

Safe and efficient road traffic by integrated road-vehicle systems

Prof Dr Bart van Arem

AIDA research centre

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AIDA

- Research into Applications of Integrated Driver Assistance (AIDA)
- Human factors, traffic and transport modelling
- Established in 2003
 - University of Twente and TNO
 - Centre for Transport Studies, Faculty of Engineering Technology
 - CTIT SRO eProductivity
- www.aida.utwente.nl

Content

- Problems in road traffic
- Integrated road-vehicle systems
- Research questions
- Approach
- Results
- Challenges

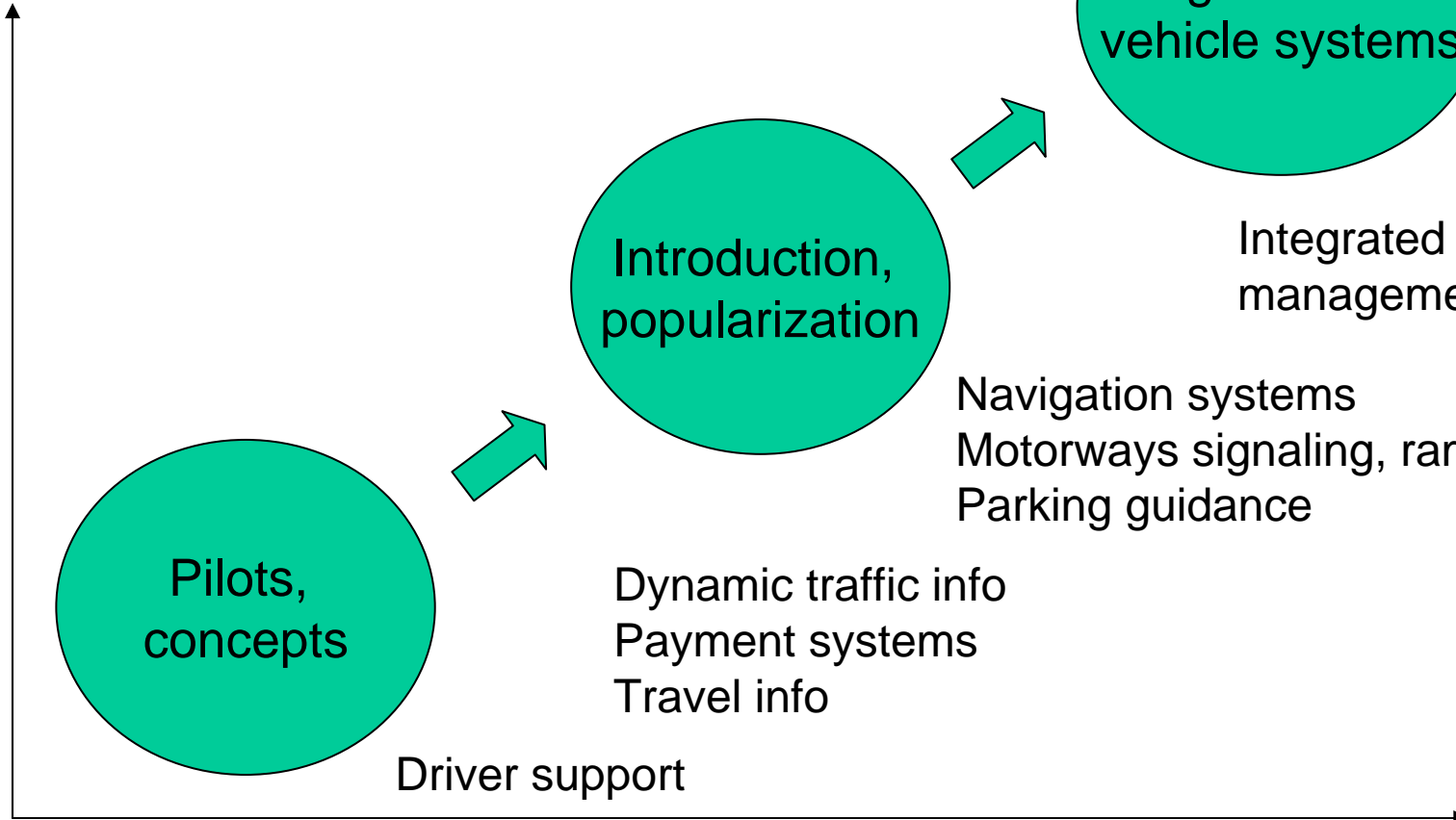
Road traffic

- Vital to society and economy
- Problems
 - Congestion: 1 Billion EUR
 - Accidents: 5 Billion EUR
 - Pollution
- In-vehicle systems proposed as part of the solution
 - eSafety Action Plan
 - Nota Mobiliteit



