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Dora Lee Borg, Neila Bhourri, Kenneth Scerri

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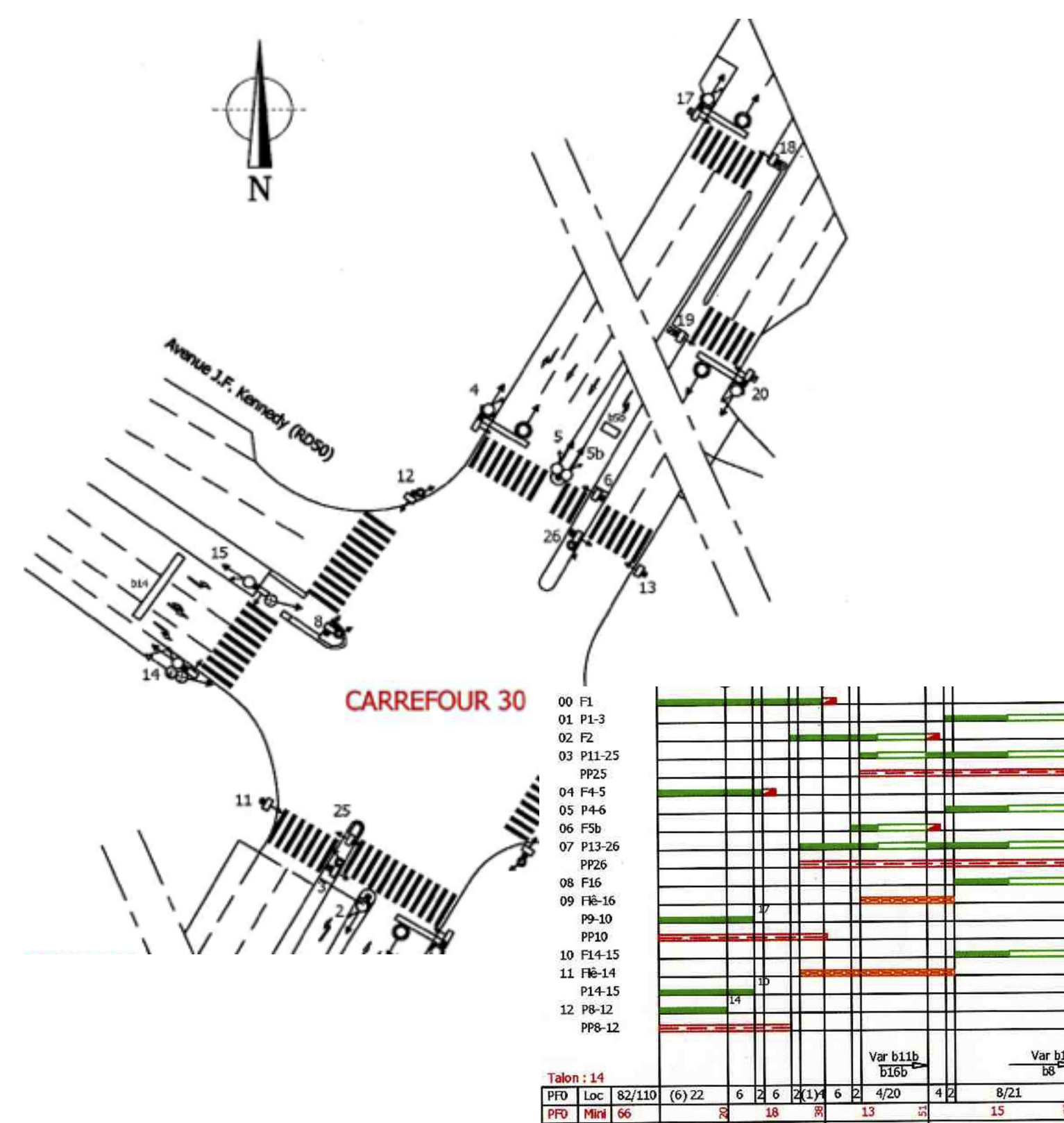


A Cooperative Traffic Control Strategy

Dora L. Borg Dr. Neila Bhourri Dr. Kenneth Scerri

With one-third of the global population living in cities by 2030 and the need for mobility fueling traffic growth all over the world, the traffic congestion problem in major cities is becoming more and more acute. Besides economic losses, traffic congestion has detrimental effects on our standard of living and on the environment. A viable solution to the traffic congestion problem is intelligent traffic control. The main aim of this work is to test a Model Predictive Control Strategy (MPC) on three prime intersections in an important arterial road in Le Bourget area northeast of Paris.

