



# Dynamic traffic management

## An industry perspective



Sven Van Segbroeck  
EU-US FOE 2013  
Chantilly, France



## *Be-Mobile & FLOW in a nutshell*

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Sister companies

Headquarters: Ghent, Belgium

Founded in 2006 & 2008

~ 25 employees

10+ countries





**Return travelers, companies & road operators  
control over their mobility**

Measure traffic & mobility situation

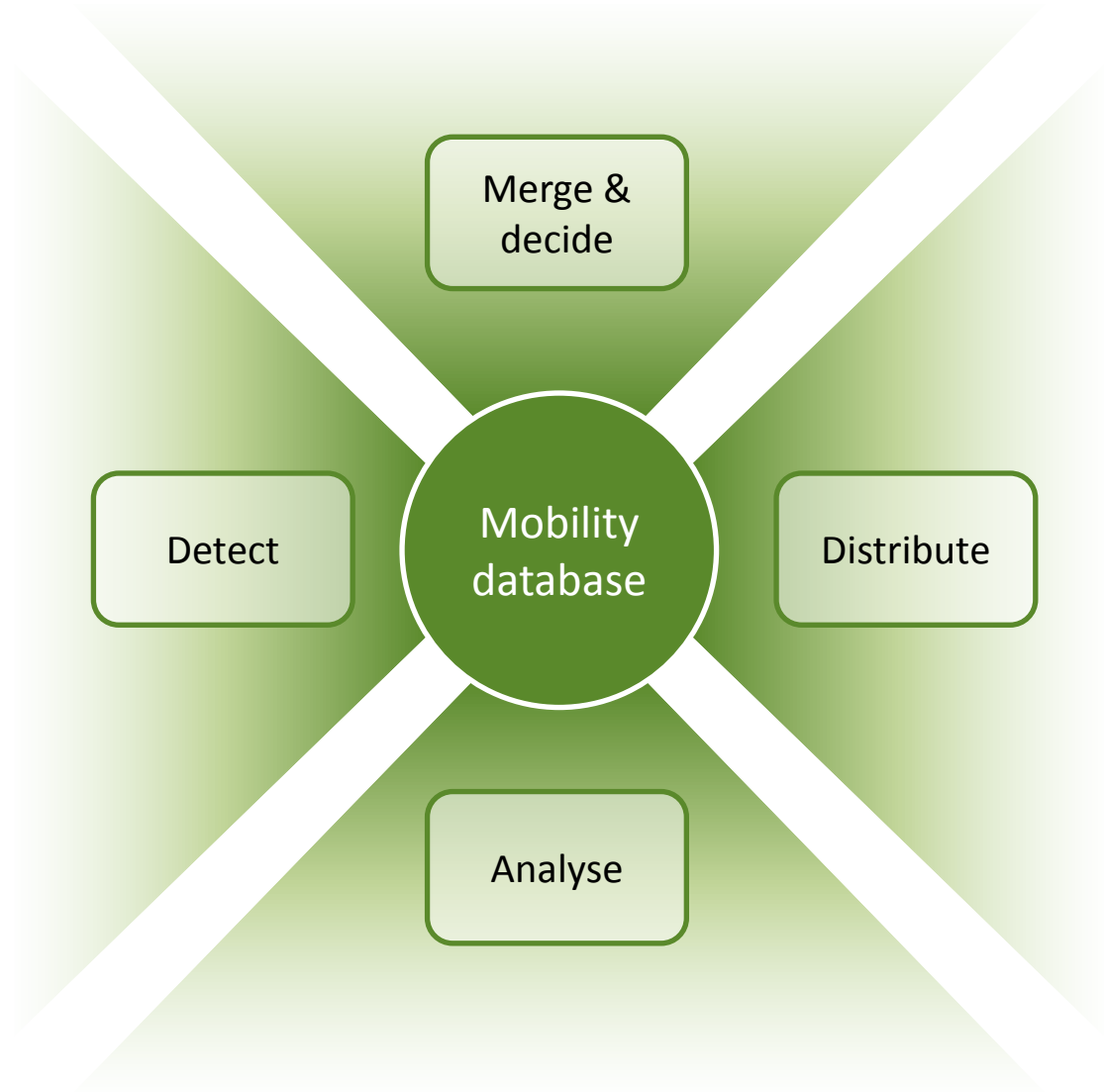
Package the information in traffic & mobility  
services

Same content on dashboard, LED-board, radio/tv,  
app, ...



# *Our traffic software platform*

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# *Our traffic software platform*