Toward integrated systems

Effectivity



Pilots,
concepts

Driver support

Introduction,
popularization

Dynamic traffic info
Payment systems
Travel info

Integrated road
vehicle systems

Integrated traffic
management

Navigation systems
Motorways signaling, ramp metering
Parking guidance

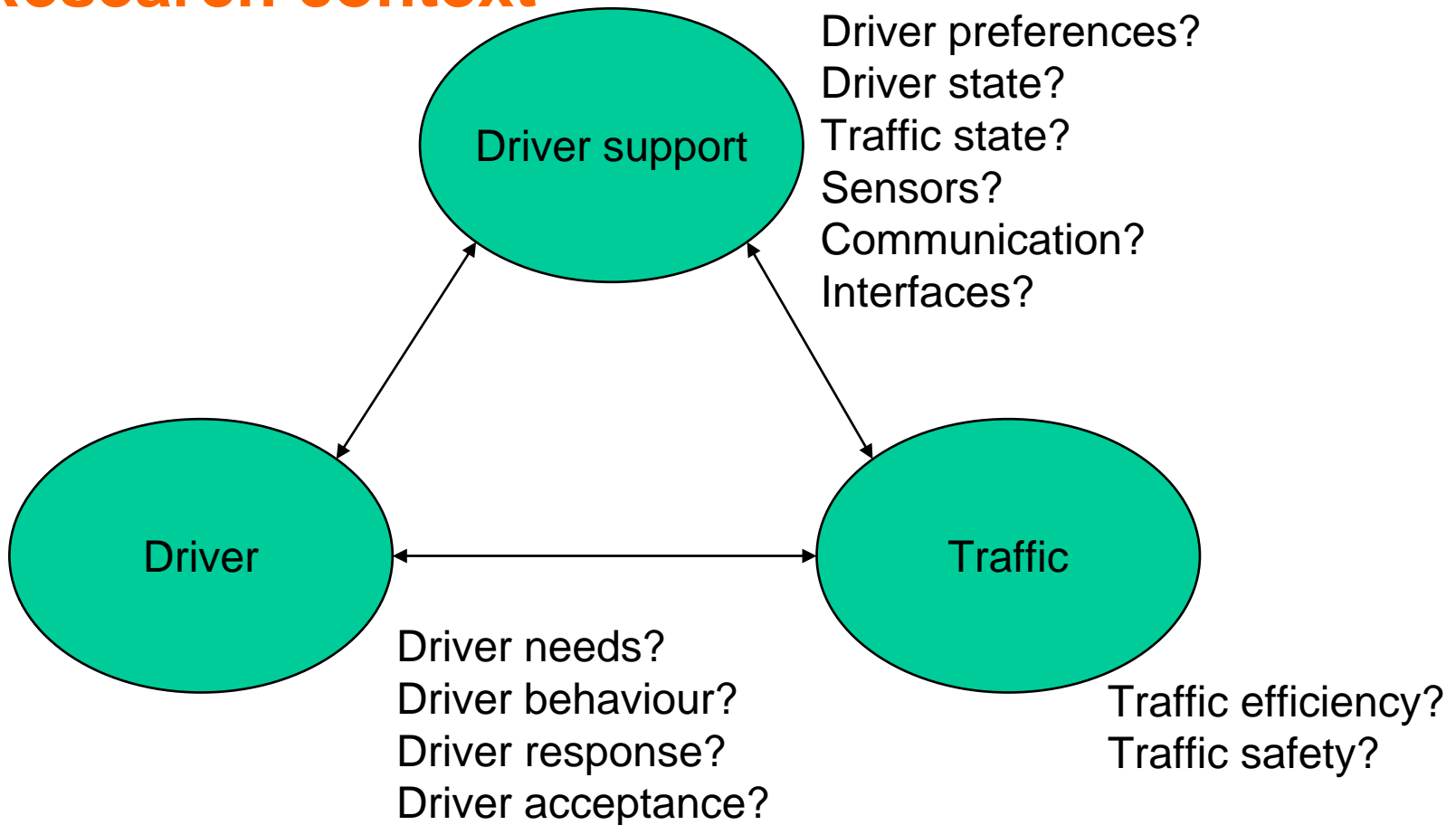
Complexity

Integrated road-vehicle systems

- Intersection safety
- Tunnel safety
- Safe lane changing
- Interactive route guidance
- Local danger warning
- Freight and fleet management
- Congestion management



