



Network Operations - the role of information

Use of floating car data in network operations

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Vlaamse overheid





Outline

- Floating Car Data
 - what ?
 - the innovative aspect
 - the added value
- How to deploy?
- What next?

Network Operations \approx monitoring

‘Network Operations’ \approx measures & scenario’s

→ measures

to inform, guide and steer (\approx equipment)

→ scenario’s

traffic management plans & co-operation

→ knowledge: capacity of the network & real time status

‘Network operations’ starts
with (real time) monitoring of the traffic status

Floating Car Data ?

= instrument for monitoring the *traffic status*

by tracking the behaviour
of *individual vehicles*
that are part of the flow

knowledge of behaviour of ++ individual vehicles

(▶ **modeling**)

▶ **behaviour of traffic flows**

Floating Car Data ?

'moving' = '*floating*'

moving individual vehicles \approx (floating) **probes**

▶ **FCD = monitoring floating probes**

\approx collecting time & space information

▶ **trajects, vehicle speeds, travel times**

Conventional monitoring techniques...



cameras



inductive loops

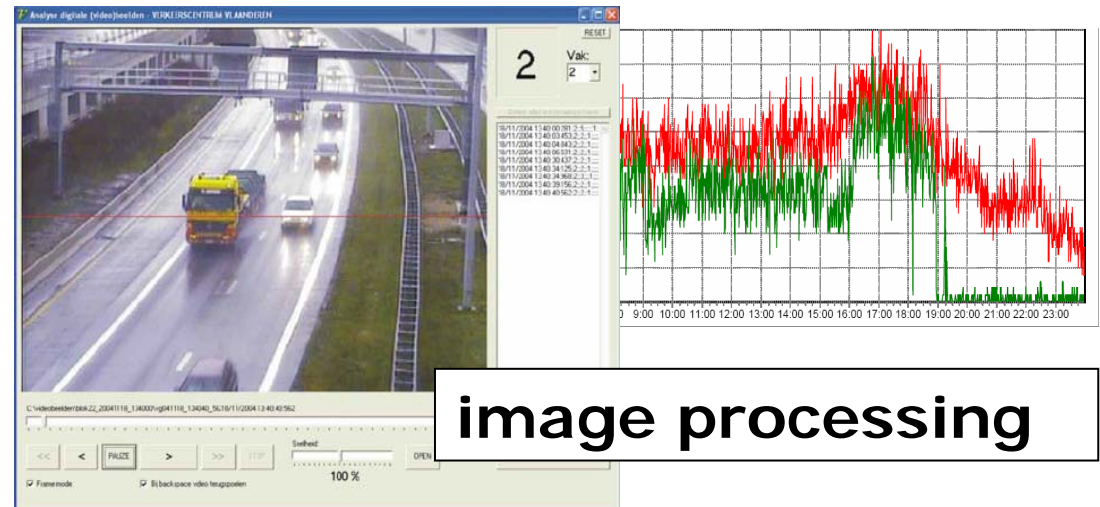



image processing

Conventional monitoring techniques...

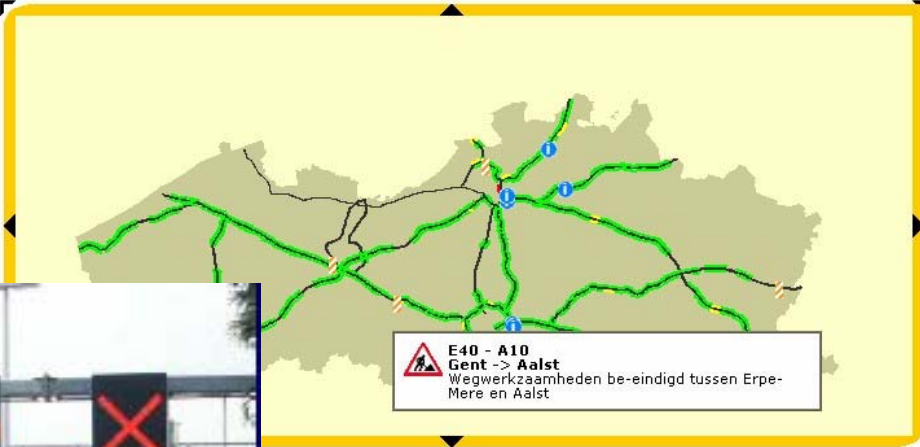
Belangrijke informatie 

E40 - A10 Gent -> Aalst
Wegwerkzaamheden be-eindigd tussen Erpe-Mere en Aalst

(1/5)

kaart | overzicht | verkeerscentrum | projecten | links | contact

Situatie op vrijdag 18 februari 2005 13:50 (automatisch laden actuele gegevens)



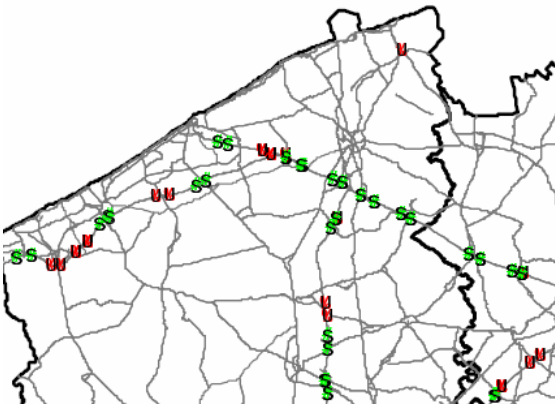
INKLEURINGEN

- verkeersafwikkeling
- incidenten >
- wegenwerken >
- info >
- Actuele situatie
- Geplande situaties

REGIO

- Vlaanderen
- Vlaamse Ruit
- Antwerpen
- Brussel
- Gent

normaal verkeer



... input for traffic management & Info

Conventional monitoring techniques ...

- are usually based on roadside equipment
- use (fixed) data communication networks

But...