Le Bourget



Why Le Bourget?

Just 10km away from the center of Paris, Le Bourget is an area in the department of Seine Saint Denis. Hosting one of the biggest air shows, a multitude of exhibitions such as the Conference Framework on Climate Change (COP21) and with an airport close by, traffic congestion is a major problem in Le Bourget.

Data Sources

This work will focus on three important intersections in 'Avenue de la Division Leclerc'. Data from loop detectors around the area will be used to simulate the traffic demand on the network and therefore re-create a realistic simulation of the current traffic situation.

Approach

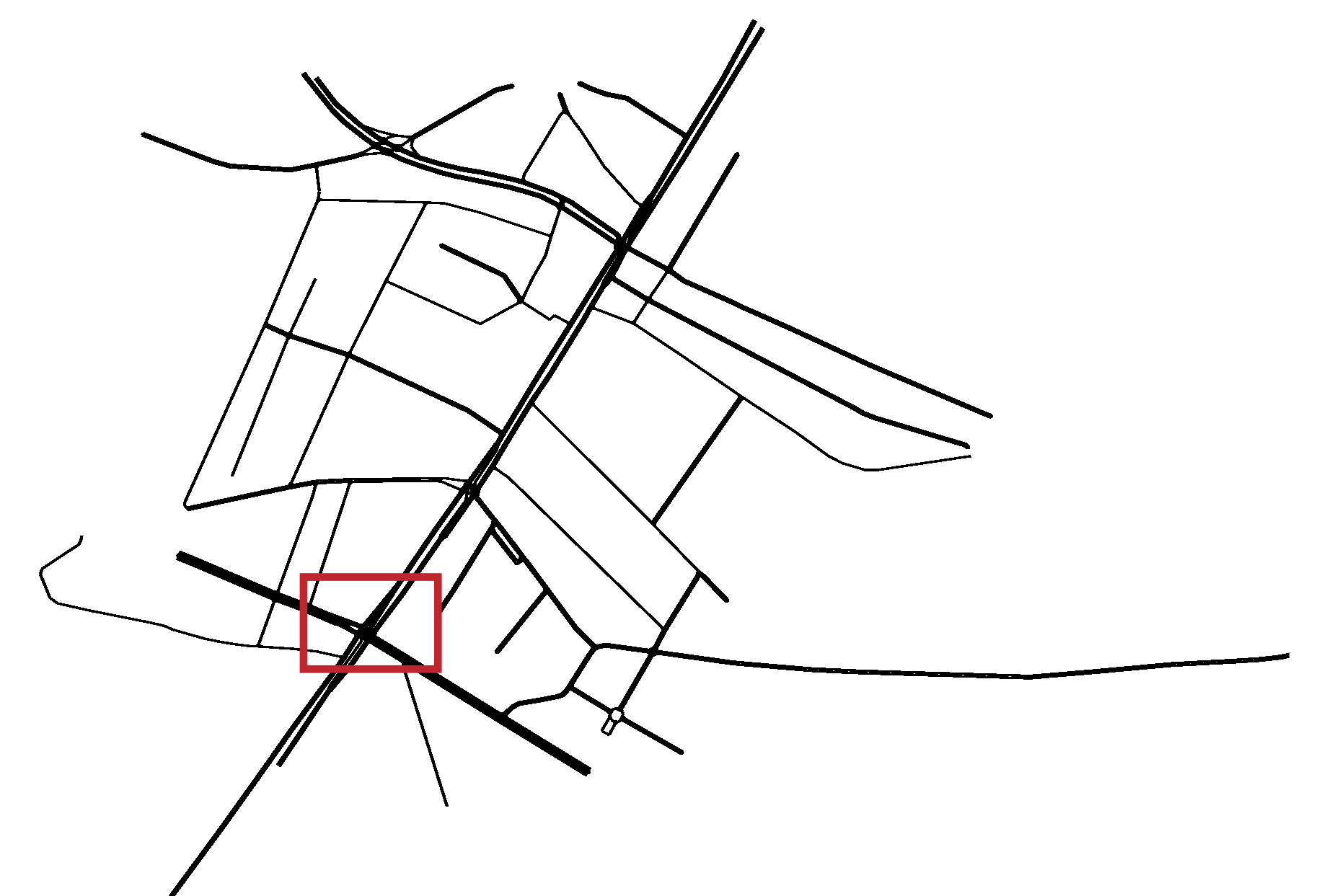
The simulation is carried out in Sumo Traffic Simulator.