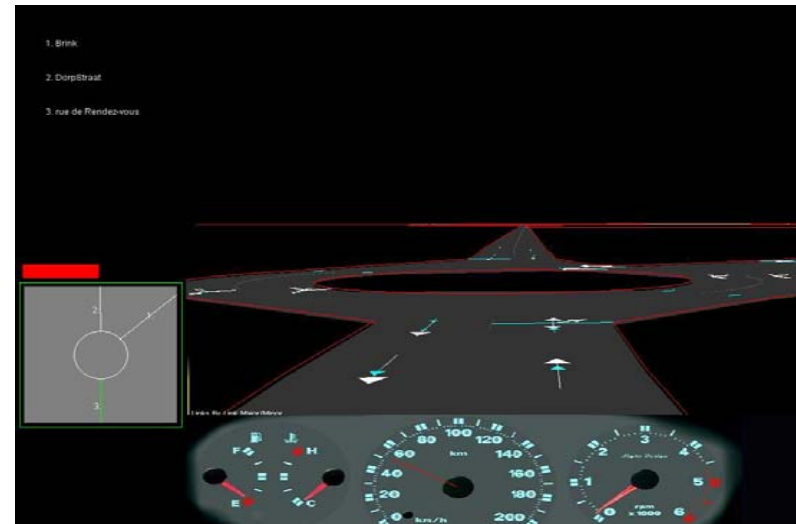
Research context



AIDA research tools



High fidelity driving simulator



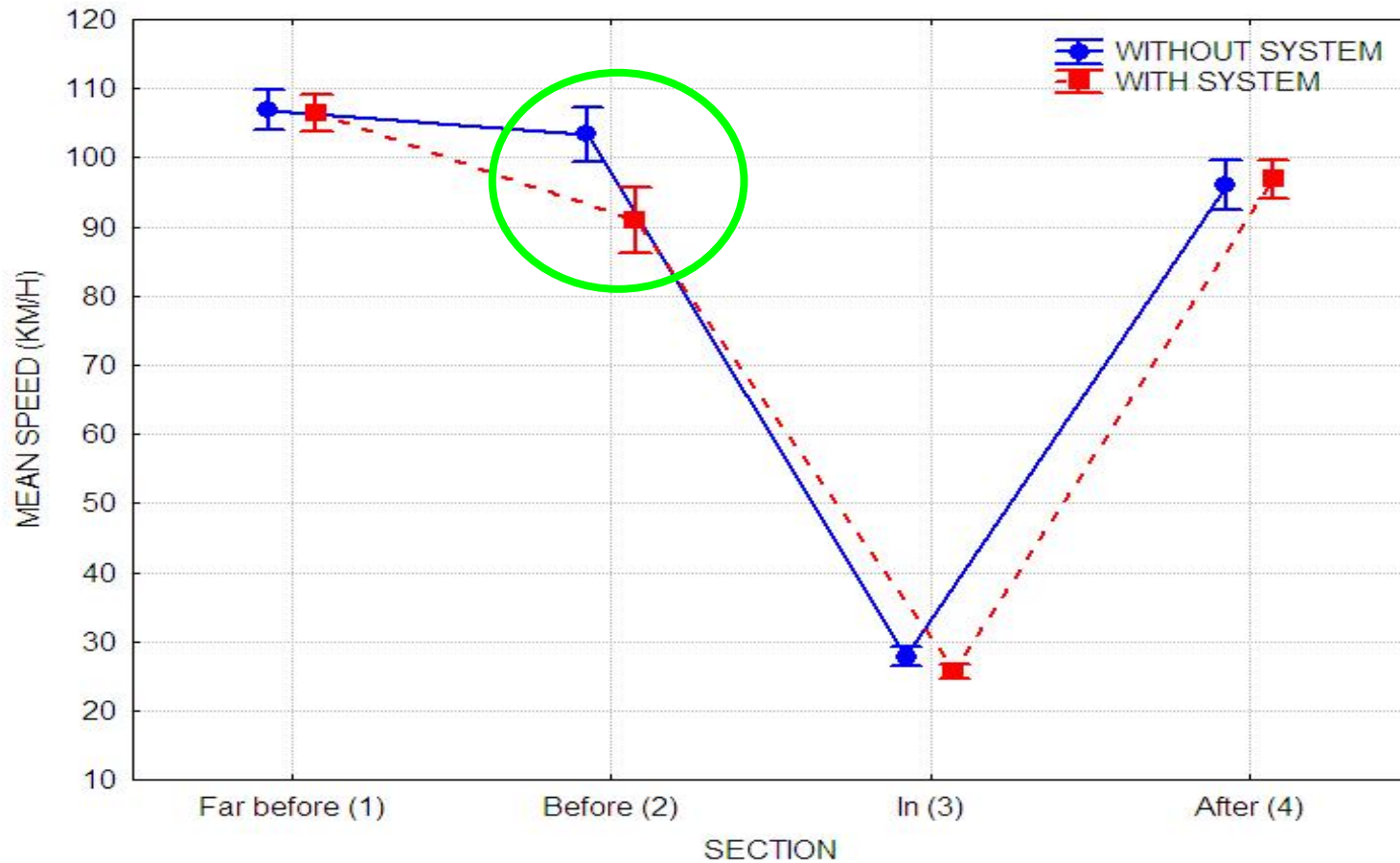
Interactive route choice simulator

The congestion assistant