- are *per definition* discontinually positioned
- are highly vulnerable (cfr work zones)
- are expensive in procurement & maintenance

Issue

***Question:* are traditional monitoring techniques able to deliver the level of detail *and* the geographical coverage**

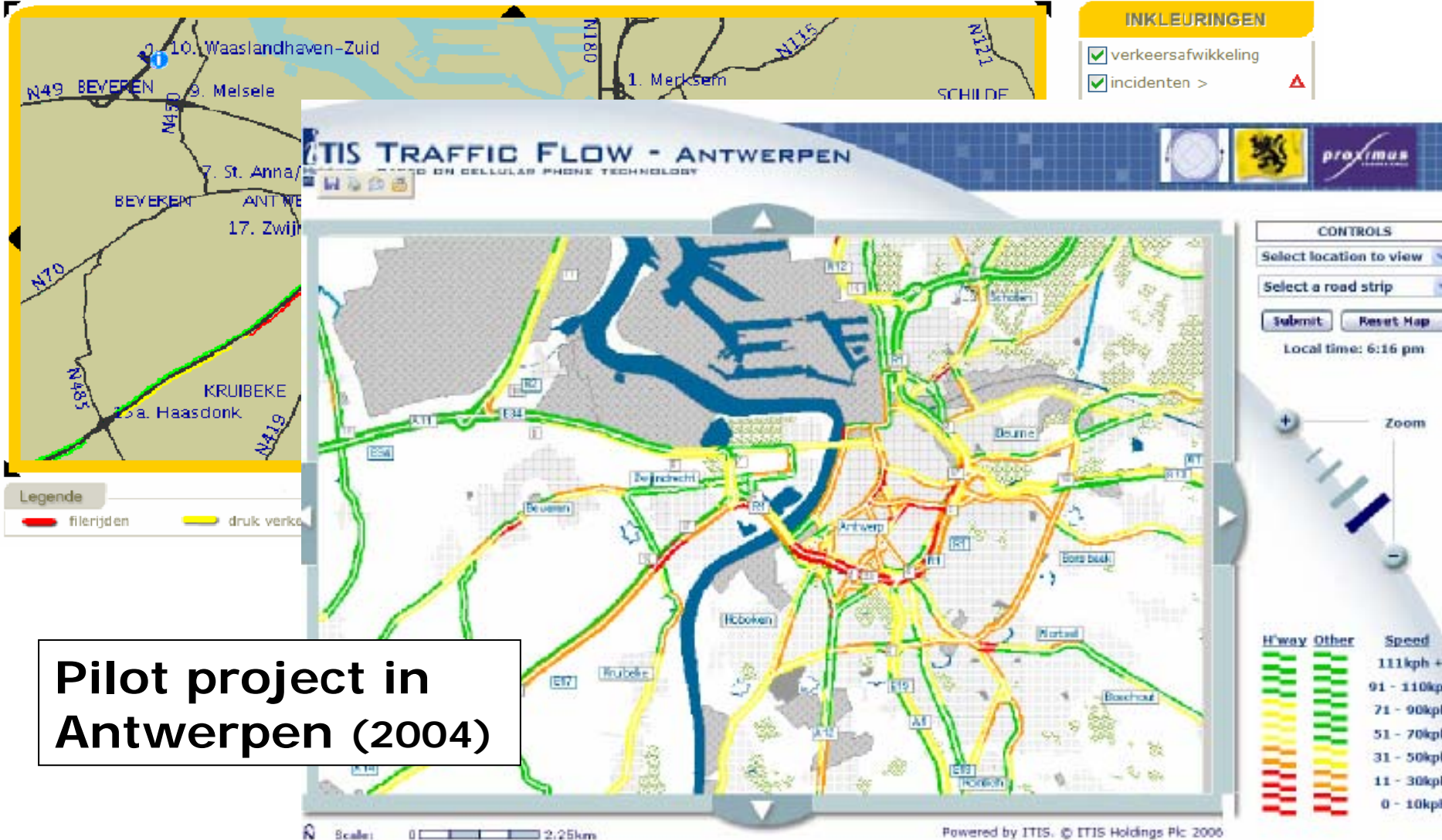
that is needed, for realising

- **dynamic traffic management**
- **personalised travel assistance & guidance**

according to the requirements and the needs of today's operators and customers?

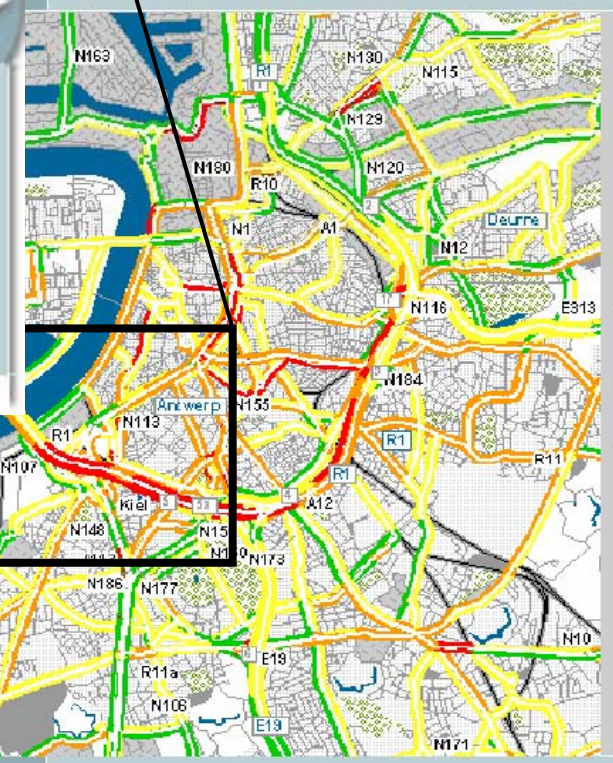
Comparing the results...

Situatie op donderdag 12 oktober 2006 18:19 (automatisch laden actuele gegevens)



Pilot project in Antwerpen (2004)

FCD: increased level of detail & scope



Pilot project in Antwerpen (2004)

Network Operations: FCD

Scale: 0 1.5km

How to deploy Floating Car Data ?

