

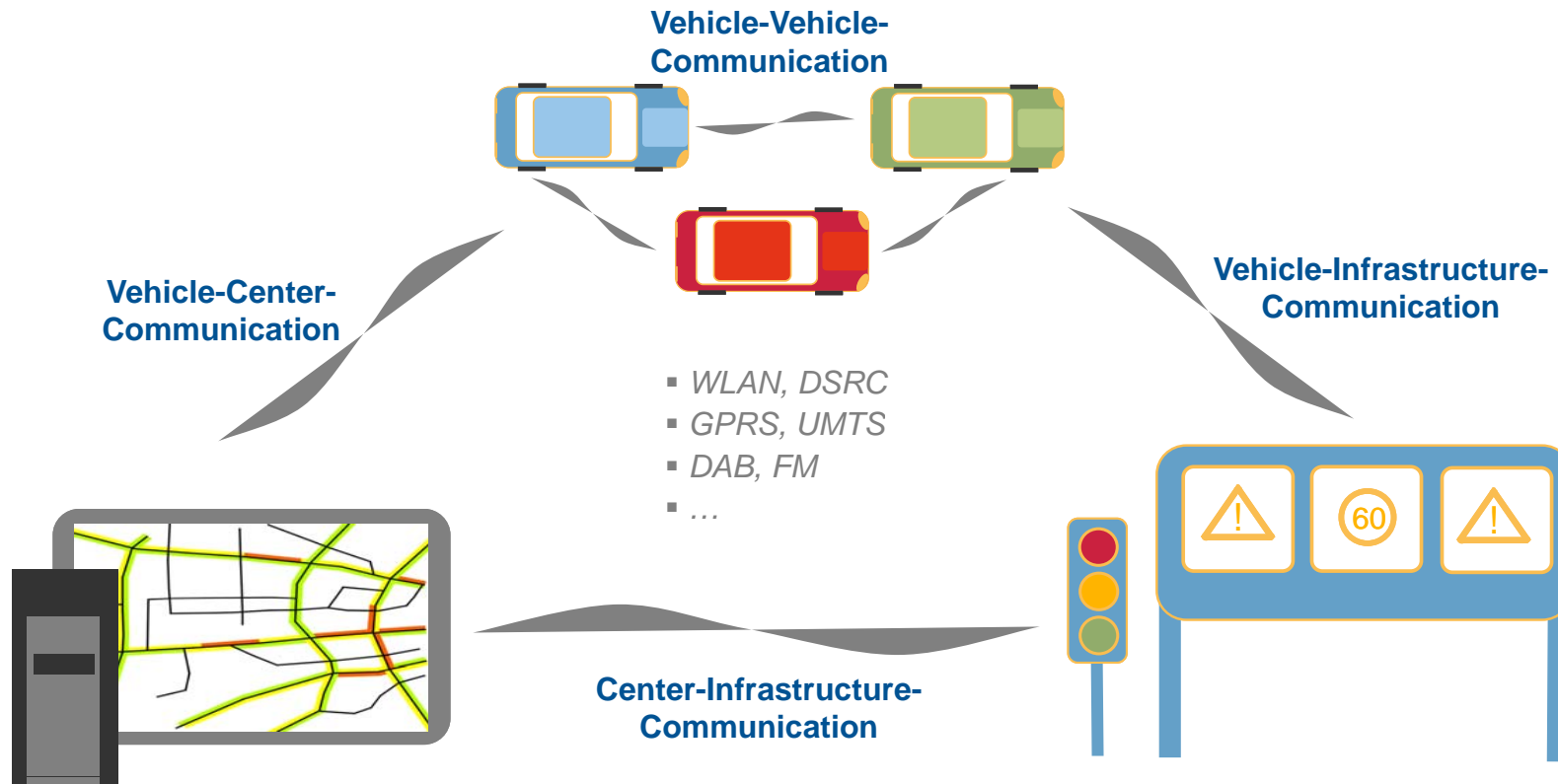
Simulative Identification of Possibilities and Impacts of V2X-Communication