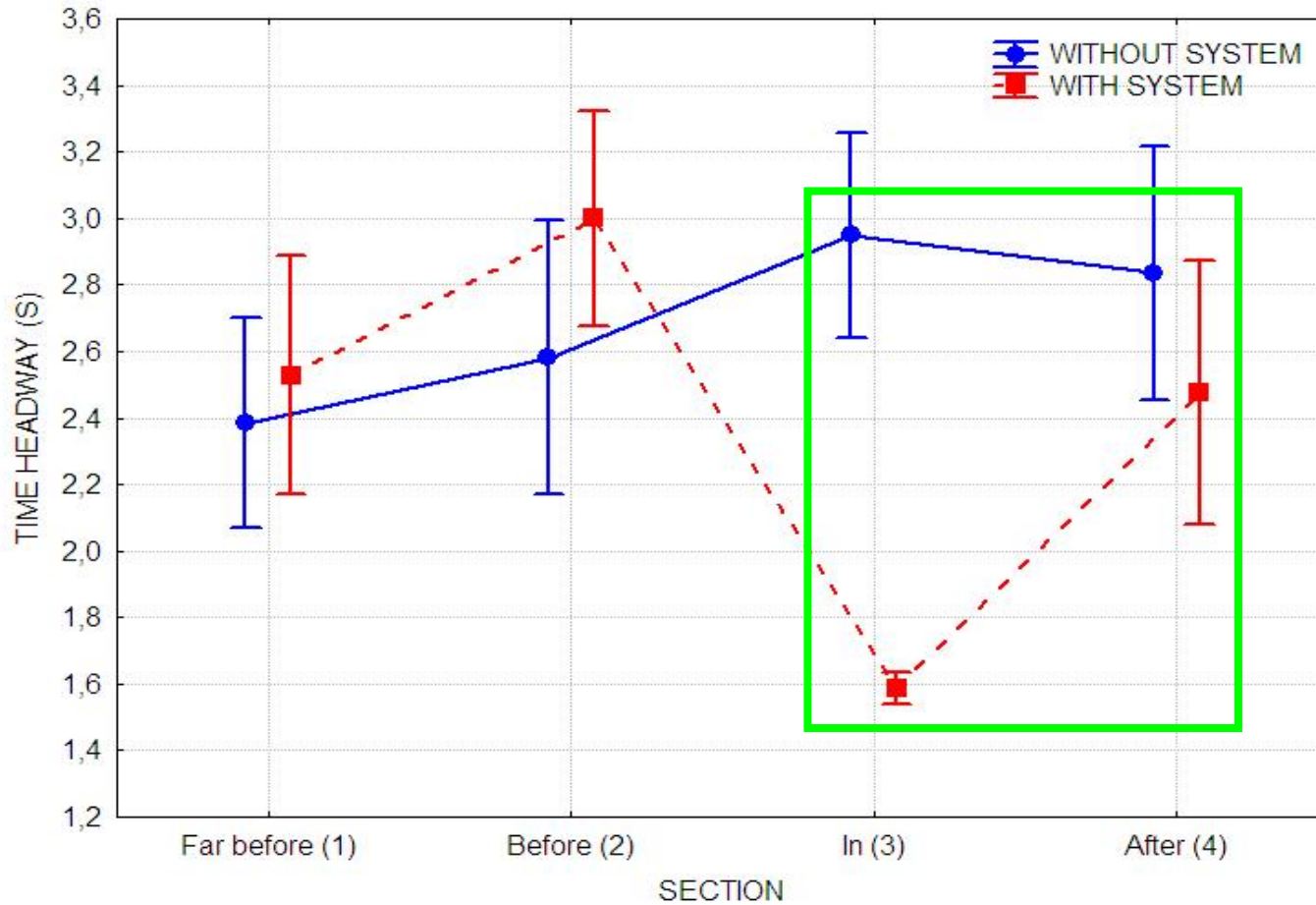
- Detects downstream congestion
- Visual and auditive warning starting at 5 km before congestion
- Active gas pedal at 1,5 km to smoothly slow down
- Takes over longitudinal driving task during congestion