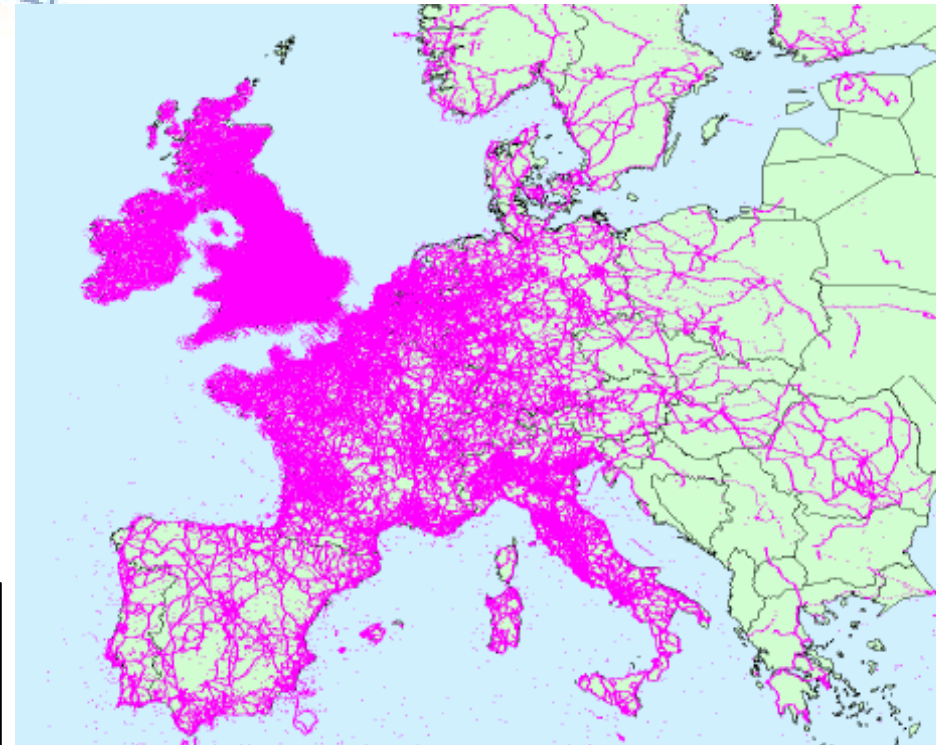
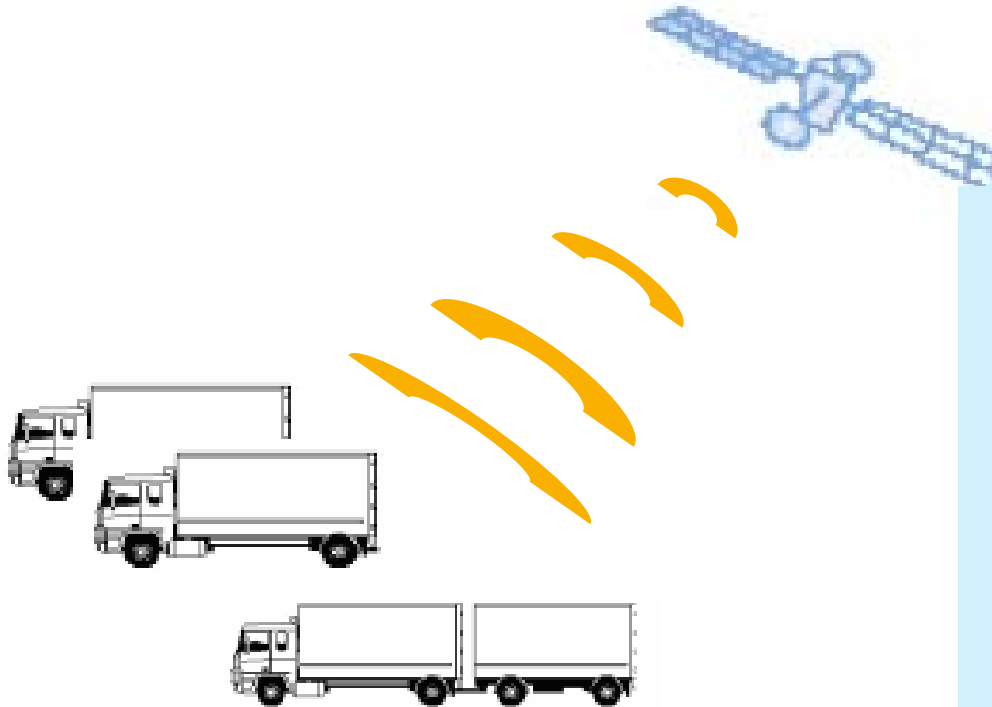
FCD = collecting time-space information from vehicles

→ by collecting information from *devices on board...*

- dedicated (tracing & tracking) gps-modules
- fleet management systems

Floating Car Data – gps tracking

Using gps or
Fleet Mangt Systems



How to deploy Floating Car Data ?

FCD = collecting time-space information from vehicles

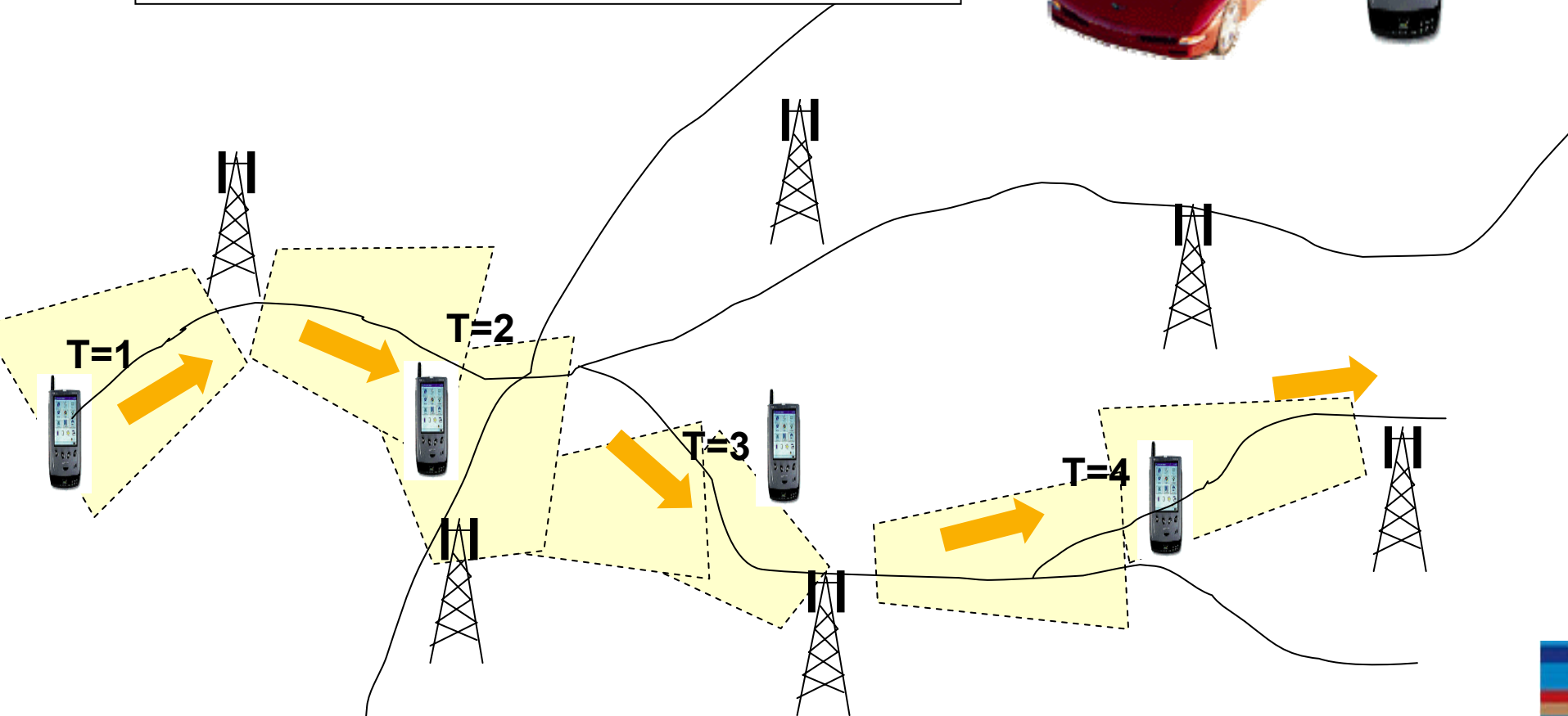
→ by collecting information from *devices on board...*