## Detect: “Own” data and 3rd party data

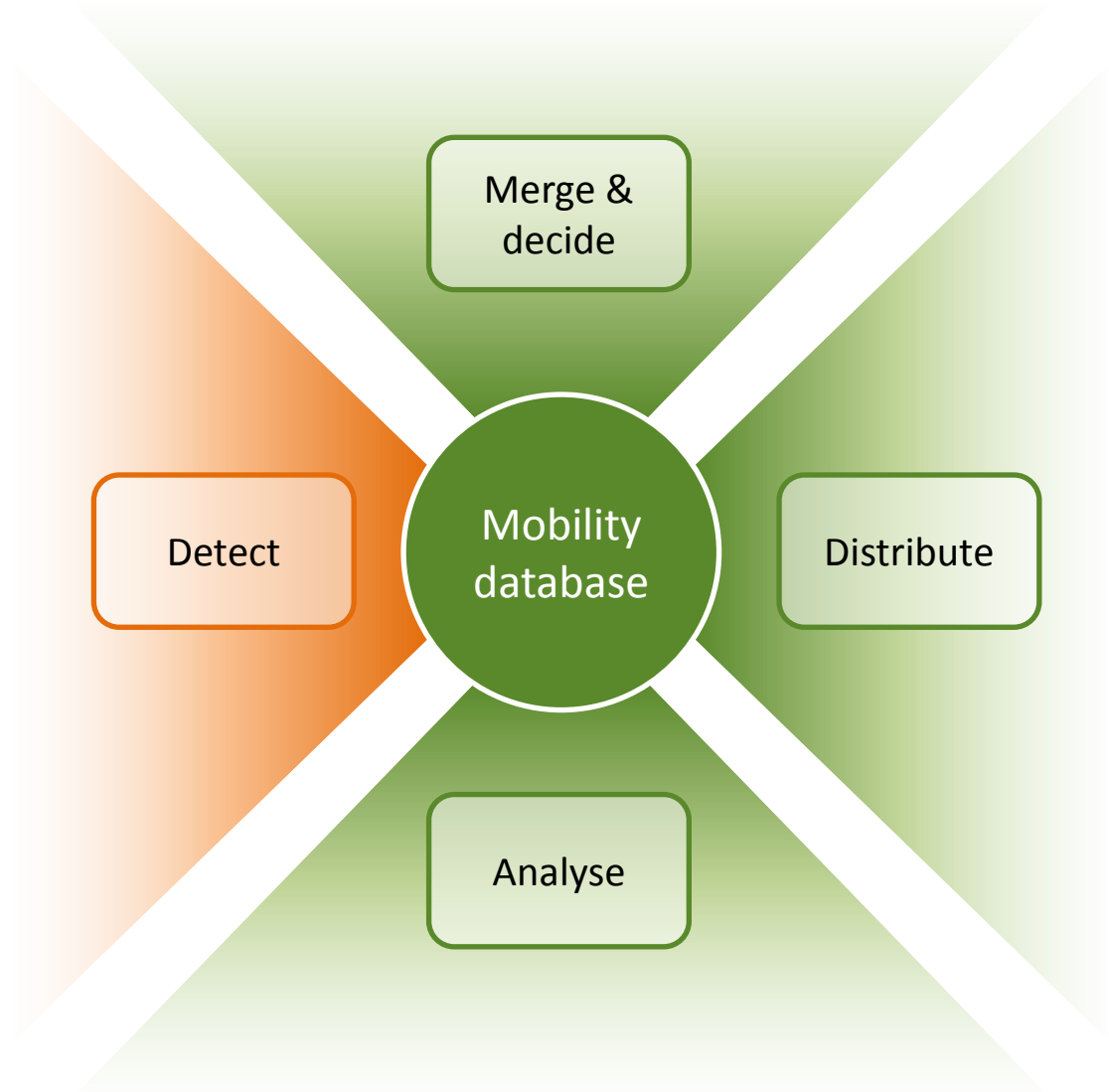
Road sensor data

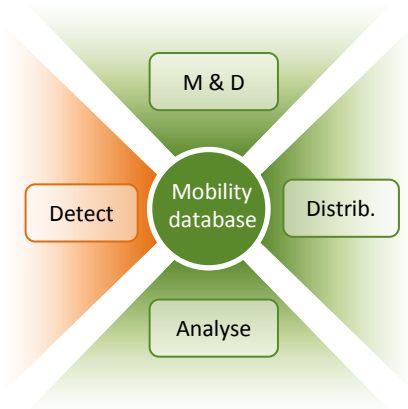
Probe vehicle data

Crowd & public sourcing

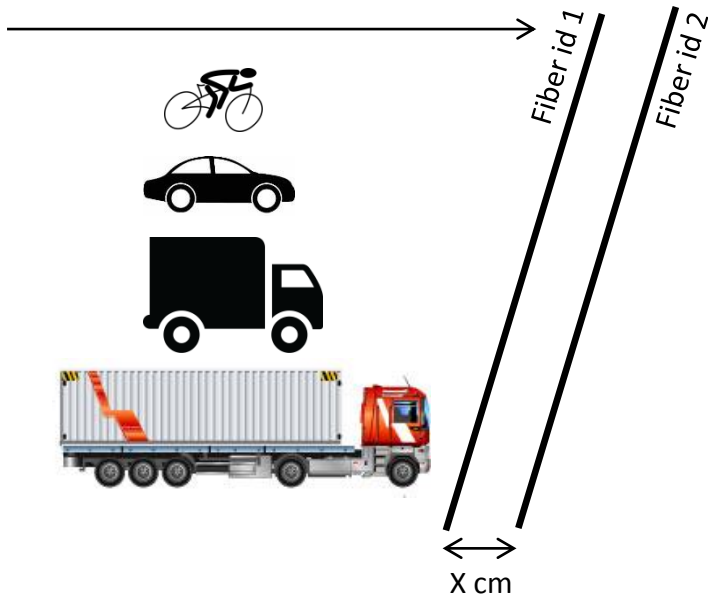
Other mobility data

Traffic centers, public transport,  
fuel, parking, meteo,  
car sharing, bike sharing, ...





## Optical fiber Tubes



(1) Collect pulses



16/09/2013 11:41:52\_793,21ms Tube1  
16/09/2013 11:42:04\_597,90ms Tube2  
16/09/2013 11:42:04\_641,85ms Tube1  
16/09/2013 11:42:04\_782,96ms Tube2  
...

(2) Identify axles



Timestamp and speed of axle 1  
Timestamp and speed of axle 2  
...

(3) Identify vehicles



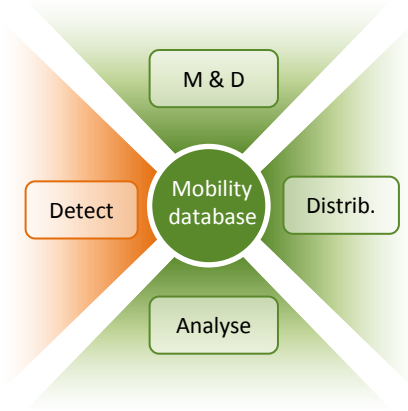
I-I	I-I	I-I-I-III
car	van	truck

Domain knowledge!!



## *Detect - road sensor data*

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Optical fiber

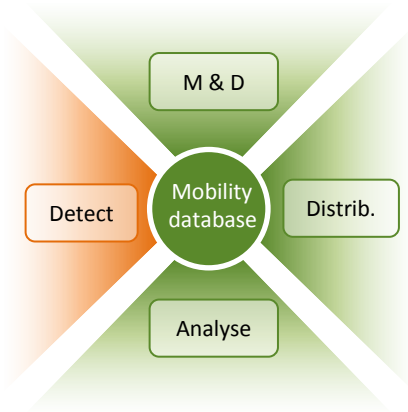
Tubes



Accurate detection & classification



All weather conditions



Optical fiber

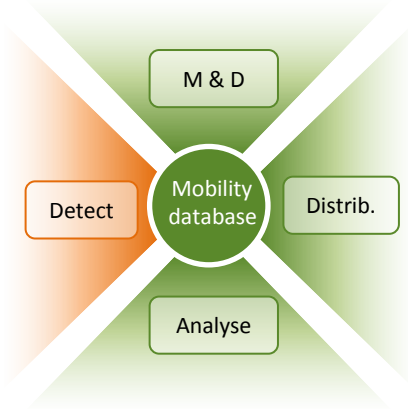
Tubes



- ✚ Accurate detection & classification
- ✚ All weather conditions
- ✚ Combination with ANPR for trajectory/intersection analysis



