BlipTrack™

Travel Times

Case Studies - v. 1.1

Filtering Engine

Time Measurement

Queue Information

Detection Rate

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Introduction

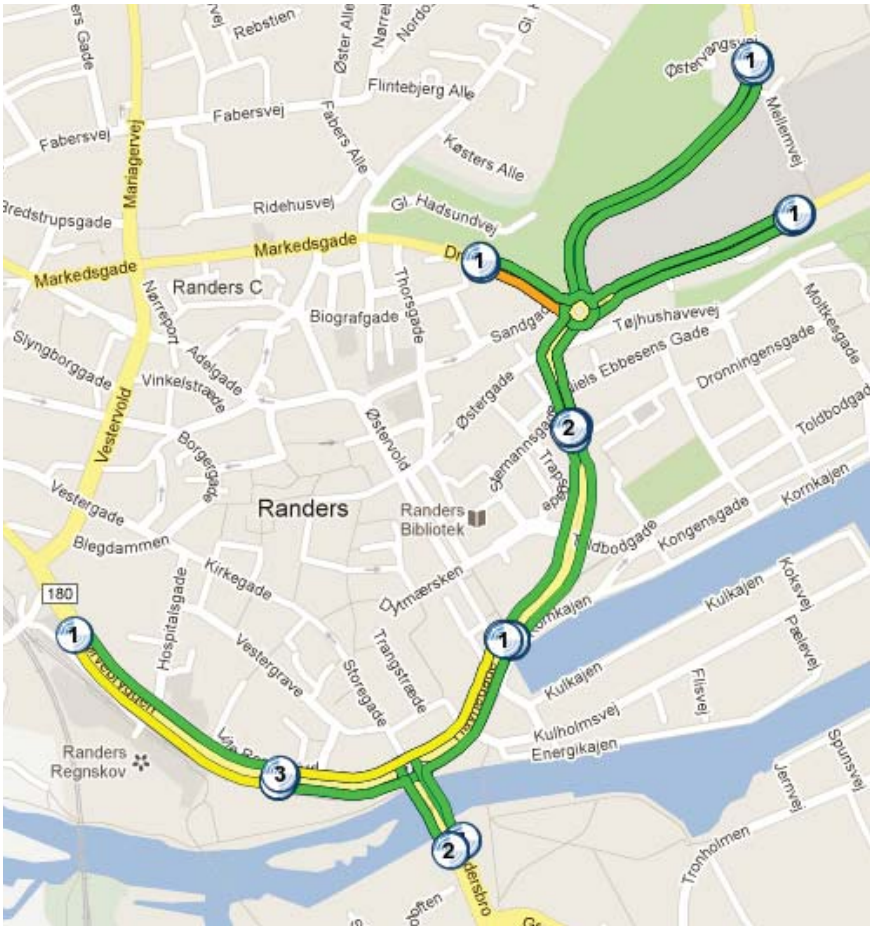
This document describes a series of cases where BlipTrack™ is deployed today.

The focus with this document is to show that the system is able to deliver accurate data in many different environments.

Case 1 - Filtering Engine

Open Road Segment in City - Randers

In total 6 BlipTrack™ sensors was deployed in the city of Randers by our Danish traffic partner, international consultancy group COWI.



Overview of Randers installation

This chapter shows how BlipTrack™ is able to provide correct data even in an urban environment with vehicles stopping between sensors, bicycles and pedestrians.

Figure 1 (next page) shows an example of the efficient outlier filters in BlipTrack™.

BlipTrack™ is capable of filtering out outliers such as vehicles stopping on the route, bicycles or pedestrians.

The filtering is based on calculating a normal driving time per device, based on the past X driving devices, to see if the driving time of the specific device deviates from the normal driving time at the time.

Please notice that the normal driving time was calculated based on devices found in vehicles ONLY.

This implies that BlipTrack™ is able to eliminate data from devices carried on bicycles, if these had a driving time deviating from the vehicles.