- dedicated (tracing & tracking) gps-modules
- fleet management systems

- mobile phones

Cellular Floating Car Data

= tracking of
'moving' mobile phones



Follow up of the moving vehicle by using the 'handover data'

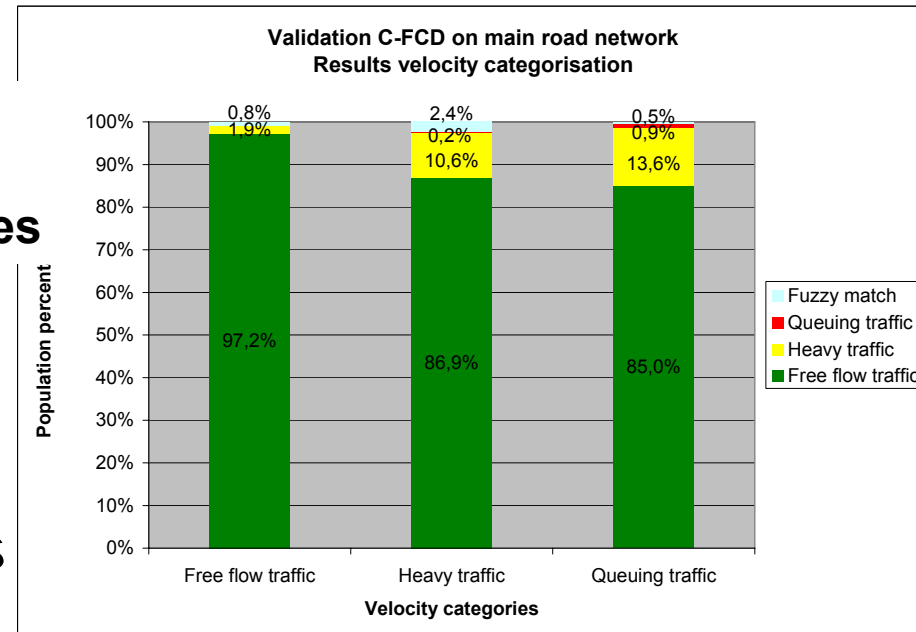
Cellular FCD - validation

Source: Antwerp pilot (2004)

C-FCD compared to ≠ reference sources

≠ reference data sources

- inductive loops
- camera images
- number plate recognition



Cellular FCD - validation

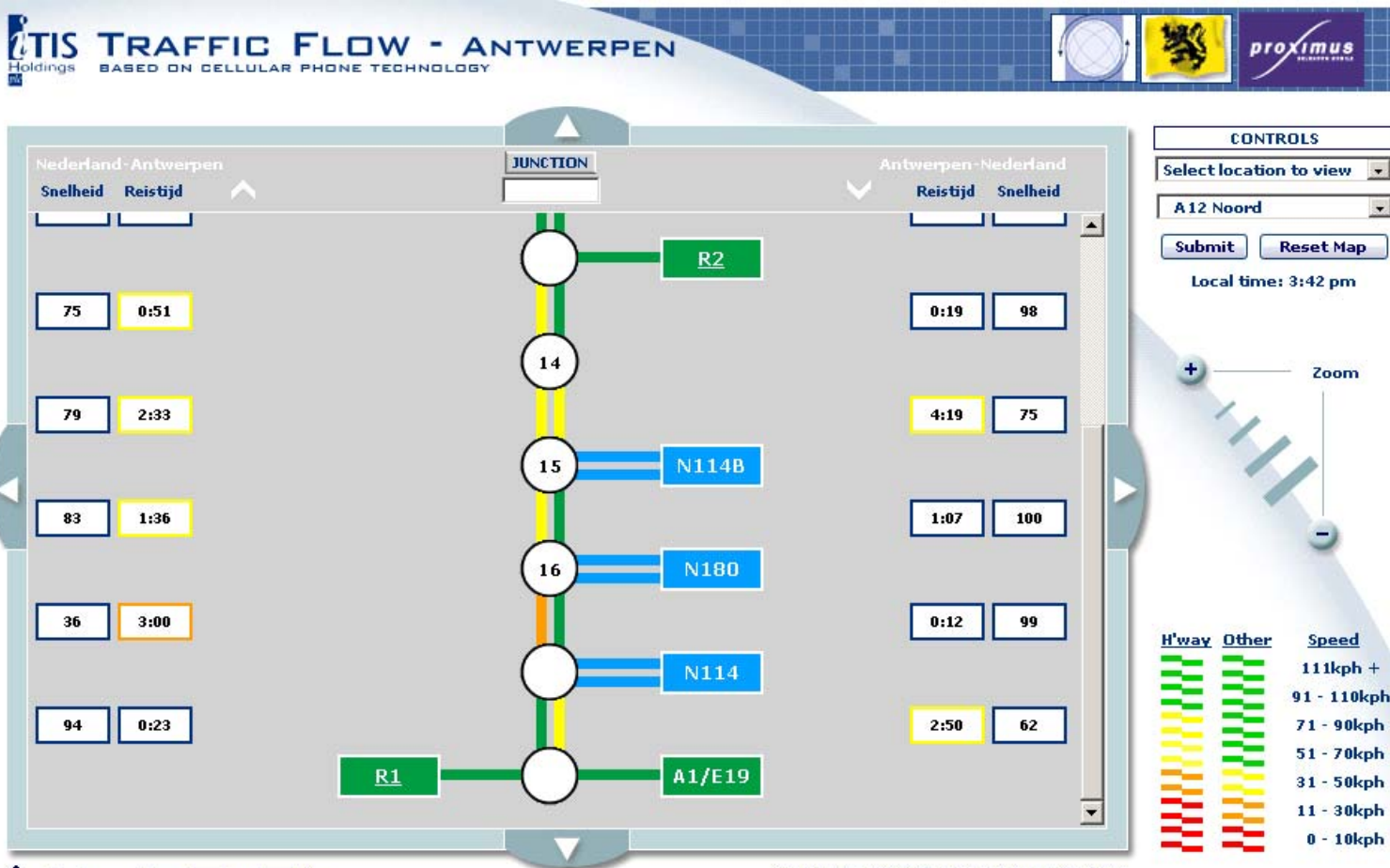
Source: Antwerp pilot (2004)