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Traffic Simulation Workshop

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Motivation



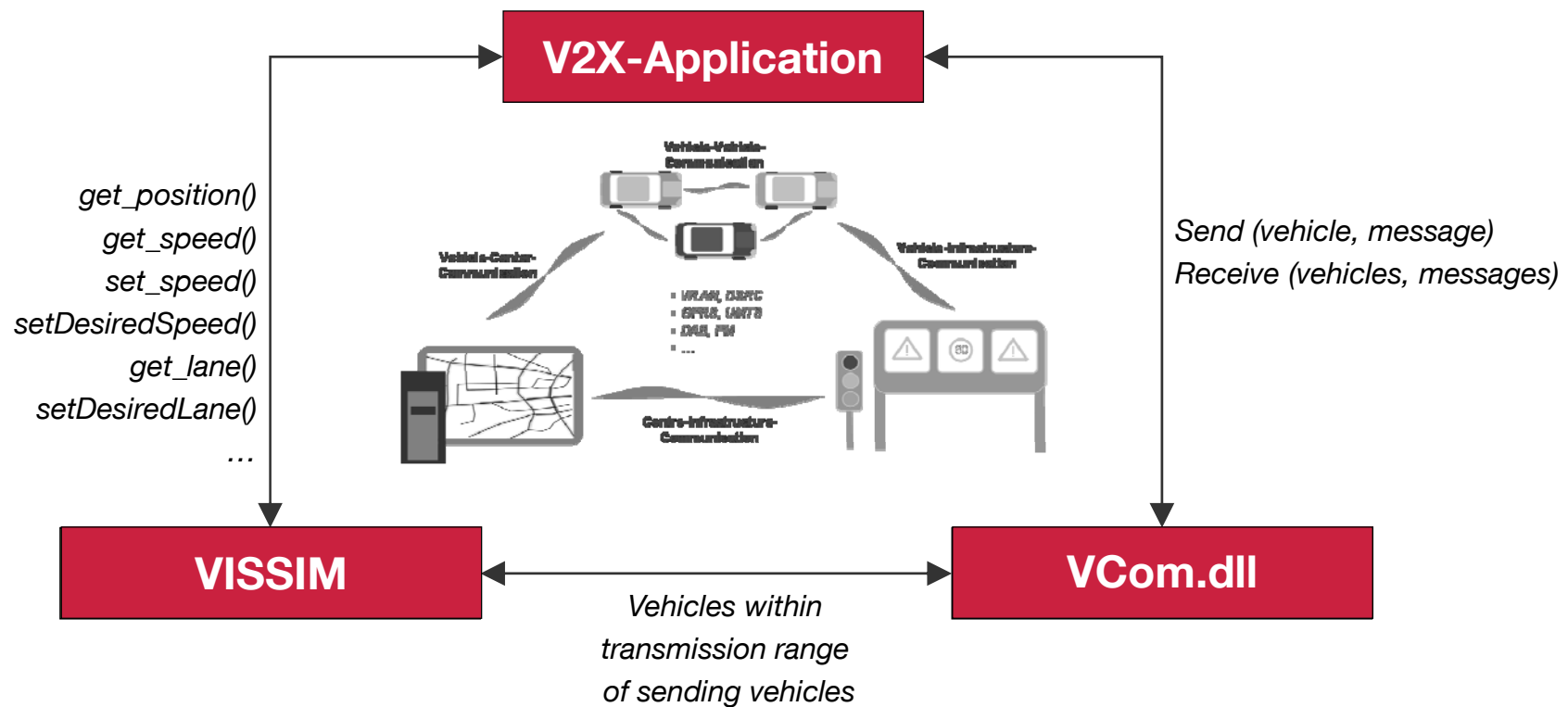
Motivation

- What kinds of applications are thinkable?
- What are the most efficient algorithms - thresholds?
 - ➔ **Simulation as a development assistance**
- Required penetration rates?
- What are the impacts?
 - *on traffic flow*
 - *traffic safety*
 - *environment, fuel consumption*
 - *data quality*
- ➔ **Simulation as an analysis assistance**
- Cost-Benefit-Analysis to assist investment decision