Case 1 - Filtering Engine

Open Road Segment in City - Randers

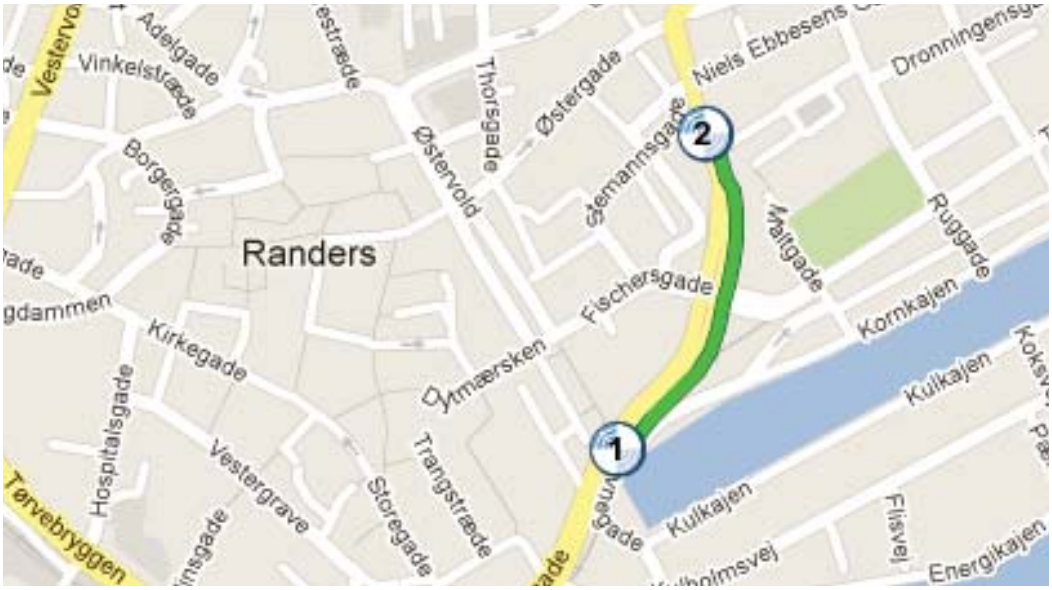
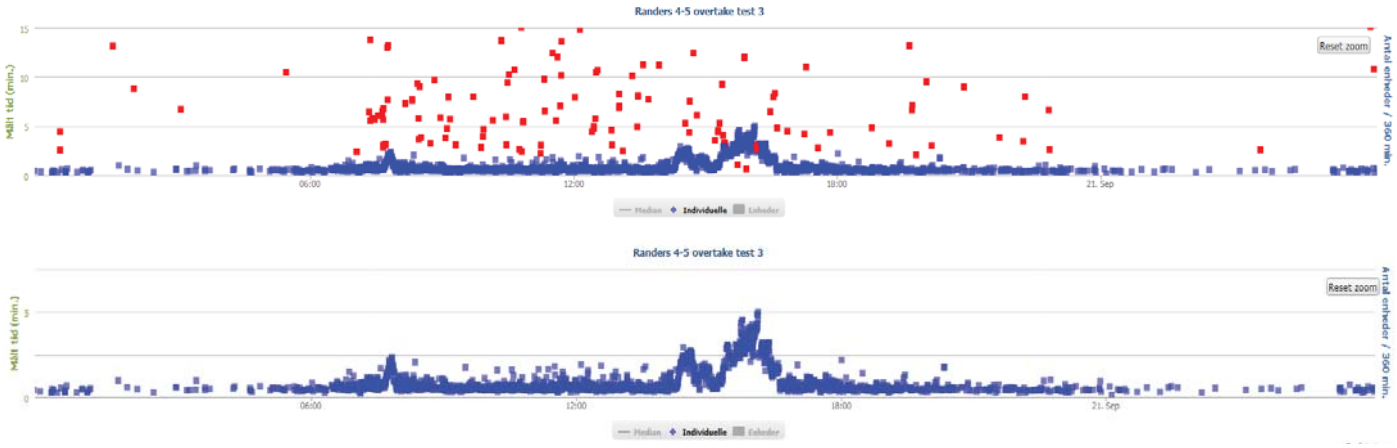


Figure 1 - Randers data

<-- Sensor placement

The widgets below show the outlier filters in BlipTrack™ GUI.



Case 2 - Time Measurement
Traffic Light Case - Randers

This section shows how it's possible to see even small changes in traffic light duty cycles in the data delivered by BlipTrack™.

Figure 2 shows how the median driving time reported by BlipTrack™ is affected by a change in the duty cycle of the traffic light controller handling the traffic at this junction.

The duty cycle is decreased from 80 to 60 at 9:00.