Effects on mean speed

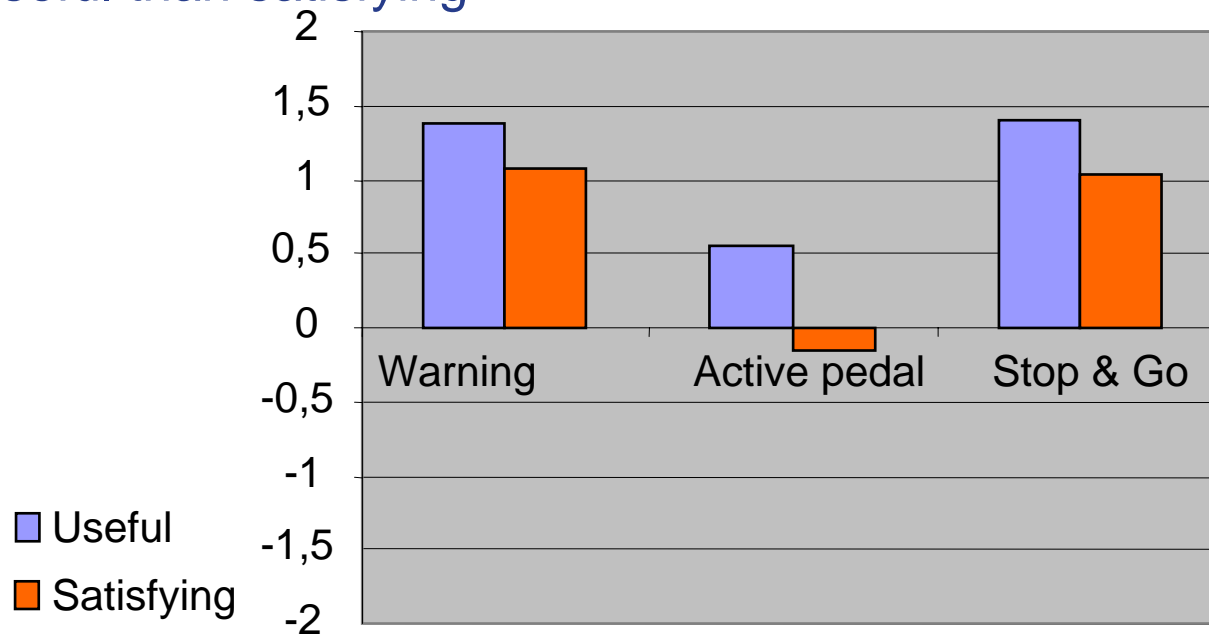


Effects on time headway



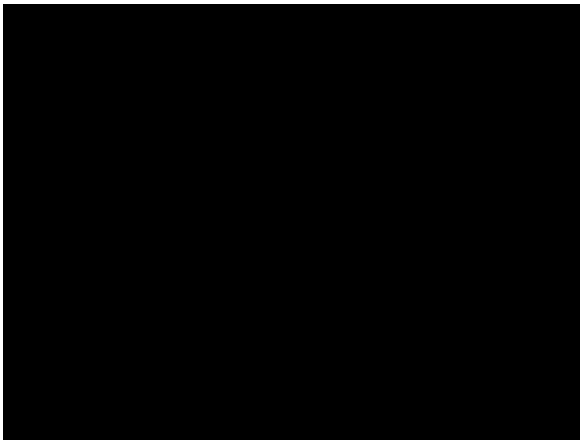
Acceptance (van der Laan scale)

