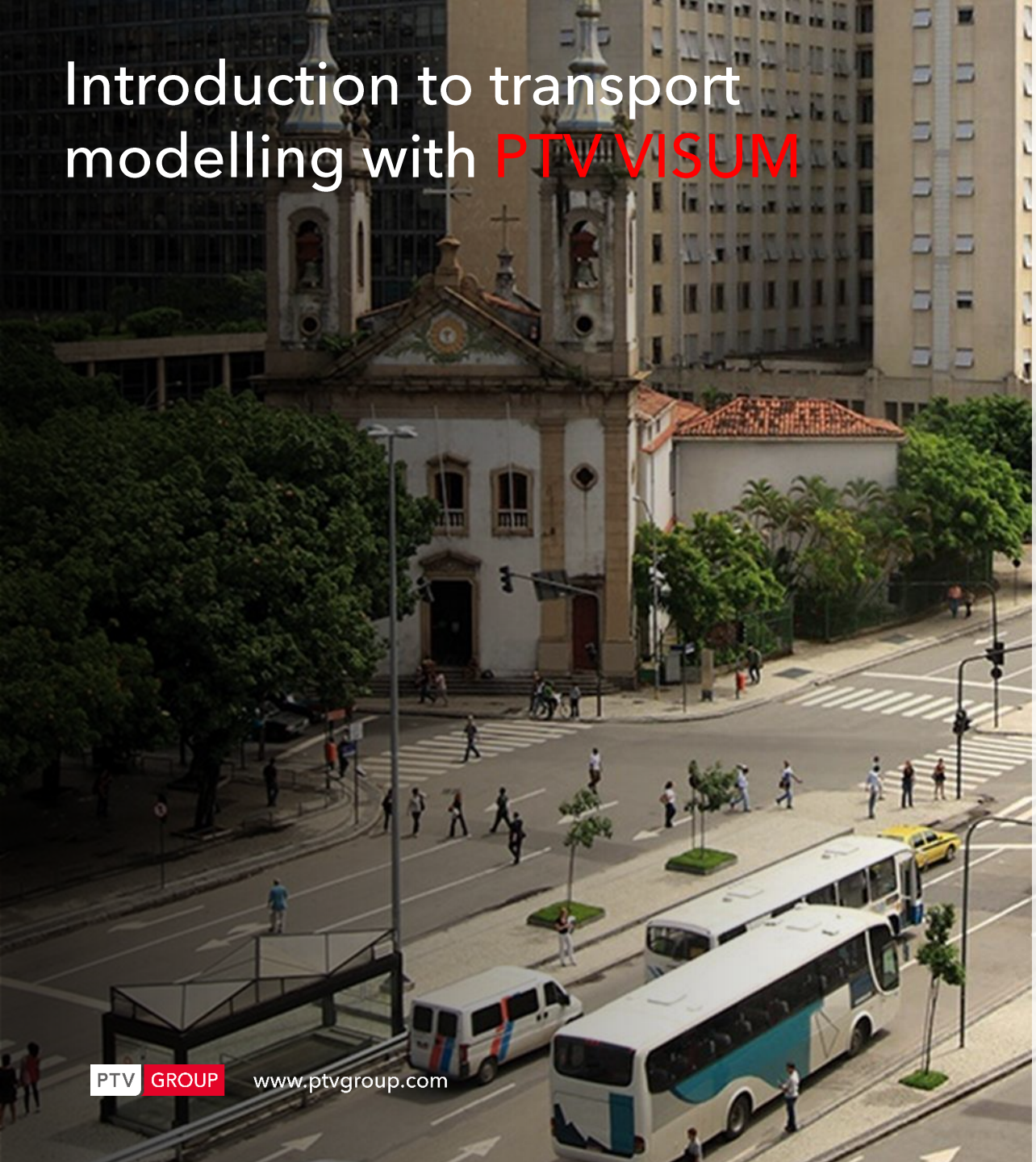
Vision Software - Clients

- Public Authorities (TfL, DfT, HE, West Midlands etc)
- Automotive Manufacturers, OEM's
- Engineering Consultants (Aecom, Atkins, Arup, Jacobs, etc)
- Universities and students (Imperial, UCL, Newcastle)
- Research Institutions and NGOs (Catapult)
- Developers and Architects
- Government Authorities (TfL, DfT, GA, Transport Scotland and Boroughs)
- Public transport operators
- Road and motorway operators
- Airport operators
- Research organisations

Introduction to transport modelling with PTV VISUM



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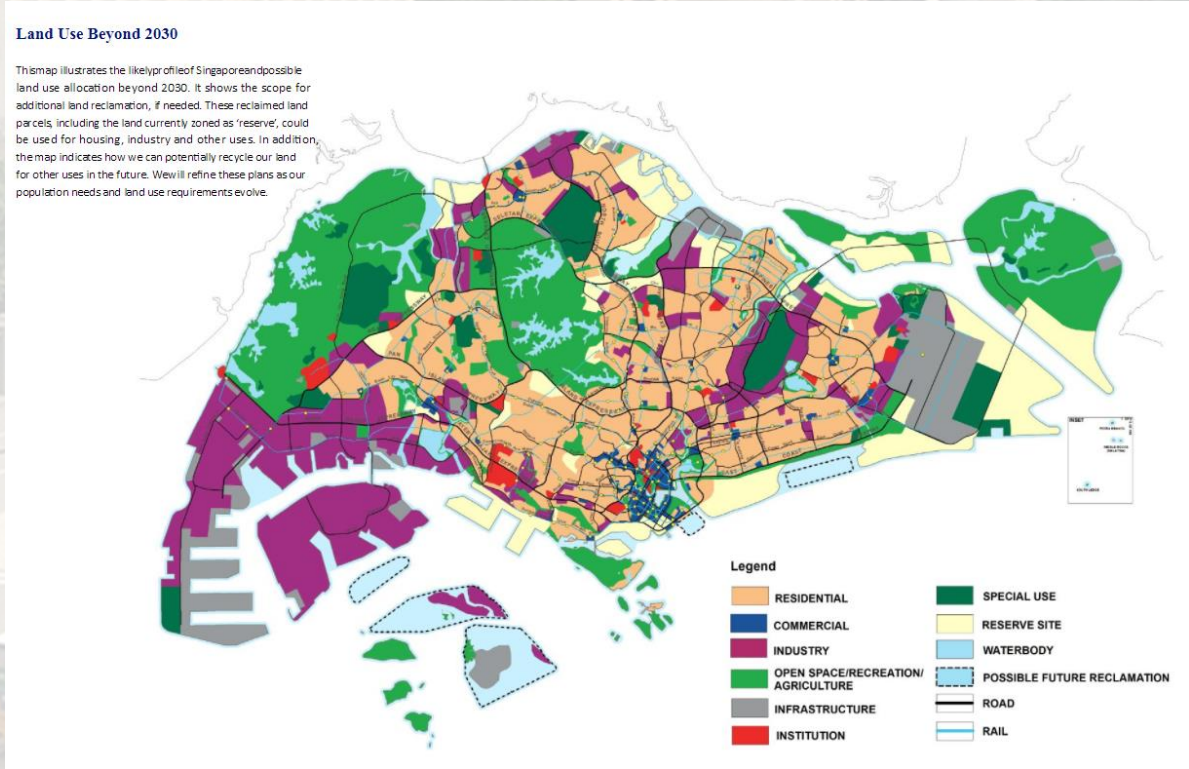
PTV VISUM

Introduction to transport modelling with PTV VISUM

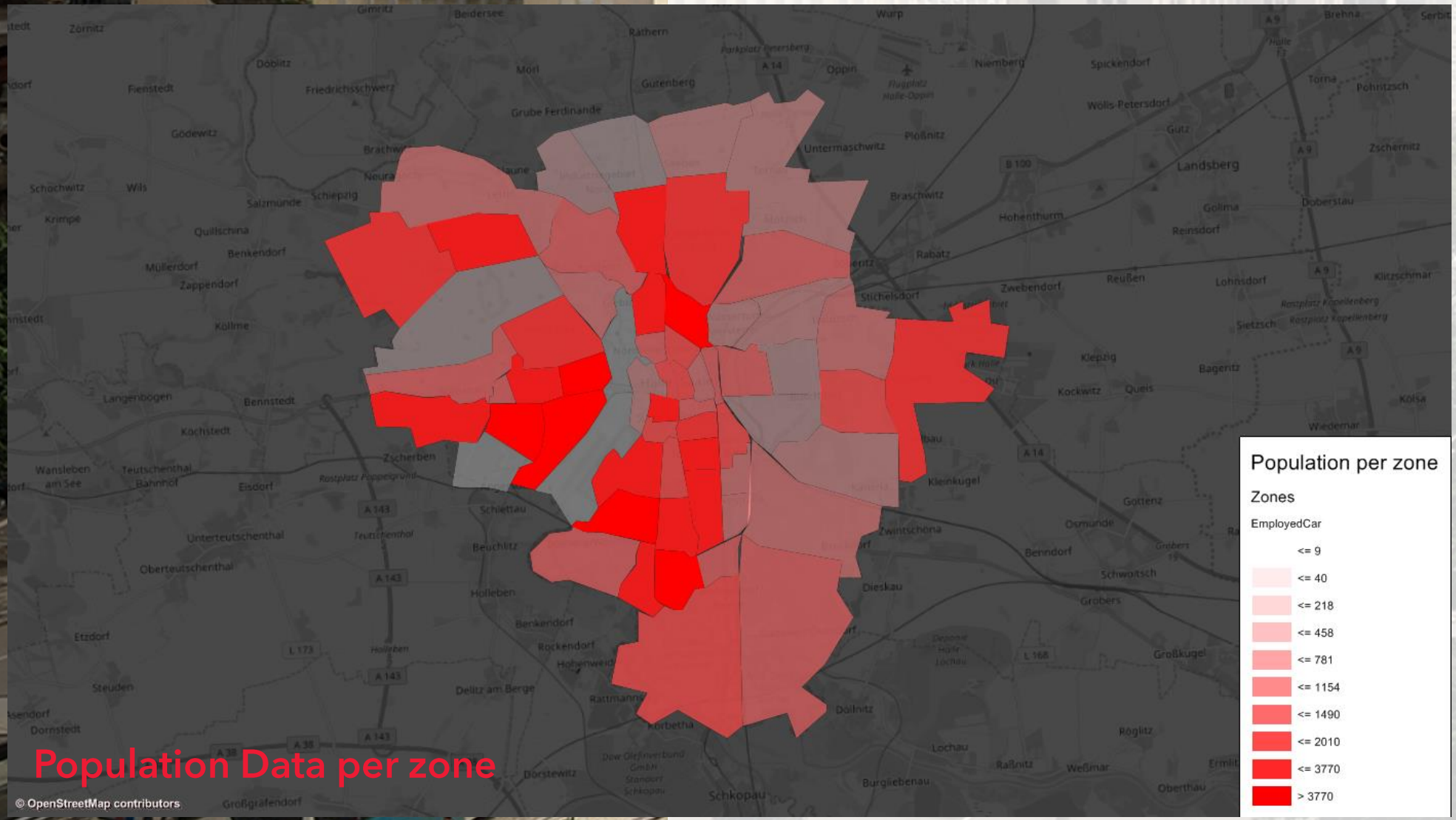
PTV VISUM

- Some problems are too complex for a spreadsheet…



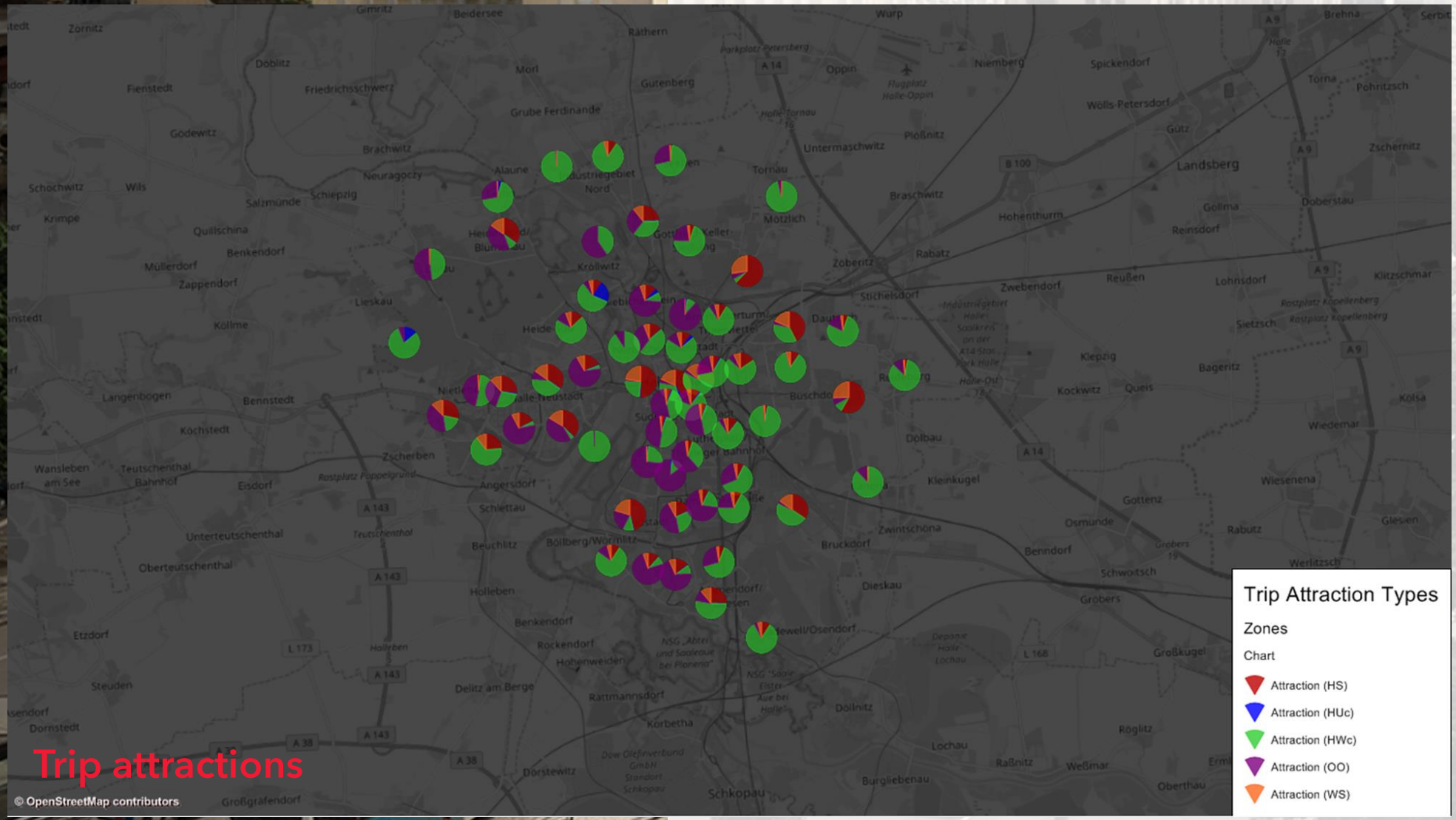
… And too important to leave for chance

- A digital replica to diagnose problems...



... And develop optimal solutions

- A digital replica to diagnose problems...



Trip attractions

... And develop optimal solutions

- A digital replica to diagnose problems...

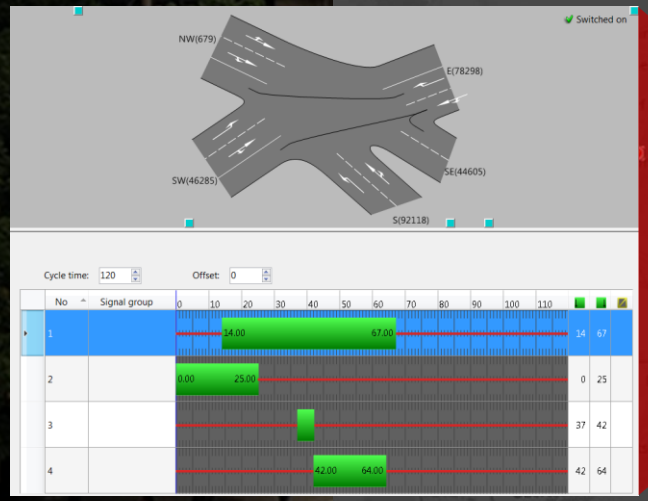
Desire Lines from Population and Attractions

... And develop optimal solutions

- A digital replica to diagnose problems...

... And develop optimal solutions

- A digital replica to diagnose problems...