C-FCD compared to \neq reference sources

Result: **Motorways & underlying Network:**

- ▶ **C-FCD usually indicates right trend**
 - excellent match in free flow conditions
 - less accurate in queuing conditions/
slow traffic not always correctly detected
- ▶ better results in case of longer stretches

FCD: typical output information

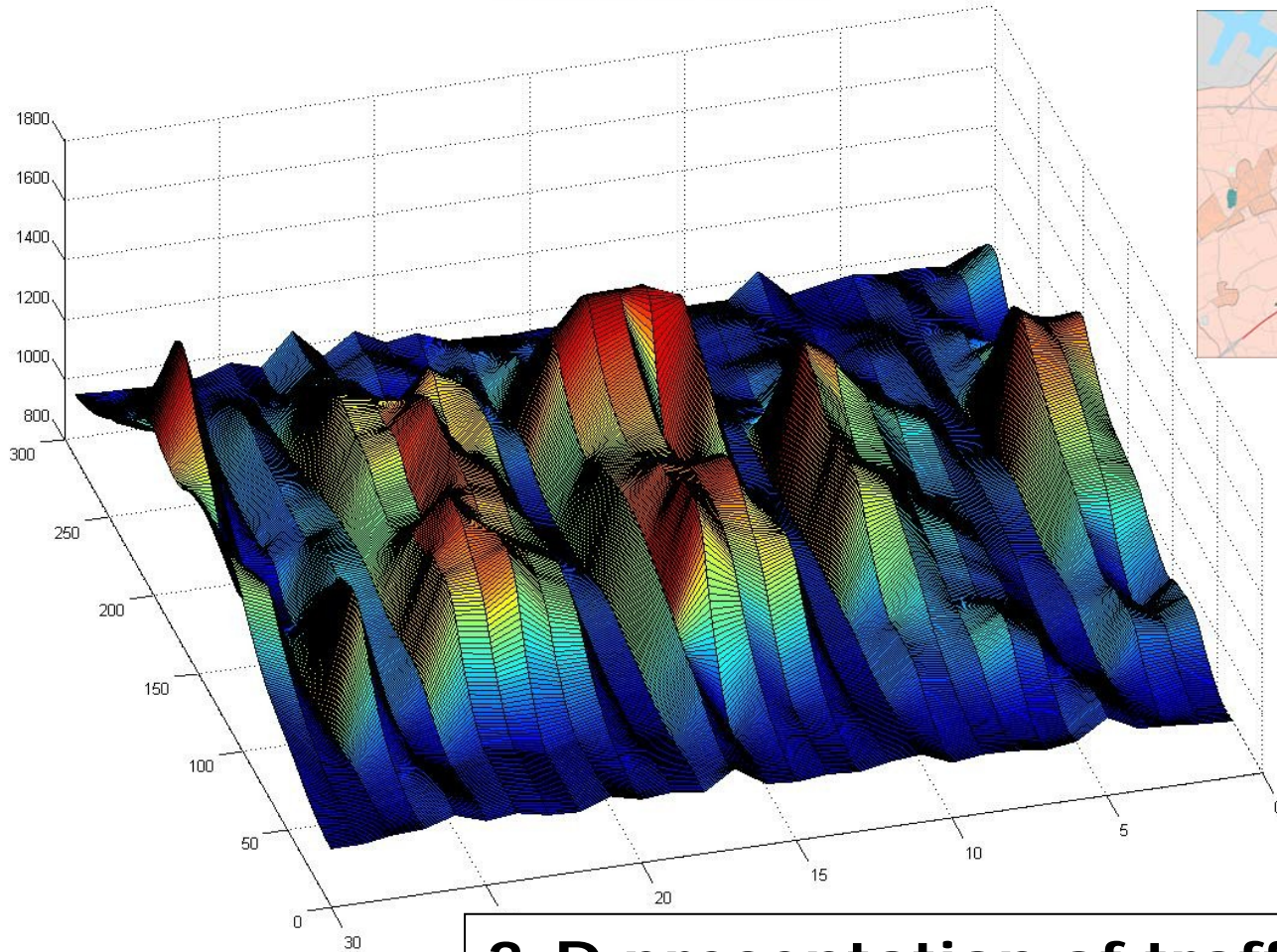


Graphical

Strip Maps: values of (real time) travel time & average Flow Velocity per segment