## *Detect - road sensor data*

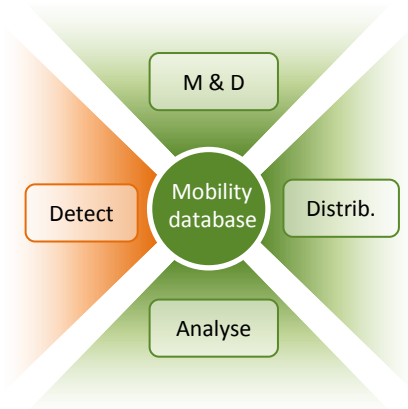


Optical fiber

Tubes



- ✚ Accurate detection & classification
- ✚ All weather conditions
- ✚ Combination with ANPR for trajectory/intersection analysis
- Installation & maintenance

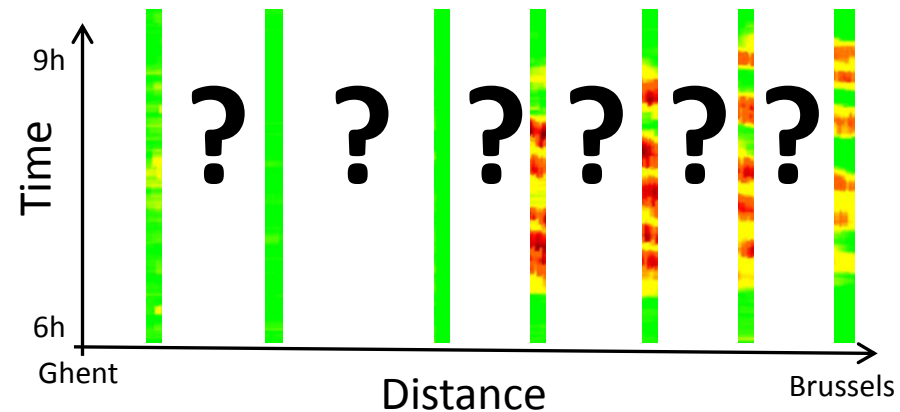
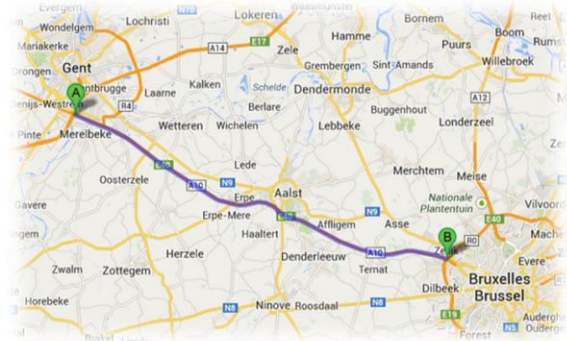


Optical fiber

Tubes

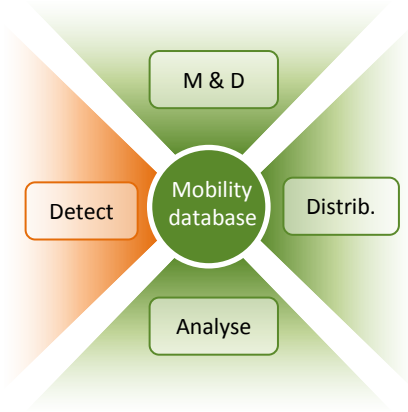


- +** Accurate detection & classification
- +** All weather conditions
- +** Combination with ANPR for trajectory/intersection analysis
- Installation & maintenance
- Limited part of the road network



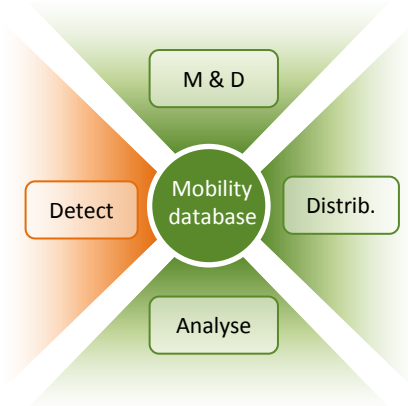
## *Detect – probe vehicle data*

Retrieve real-time GPS positions of X% of the traffic (taxis, trucks, vans...)