} *large-scale scenarios*



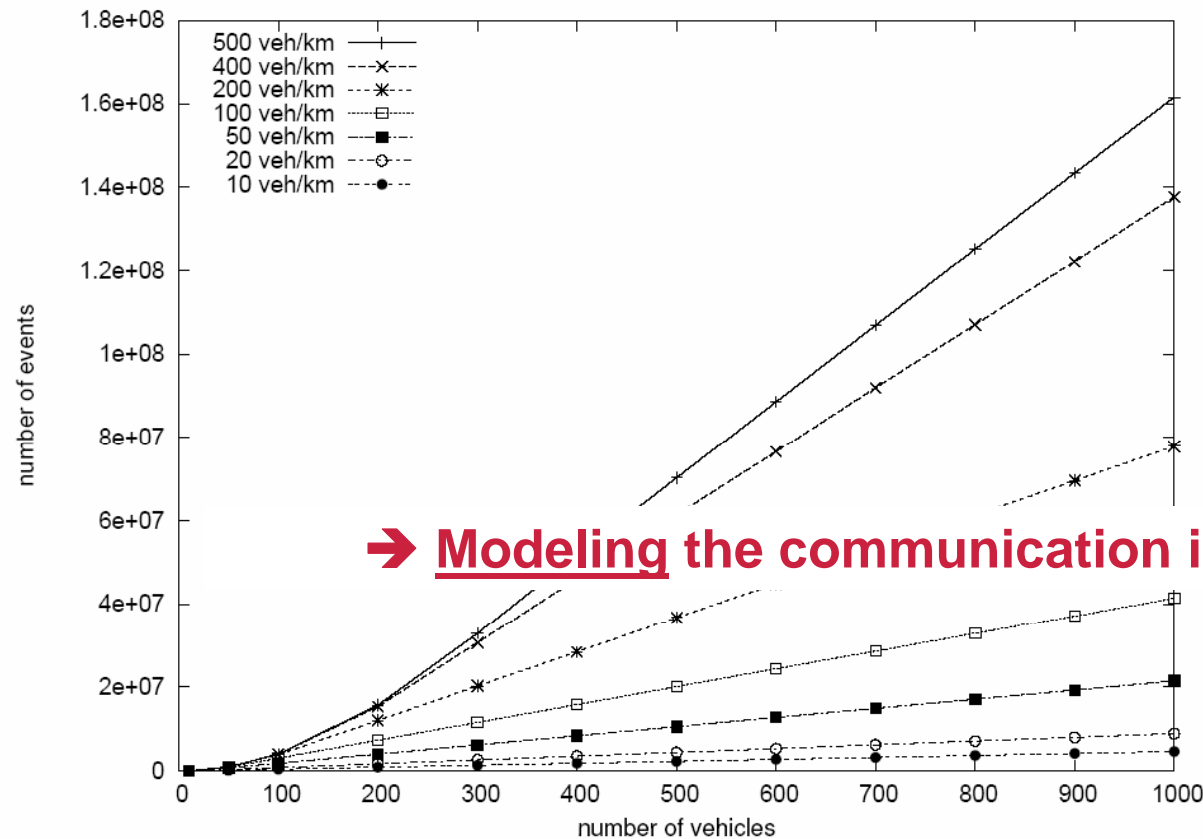
Simulative Approach - Architecture



Simulative Approach - Communication

Main Requirement:

Scalability: scenarios that are interesting easily comprise a few ten thousands of vehicles over tens of hundreds of kilometers.



