

## The way to networked traffic management systems for lower stress and pollution

### Introduction

Many European countries have dense road networks and significant traffic problems. The flow of traffic on Europe's roads is managed by Traffic Management Systems (TMSs) that are owned and controlled by various local and national authorities. A TMS consists of distributed systems and devices installed along the roadside such as sensors that collect traffic data (e.g. cameras, radar detection systems) and actuators that communicate signs and signals to road users (e.g. VMSs, ramp metering systems, and so on). Current TMS architectures are usually run centrally by regional control centres. A low degree of collaboration hinders efficient management of traffic problems that straddle boundaries between authorities, because TMSs cannot communicate between regions and may have competing goals for traffic flow. While cooperation between various road authorities at a governance level has improved recently, technical barriers for collaborative and distributed TMSs are still to be removed.

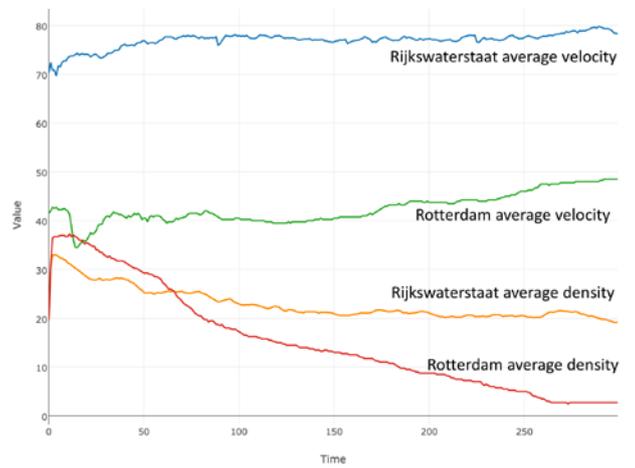
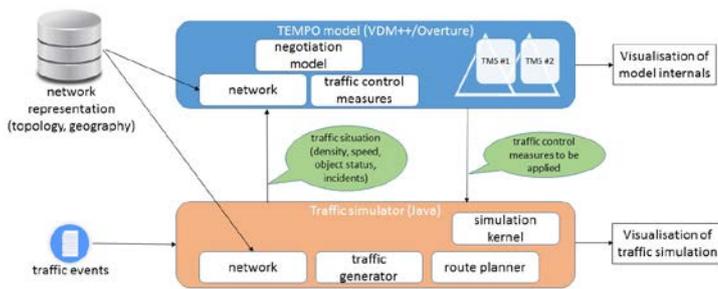


### TEMPO

The TEMPO (TMS Experiment with Mobility in the Physical world using Overture) experiment tackles the problem of disconnected TMSs by providing collaborative and distributed control architectures that engage with each other in a machine-assisted negotiation processes. Negotiations can be targeted to find the best control measures for the network as a whole, but also to achieve the best results for only few of the TMSs involved, based on a cost model.

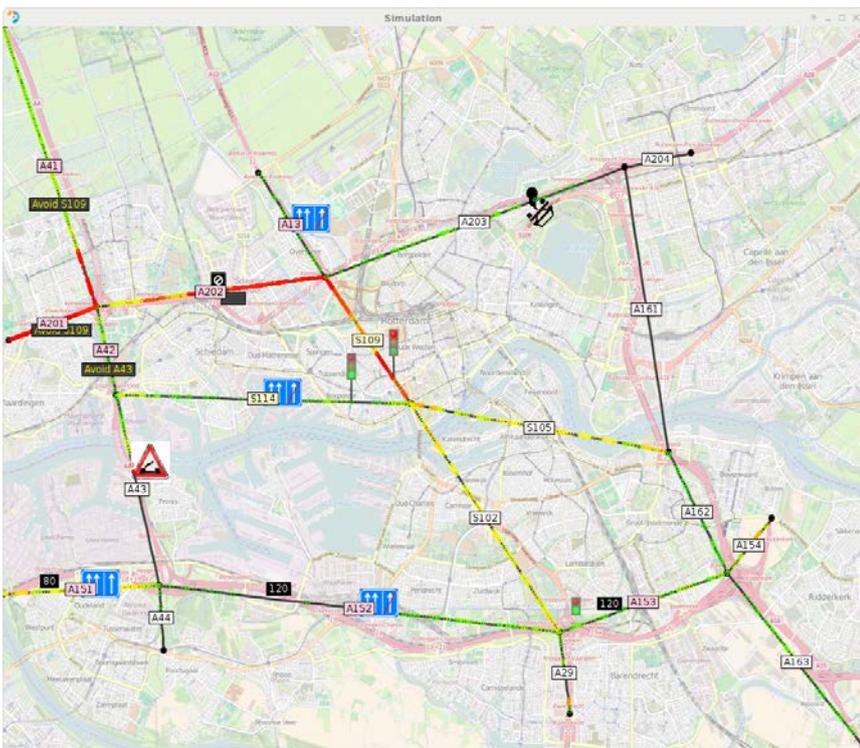
### Overture

TEMPO uses the open source Overture technology ([www.overturetool.org](http://www.overturetool.org)) as a basis. Overture is a software platform for modelling and analysing systems. Models can demonstrate the correctness and benefits of (complex) designs prior to costly implementation, which is why it was chosen to use a model-oriented approach in TEMPO. Traffic simulations produce a large amount of numerical data. It is therefore imperative to present them in an understandable way to non-experts. The existing Overture technology has been extended with 2D/3D visualization to illustrate the negotiations between TMSs and the effect on the traffic flow.



## Demonstrator

We refer to the Overture model that specifies the business logic of machine-assisted negotiations as the “TEMPO engine”. This engine is part of a demonstrator used to illustrate the working of collaborating TMSs in a sample network, plotted on a geographical map. The topology of the network can be specified, and various kinds of traffic control measures, directed by a TMS, can be defined. These measures include hard shoulders, diversions, ramp metering, dynamic speeds, lane closures, and so on. The TEMPO model communicates with a traffic simulator that provides the model with updates on the traffic situation, and calculates the effect of the traffic control measures that the model produces on the traffic flows. An event language is provided that can be used to manipulate traffic flows on given parts of the networks, and simulates accidents occurring and events such as bridge openings.



### How to obtain the TEMPO demonstrator?

The TEMPO demonstrator can be downloaded from [www.tempoproject.eu/downloads](http://www.tempoproject.eu/downloads).

### More information?

See [www.tempoproject.eu](http://www.tempoproject.eu). Contact is Dr. Kenneth Pierce at Newcastle University. He can be reached via email at [kenneth.pierce@newcastle.ac.uk](mailto:kenneth.pierce@newcastle.ac.uk).

TEMPO is an application experiment funded by the CPSE Labs Innovation Action ([www.cpse-labs.eu](http://www.cpse-labs.eu)), part of the Smart Anything Everywhere initiative ([www.smartanythingeverywhere.eu](http://www.smartanythingeverywhere.eu)). This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 644400.