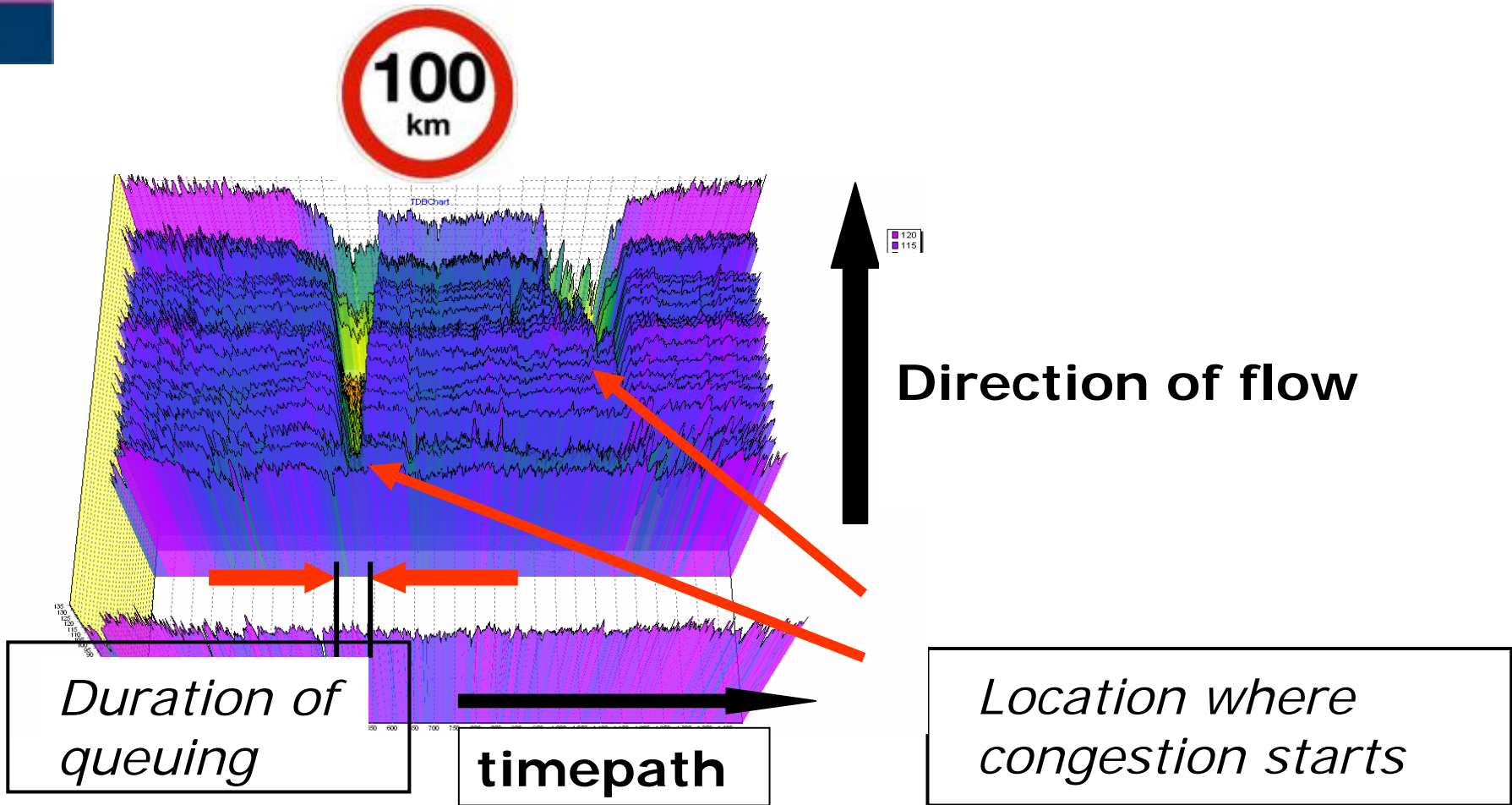
FCD: advanced output information

Travel Time Pattern on June - CounterClockwise



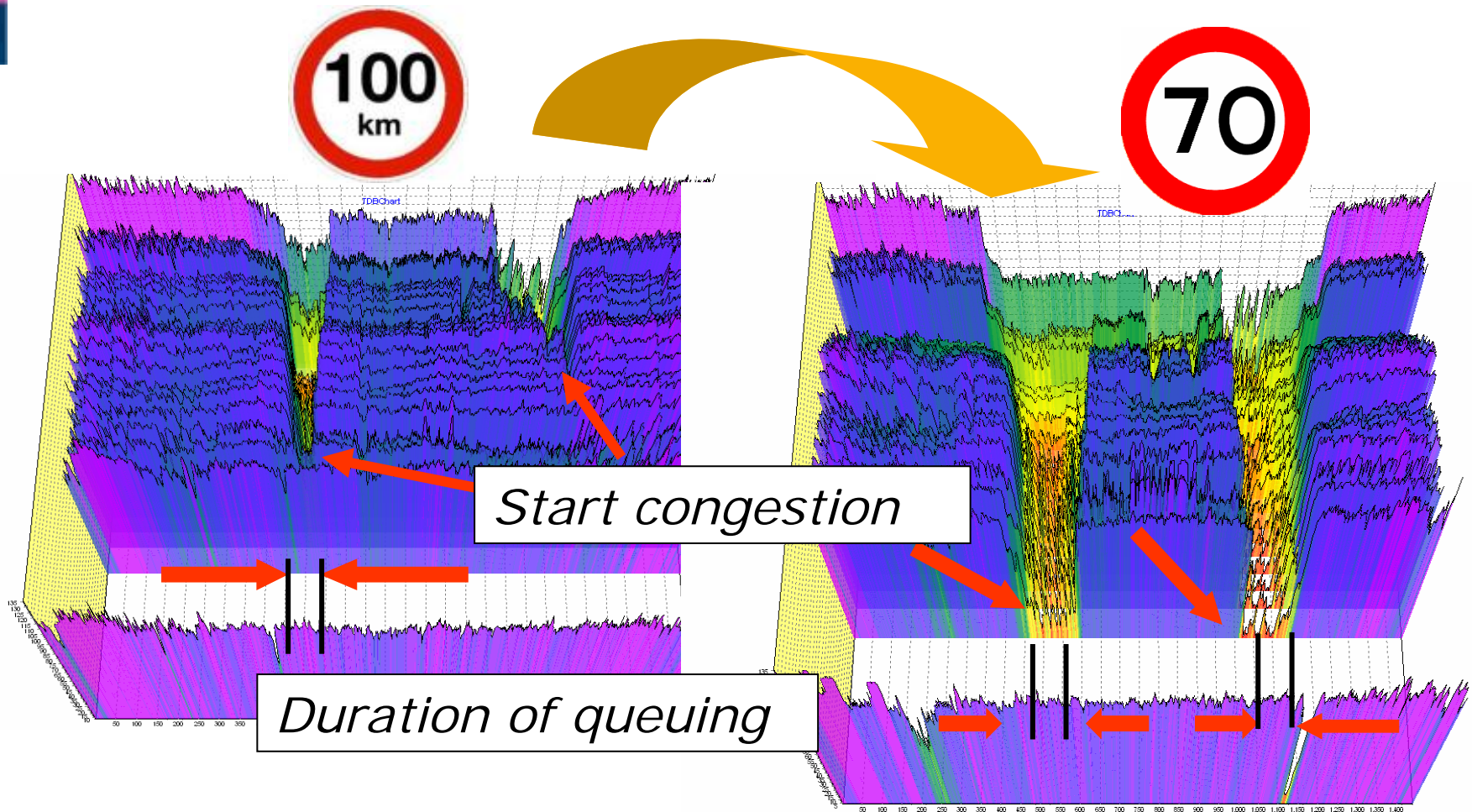
3-D presentation of traffic fluidity

FCD: advanced output information



Flow analysis: effect of modifying maximum speed

FCD: advanced output information



Flow analysis: effect of modifying maximum speed

Potential of (Cellular) FCD technology

▶ more detailed traffic data

- Underlying network
- No need for road side equipment
 - * work zones
 - * avoid (temporarily) malfunction system

▶ real time traffic information: speed & travel times

! FCD can not substitute for live camera images

➔ should be considered as an (excellent) extension

Floating Car Data: costs?