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## Map-matching

### External digital map

Links: orange lines

Supernodes: red dots

### Internal road network

Segments: blue lines

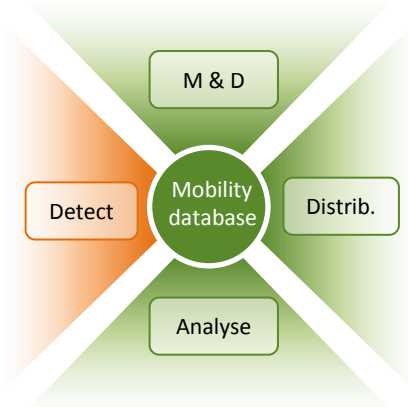
Nodes: green dots



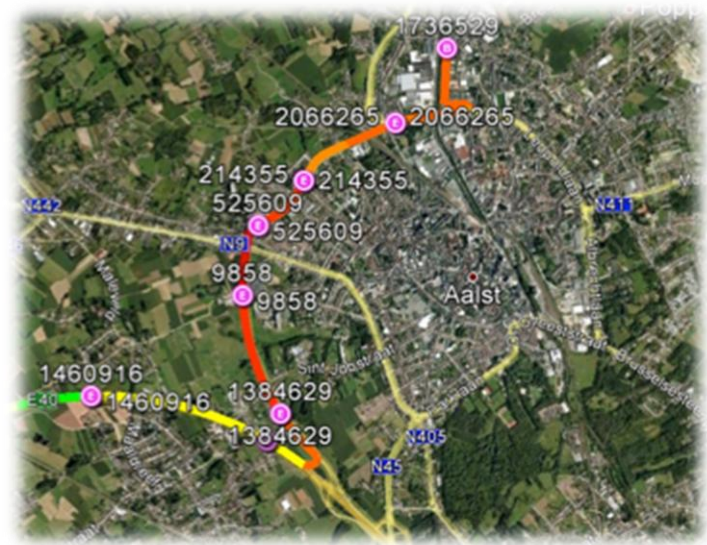
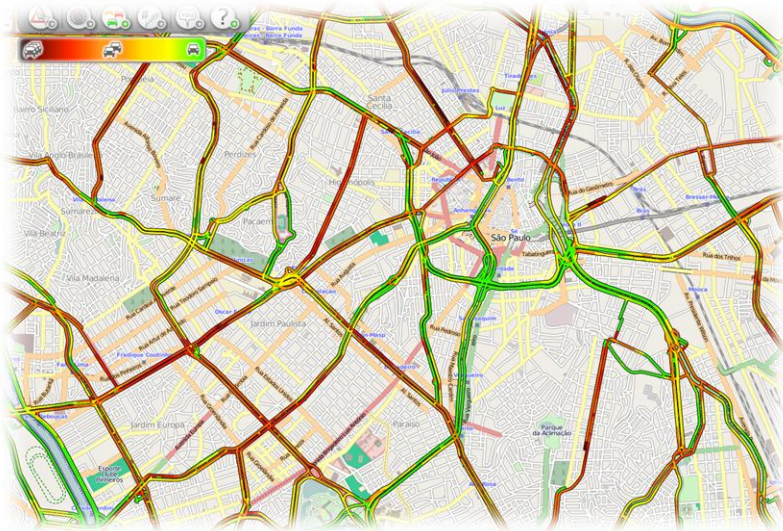
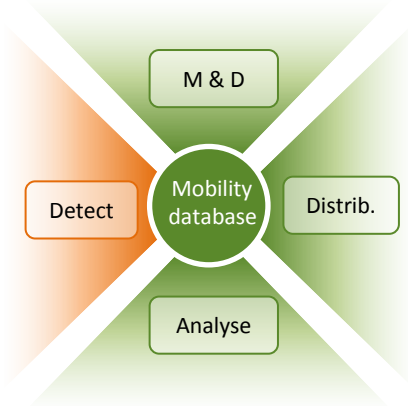
## *Detect – probe vehicle data*

Calculate trajectories  
between those points

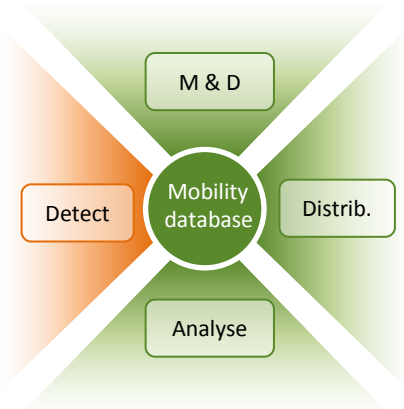
Traveltime information  
per trajectory



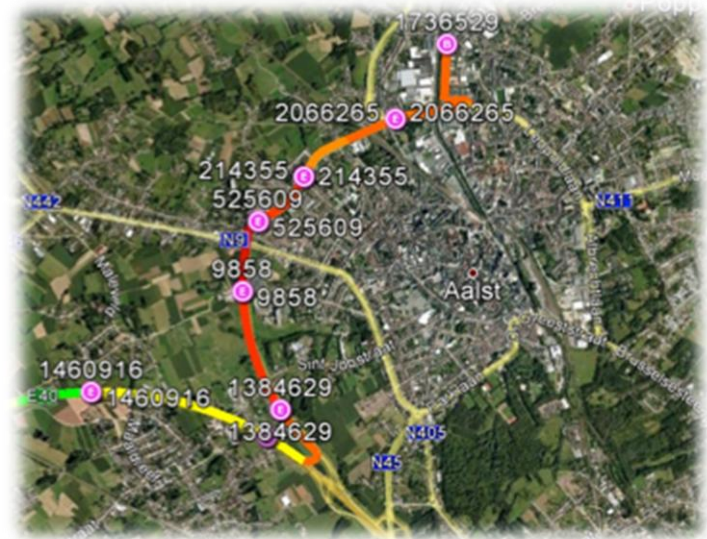
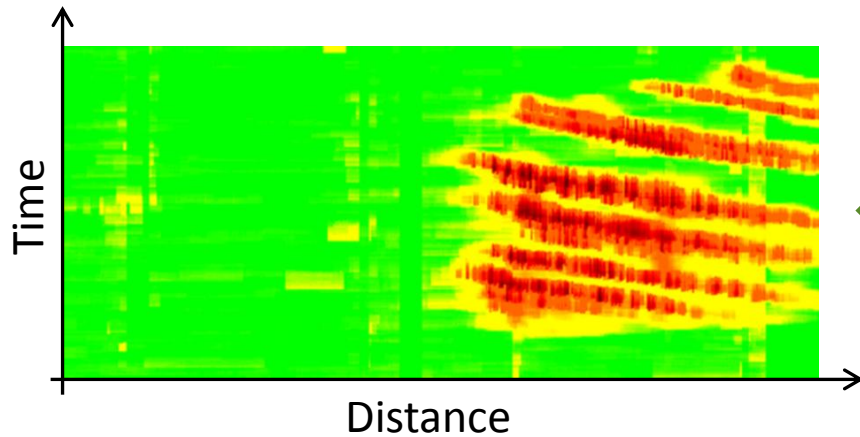
Merge traveltimes  
of all trajectories



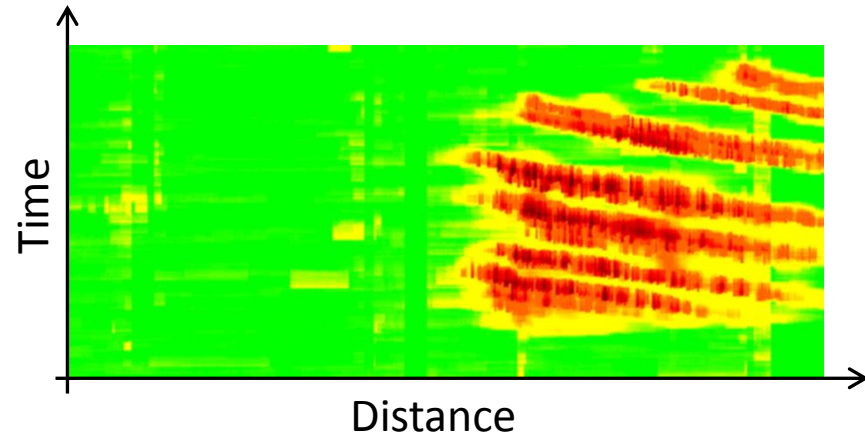
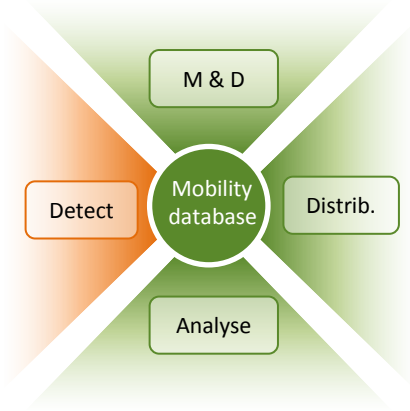
## *Detect – probe vehicle data*