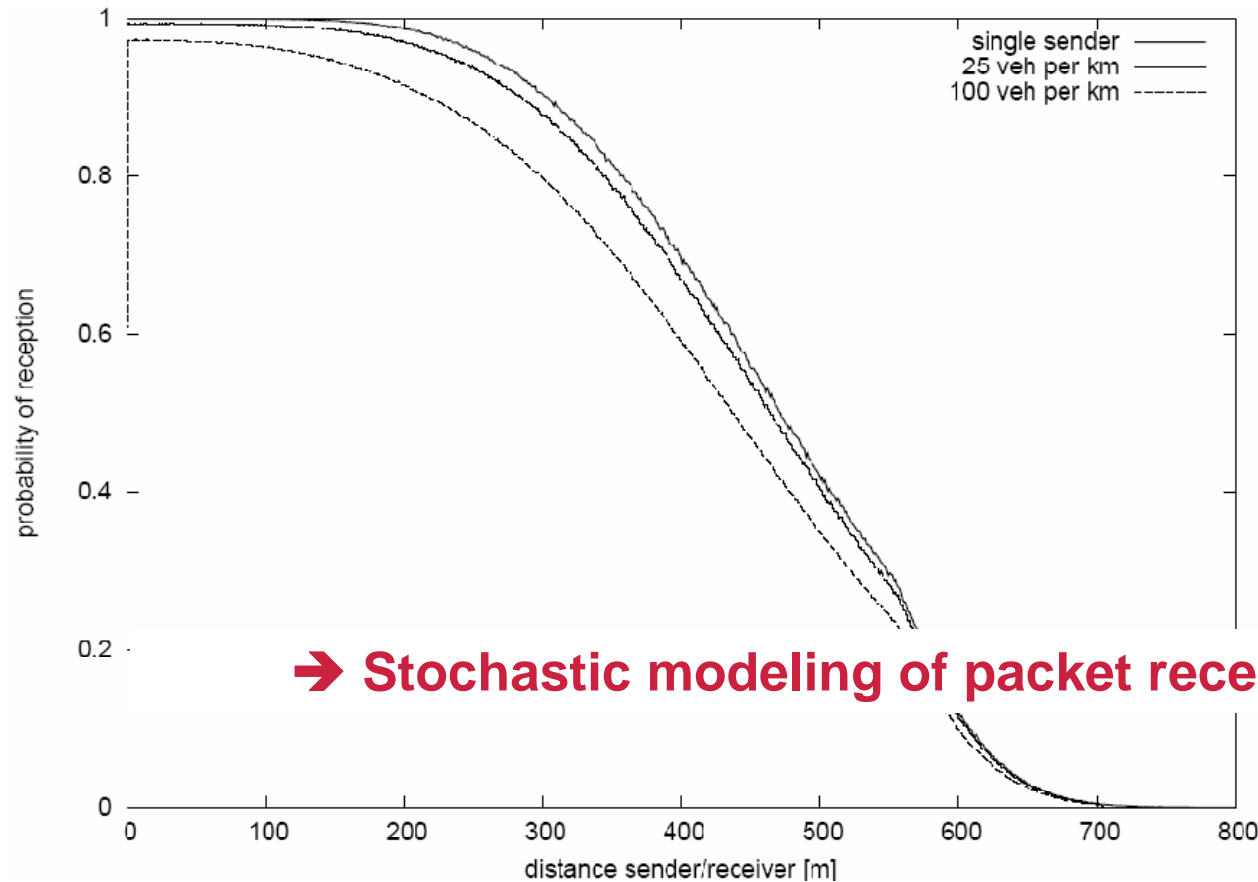
Beaconing

Number of scheduled events in NS-2 in dependency of the number of vehicles and of the traffic density. All scenarios ran 100s and each node broadcasted a single 500-byte packet each second.