- Van der Laan scale
- Warning and Stop & Go most accepted
- More useful than satisfying



Traffic flow simulation

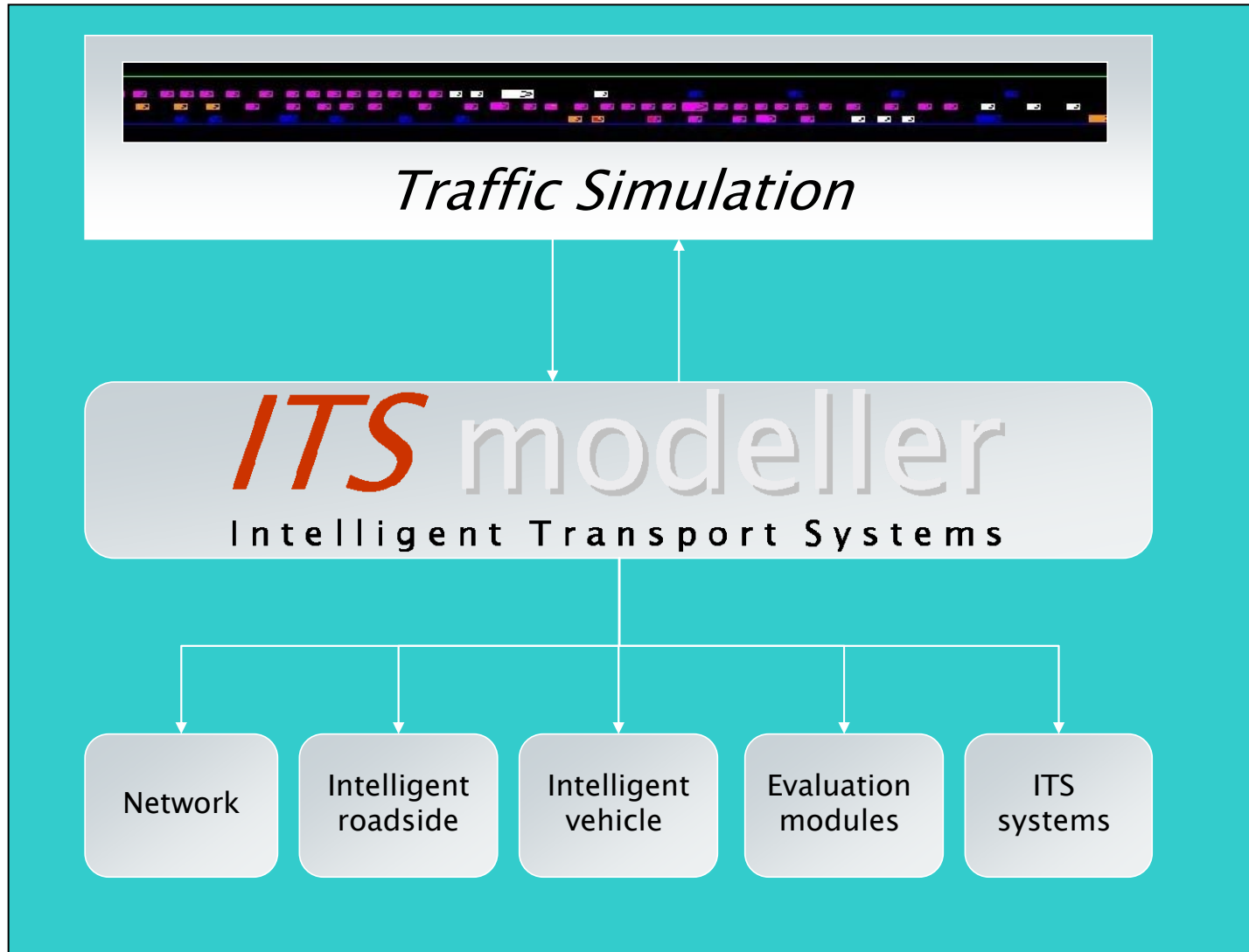
- Commercial models offer great graphics
- Relative black boxes regarding behaviour of drivers, vehicle and Intelligent Transport systems