Store speed info per  
segment & per minute  
for given route

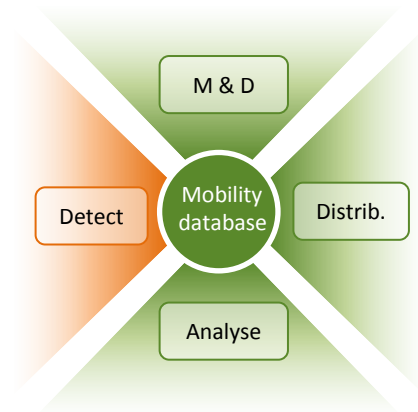


## *Detect – probe vehicle data*



-  Entire road network
-  No new equipment
-  Accurate traveltimes
-  No distinction between lanes

Road sensors & FCD  
are complementary



Journalistic data : cause of traffic jams & other related info

Human traffic operators



A driver sees a live accident ...

... and informs the traffic centre.

A traffic operator receives the alert ...

... and enters the data into the traffic **EDITOR**.



# *Our traffic software platform*

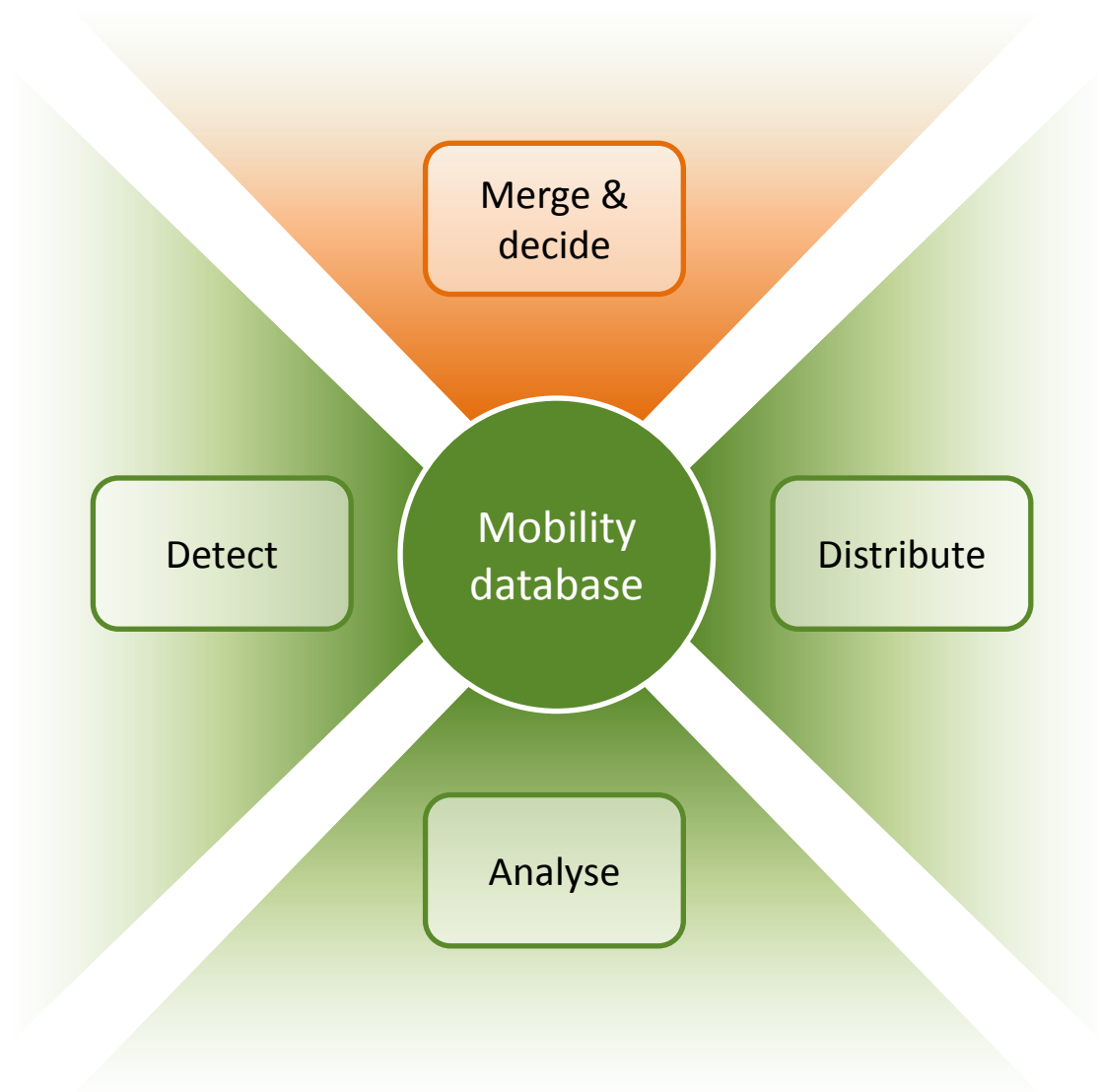
## Merge & decide

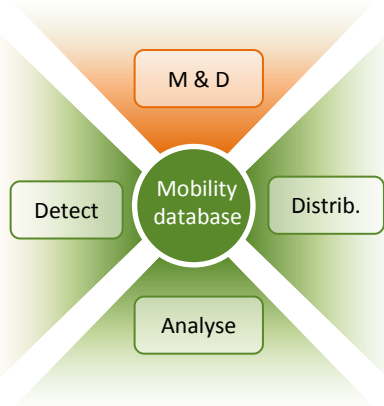
Merge different data  
sources

Handle inconsistencies  