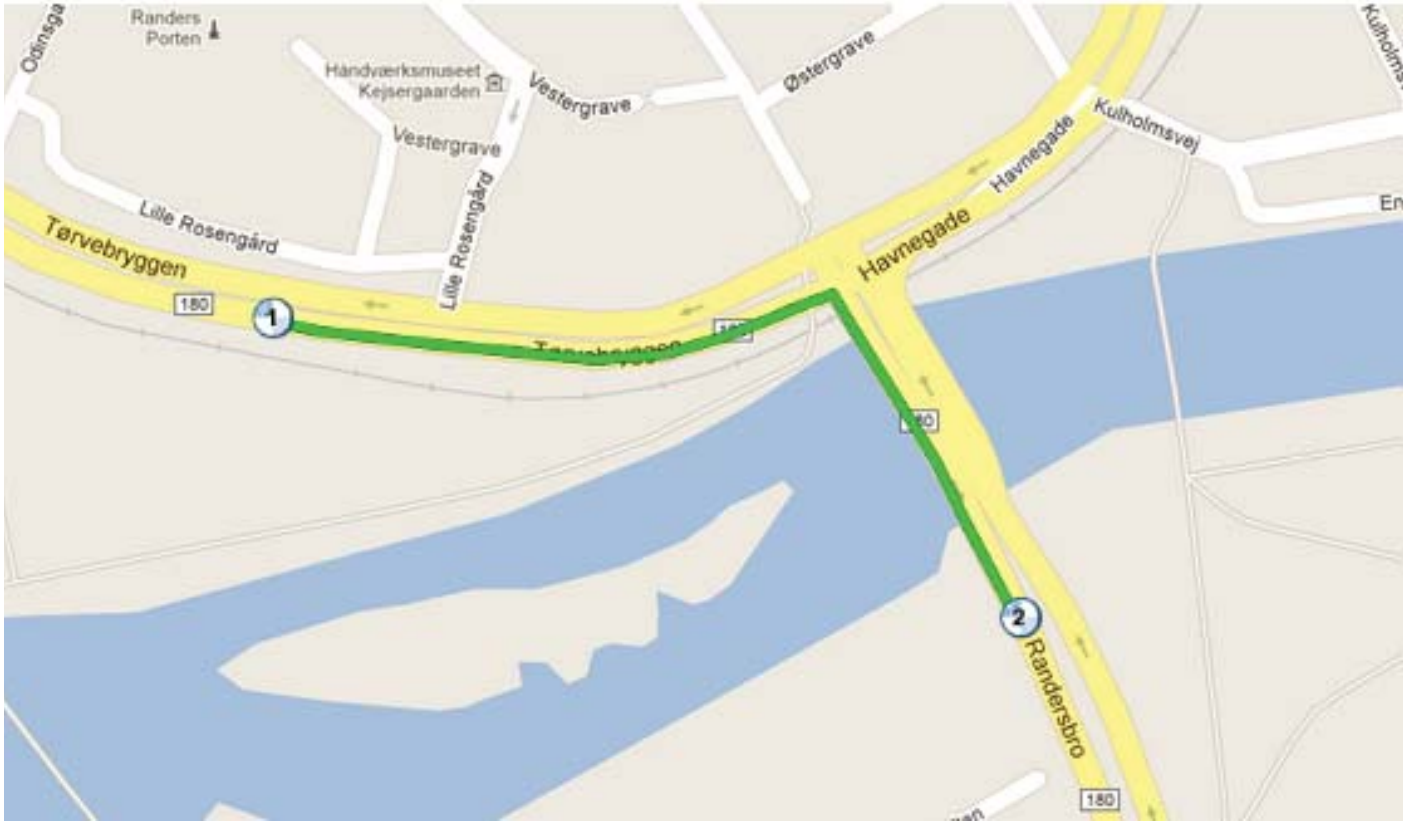
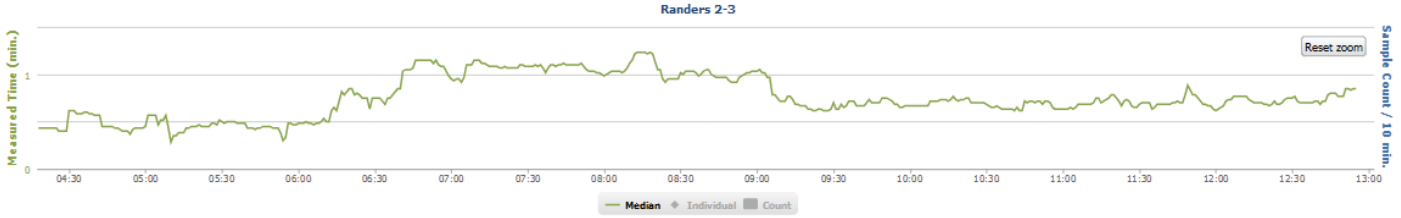