The area of Le Bourget is imported in Sumo using 'openstreetmap'.

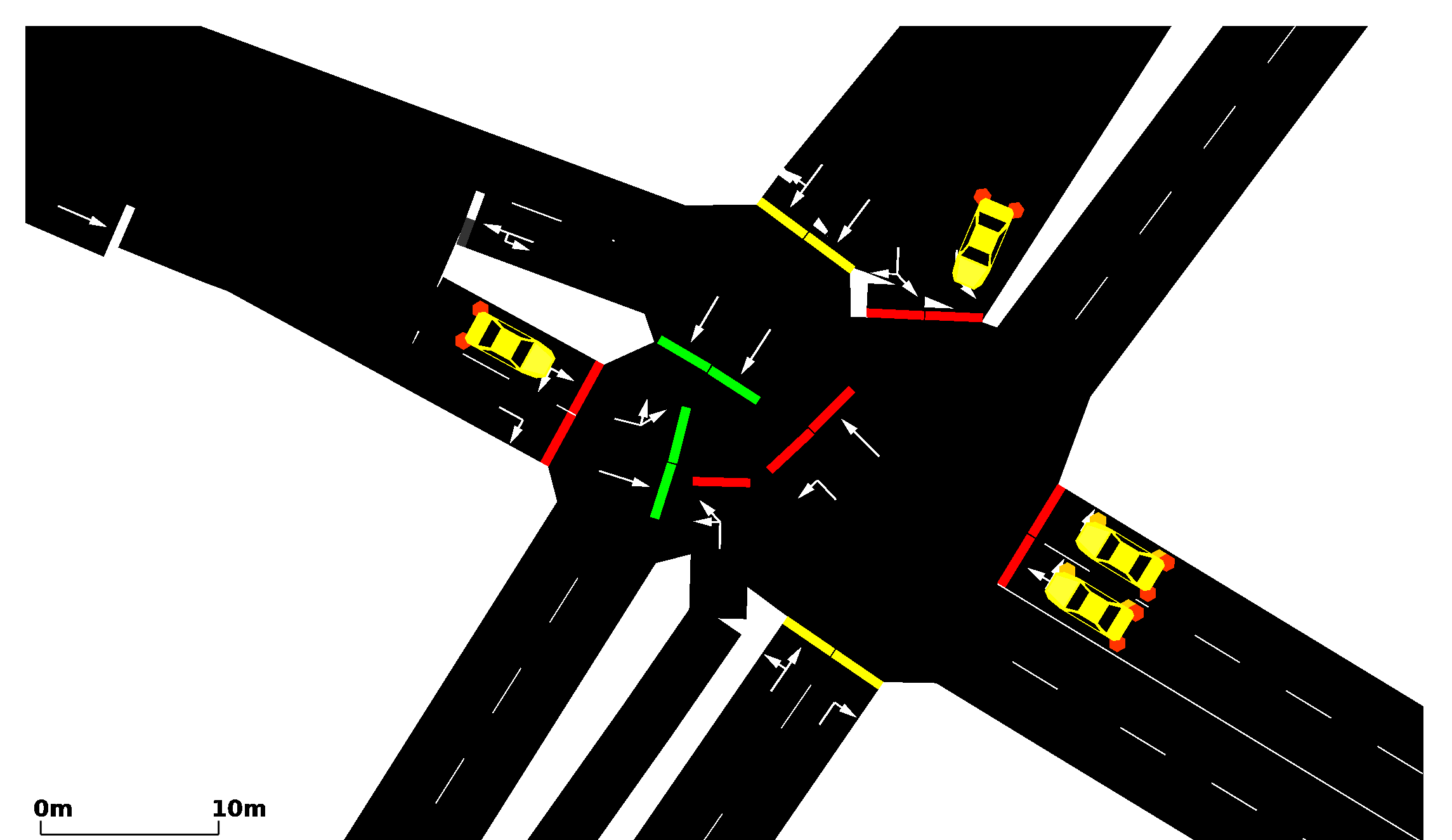
Empirical data collected from loop detectors will be used to model the traffic demand.

The control strategy will be interfaced with the simulation using 'TraCi' to control in real time the traffic light timings.

Results will be compared with the current timing plans to analyse the improvements when using the proposed control strategy.



