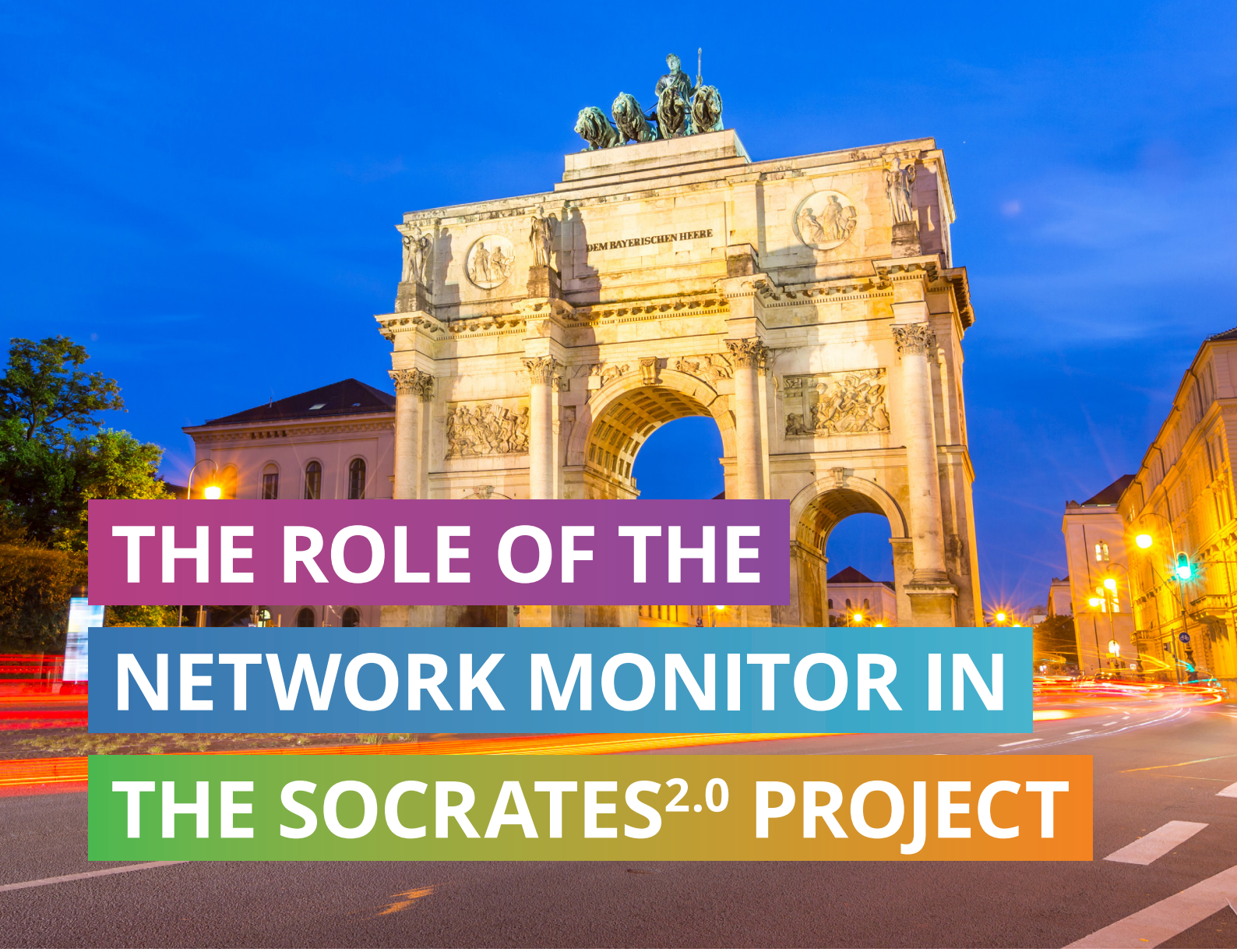


THE ROLE OF THE NETWORK MONITOR IN THE SOCRATES$^{2.0}$ PROJECT

SOCRATES$^{2.0}$

In the European project SOCRATES$^{2.0}$, a consortium consisting of eleven public and private organisations has been challenged to try different ways of working together to realise smart traffic and navigation services. The partners have selected and developed multiple services in the regions of Amsterdam, Copenhagen, Munich and Antwerp.

SOCRATES$^{2.0}$ partners believe that new and better traffic information and navigation services for road users can be realised by more cooperation and sharing of information. To facilitate this, the SOCRATES$^{2.0}$ partners created a Cooperation Framework consisting of a set of cooperation models and enabling "Intermediary roles" to support these cooperation models.