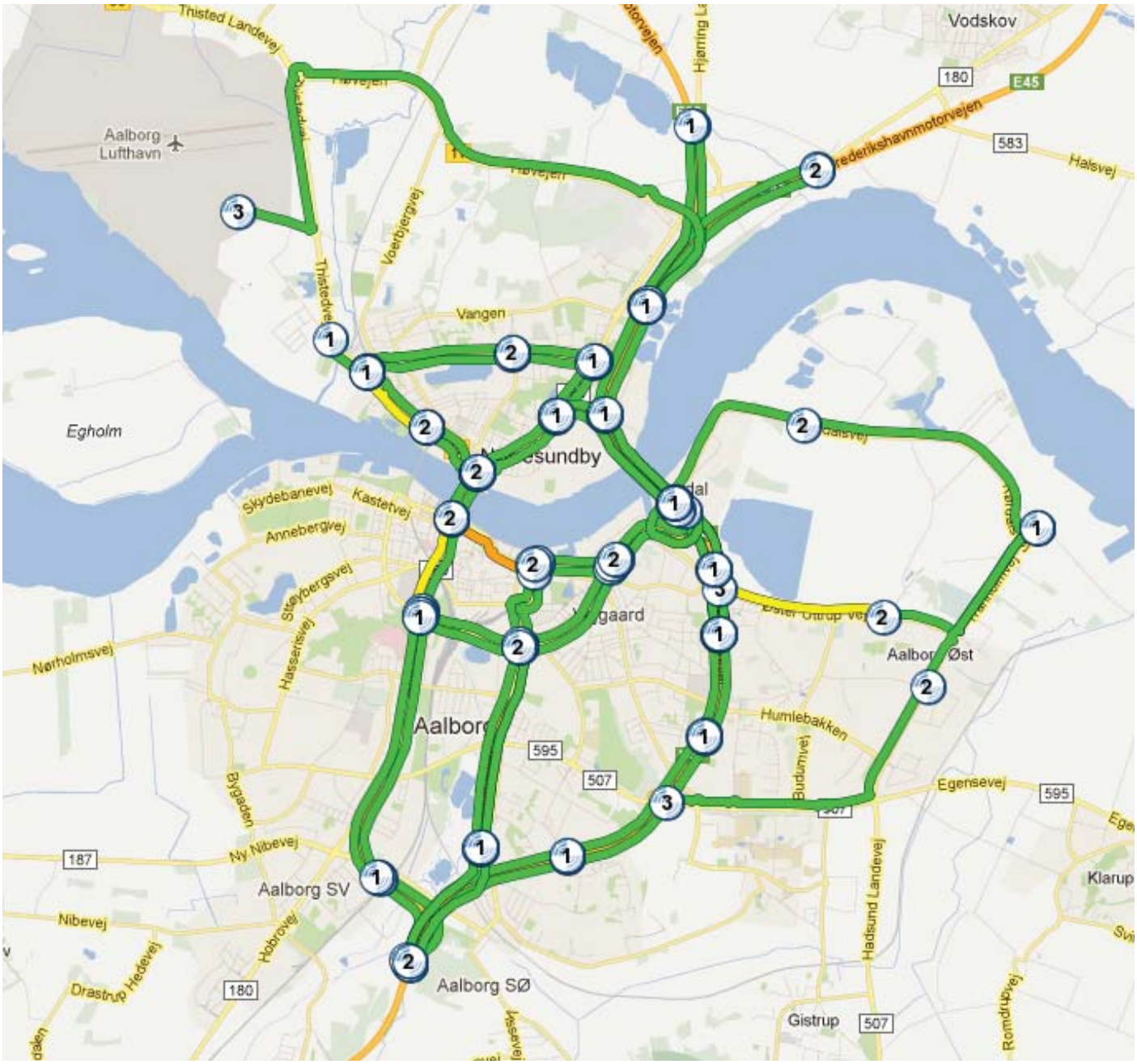
Figure 2 - Randersbro Junction



Case 3 - Queue Information

Queue Details, Highway E45, Aalborg

A total of more than 35 BlipTrack™ sensors are installed in and around the city of Aalborg.



Overview of BlipTrack™ sensors in the city of Aalborg

Case 3 - Queue Information

Queue Details, Highway E45, Aalborg

This chapter shows data from highway E45 north of Aalborg, for South bound traffic (Figure 3). The scope is to show how detailed queue information can be retrieved from BlipTrack™. This case is focused on analysing the traffic from point 1 to 4, on the 26 of August 2012.

Notes about the route.

a) E39 is merging with E45 between sensor S1 and S2

b) There is a tunnel between point S3 and S4. Incidents are frequently causing delays here.

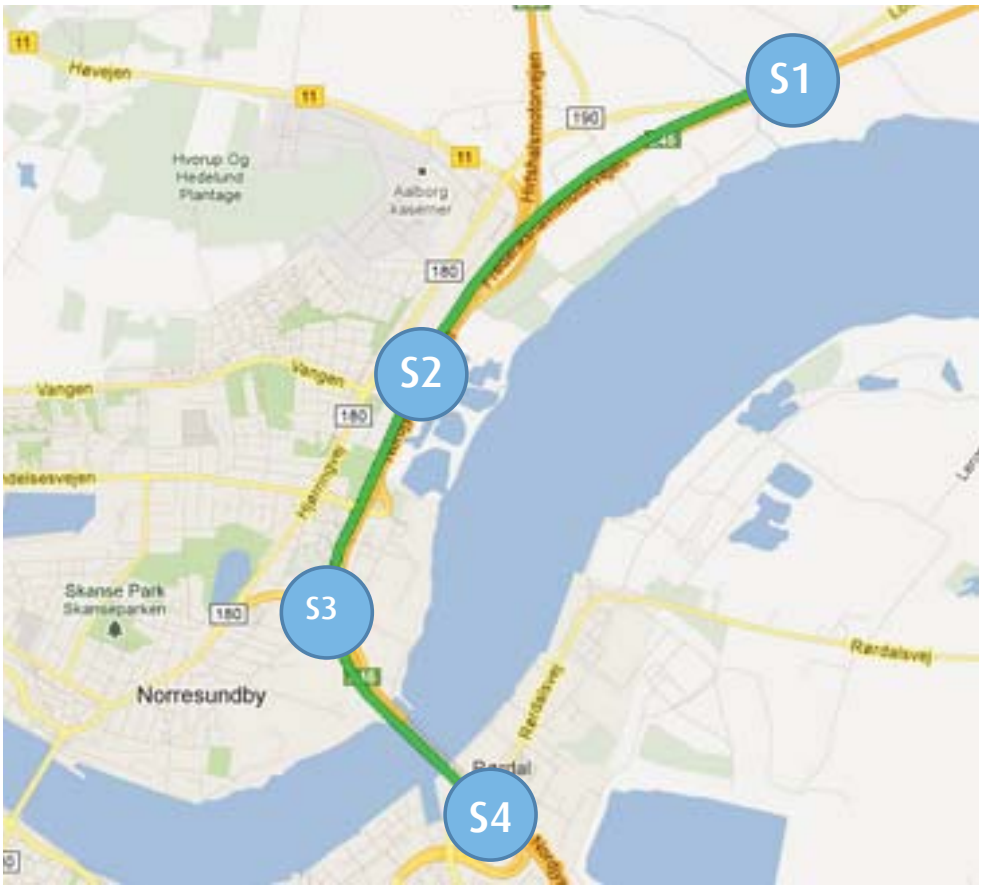
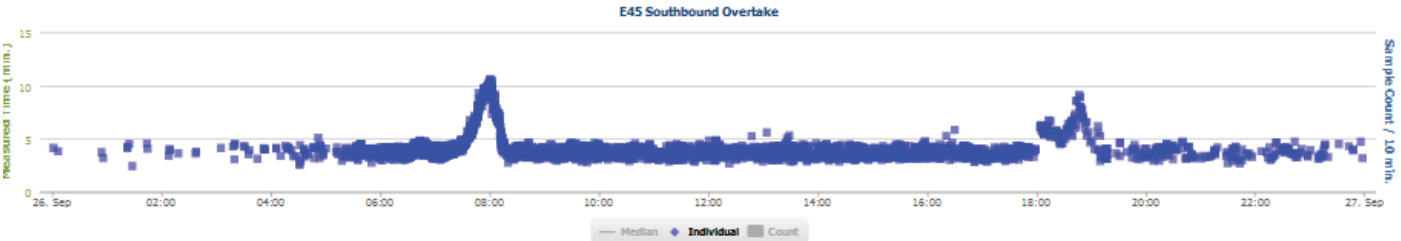