→ Modeling the communication instead of simulating

Simulative Approach - Communication

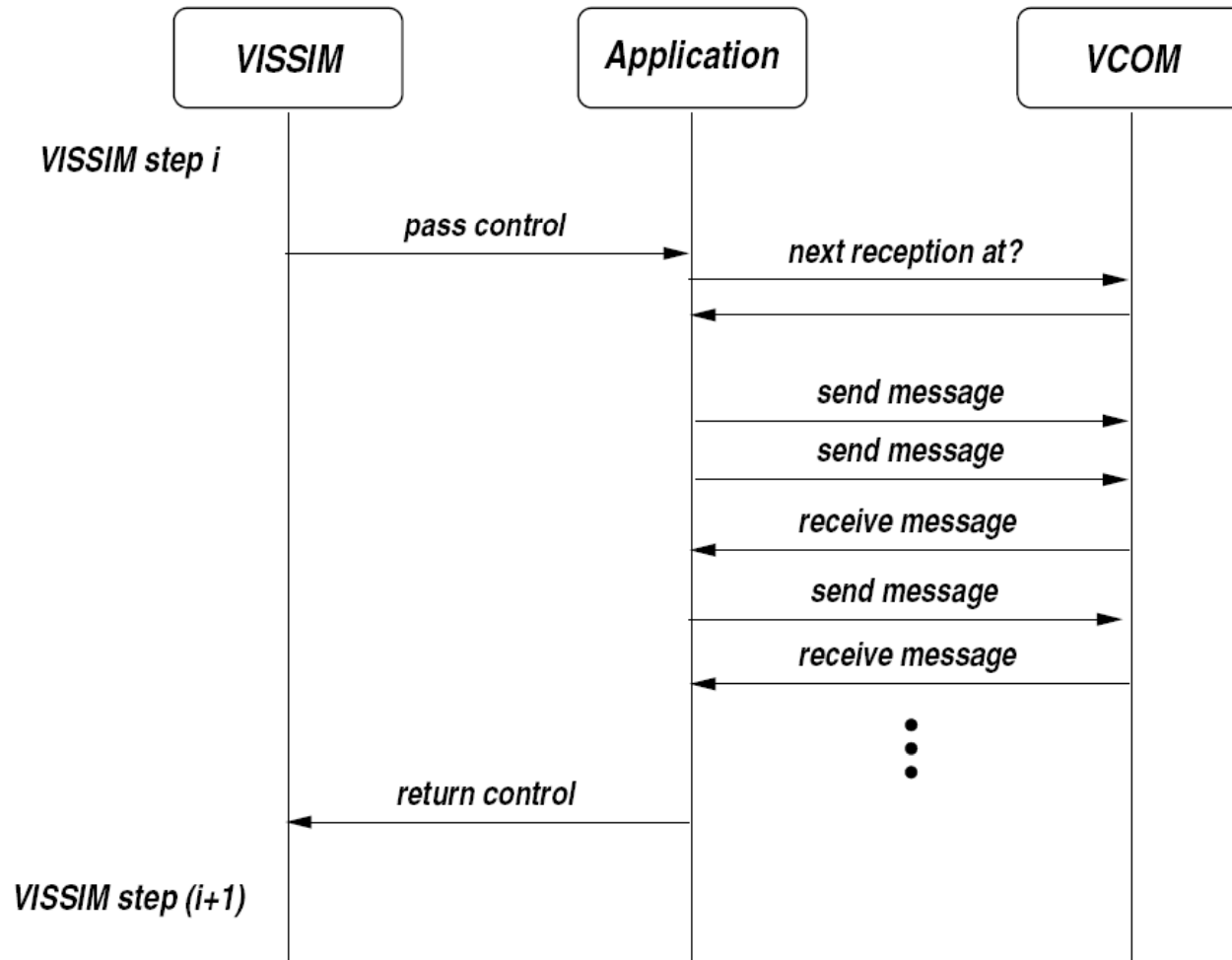
Probabilities of packet receptions