Code capacity data, traffic signal

Junction control data

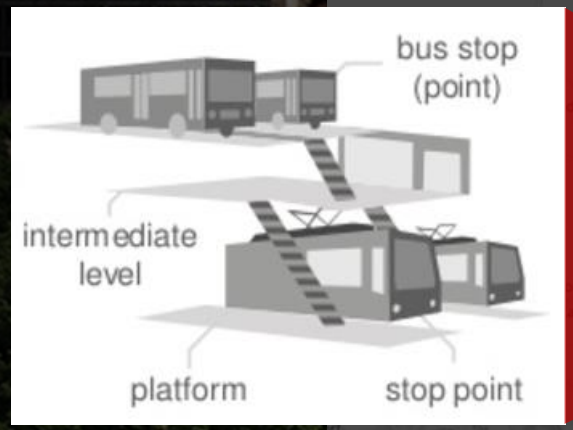
Nodes

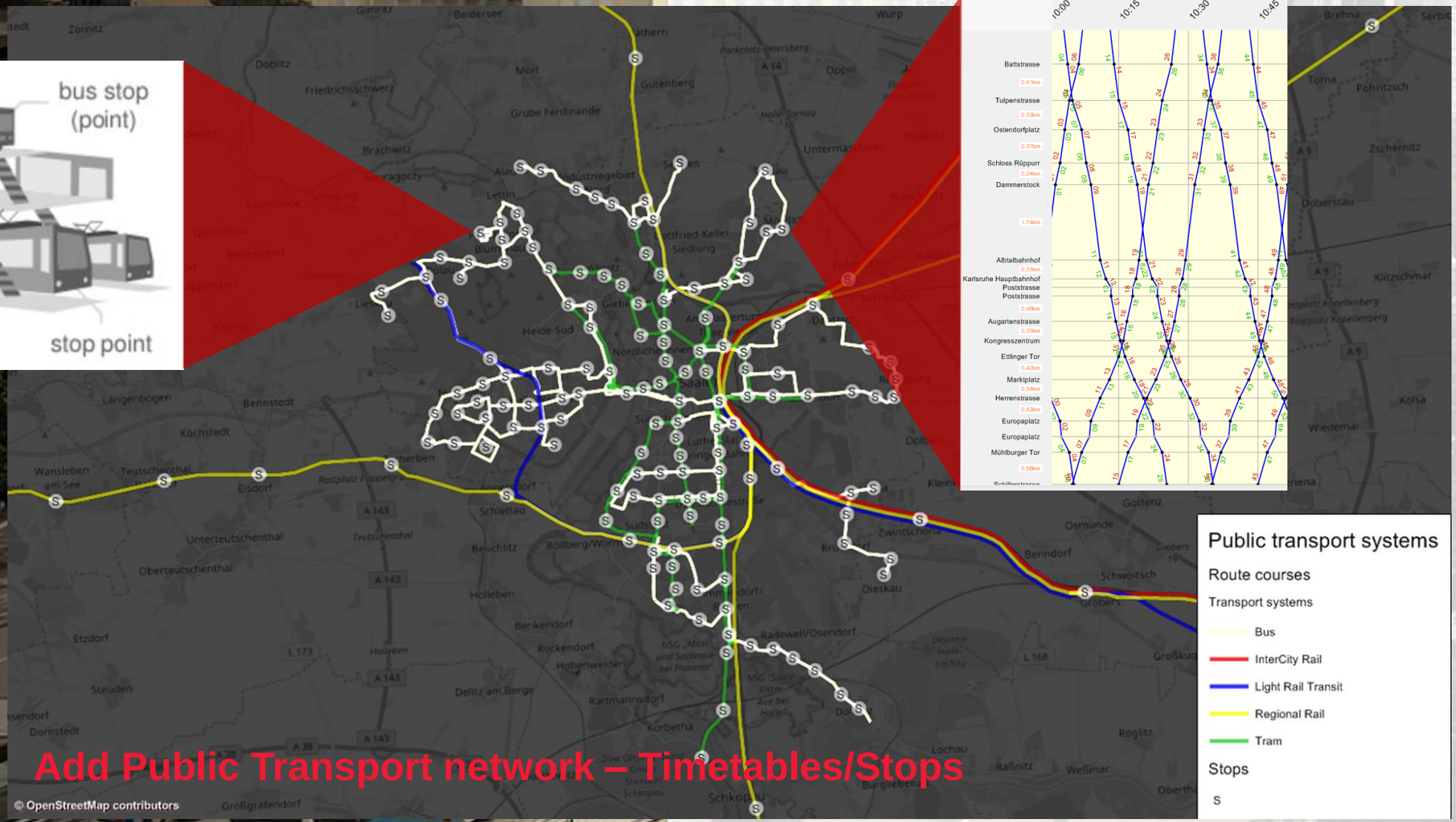
Control type

- Uncontrolled
- Two-way stop
- Signalized
- All-way stop
- Roundabout
- Two-way yield

... And develop optimal solutions

- A digital replica to diagnose problems...





Add Public Transport network – Timetables/Stops

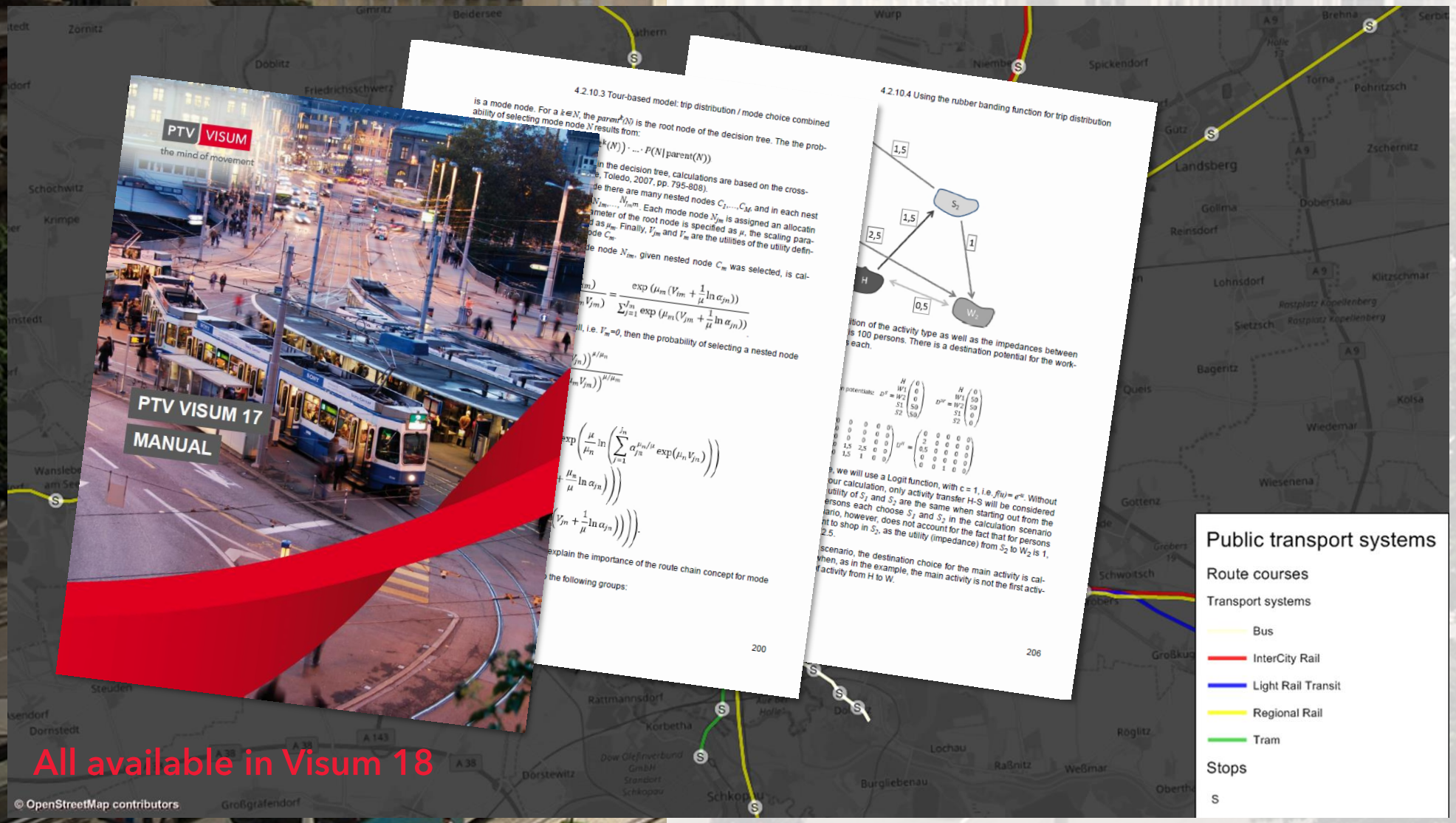
... And develop optimal solutions

- A digital replica to diagnose problems...

Inject RSI data, ticket information, mobile data

... And develop optimal solutions

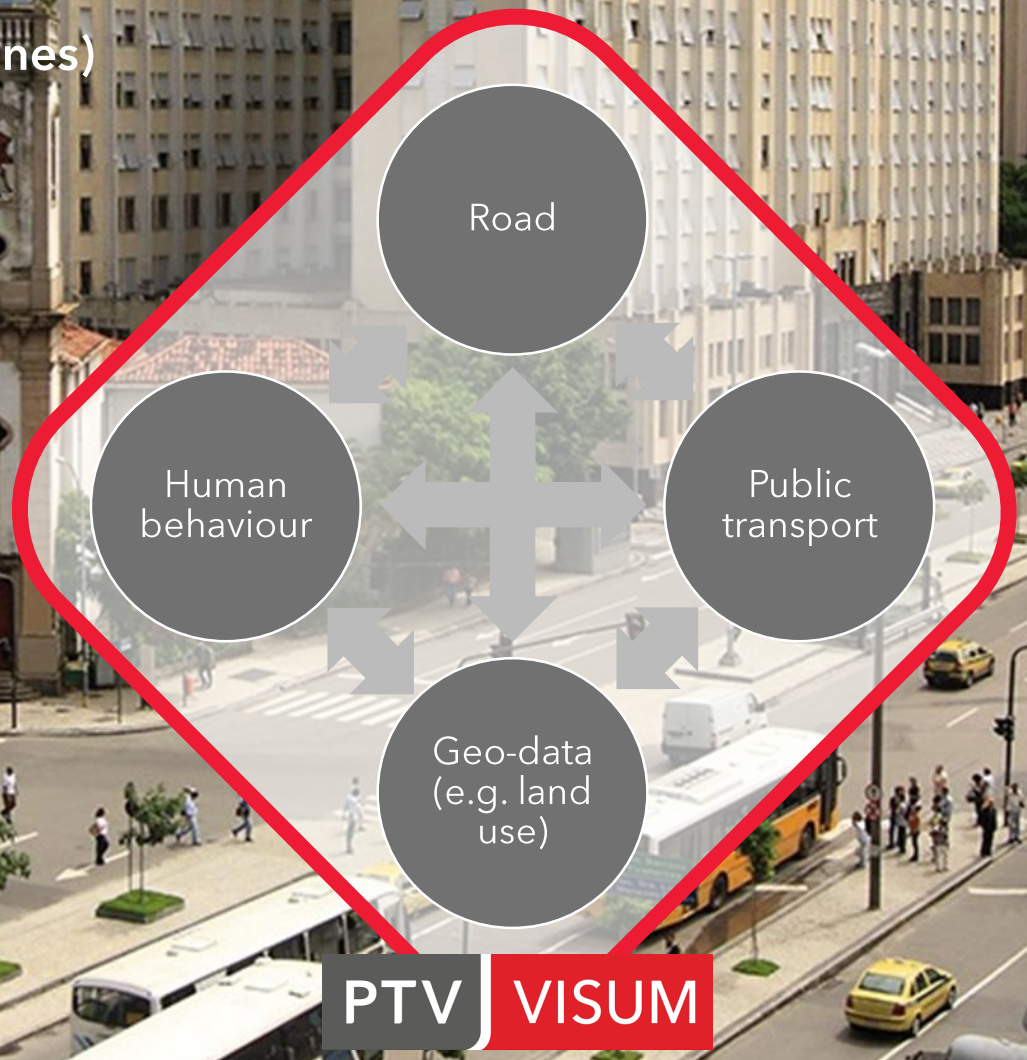
- A digital replica to diagnose problems...



... And develop optimal solutions

PTV Visum is a hub for city data, analytics and decision support

- Junction info (e.g. type, signal data)
- Road info (e.g. speed limits, lanes)
- Map data (links / nodes)
- Behavioural surveys
- Land use data
- Growth projections
- OD demand & surveys
- Delay-functions
- Parking data
- Traffic/passenger counts
- Journey times
- Stop locations
- Timetables
- Interchanges
- Fare systems



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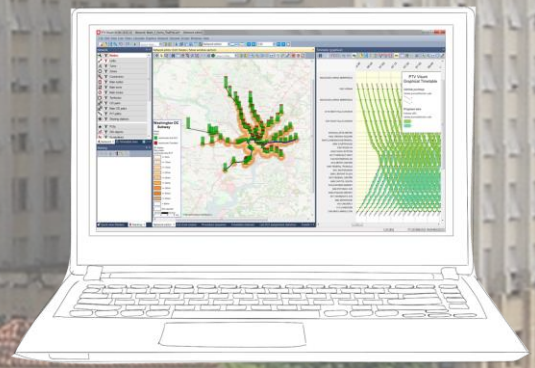
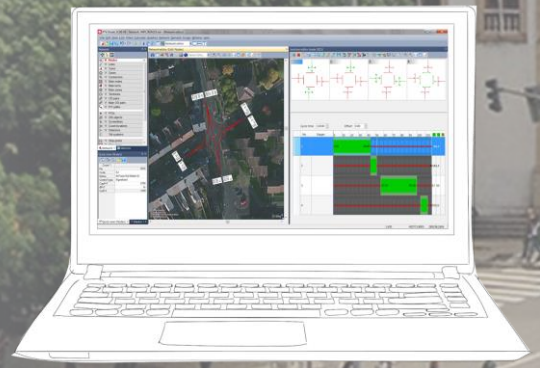
PTV Visum is a hub for city data, analytics and decision support

Map & geo-data import



Public transport operator data

Mass-movement data



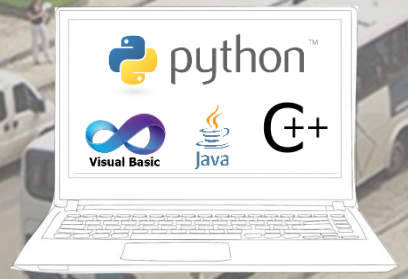
Computer-aided coding

Comfortable GUI

a

b

c



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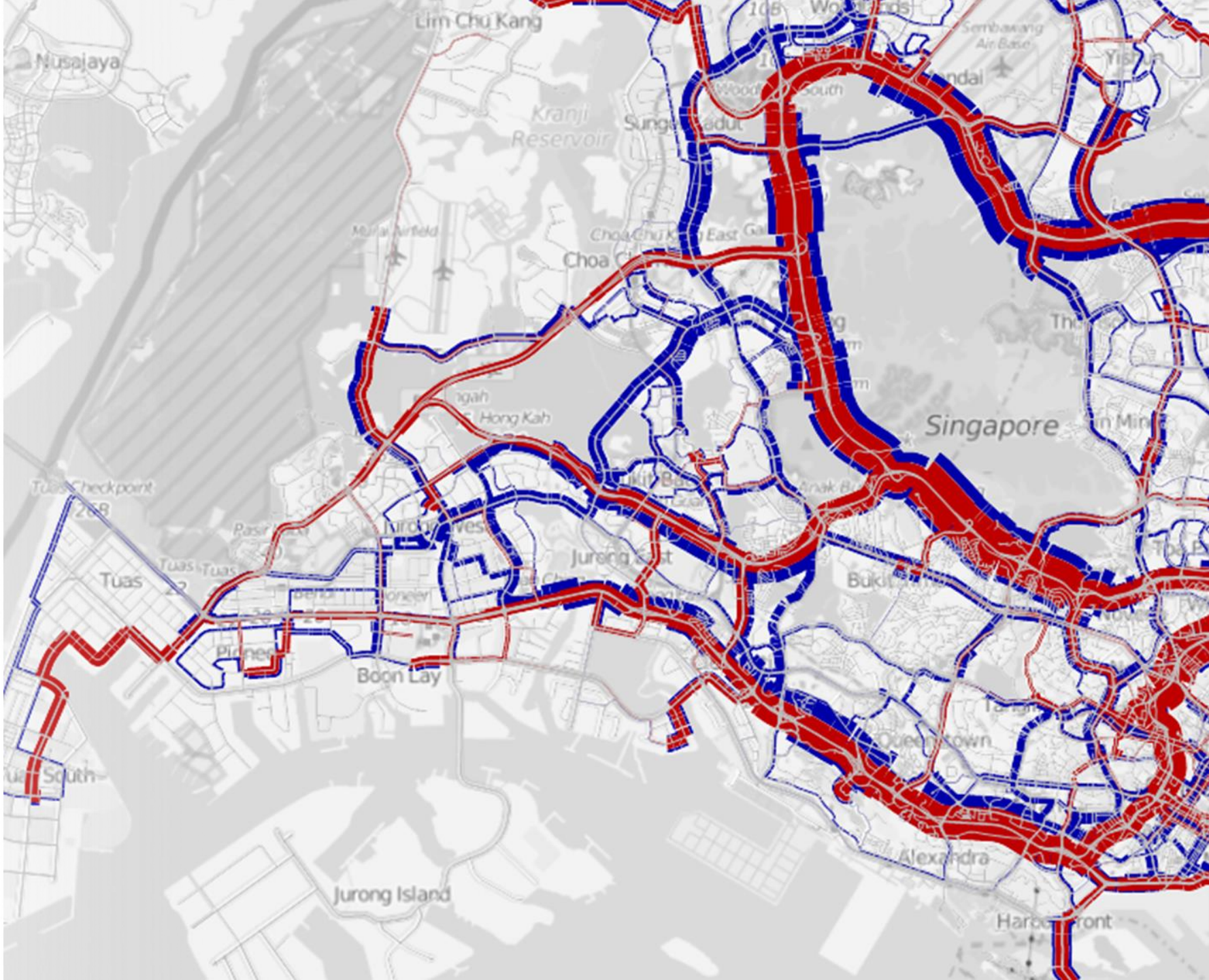
Transport model of Singapore in 60 minutes



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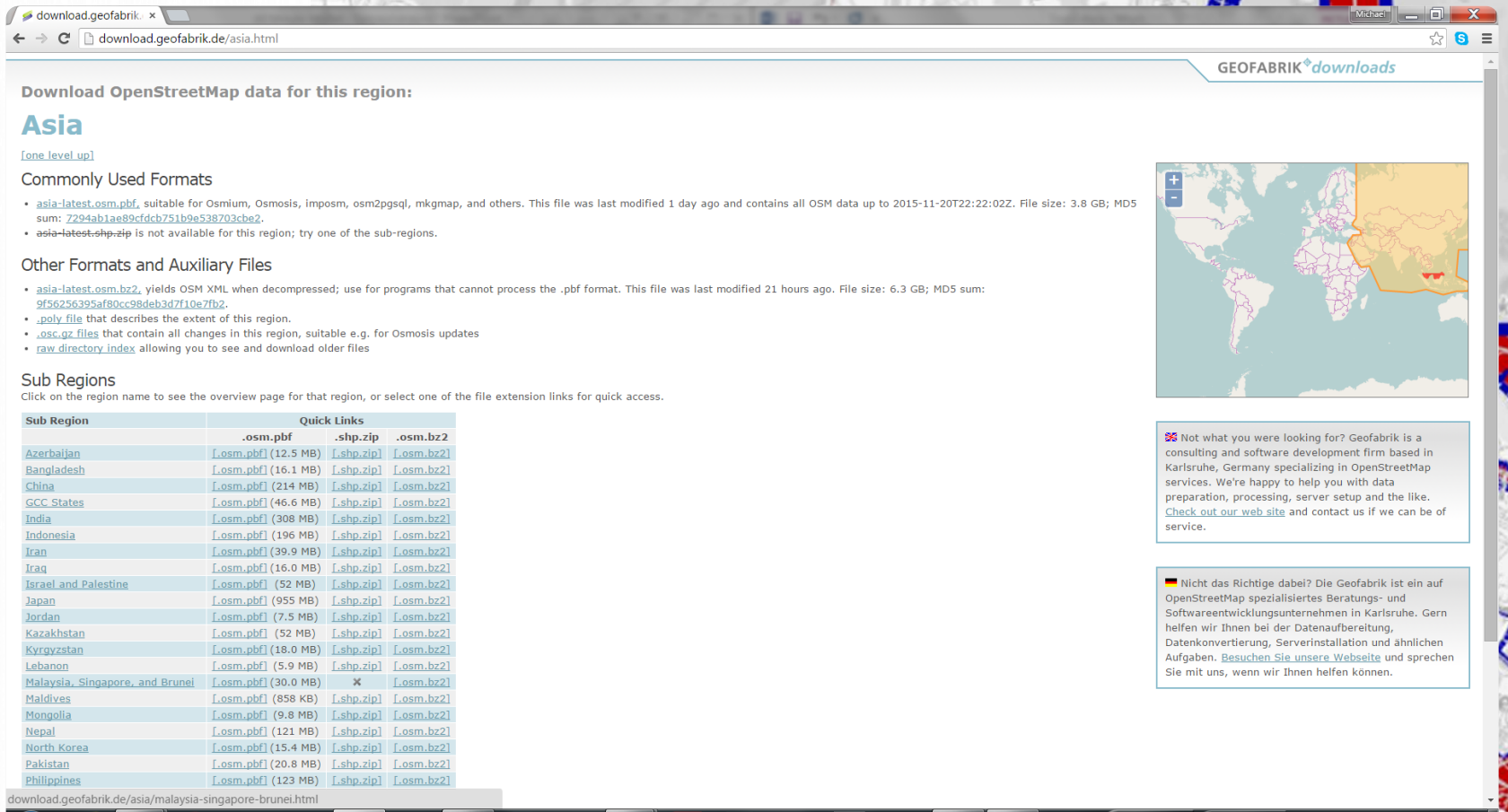
Data Source – Openstreetmap (geofabrik)