Table: Equipment costs for roadside detection

Unit Cost Element	Lifetime	Unit Cost	O&M Cost US\$ 000
Inductive Loop Surveillance on Corridor	10	3 - 8	0.5 - 0.8
Inductive Loop Surveillance at Intersection	10	1 - 2	1 - 1.6
Machine Vision	10	1 - 2	0.7 - 1.0
Machine Vision Sensor at Intersection	10	15 - 25.7	0.7 - 1.0
Passive Acoustic Sensor on Corridor	10	3 - 4	0.2 - 0.4
Passive Acoustic Sensor at Intersection	10	1 - 2	0.2 - 0.4
Microwave Sensor on Corridor	10	0.5 - 1	0.1
Microwave Sensor at Intersection	10	18	0.1
Infrared Detector - Active	10	6 - 14	
Infrared Detector - Passive	10	0.7 - 1.2	
CCTV Video	10	7.5 - 17	1.5 - 2.4
CCTV Video at Intersection	20	2 - 12	
Portable Monitoring System	15	5 - 15	
Portable Traffic Management System	15	80 - 100	

Source: Department of Transport, USA

+/- comparable, but all depends on the implementation

1. Ongoing projects

1. Netherlands: province of North Brabant
2. USA: Baltimore – real time traffic data
3. Sweden: Stockholm & Göteborg

2. Studies / pilot projects

1. Sweden: merging FCD & fixed stations' data
2. Norway (Oslo): trial
3. Finland: 1100 taxis equipped

3. Research projects:

1. Co-operative Systems (EU): **CVIS**

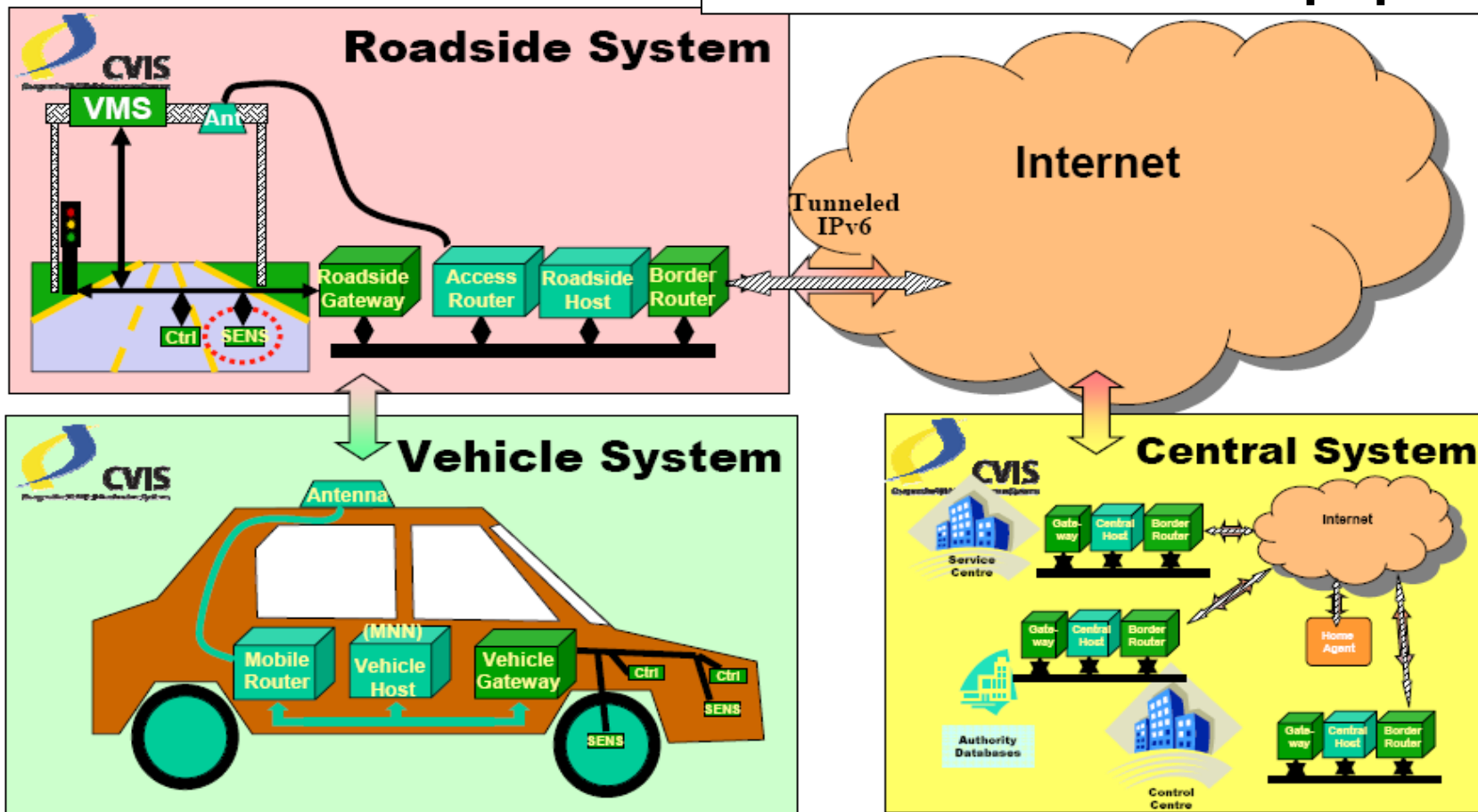
- Intelligent Vehicles \equiv Roadside Equipment
- communication V2V and V2I
- integrating probe data = X-FCD