Figure 3

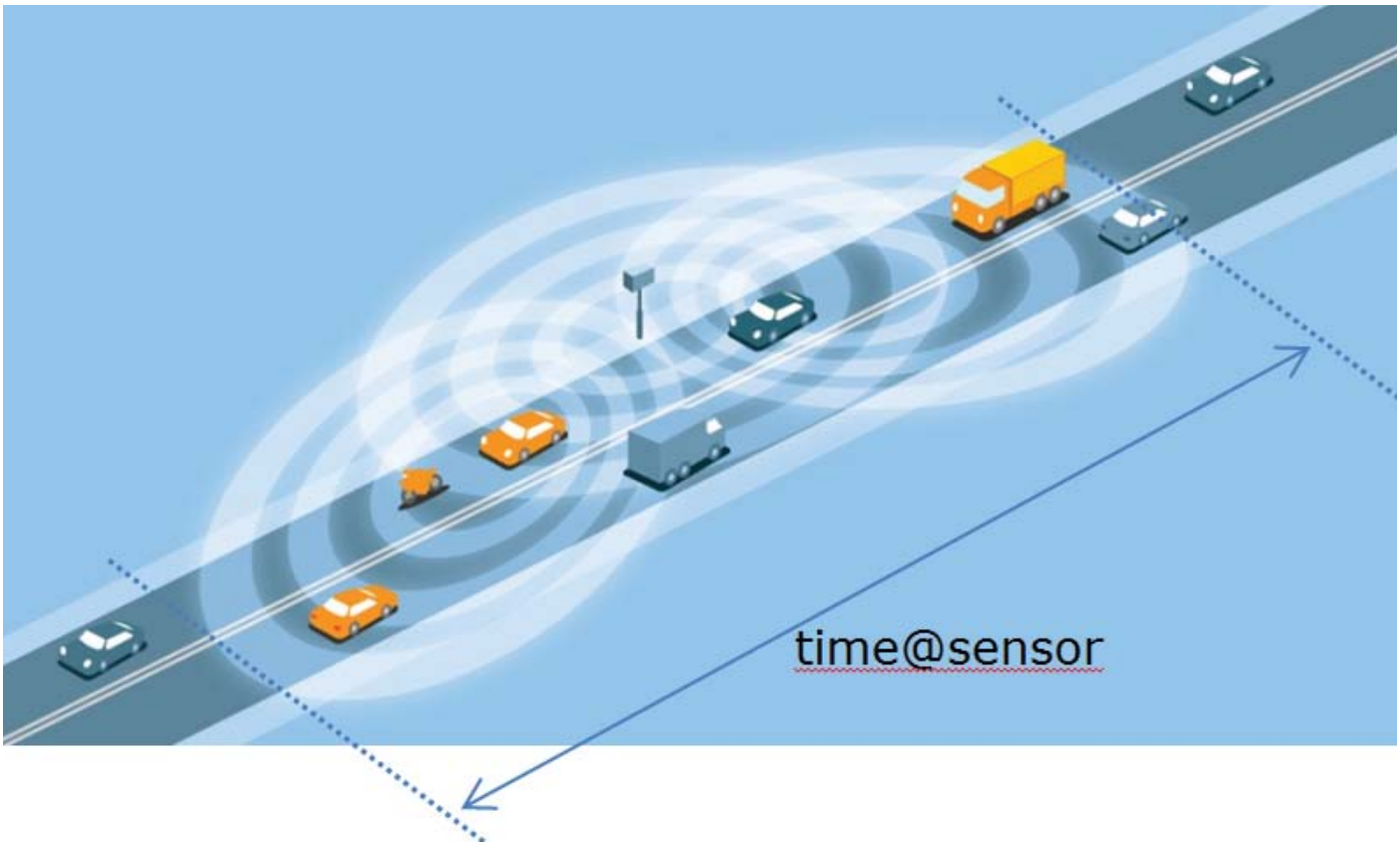
Location of sensors and total driving time from sensor 1 to sensor 4 per vehicle on the 26 of August.



Case 3 - Queue Information

Queue Details, Highway E45, Aalborg

The purpose of this chapter is to show how detailed information can be retrieved from the 4 sensors. The level of detail is not limited to the driving times per road segment, also the "time@sensor" is analysed. This "time@sensor" represents the time from the device is seen first time by the sensor until it is seen last time. At times with free flow this time is around 4-5 seconds, but a times with congestion this time is increasing to minutes. BlipTrack™ can due to its antenna design deliver these data per direction.



This figure shows where the travel time at the sensor would be measured from and to, in the case, the device is picked up exactly where the sensor coverage starts and ends. Notice that each BlipTrack™ sensor has 3 antennas.