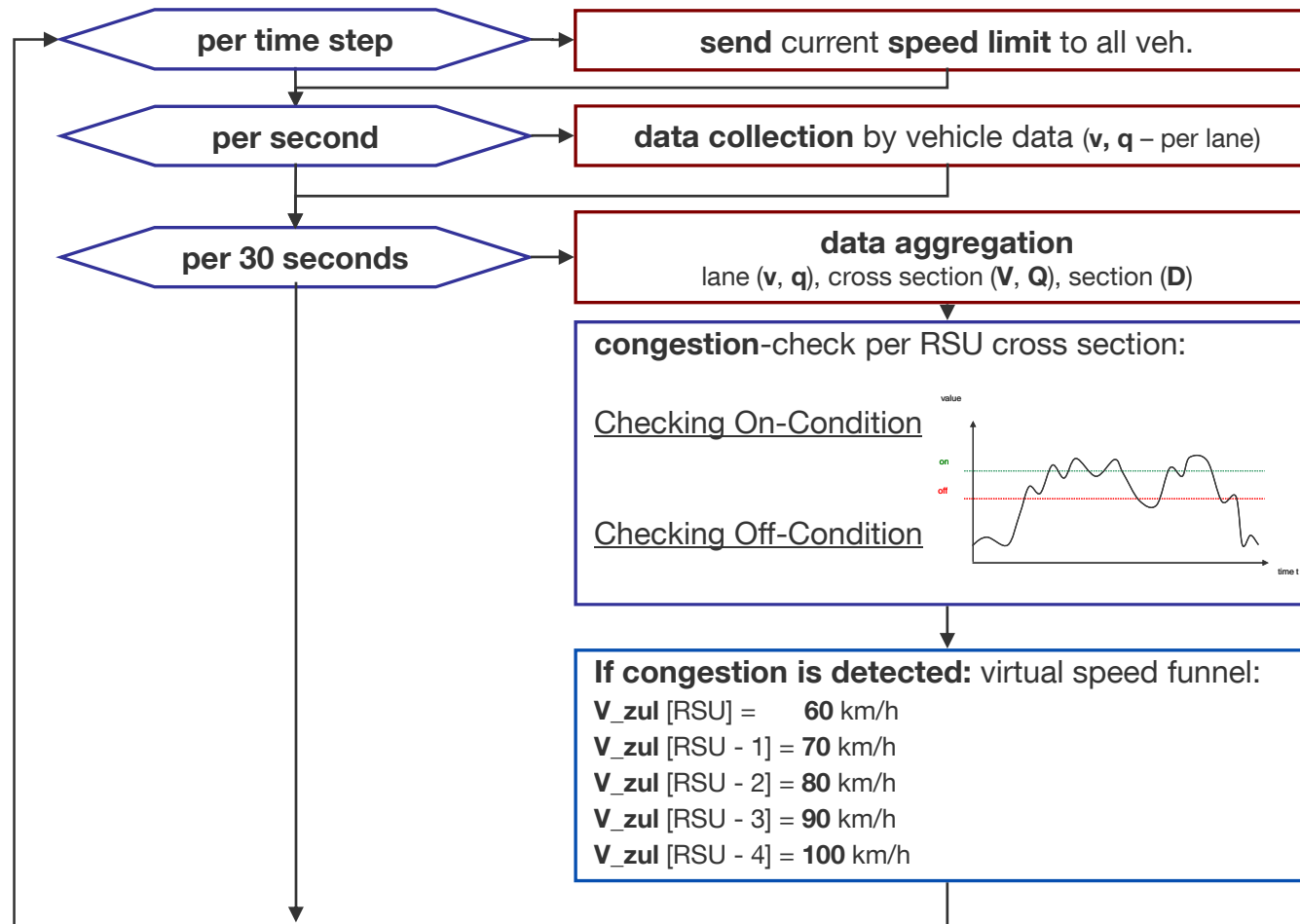
Comparison of probabilities of packet receptions depending on the distance between sender and receiver and varying traffic densities