2. Field Operational Tests (FOT)

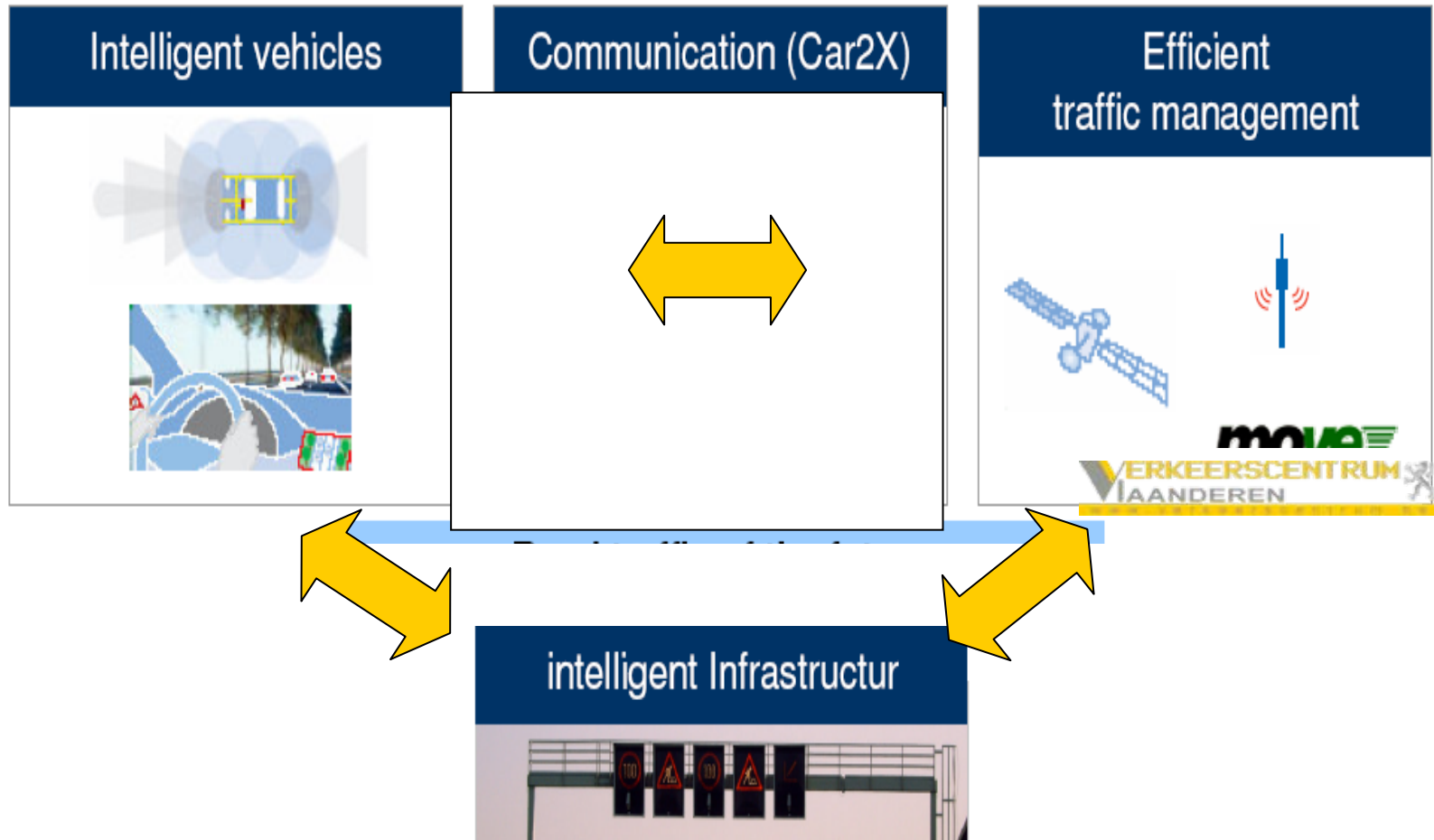
- large scale trials & assessment of results

Co-operative Vehicle-Infrastructure Systems

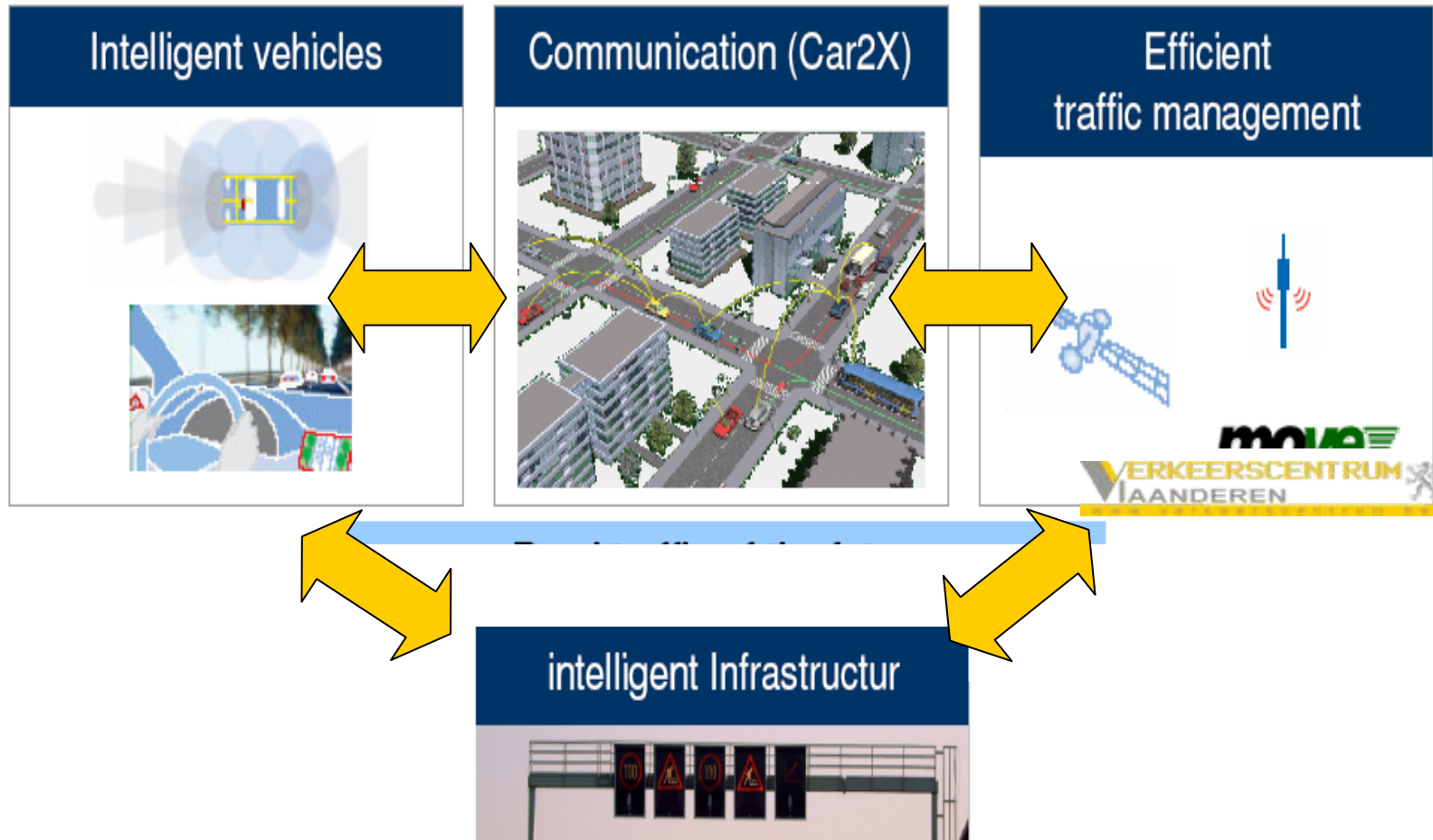
integrating the vehicle and the Roadside Equipment



FCD: incorporating the vehicle



FCD: incorporating the vehicle as a source for data & modus for info





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questions?

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