Paramics

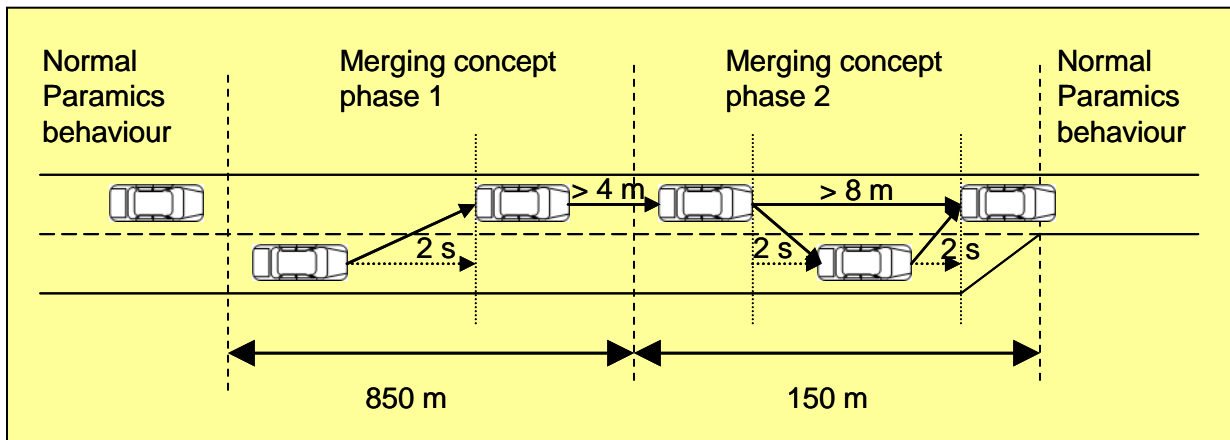


VISSIM



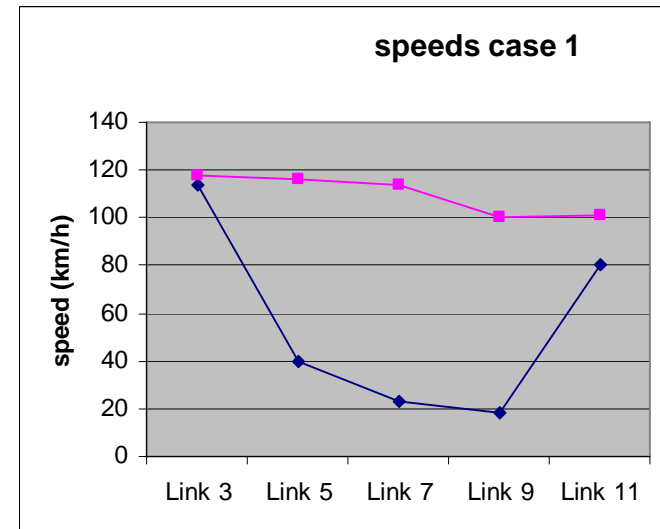
Communication based merging

- Vehicles determine status
 - Congestion: approaching, in, leaving
 - Merging
- Based on status vehicles
 - Create merging options
 - Merge
 - Harmonize speeds
 - Speed up



Results communication based merging

	Average travel time (min:sec)	Standard deviation travel time (min:sec)
Reference case	9:18	4:35
Merging concept	2:43	0:13



Conclusions

- Integrated road-vehicle systems offer
 - Value to the driver
 - Improved traffic efficiency and safety
- Tools for studying impacts on driver
 - Driving simulator, route choice simulator
- Tools for studying impacts on traffic
 - ITS Modeller with commercial simulation software
- Many applications possible

Challenge 1: Stimulate deployment

- FP6: SAFESPOT, CVIS, COOPERS, eImpact, NL test site
- NL: TRANSUMO, AIDA, V&W, Industry
- FP7: Large scale pilots, also in NL!
- Develop communication infrastructure with useful Day 1 applications:
 - Advance in-vehicle warning (traffic lights, curves, schools, accidents)
 - Floating car data
 - Interactive route guidance
 - Electronic Fee collection
 - Fleet management

Challenge 2: Make it SMART

- Communication technology
- Communication based sensing
- Context aware systems
- Distributed or hybrid control, agent based control
- Human Machine Interaction
- Develop policy and business cases
- Participation of industry and government is crucial

Outlook AIDA activities

- NIRICT Programme ICT & Mobility
- FP7: R&D and large scale pilots
- June 2008: IEEE Intelligent Vehicles in Enschede/Eindhoven



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