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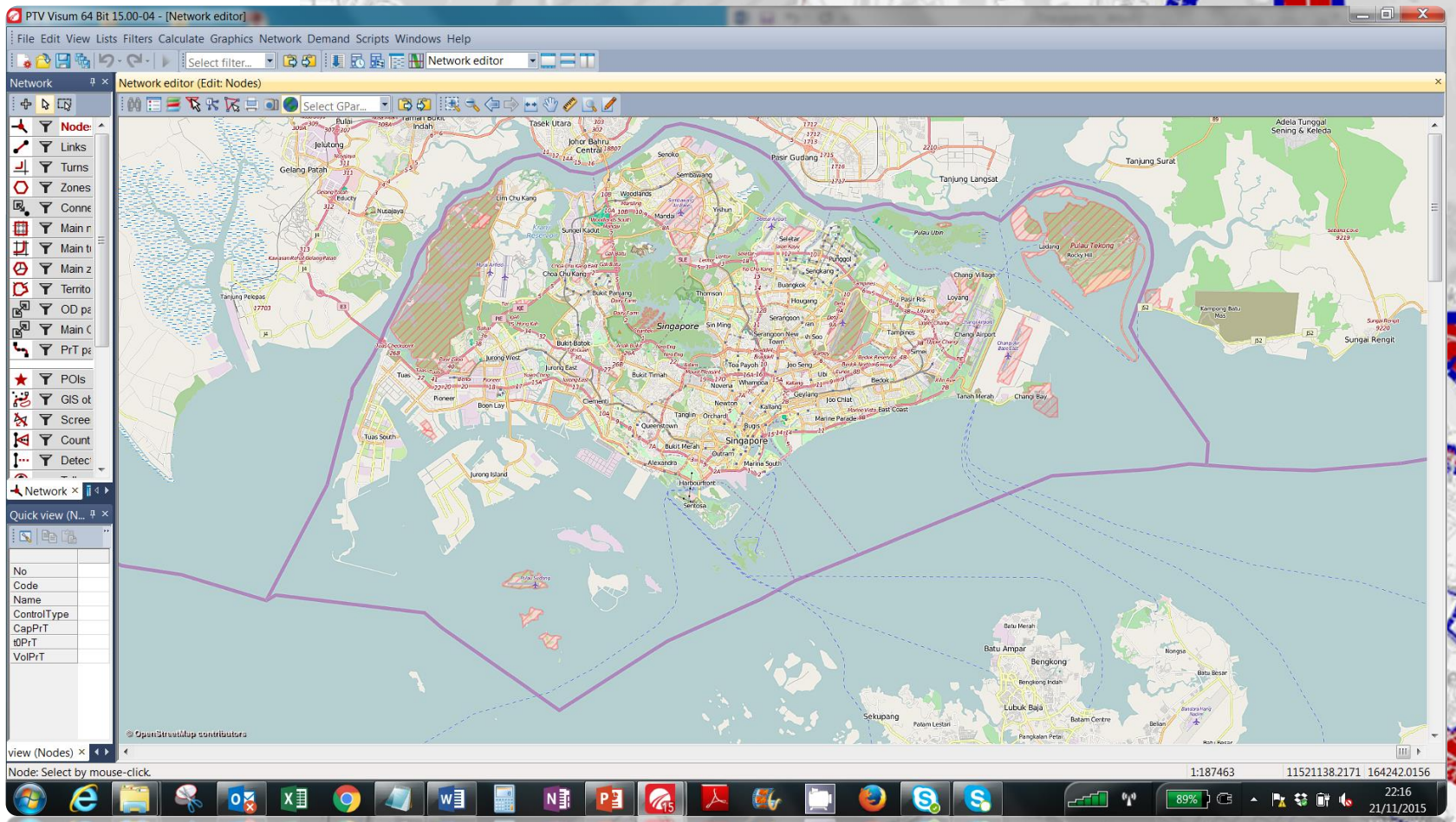
Data Source: - PTV Visum background map



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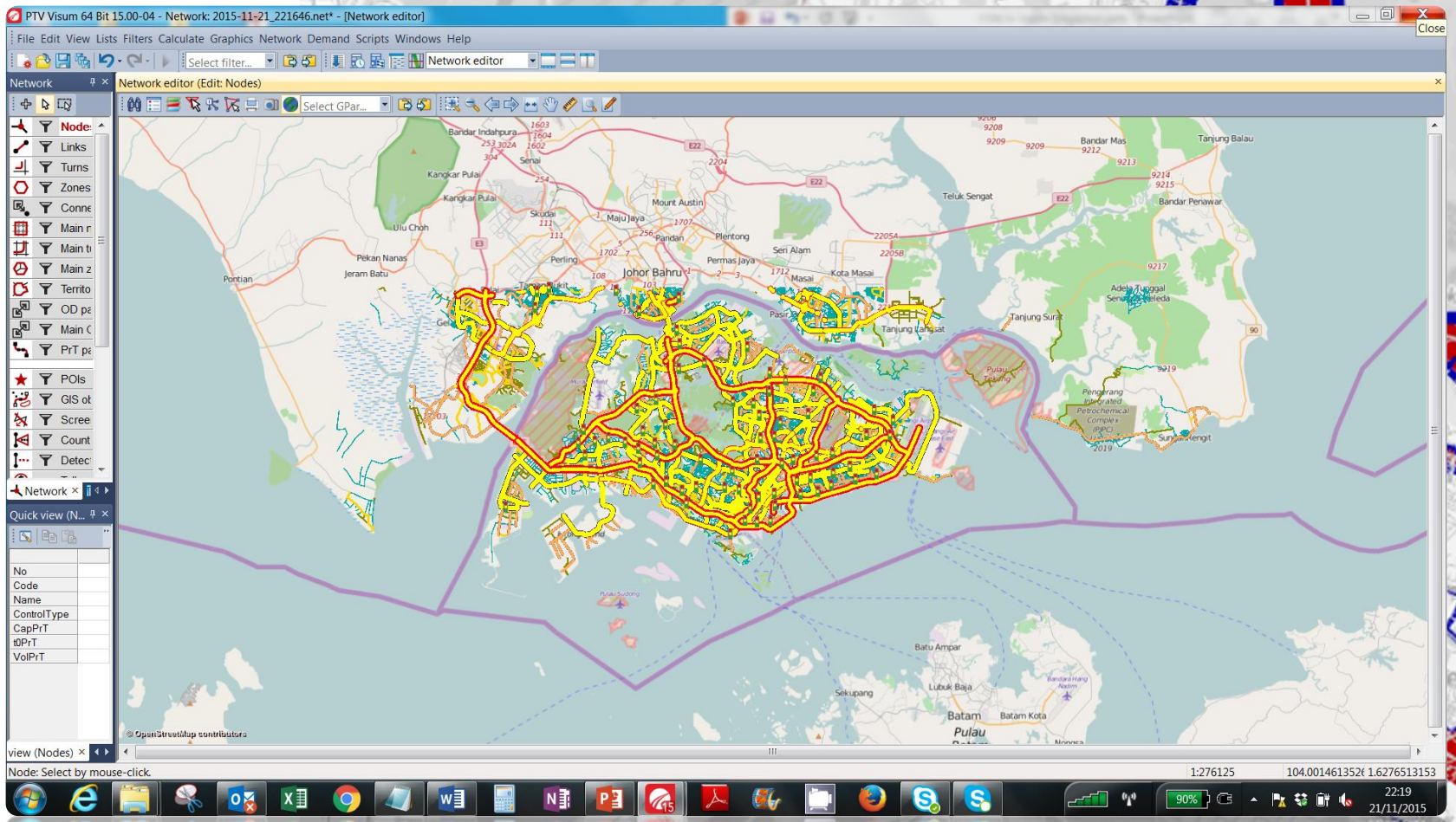
Process: - import Openstreetmap area



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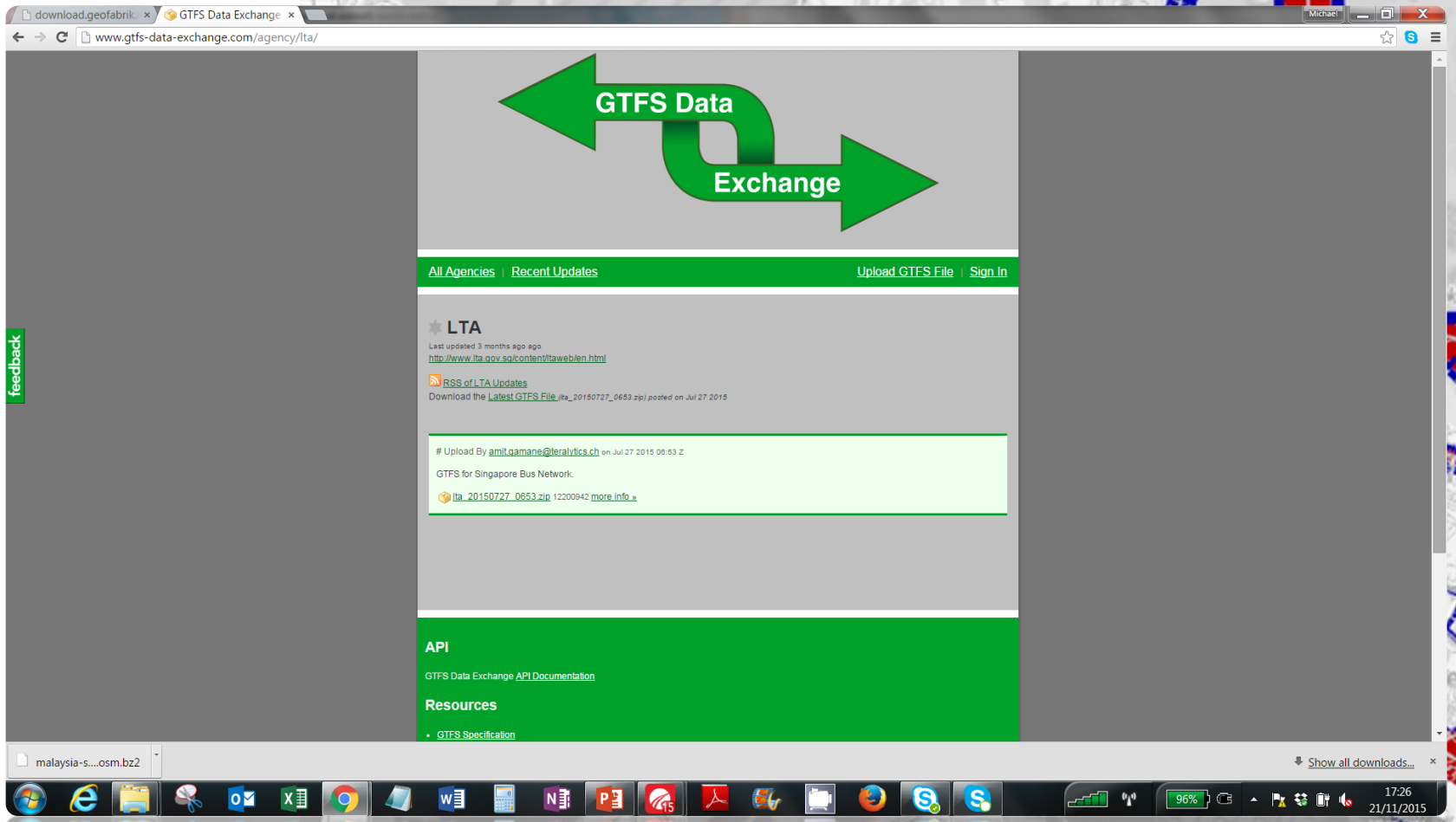
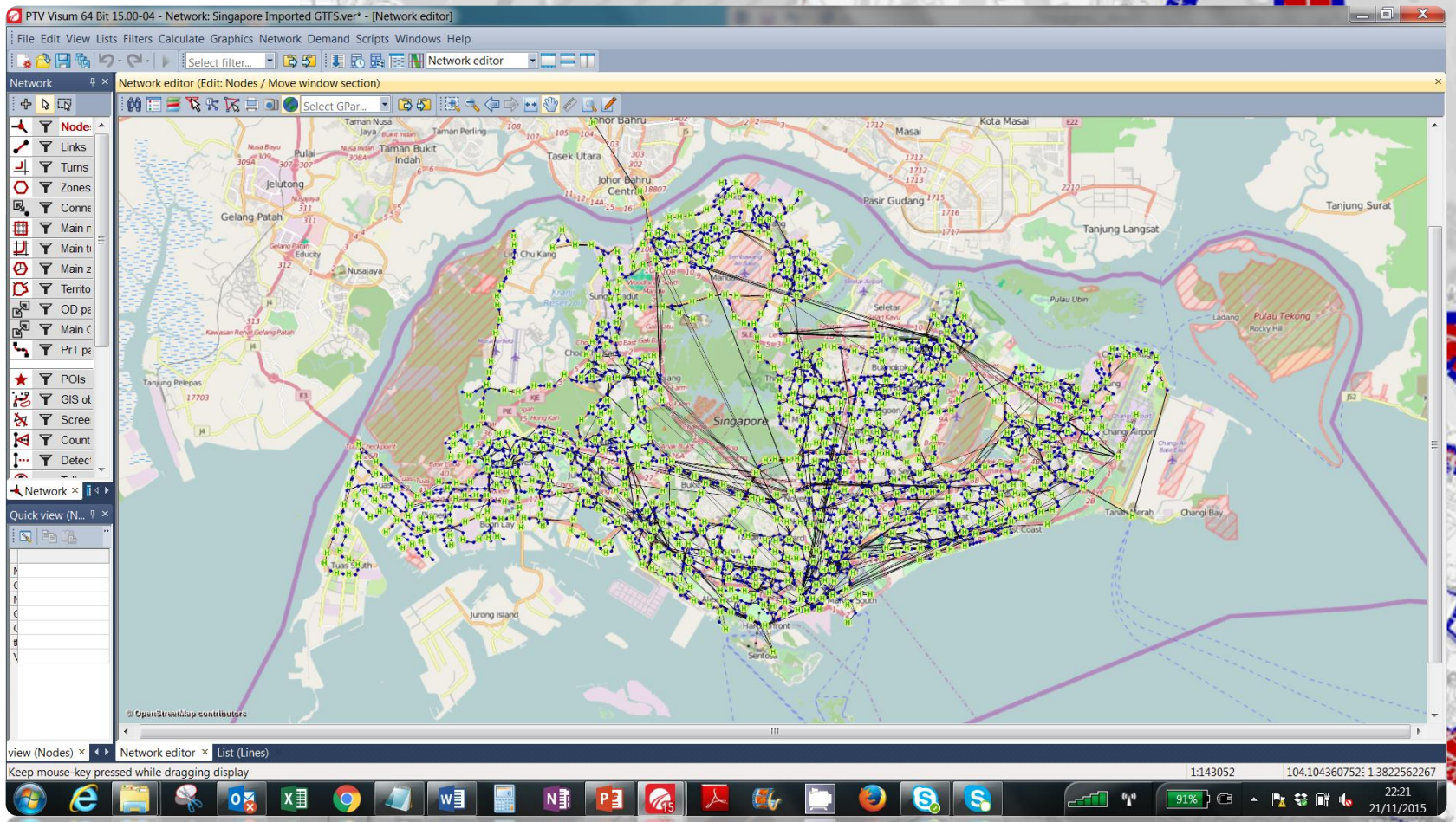
Data Source: - GTFS (Data exchange)



PTV GROUP

Process: - Import GTFS



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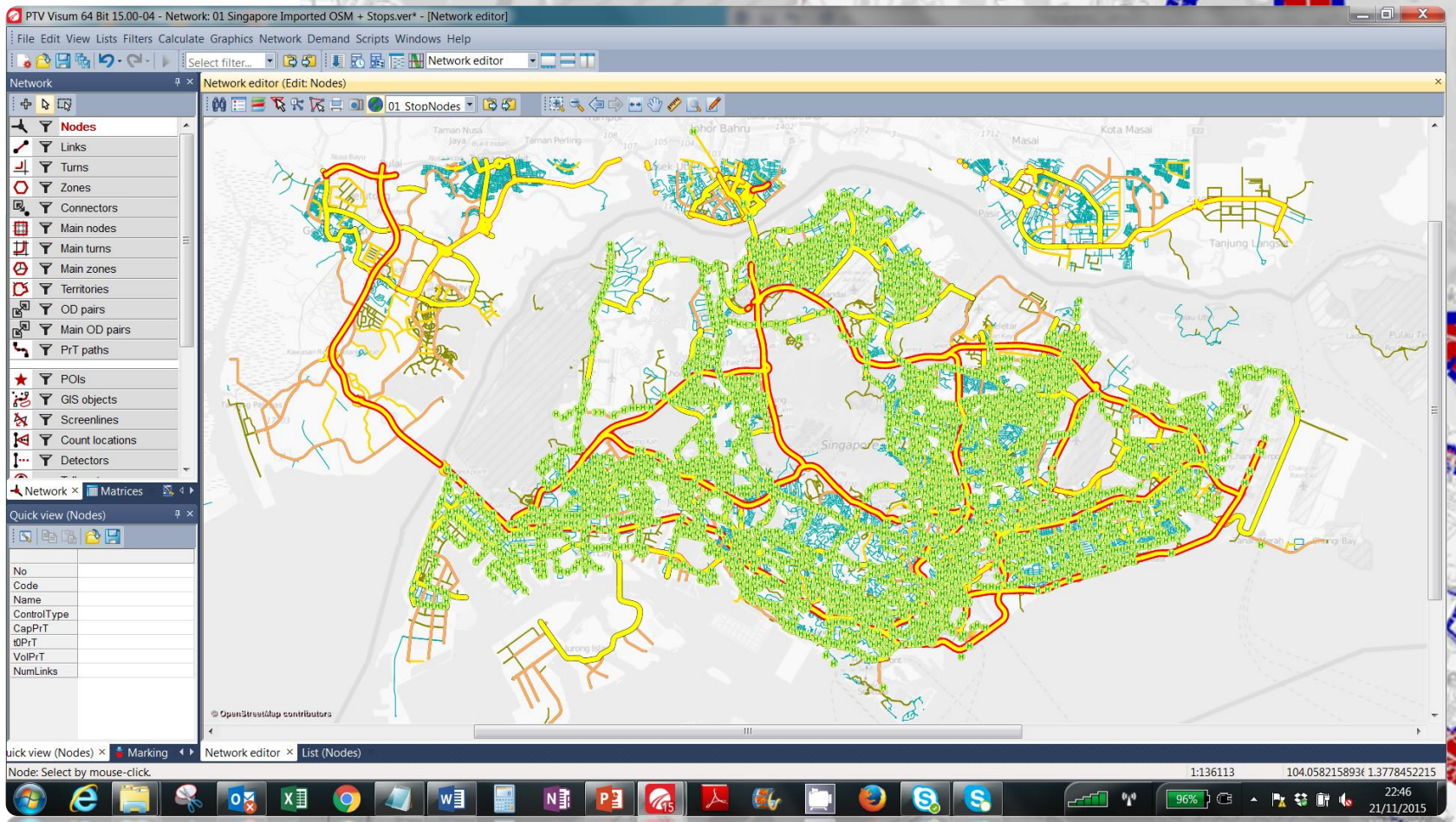
Fusion: - GTFS stops with Openstreetmap