Case 3 - Queue Information

Incident A

Concerning "Incident A" see marking on Figure 5 (next page), it can be seen that this incident only affected the travel times between sensor S1 and S2.
There is NO increased time at S1 and S2. There was an increase in travel time between sensor 1 and sensor 2, but the queue didn't reach sensor 1 and was resolved before sensor 2. The issue was simply that traffic was delayed due to the merge of E45 and E39 at the red marking. (Figure 4)

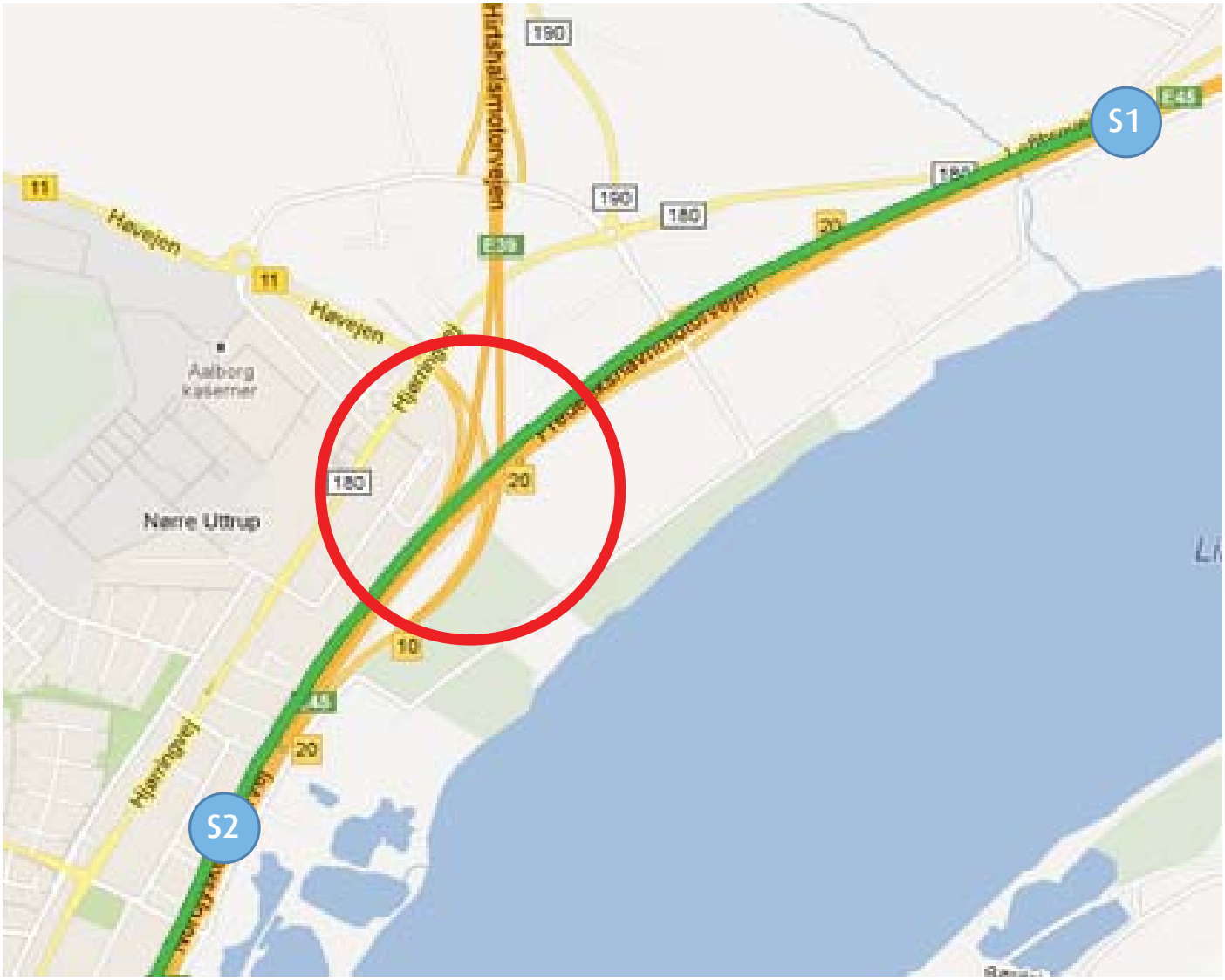


Figure 4 - Close up on area between sensor S1 and S2

Case 3 - Queue Information

Incident B

Concerning Incident B see marking on Figure 5, it can be seen that this incident affected driving times from S2 -> S3 and from S3 -> S4. Based on the time spent by vehicles in range of S2, S3 and S4, it can also be seen that the queue did not reach S2 and was not yet resolved at S4.