SOCRATES$^{2.0}$
FAST SAFE GREEN

INTERMEDIARY ROLE: NETWORK MONITOR

When partners decide to cooperate by exchanging their data and based on that create a shared view, a Network Monitor function needs to be implemented. The Network Monitor is especially useful if multiple data providers are available and the need for a qualitative high level of common view is appreciated. To this end, a trusted Network Monitor collects data from road authorities and private data providers and determines the common current (and if possible predicted) state for a pre-defined use case related network and indicators. In this process the Network Monitor can perform data handling services such as quality assessment, data completion and fusion of different public and private sources according to use case and business requirements. The Network Monitor distributes the network common state to other intermediary roles and other agreed parties. Partners then can base their own services on a higher quality based shared view.

Various use cases have been tested in SOCRATES$^{2.0}$. Different versions of the NETWORK MONITOR role have been deployed in these use cases. In principle, the tasks remain the same, but the specific interpretation depends on the purpose of the use case.

TASKS NETWORK MONITOR

- Data collection
  Multiple input sources are used by the Network Monitors in SOCRATES$^{2.0}$. The Network Monitor for Optimizing Network Traffic Flow in Amsterdam and Antwerp obtained information from various sources about speeds, volumes, incidents and road closures. The Network Monitor for Smart Destination retrieved information about the parking facilities and the Network Monitor for Road Works used information from road authorities and service providers about current road works.

  Less regular data sources have also been used or even developed in SOCRATES$^{2.0}$. In Copenhagen, the Network Monitor used data sources about the number of cyclists and air quality, and in Amsterdam information about the status of environmental zones was collected and a data feed was developed with traffic management measures activated by the TMCs.

TRAFFIC FLOW AND QUALITY OF ENVIRONMENT IN COPENHAGEN

Based on the policy goals to turn Copenhagen into a Carbon Neutral City by 2025, the pilot in Copenhagen focused on a multi-modal interactive traffic management approach. The goal was to incorporate multiple modalities (cars & cyclists) and optimise the traffic flow based on the policy goals of the City of Copenhagen, including air quality.

The Network Monitor

The Network Monitor obtained the data from various sources that were needed to create a picture of the situation on the road and the quality of the air. In addition to TomTom's FCD for car traffic speeds, data was also obtained from ViSense sensors which count cyclists. For this, sensors were used that were located at intersections of important bicycle routes and major roads. Current data for air quality was collected from Aarhus University, which uses a number of air quality sensors for this. The Network Monitor collected all relevant data and forwarded it to the Network Manager who used it to activate traffic management services.

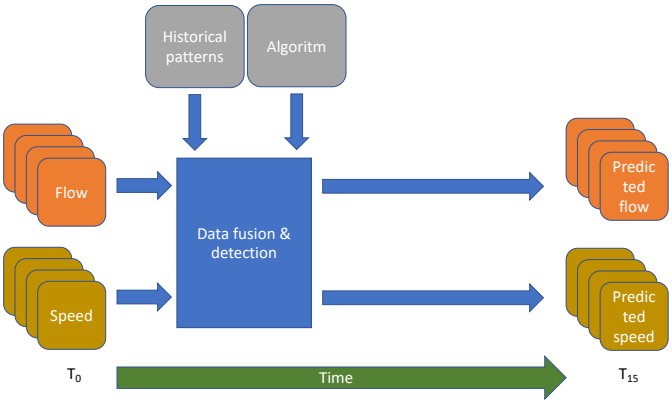
- Data processing
  In this task the Network Monitor performs data handling services such as quality assessment, data completion and fusion of different public and private sources.
  In most use cases of SOCRATES$^{2.0}$, it is first determined for which roads or for which road network the service will be performed. The challenge for the network monitor is to ensure that the information from the different sources is linked to the correct road segments. During the use cases of SOCRATES$^{2.0}$, it turned out that a ample time was spent on determining the network and the map matching of the data. If done correctly, a common current (and if possible predicted) state is determined.

PREDICTED STATE IN AMSTERDAM

In Amsterdam, a use case has been set up to improve the flow of the road network. It was examined whether a prediction of the traffic situation can help in taking measures more proactively. The prediction provided the expected traffic situation (speeds and flow) with a horizon of 15 minutes.

Three types of prediction have been used:
- Traffic model based
- Based on historical data
- Combination of traffic model and machine learning

Unfortunately, the Covid-19 situation meant that there was no usual traffic image. And that turned out to be a problem for the predictions. Predictions work best with capacity related congestion, but during this period there were only traffic jams due to incidents. With incidents there is a delay in detection of the changes in flow and speed and therefore the predicted situation is lagging to the real situation.