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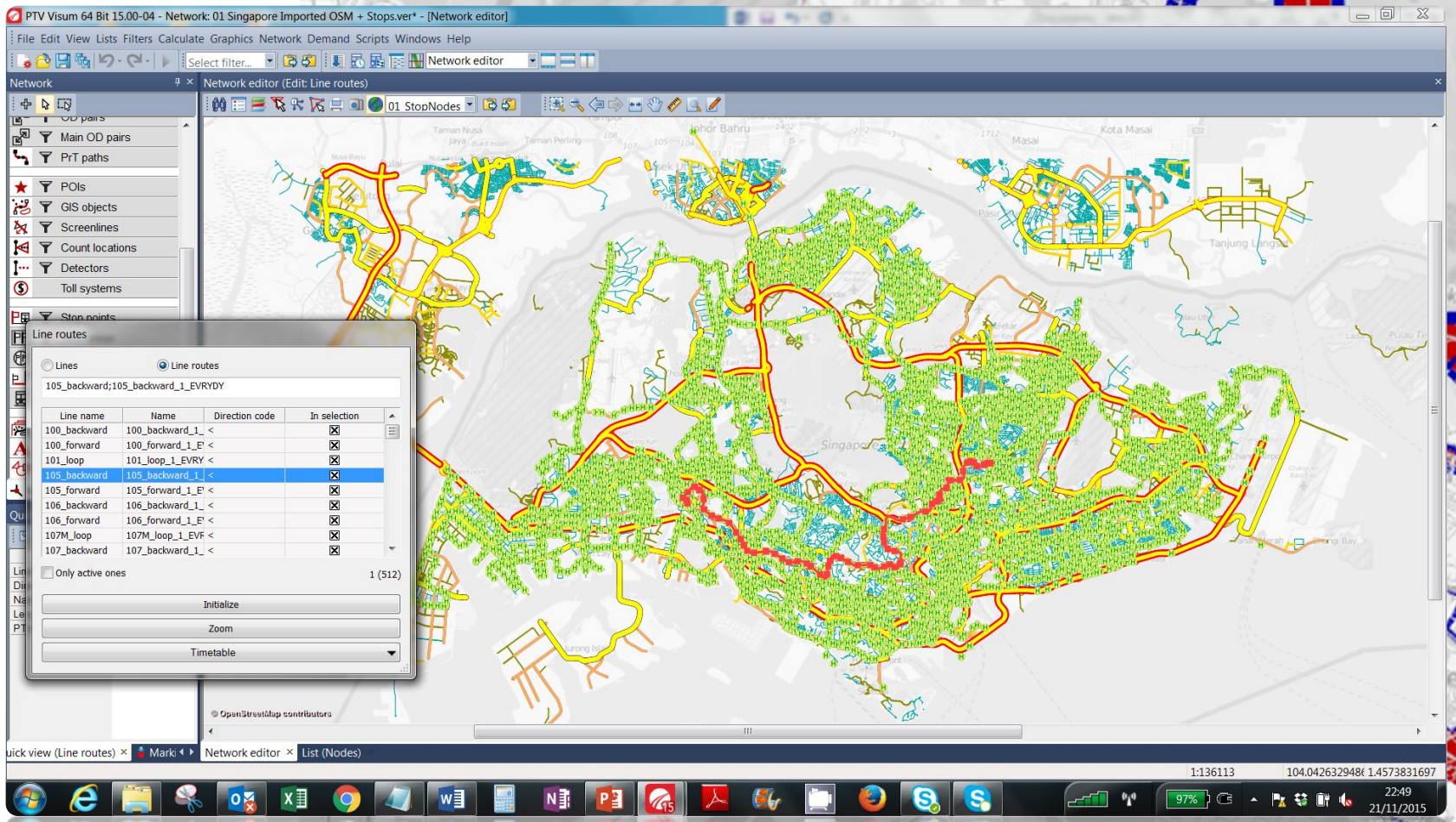
Fusion: - GTFS lines with Openstreetmap & stops



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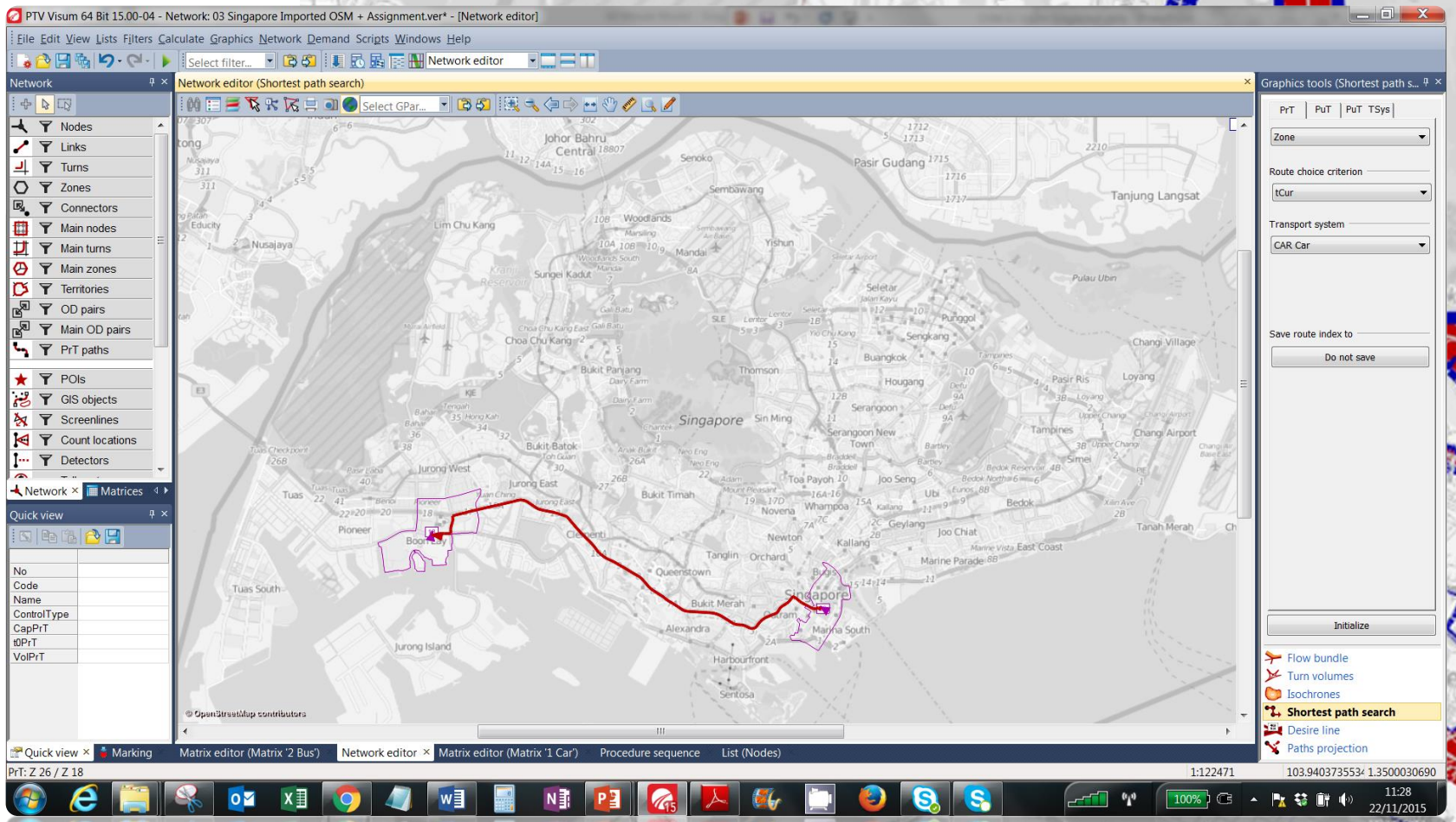
Analysis: - Shortest path



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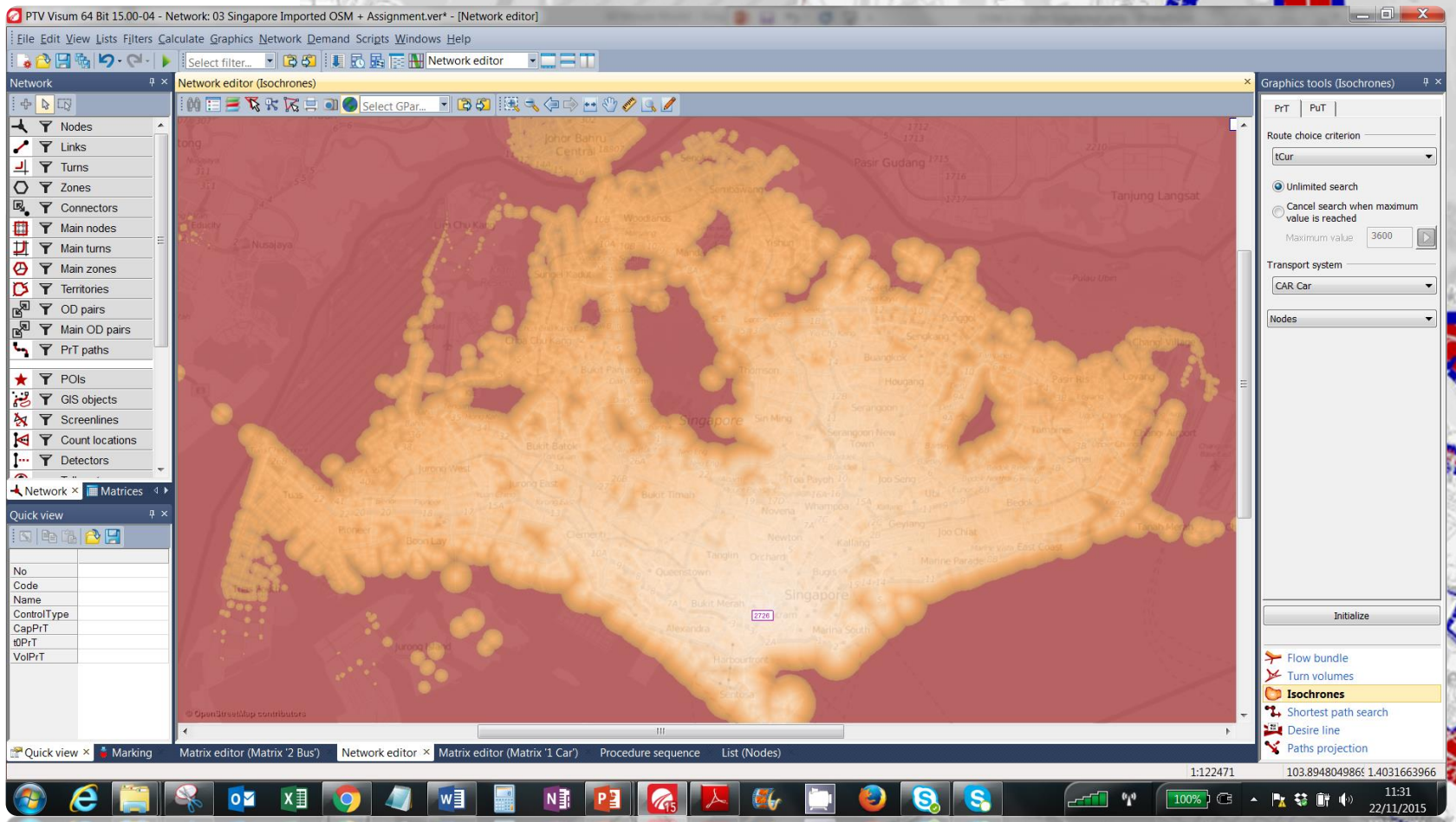
Analysis: - Isochrones (accessibility analysis)



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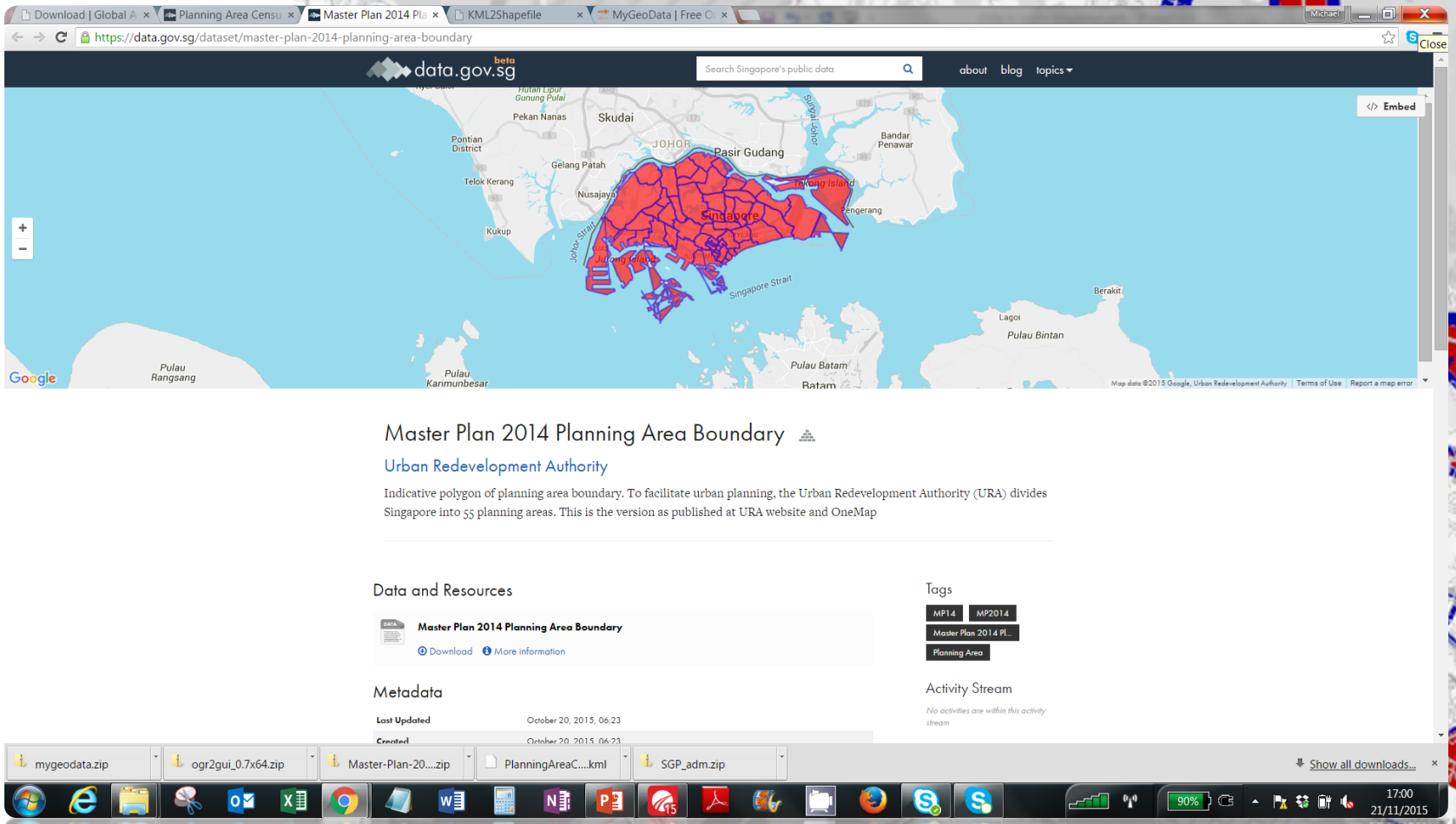
Data source: Official LTA website (planning zones)



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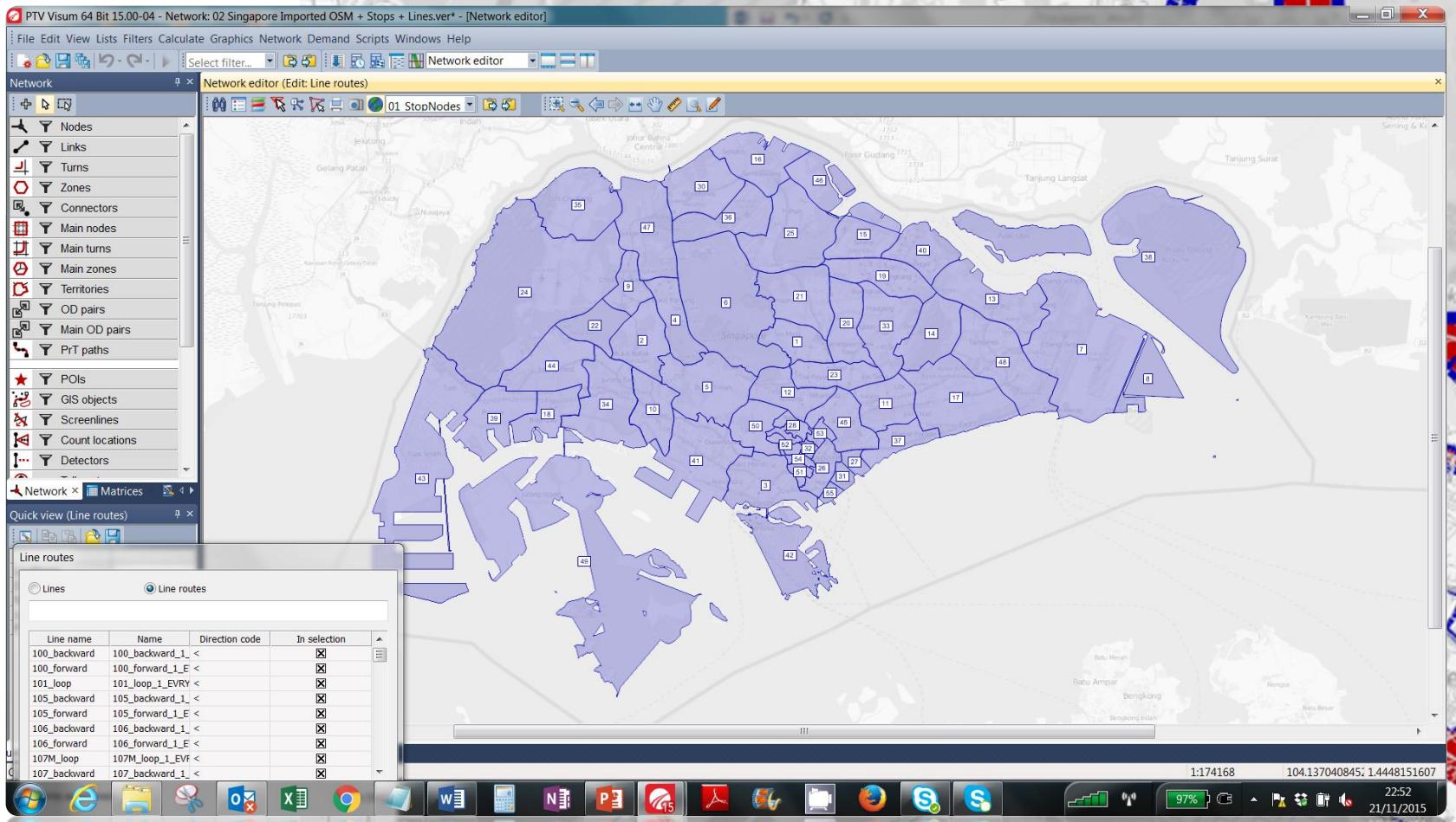
Process: Import shapefile as zones