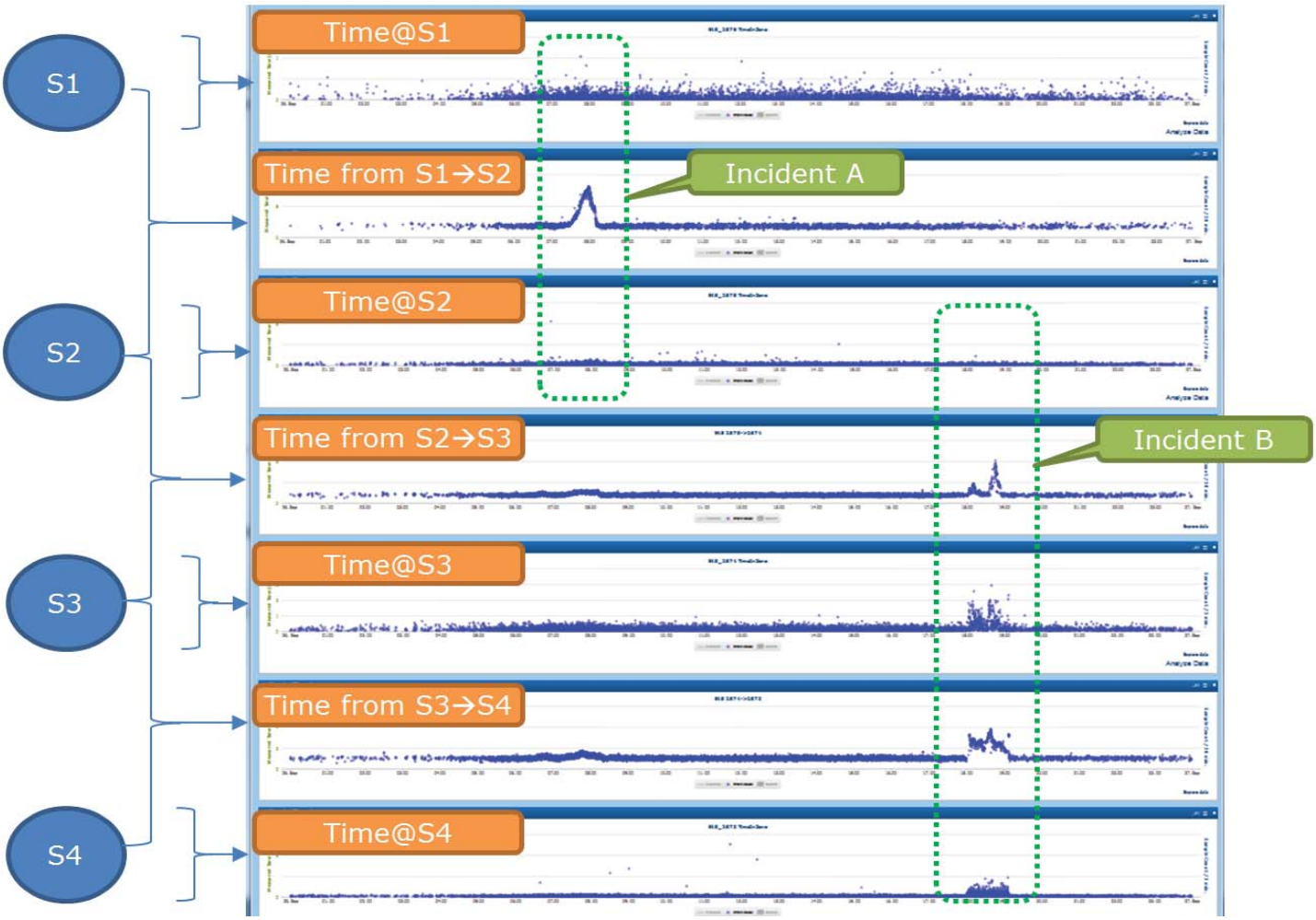


Figure 5. Detailed view of time spent on route

Case 3 - Queue Information
Incident B

Additionally Figure 6 shows that it's possible to create queue warnings based on time@sensor, and that these can be triggered earlier than an alarm based on driving time measured over a segment.

BlipTrack™ offers the possibility to create alarms, send emails and/or mobile text messages in case of incidents.

Figure 6. Close up on incident B, showing driving time from S3 -> S4 and time@S4

Case 4 - Detection Rate

Proven High Detection Rate, Aarhus

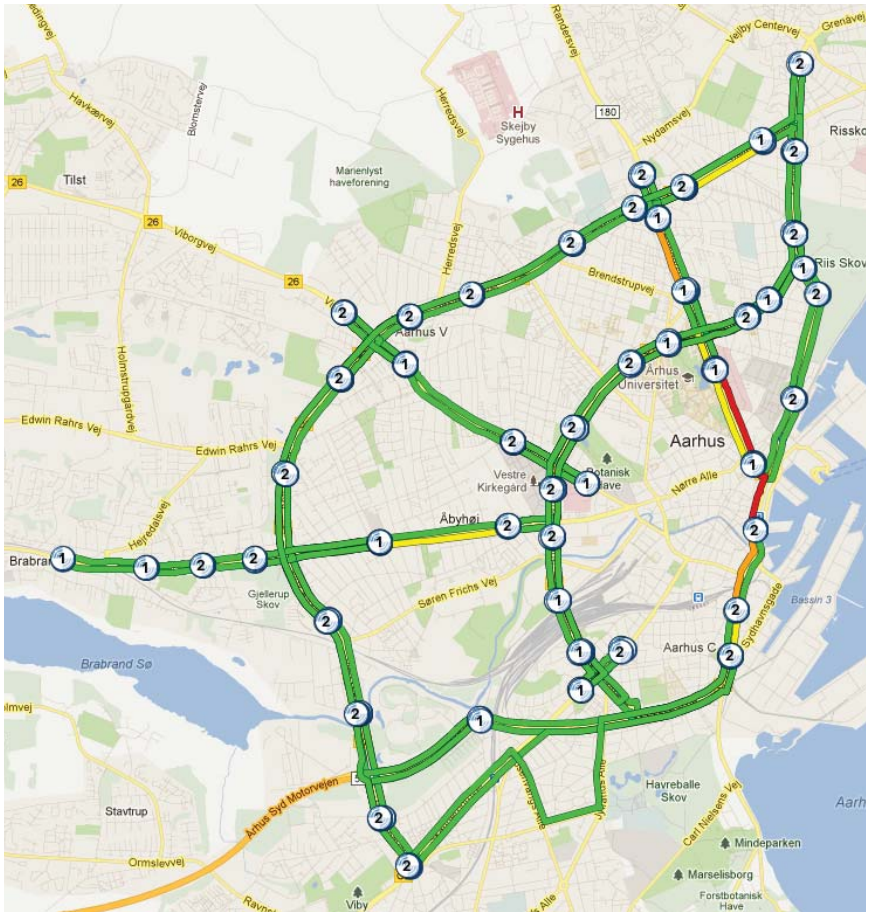
More than 60 BlipTrack™ sensors are installed in the city of Aarhus. The sensor provide driving times for all major road segments in the inner city.