between data sources

Generate standardized  
data output formats

Online traffic room for  
traffic mgmt



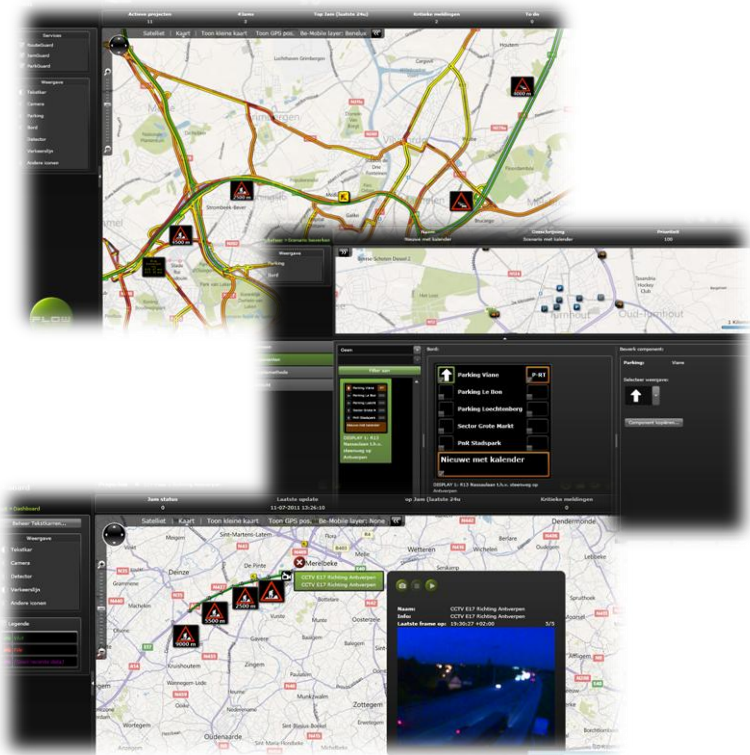


## Web-application

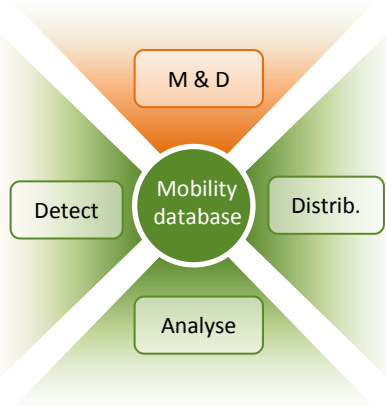
Traffic management solutions for *all* governments, also the small ones!

Focus on usability

Future challenge: Coordination of traffic management measures among different traffic centers



# Online traffic room - scenarios



Core of most traffic  
management solutions

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Scenario engine

Activation rules

Calendar

Traffic conditions

Manual interventions

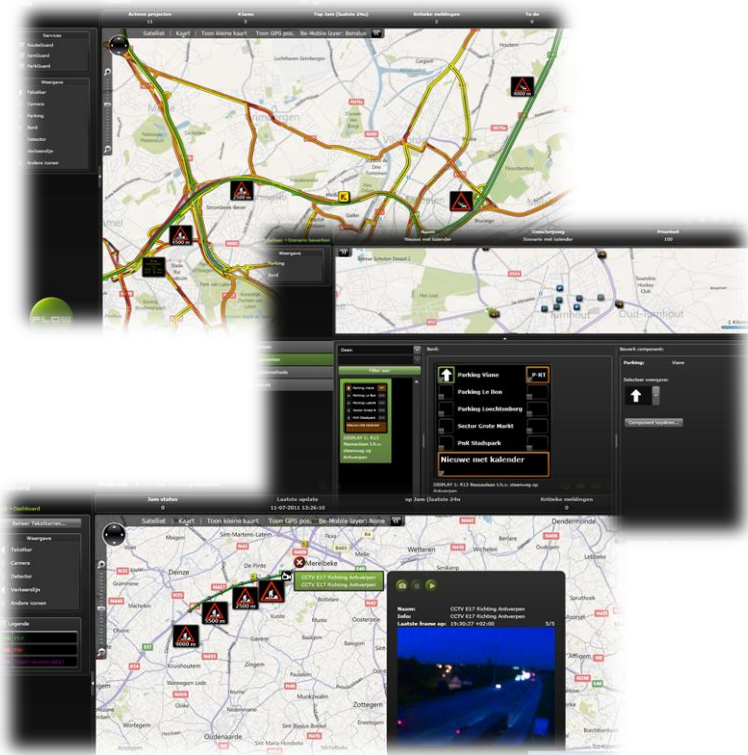
...

Output measures

Content on a LED-display

Scenario in a traffic light

...