0m 100m



0m 10m

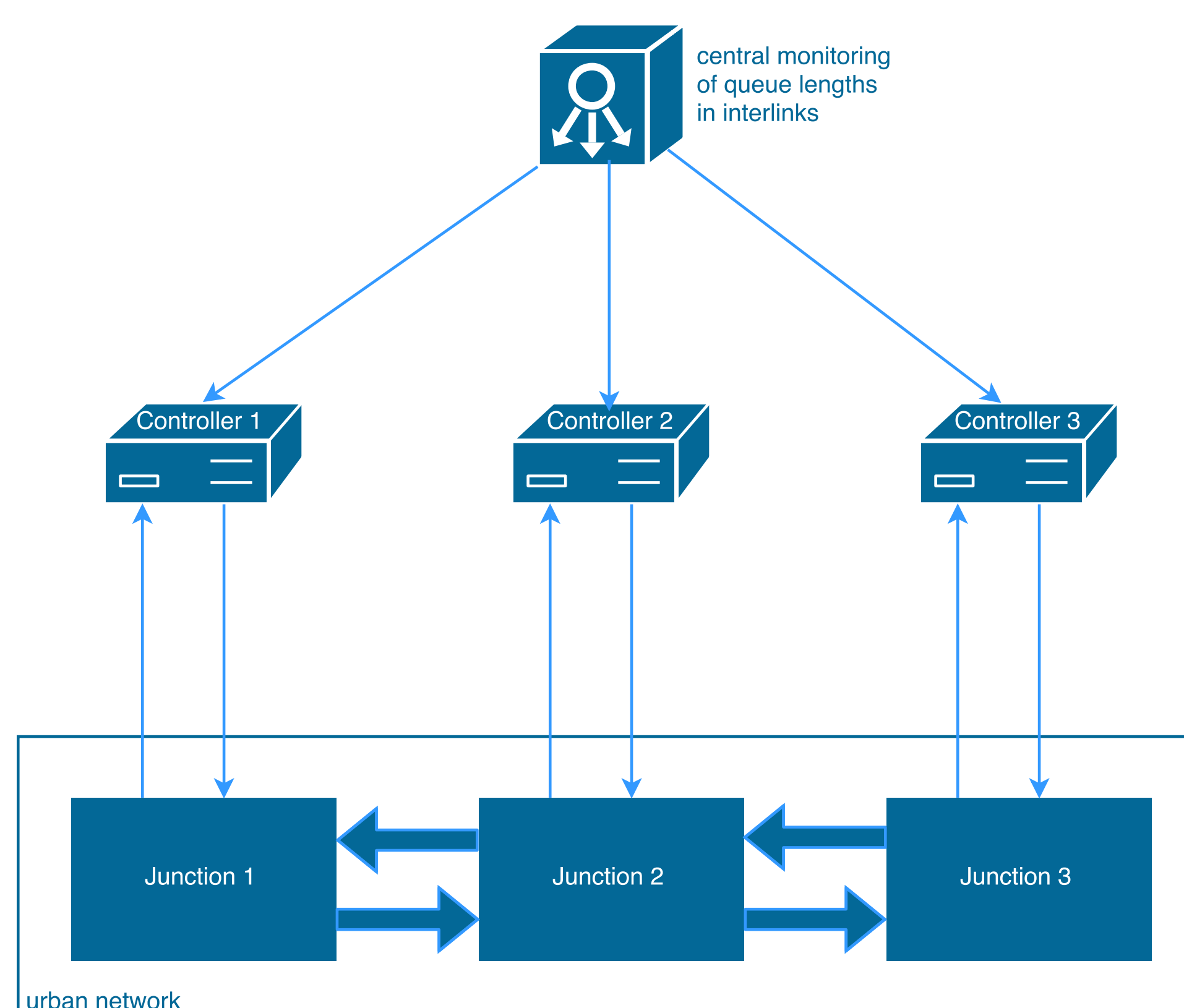
Analysis of the results obtained will highlight possible ways how the control strategy can be improved in the future.

The MPC Control Strategy

A hierarchical MPC control strategy [1] will be implemented.

The control scheme is based on a state space model describing the traffic dynamics through multiple urban junctions [1].

An MPC controller [2] will be used to control each junction locally while a central controller will be used to monitor the queues on the interlinks and tune the controller parameters.



[1] Borg, D. L., Scerri, K. Efficient Traffic Modelling and Dynamic Control of an Urban Region. Proceedings of the 4th International Symposium of Transport Simulation, Ajaccio, 2014.

[2] Borg, D. L., Scerri, K. 2014. Constrained Dynamic Control of Traffic Junctions. Procedia Computer Science, 32, 293-300.