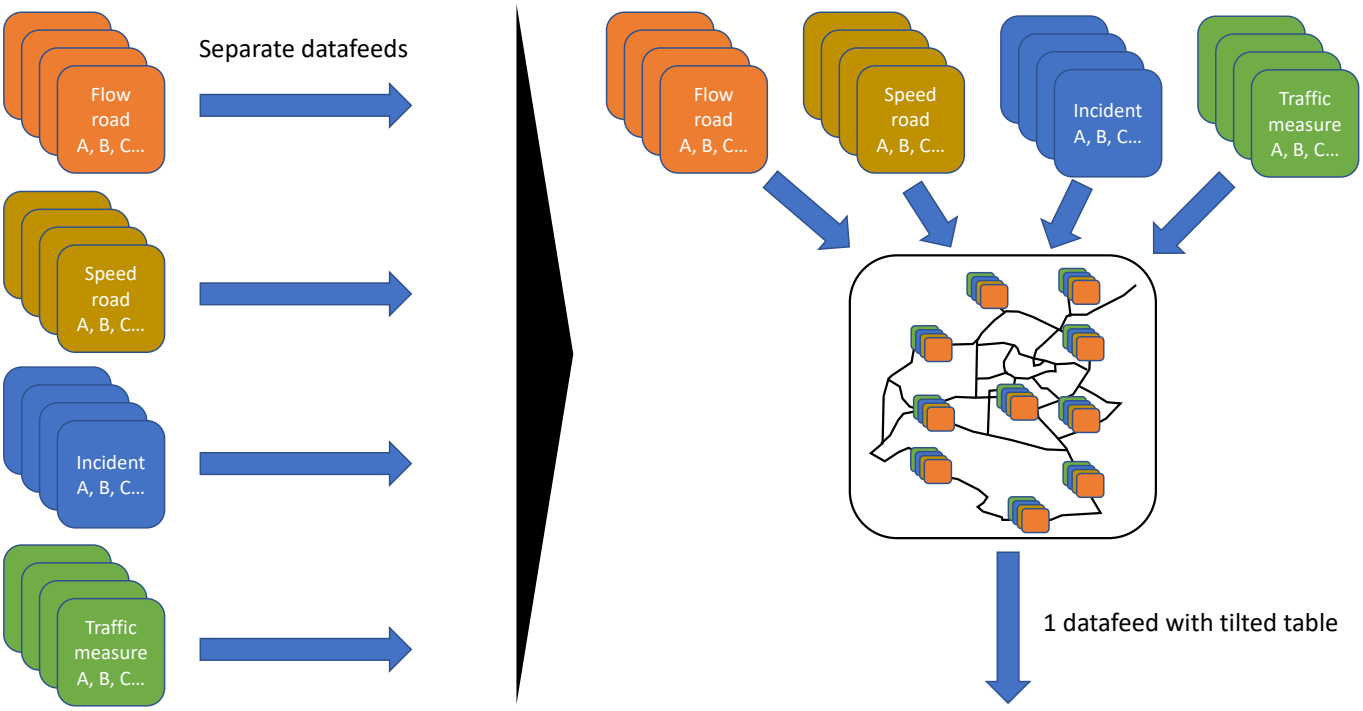
The use of the predictions in Amsterdam has therefore mainly visualised how predictions work in an abnormal traffic situation. Important explanations for the quality of the prediction were the latency in the chain and the speed with which an incident was detected.
In the latter case, a good trade-off between speed and certainty is important: reacting quickly to a drop in speed can also mean reacting too quickly to a temporary drop in speed.

- Data distribution
  After collecting and processing the data, the data is delivered to the customers. Important are agreements with customers about the data format to be used, the frequency of delivery (for example on a one-minute basis) and the method of delivery (push by Network Monitor or pull by customer). The connections and data points are set up on the basis of these agreements.

- For the data format, there has been a separate agreement between the parties within SOCRATES$^{2.0}$, in which it is laid down which data formats were used for which purpose (TMex). To this end, the DATEX II format was often used.
  Finally, agreements must be made about the level of service: what should be done and what can be expected in the event of a disturbance.

'TILTED TABLE'

In Amsterdam, a different format of a data feed has been developed especially for SOCRATES$^{2.0}$. The 'tilted table' is a DATEX II protocol in which different data are combined in a data stream. Traffic information (such as speeds and flow) is usually offered as separate feeds to customers; 1 feed then provides information about 1 specific part for all roads. In SOCRATES$^{2.0}$, this data delivery is "tilted". Not the information is the starting point for the data feed, but the location is the starting point. The data feed thus shows all available information per road segment.



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