# Our traffic software platform

## Distribute

### Navigation / In-car

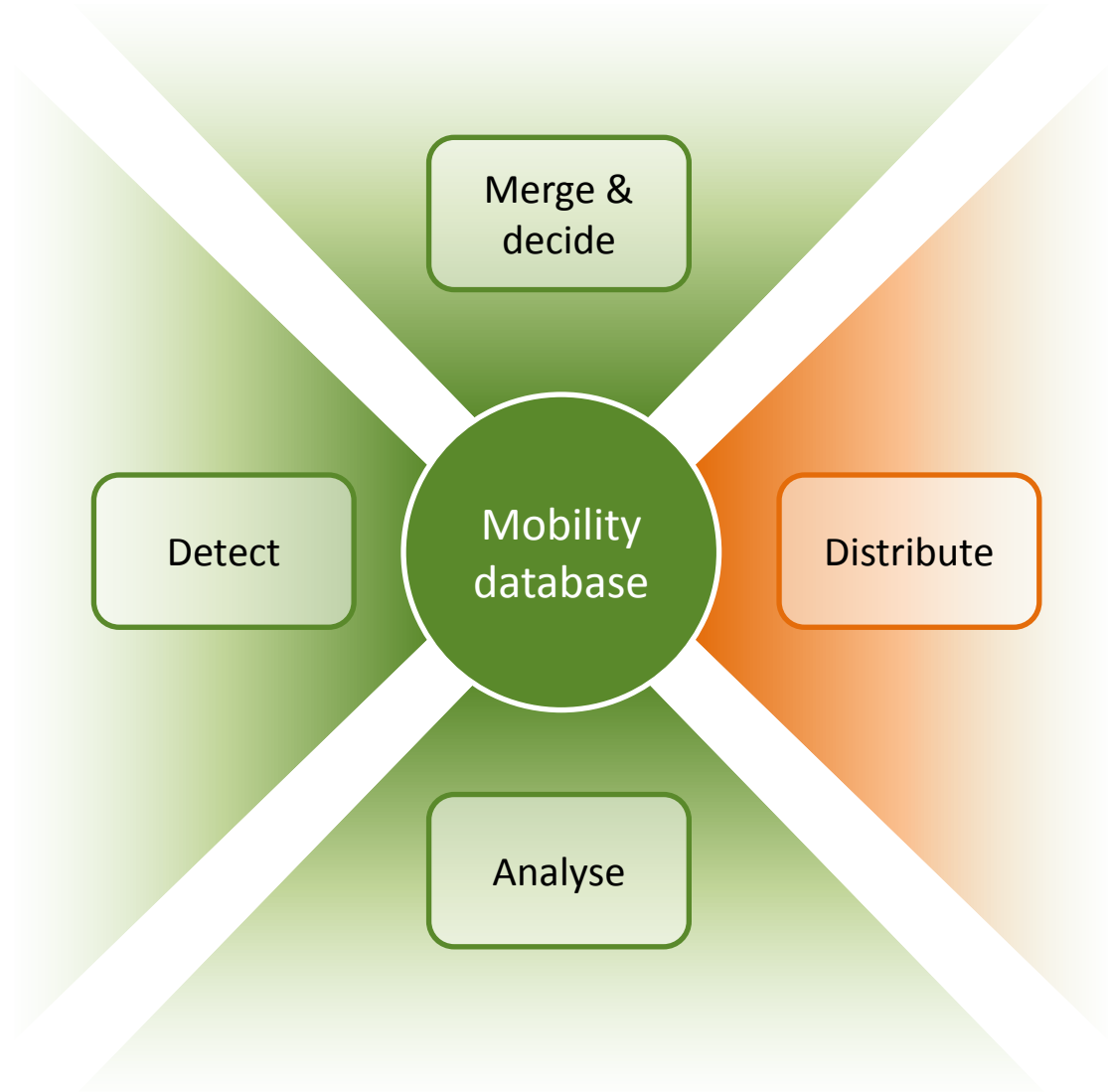
Broadcast  
RDS-TMC  
DAB-TPEG

### Roadside infra

LED-displays  
Traffic lights

### Media

TV & Radio  
Mobile phones  
Internet



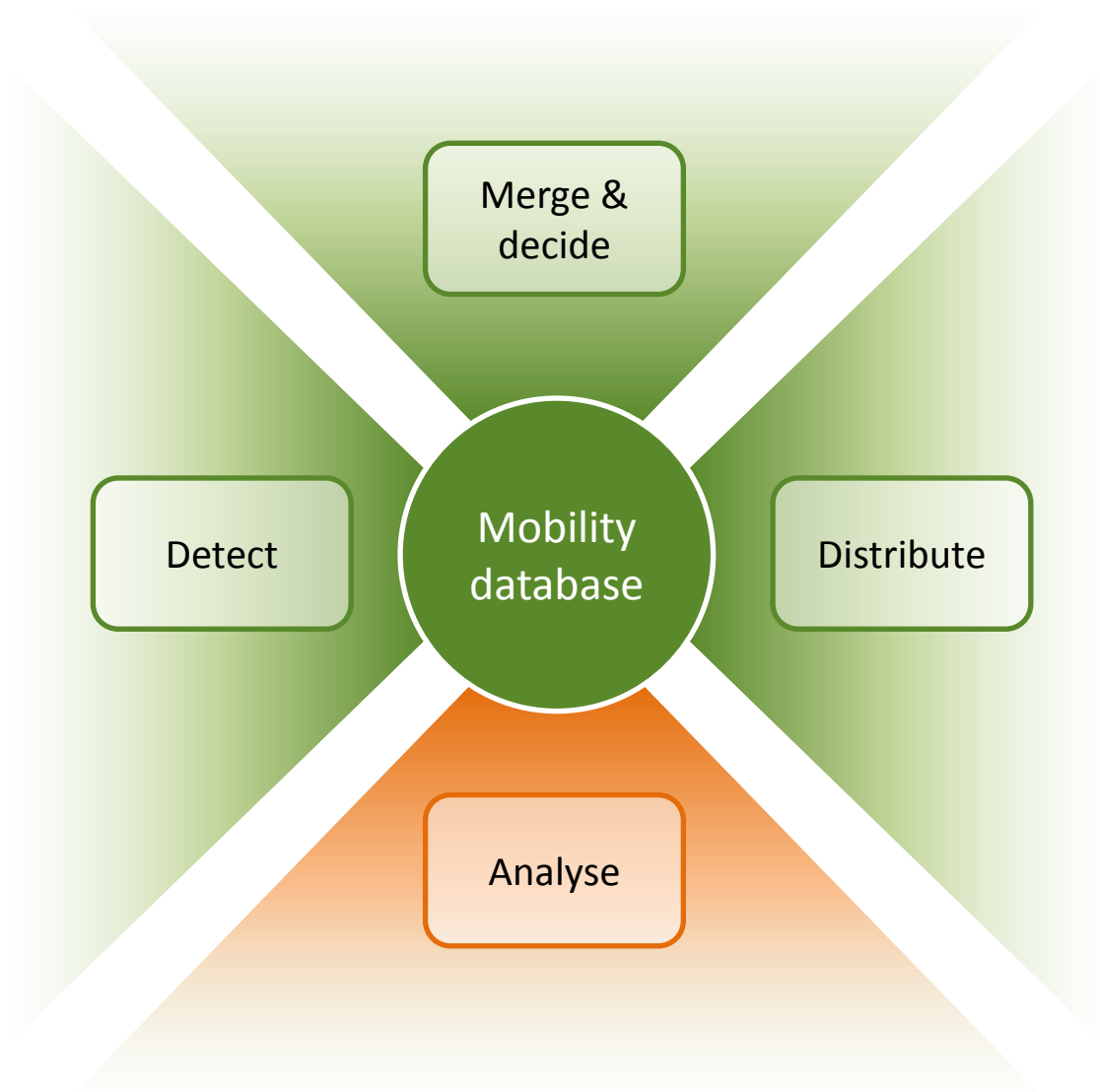


# *Our traffic software platform*

## Analyse

Historical data (FCD,  
road sensor data, events)