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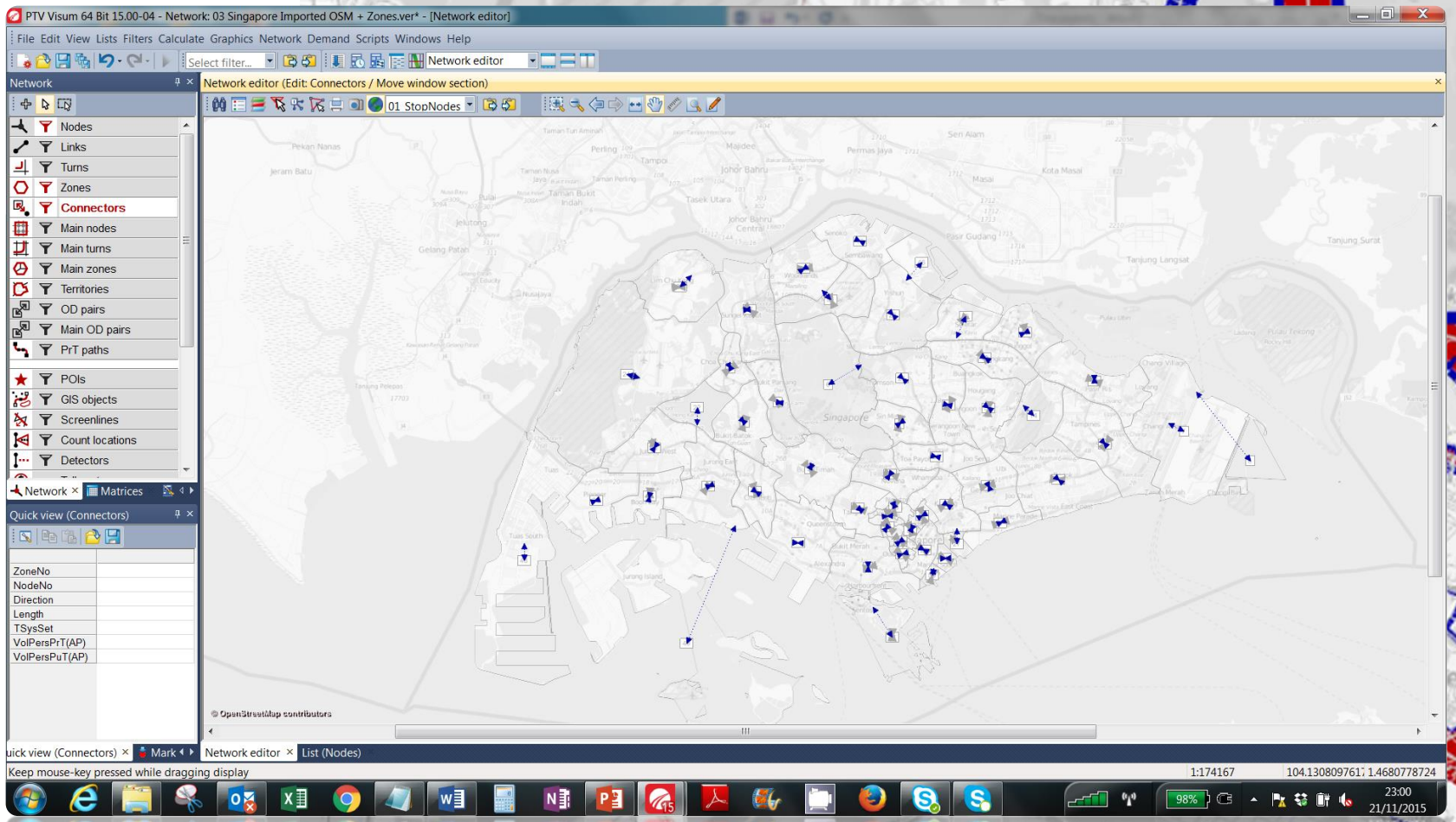
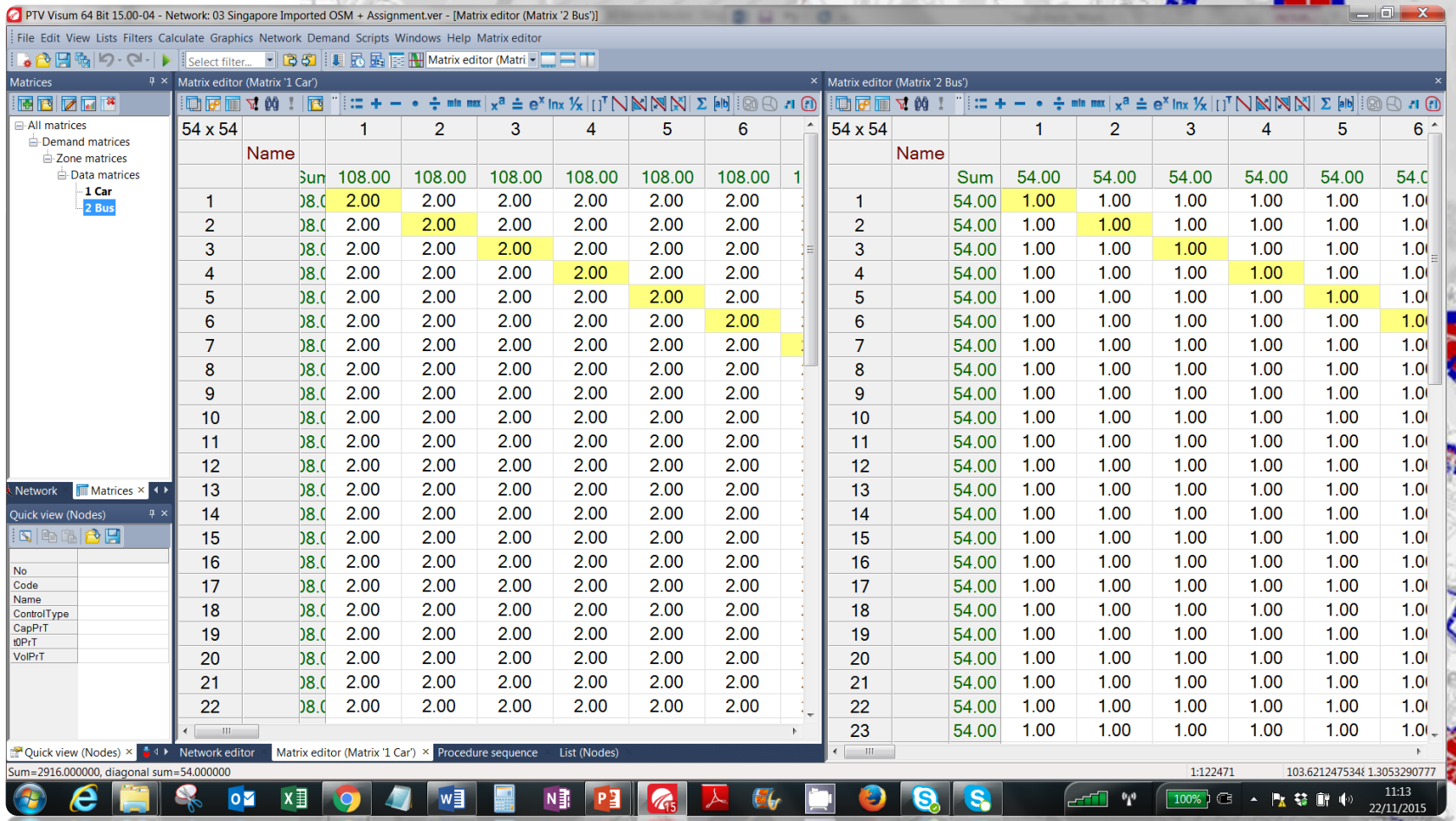
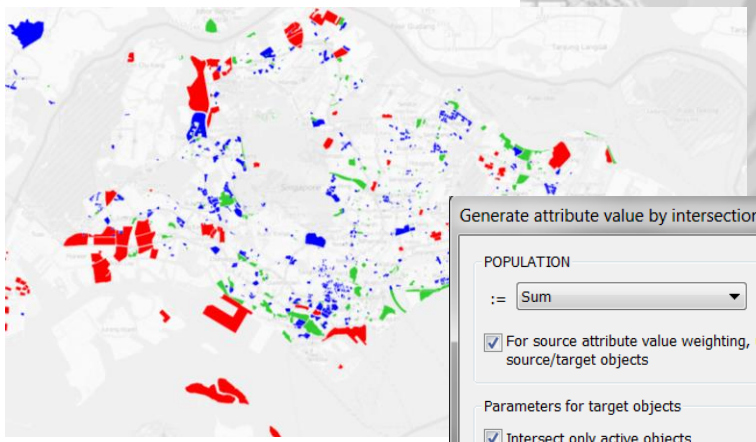
Fusion: Generate connectors

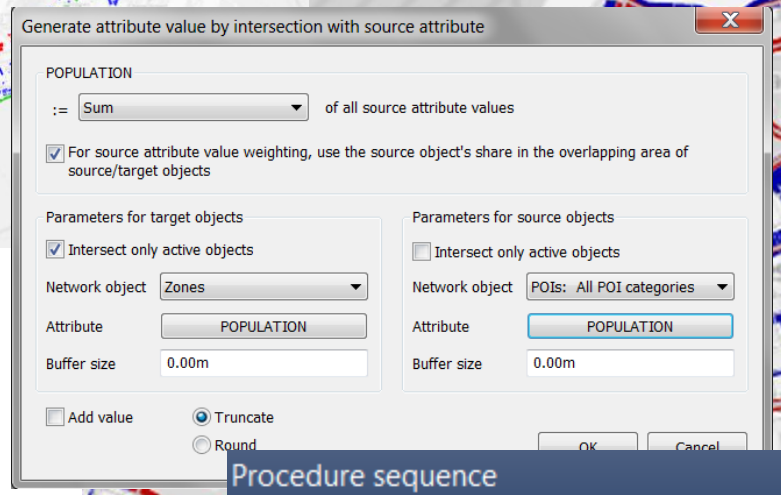


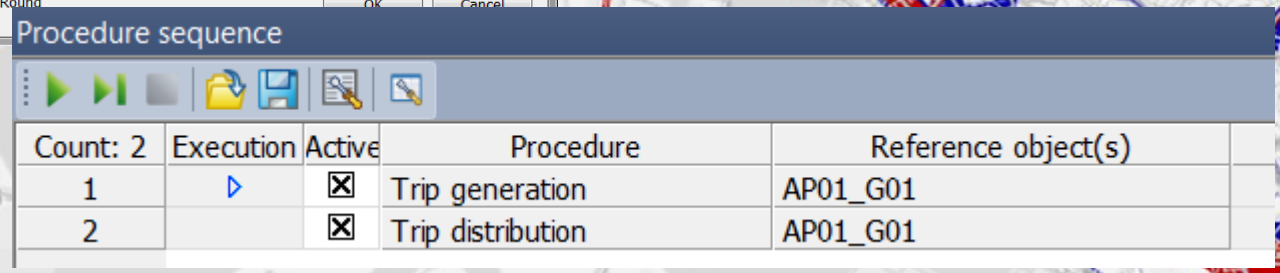
Travel demand (for this demo…)



Travel Demand (alternatively...)







SINGAPORE

Population: 5.1 million
Land area: 712 km²

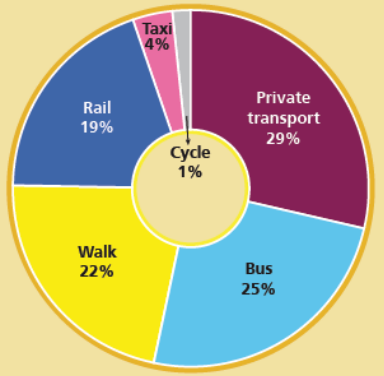
Mode share

Based on the number of journeys by main mode of transport. It includes all modes for all purposes. Mass transit constitutes 44% of all journeys.

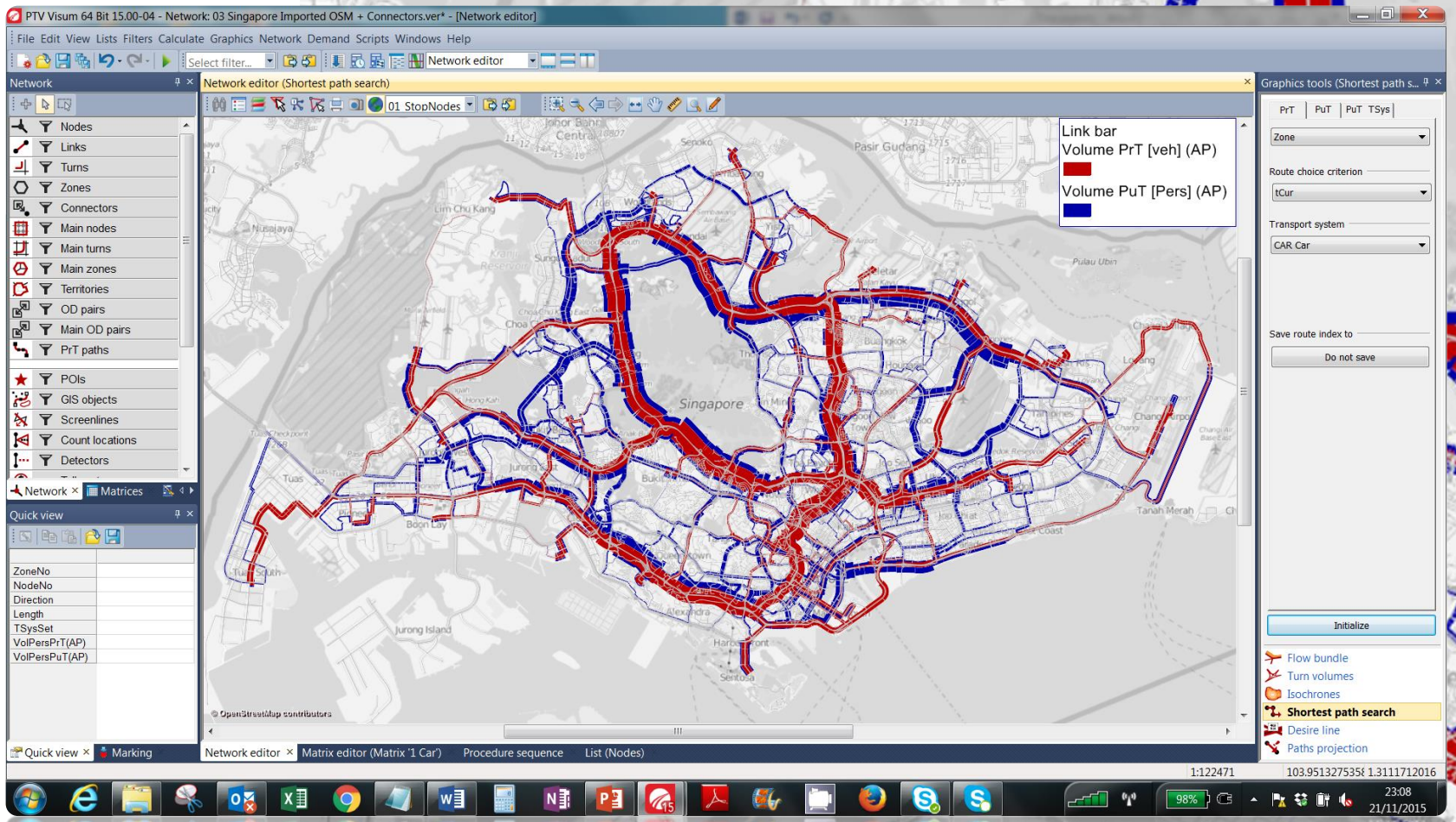
Data Sources:

Singapore in Figures 2011
Travel Survey 2011, Land Transport Authority, Singapore