A lot of interesting data could have been shown from the Aarhus data, but in this document it was chosen to use the Aarhus data to show how good the BlipTrack™ detection rate actually is.

Our definition of detection rate is the following: A sensor would have a detection rate of 100% if all Bluetooth devices passing by the sensor are detected.

A high detection rate is essential because:

1. It improves number of matched devices between sensors, If two sensors each have a detection rate of 50%, they will only be able to provide driving times for 25% of the devices.



Location of sensors in Aarhus

2. A high and consistent detection rate is essential for Origin and Destination analysis.

BlipTrack™ has a detection rate close to 100%, this is achieved by our unique sensor design. The detection rate was analysed using the sensors shown in the figure below.

Location of sensors

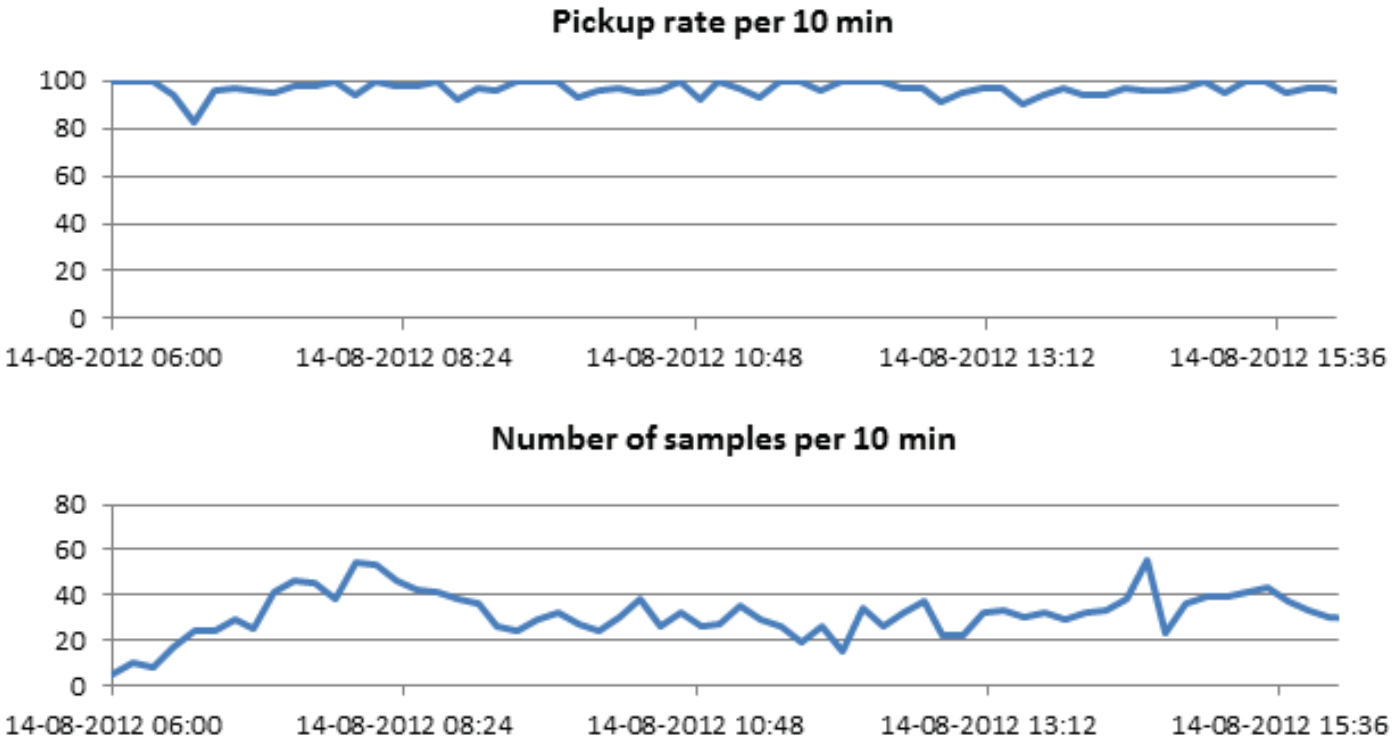
Case 4 - Detection Rate

Proven High Detection Rate, Aarhus

The test methodology was this:

1. For each device detected at the BlipTrack™ sensor 1, it is checked whether the device is detected within 10 minutes at BlipTrack™ sensor 3.

2. For each device detected at the BlipTrack™ sensors 1+3, it is checked whether the device was at sensor 2 between the detection at sensor 1 and 3.



Detection rate and corresponding number of samples

The average detection rate in the period was 96.6%