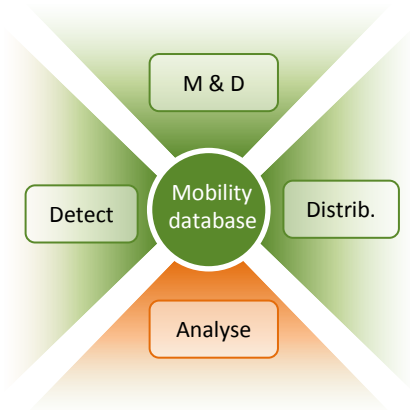
Online traffic room  
for data analysis



## Analyse – Big data & traffic

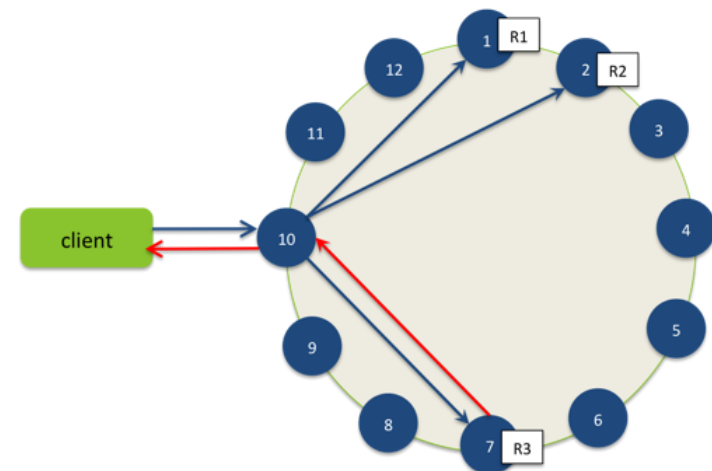
3m road segments in BeNeLux

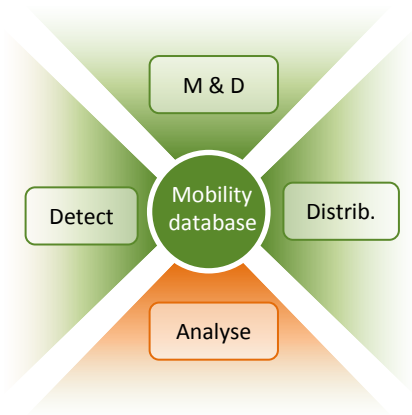
Every minute a new value on each segment =  $4 * 10^9$  records a day



Partitioning  
Replication

All historical data  
Database cluster





3m road segments in BeNeLux

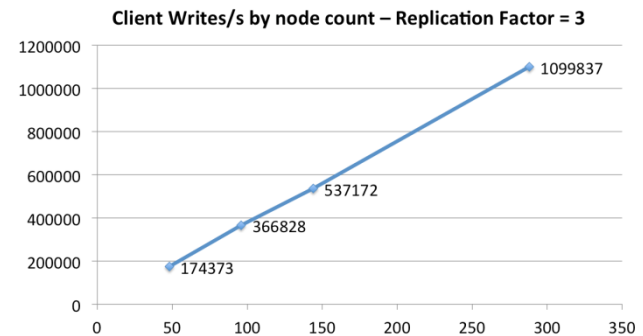
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All historical data  
Database cluster

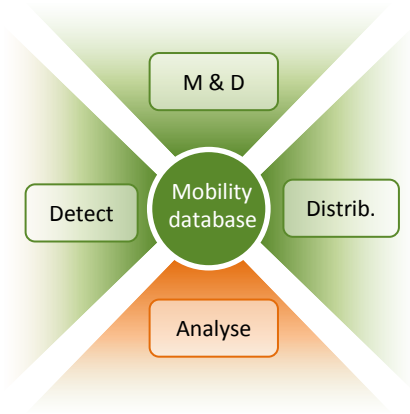
Scalability

Scale-Up Linearity



## *Analyse – Big data & traffic*

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3m road segments in BeNeLux

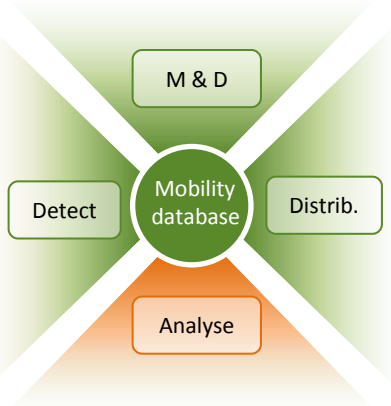
Every minute a new value on each segment =  $4 * 10^9$  records a day



All historical data  
Database cluster



Last 24 hours  
In memory database



Most governments still store their traffic data locally

Traffic data collection as a service

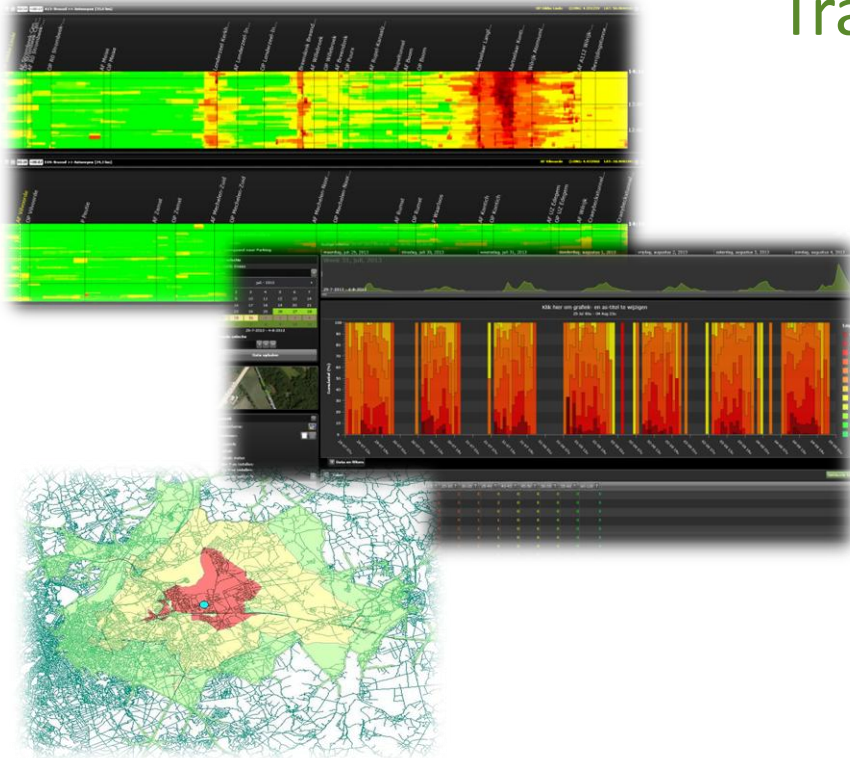
Upload & validate your own data

Analyse your data

Correlate with FCD

Data centralisation

Different data sources





Q & A

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