Figure 23: Mode share in Singapore



Assignment : Private and Public transport



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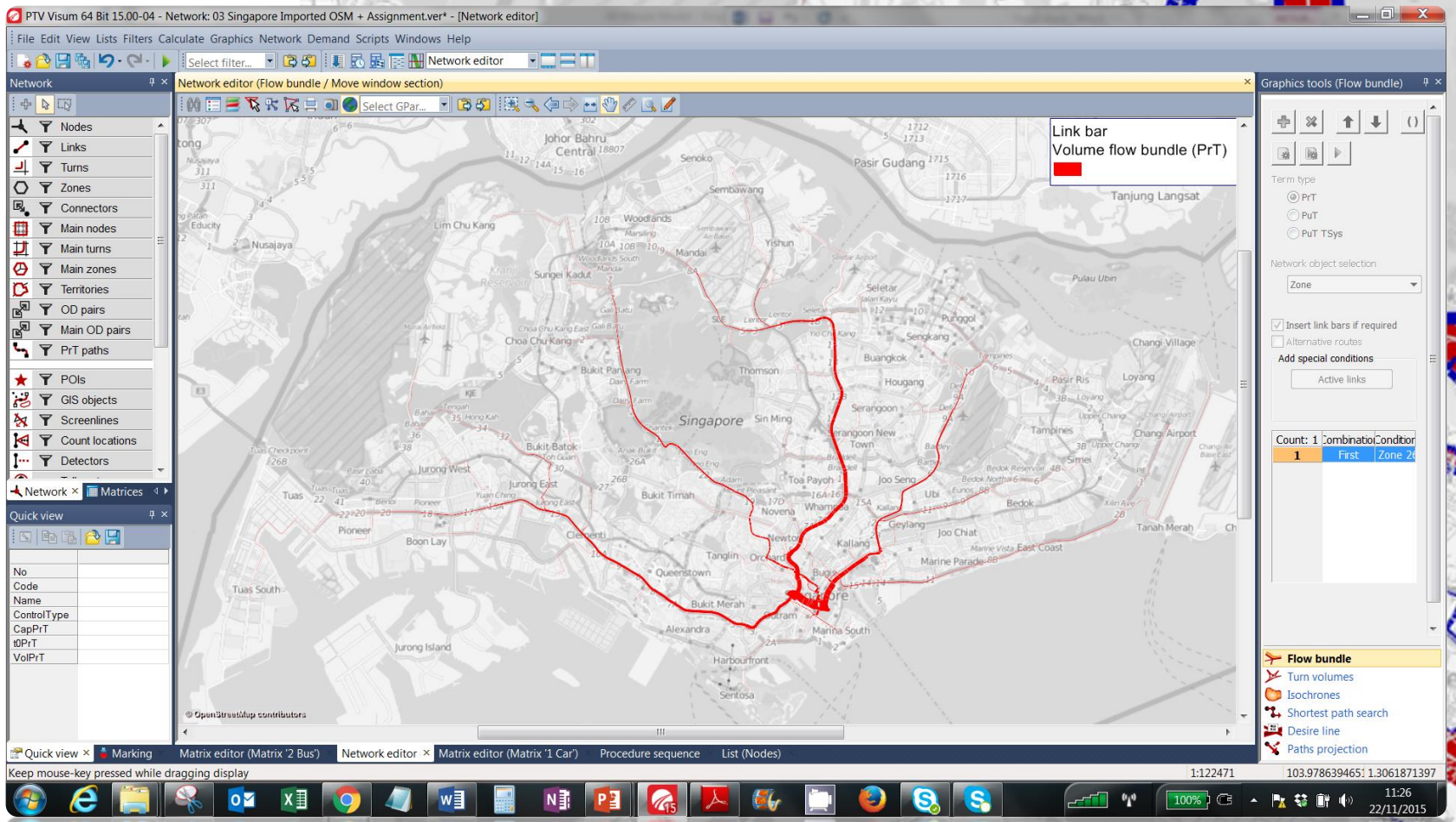
Analysis: Flow bundle (all travel to/from location)



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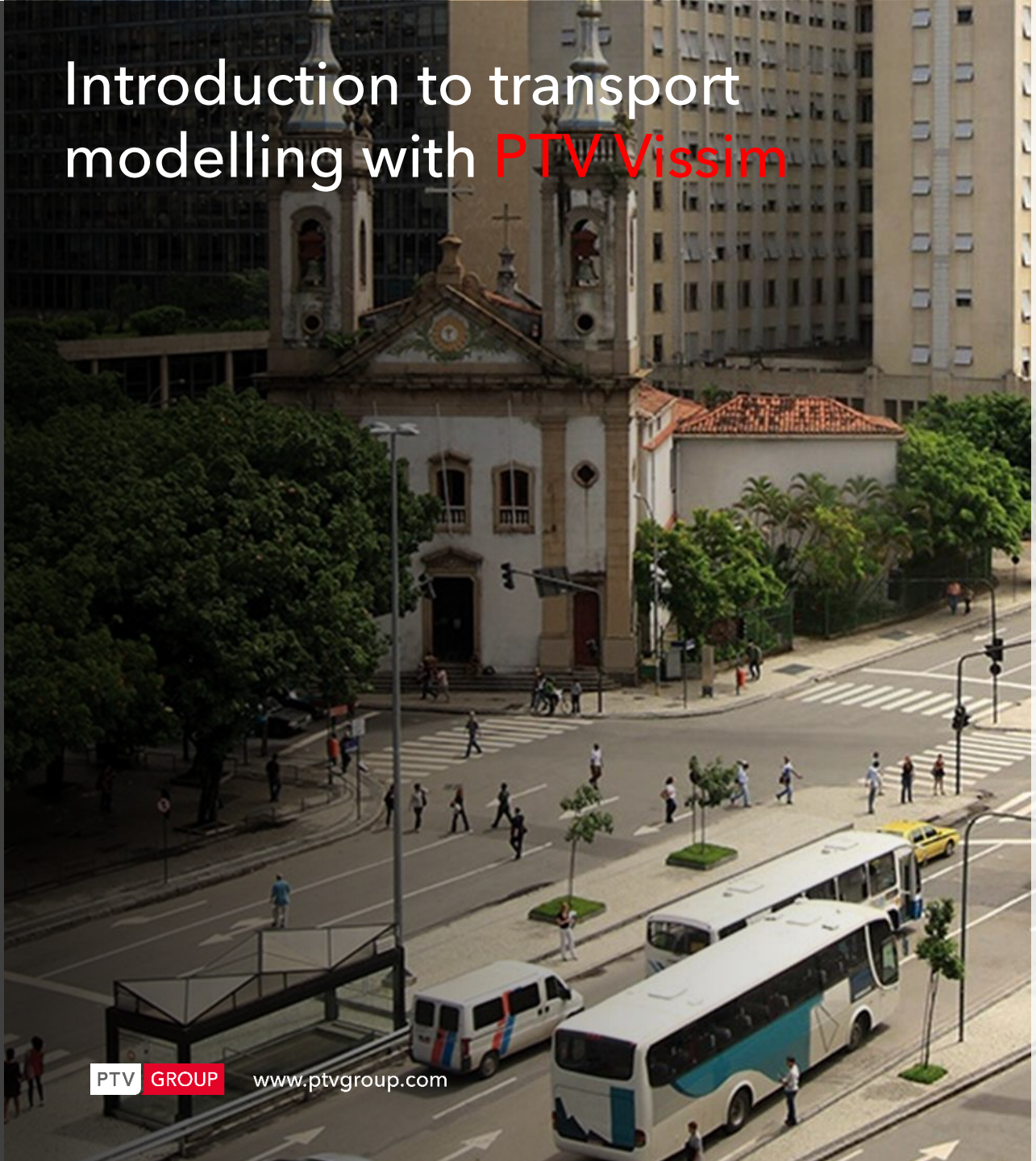
Introduction to transport modelling with PTV Vissim



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PTV VISSIM

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Traffic Simulation

Multimodal traffic simulation

- Simulation of all modes of transport in a single piece of software.
- Modelling of public transport.
- Detailed representation of all network objects.
- Online visualization in 2D and 3D for decision support.
- Simulation of advanced traffic control measures.
- Emissions modelling

Video: Courtesy of Stuart Gibb, Jacobs

Traffic Simulation

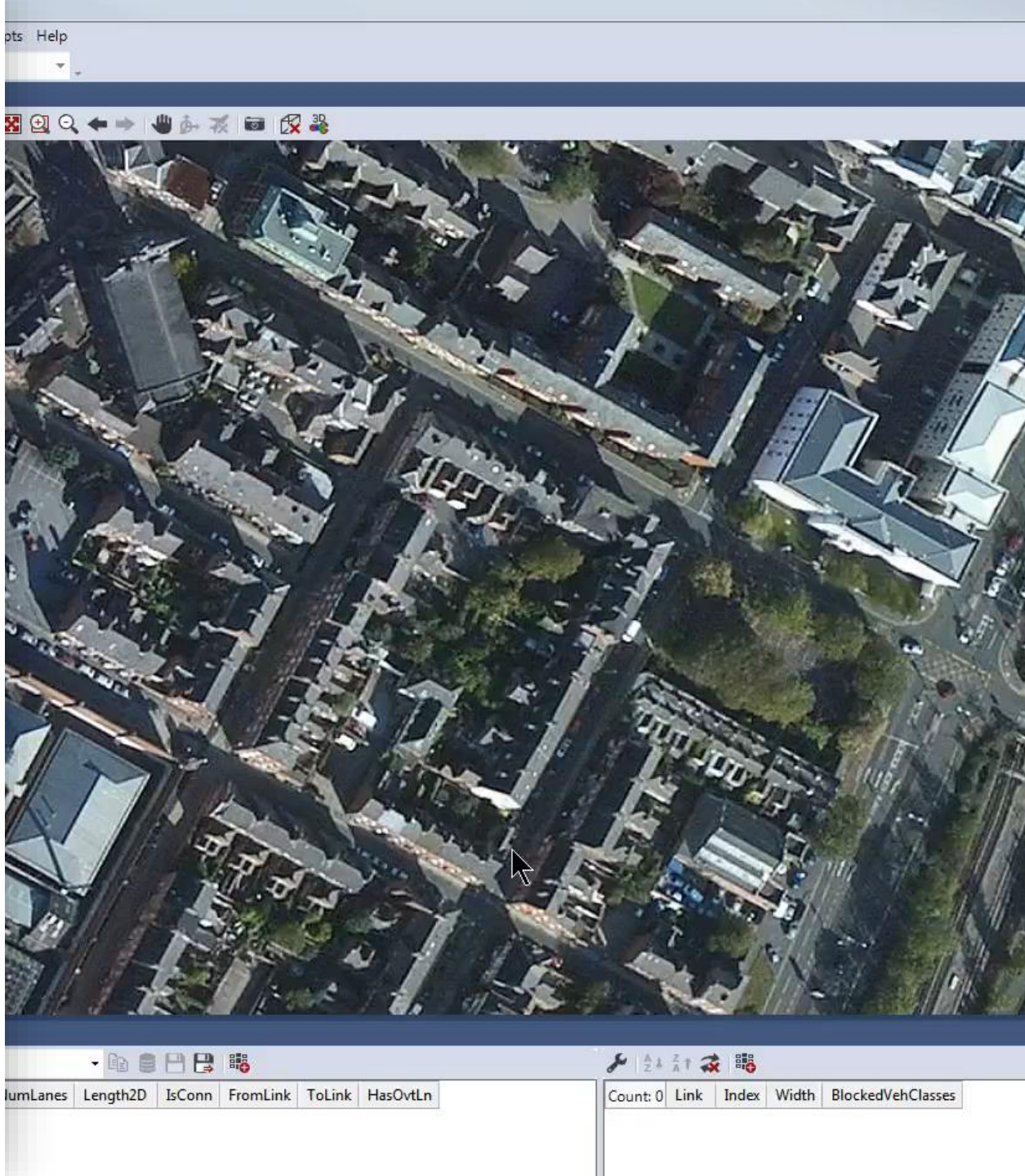
Highway network modelling

- Realistic junction and highway geometry.
- Integrated mesoscopic/ microscopic/ hybrid simulation.
- Scientifically proven car-following model.
- Quantitative evaluation data output:
  - Journey times, queues, delay, speed etc
  - Trajectory data
- Used in wide range of traffic engineering, transport assessment projects.

Traffic Simulation

Easy to use Graphical User Interface

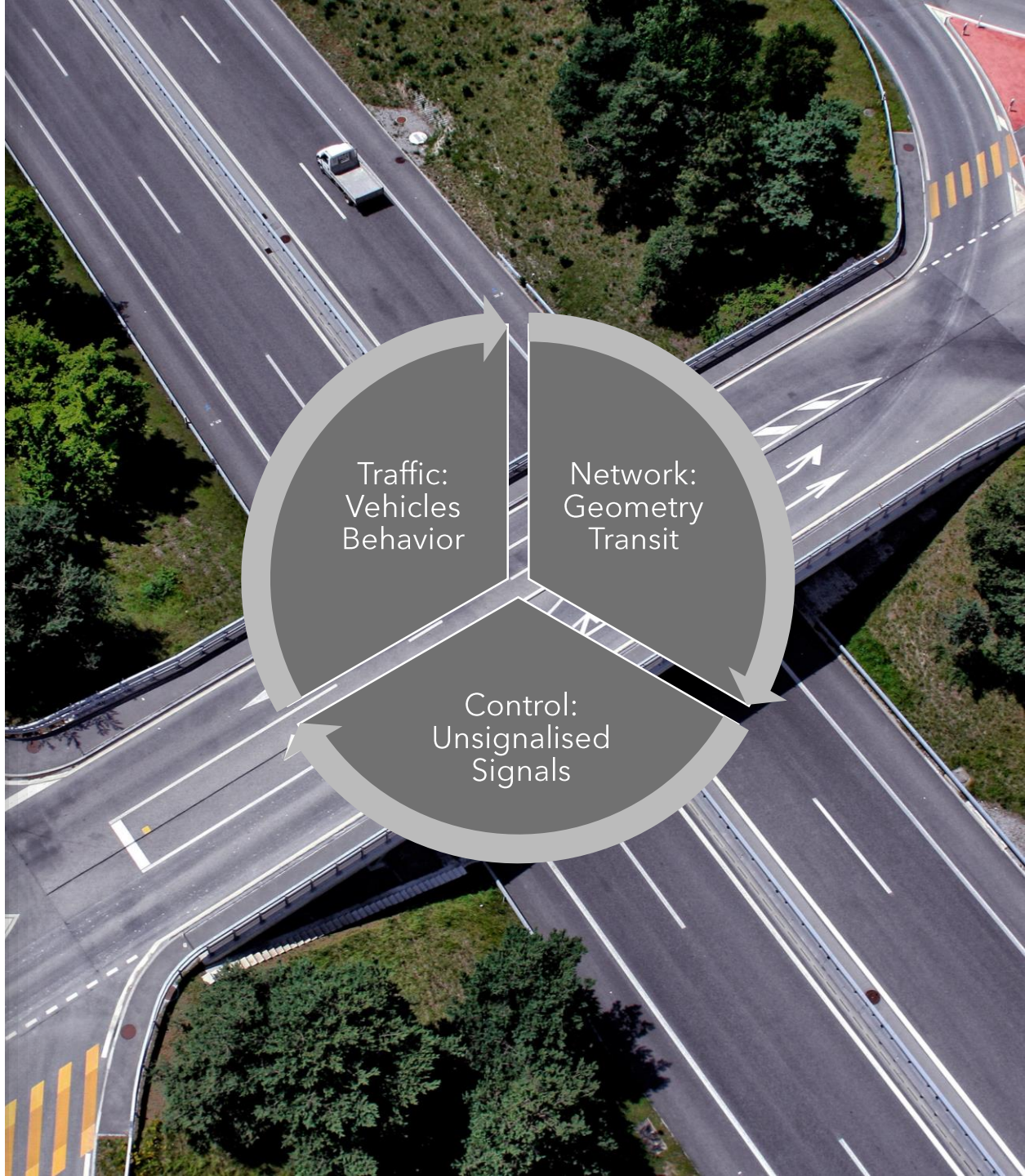
- User friendly interface (including copy/paste).
- Scenario Management.
- Integration with PTV Visum for multi-resolution modelling.
- Modelling of traffic demand, network supply and vehicle behavior.
- Integrated mesoscopic/ microscopic/ hybrid simulation.



Traffic Simulation

Core Building Blocks

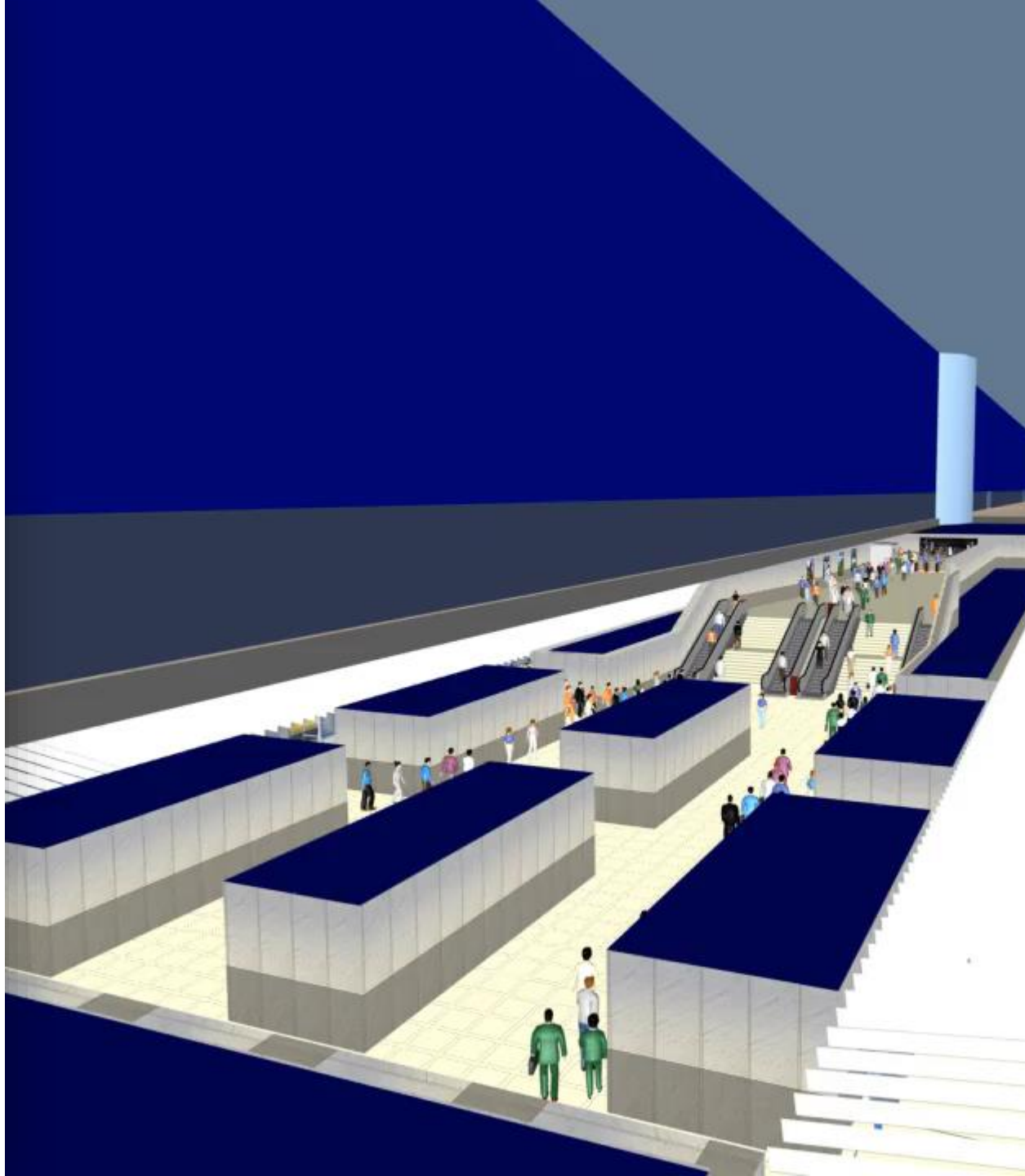
- **Network:** the physical infrastructure for roadway and tracks
- **Traffic:** the vehicular movements on the network
- **Control:** how traffic behaves in case of conflicting movements



Pedestrian Simulation

Simulation of people walking every step

- Simulation of the interaction of pedestrians with
  - Each other
  - In crowds
  - Built environment
  - Public transport
  - Vehicles
- Can be used for:
  - Pedestrian Infrastructure Engineering
  - Crowd Flow Management
  - Transport Infrastructure Design
  - Building and Space Design



Rich Data Outputs

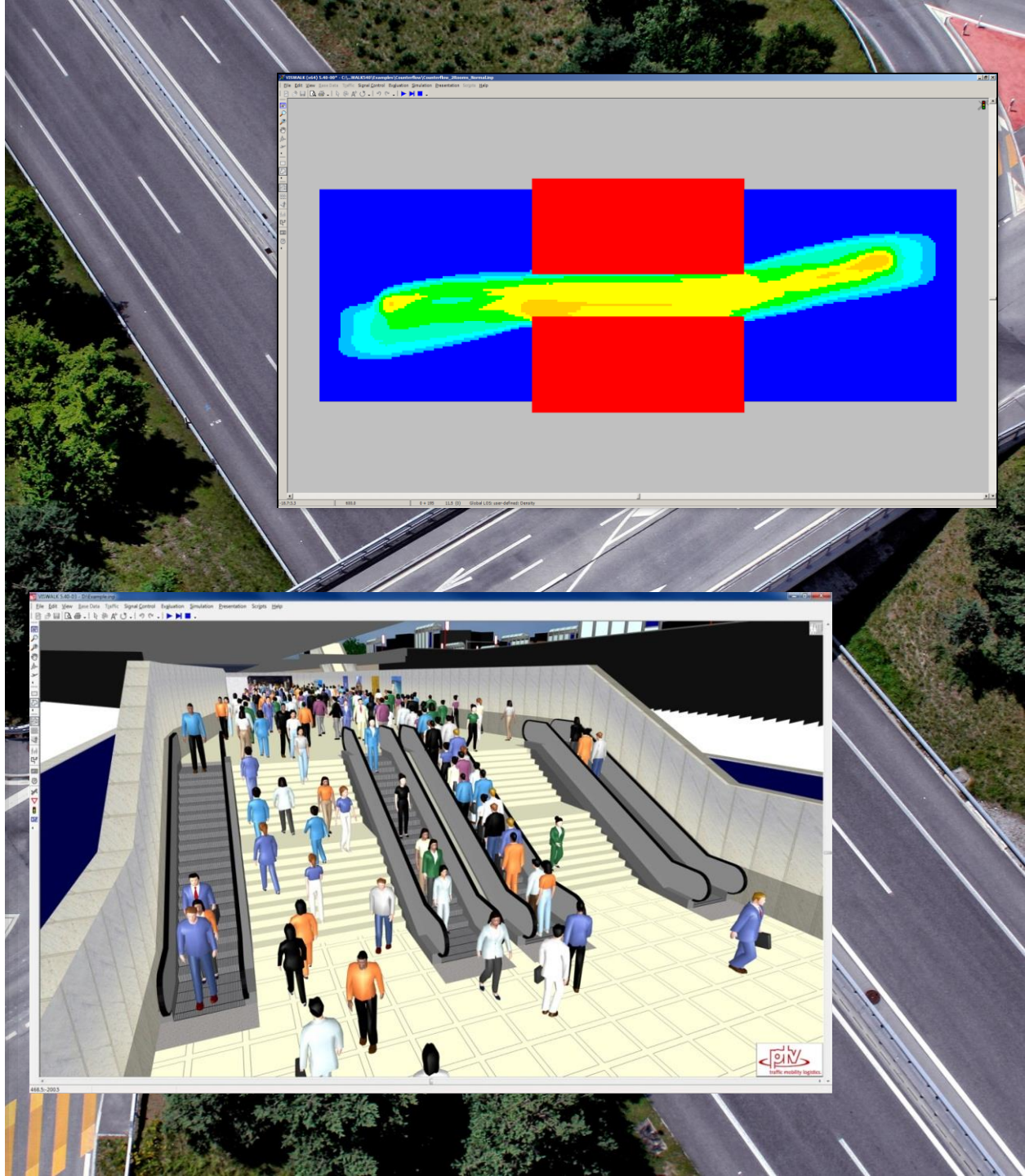
Numerous available parameters

- Journey times, queues, delays, stops
- Detailed trajectory data
- Emissions
- Individual vehicle data
- 2D / 3D-animation

Rich Data Outputs (Pedestirans)

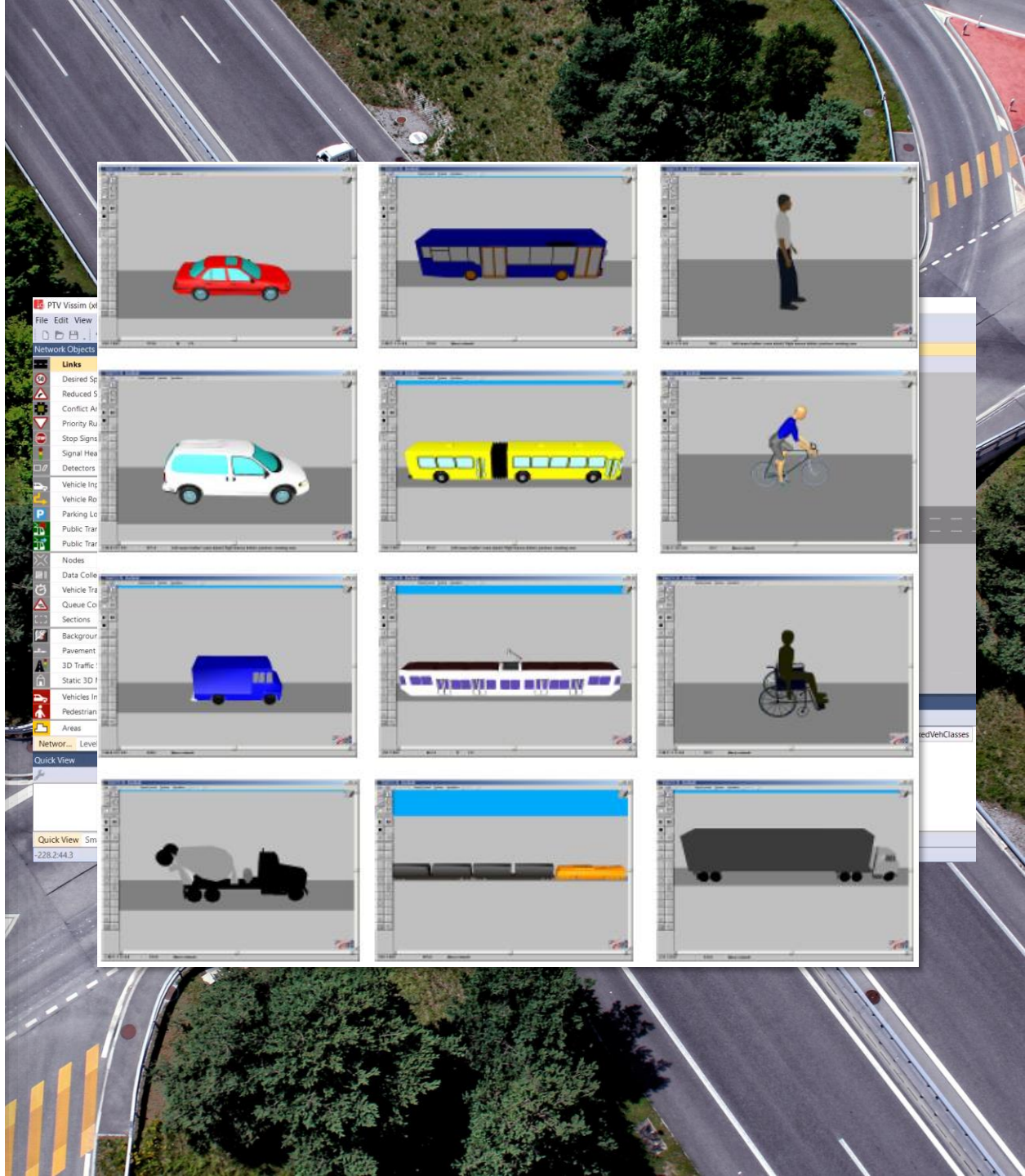
Numerous available parameters

- Density, speed, dwell times, and other properties one can measure for an area
- Record file (in effect detailed trajectory data)
- Level of Service (LOS) in various variants
- Individual on-simulation data
- Queuing / transaction times
- 2D / 3D-animation
- Journey times



PTV Vissim Advantages

- Detailed geometry, driving behavior & traffic control.
- Access to lists and intuitive interface.
- Ease of use and configuration to local conditions.
- Unlimited vehicle types and number.
- Scenario Management & comparison for multiple designs.
- Link to external interfaces for signals, design, visualisations, simulators etc
- Assignment options for traffic input.



Traffic Simulation

Public Realm

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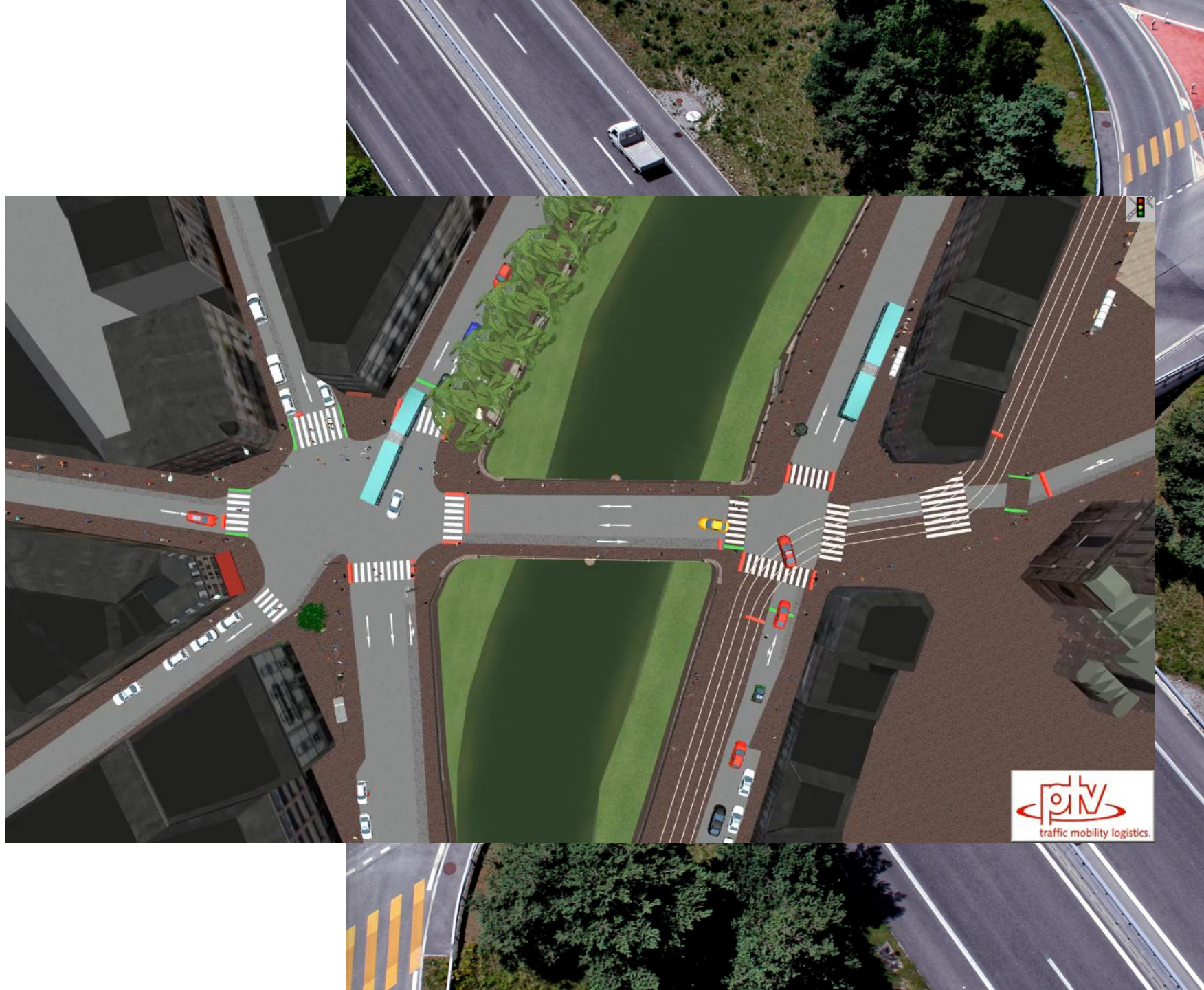
Traffic Simulation

Public Realm

Pedestrian improvements



Traffic Simulation

Public Realm

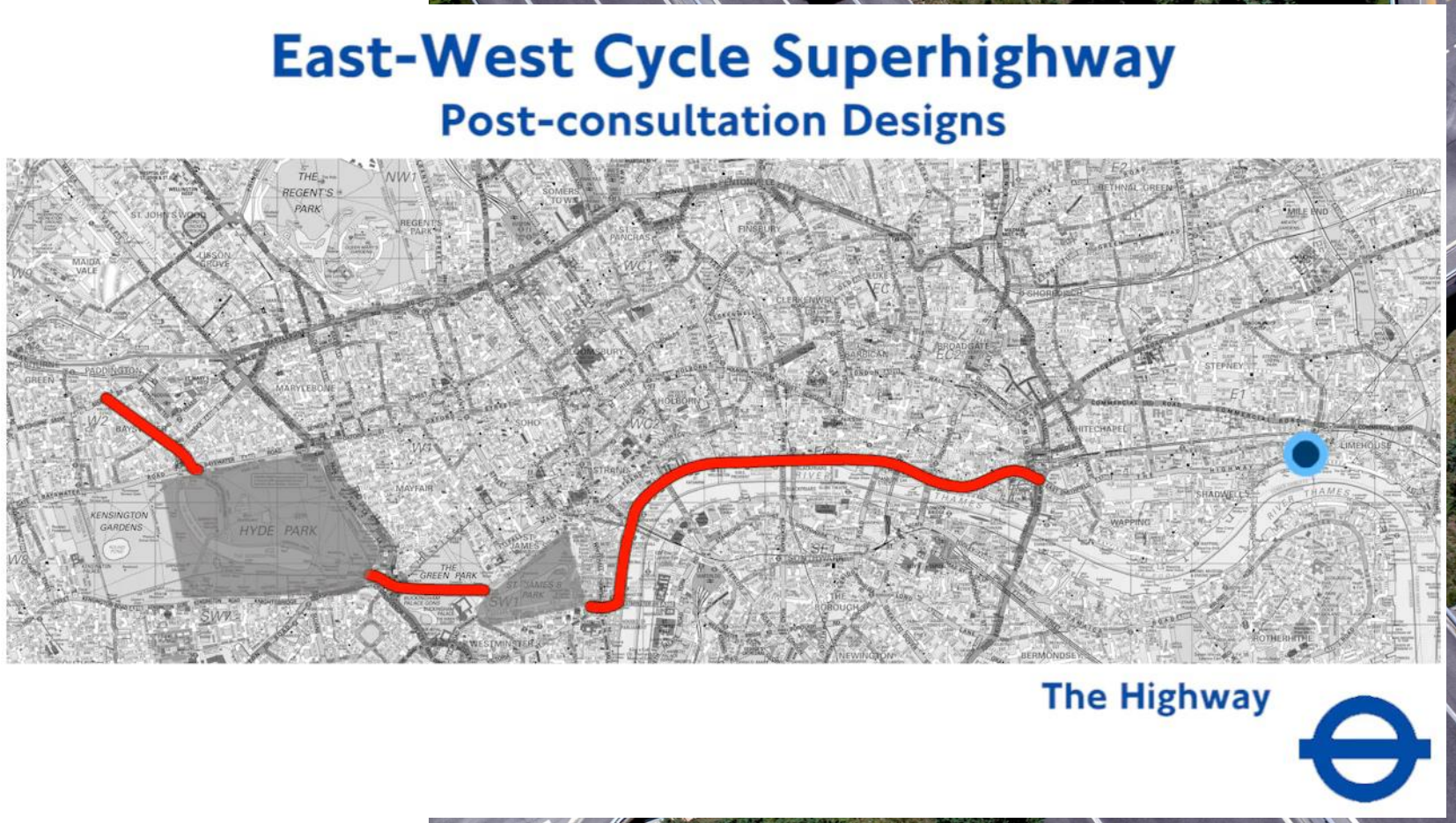
Pedestrian improvements (ii)

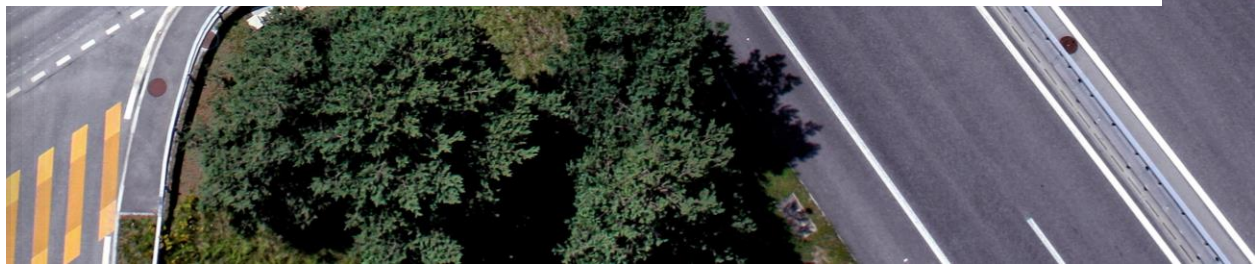
Traffic Simulation

Public Realm

Pedestrian improvements

Cycle Schemes





Simulation of Connected Autonomous Vehicles with PTV Vissim

PTV Vissim is quickly establishing itself as the go to software for simulating CAV's in a wide range of applications and industries.

Can support traffic analysis with top down assumptions and bottom up technology led hardware in the loop applications.

Different levels of detail ranging from adapting driving behaviour to utilising external interfaces.

PTV Group engaged in a number of research and development projects to support software development.

Example files developed to demonstrate functionality in PTV Vissim for CAV modelling.

Development in ride hail & mobility as a service applications.

How to model CAV's with PTV Vissim

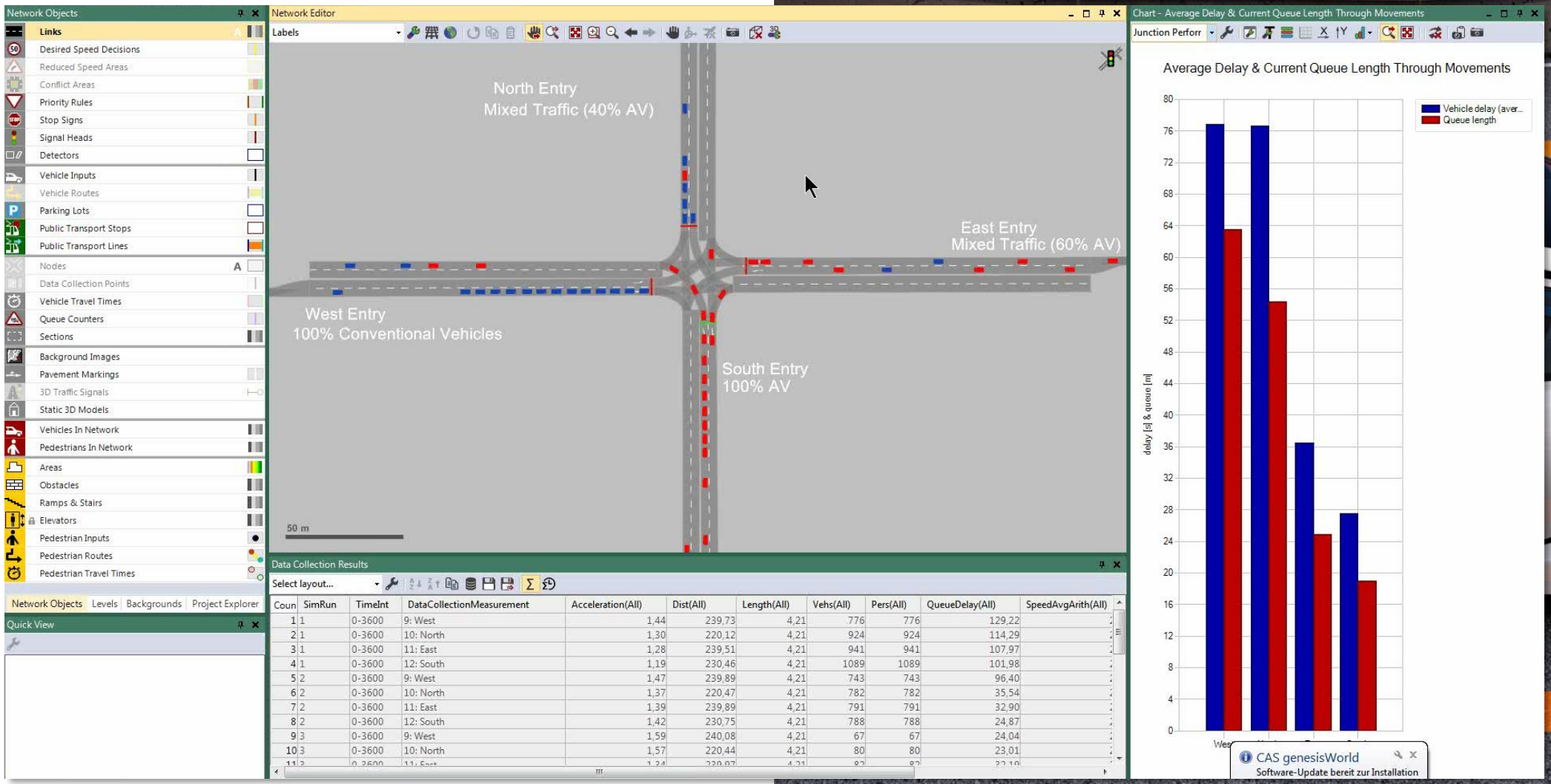
Using INTERNAL capabilities by adapting default parameters:

Driver Behaviour

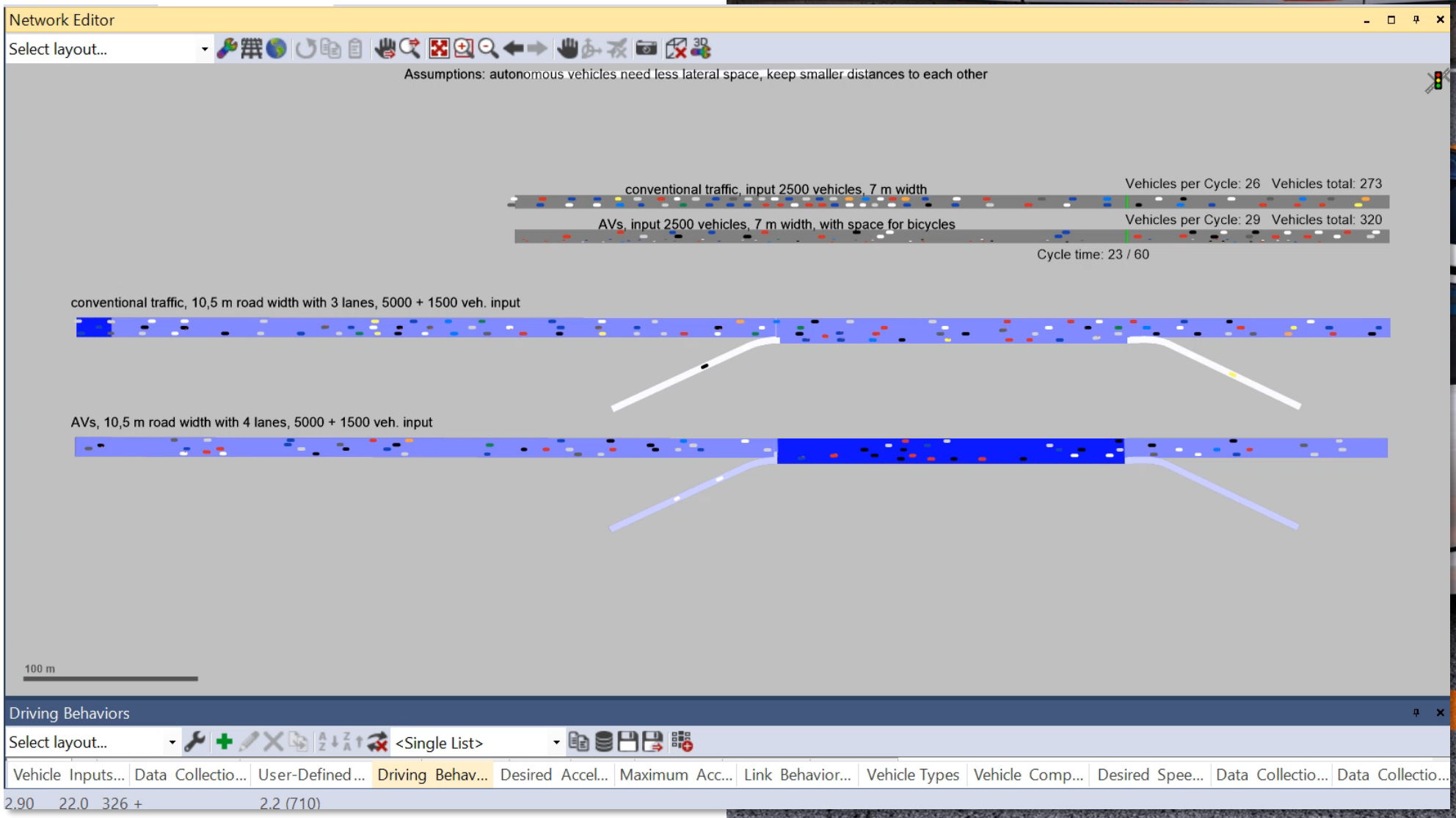
Lane Change Behaviour

Speeds

C2X via COM Interface



Lane and Lateral Behaviour



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How to model CAV's with PTV Vissim

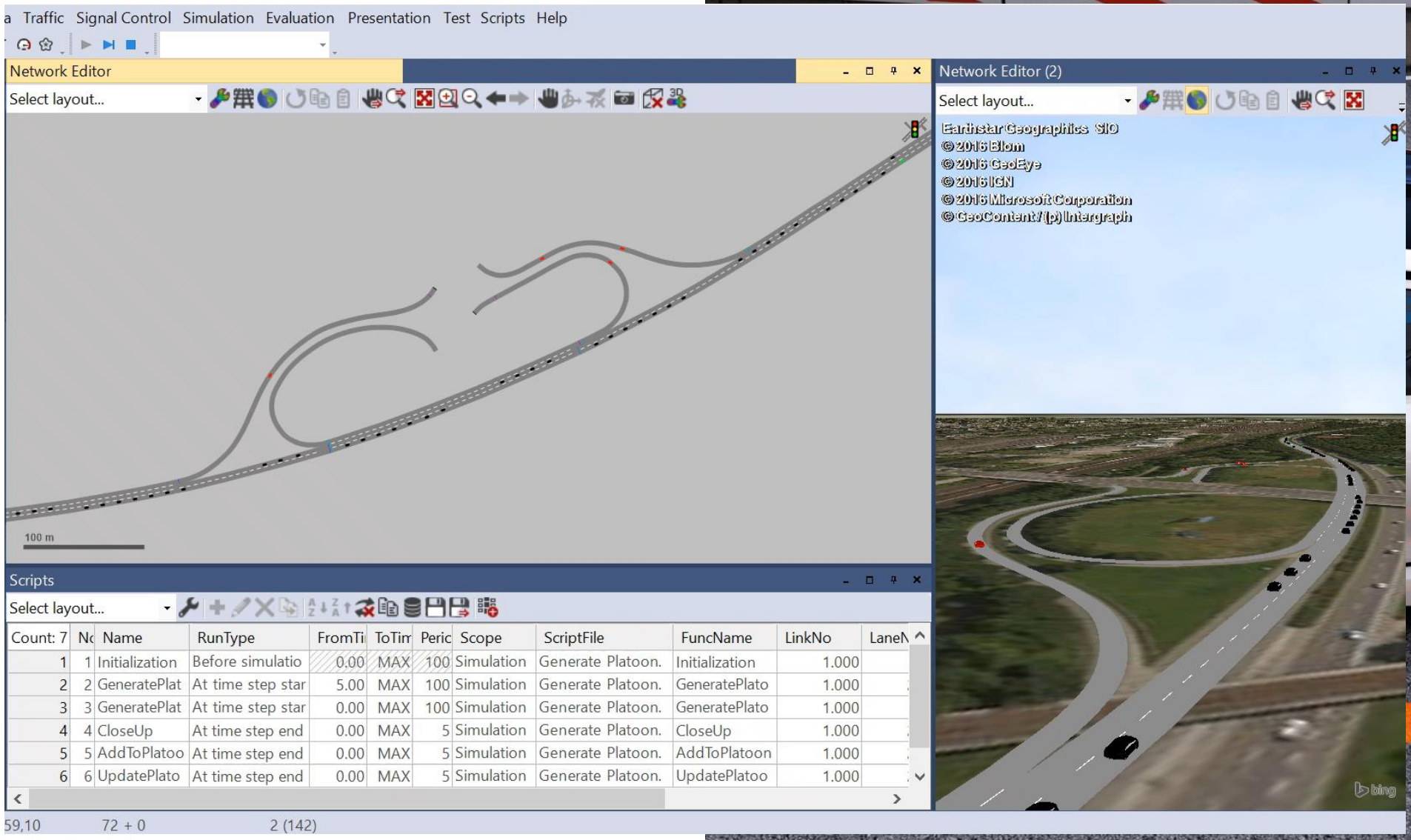
Using EXTERNAL capabilities by PTV Interfaces

COM Interface

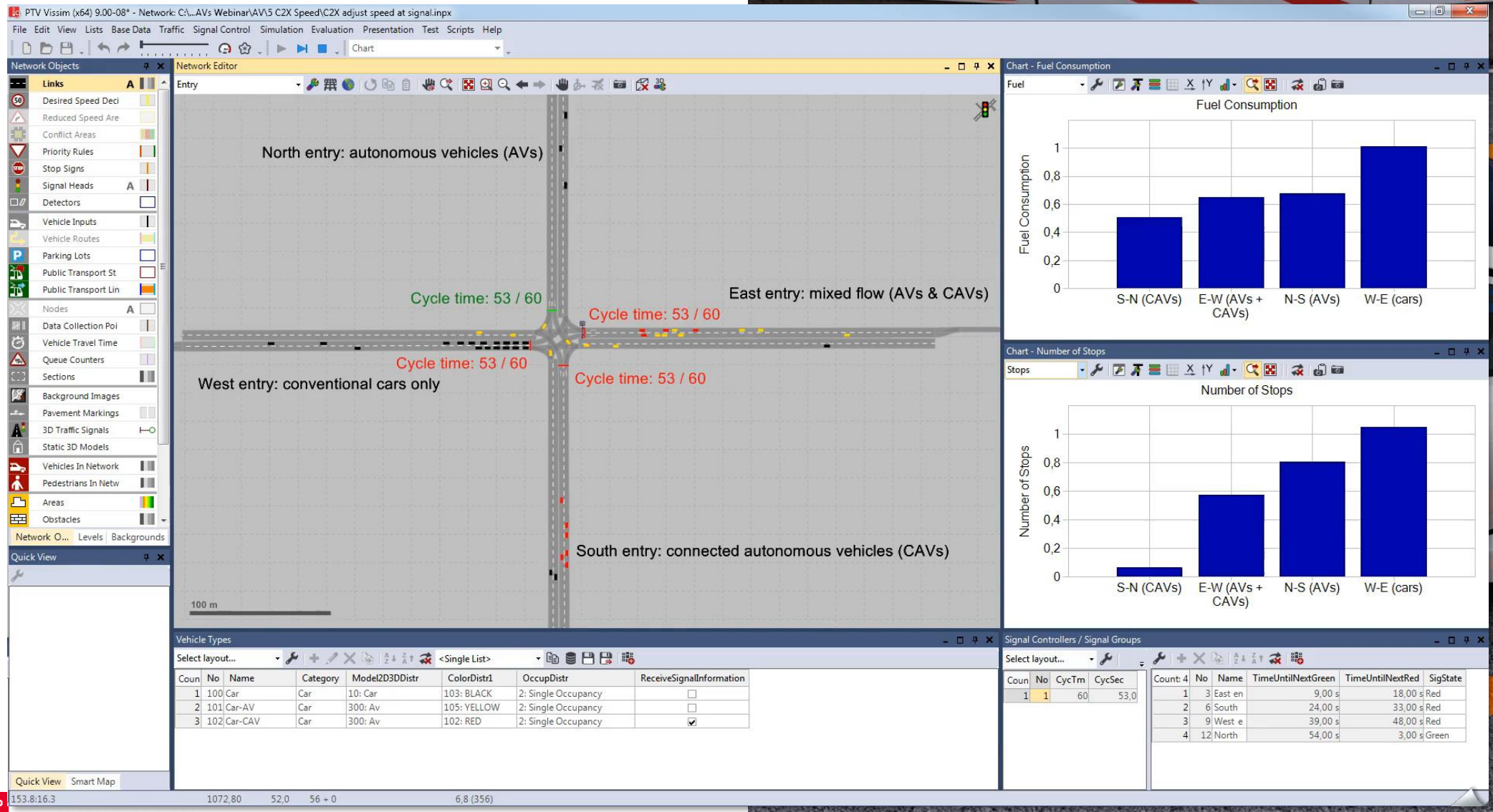
Driver Model DLL

Driving Simulator DLL

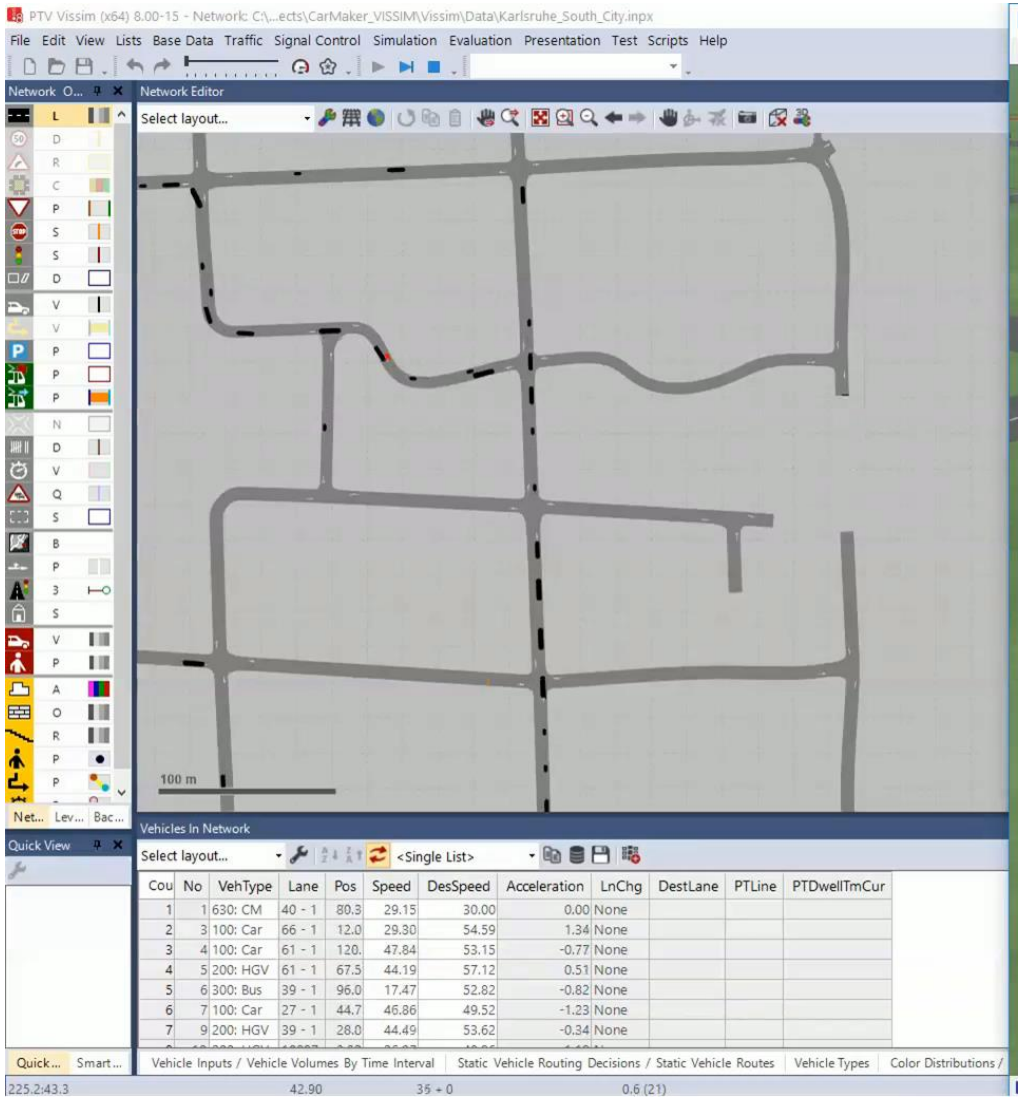
Platooning via the COM Interface



C2X via the COM Interface



Driving Simulator Interface with PTV Vissim



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Driving Simulator Interface with PTV Vissim

Vissim +PreScan

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Driving Simulator Interface with PTV Vissim

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Questions

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