→ Stochastic modeling of packet receptions with VCOM.dll

Simulative Approach - Interaction



Simulative Approach – Application Example



Simulative Approach – Application Example

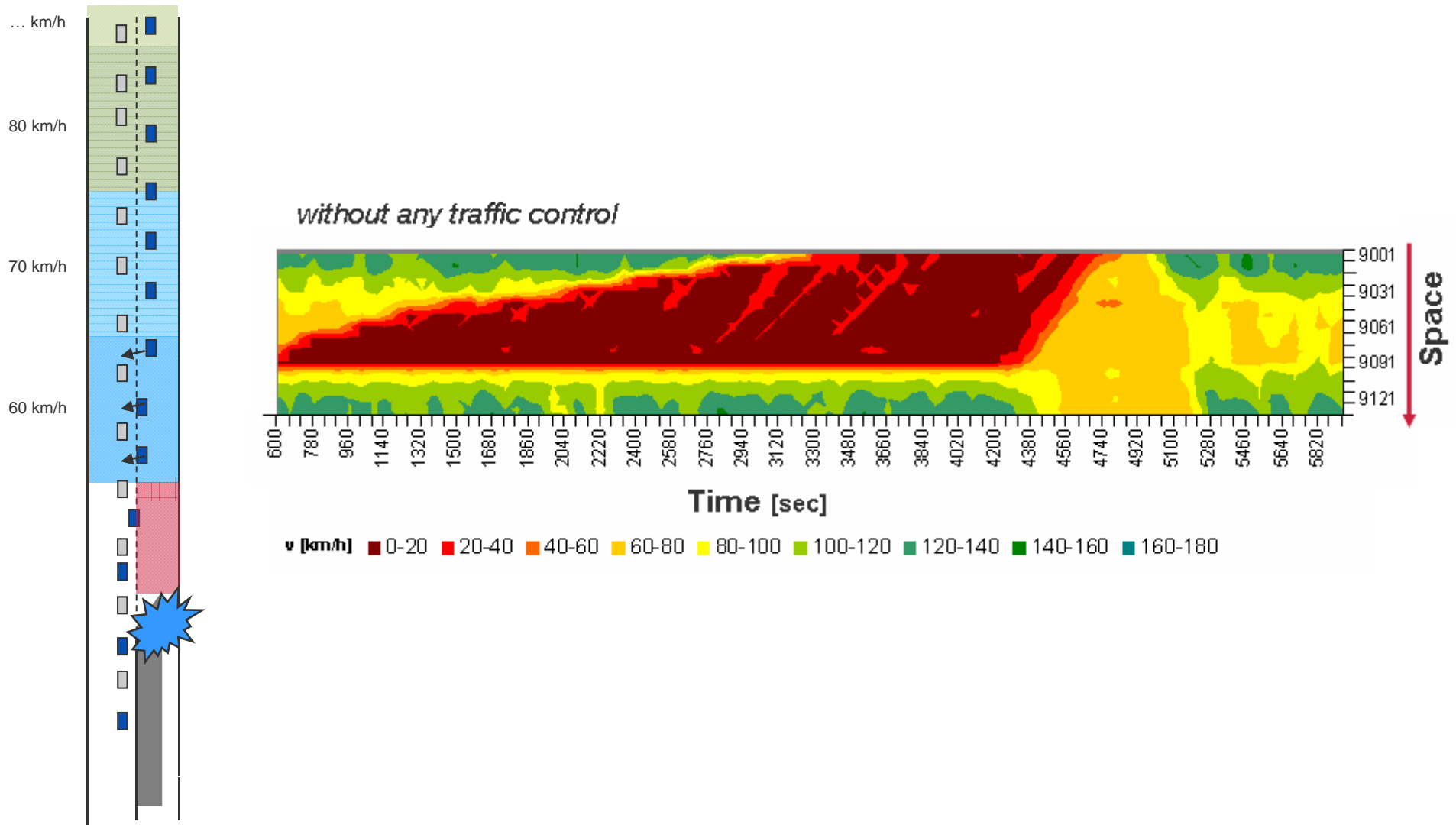
Congestion/Hazard **detection**:

- Everywhere
- Faster

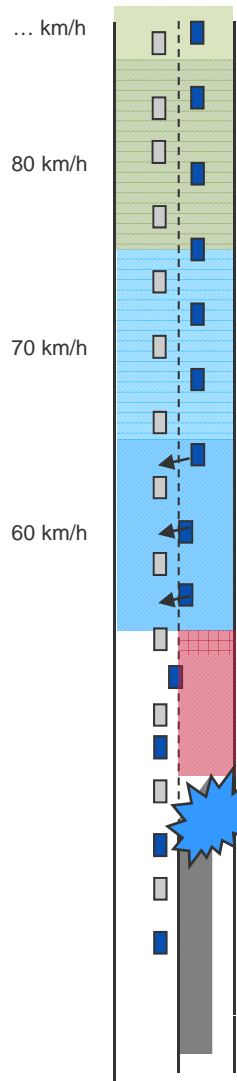
Congestion/Hazard **Warning**:

- Everywhere
- Faster
- More Adaptive

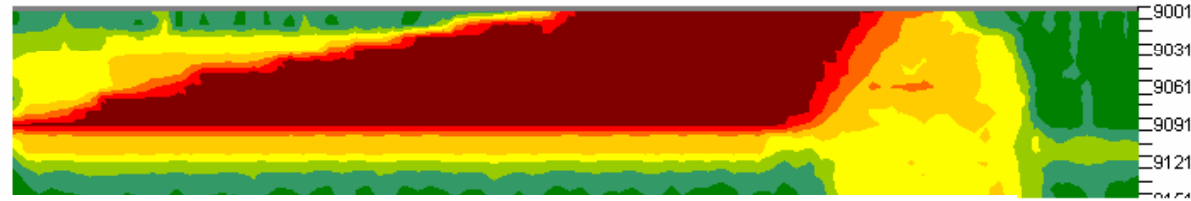
Simulative Approach – Application Example



Simulative Approach – Application Example



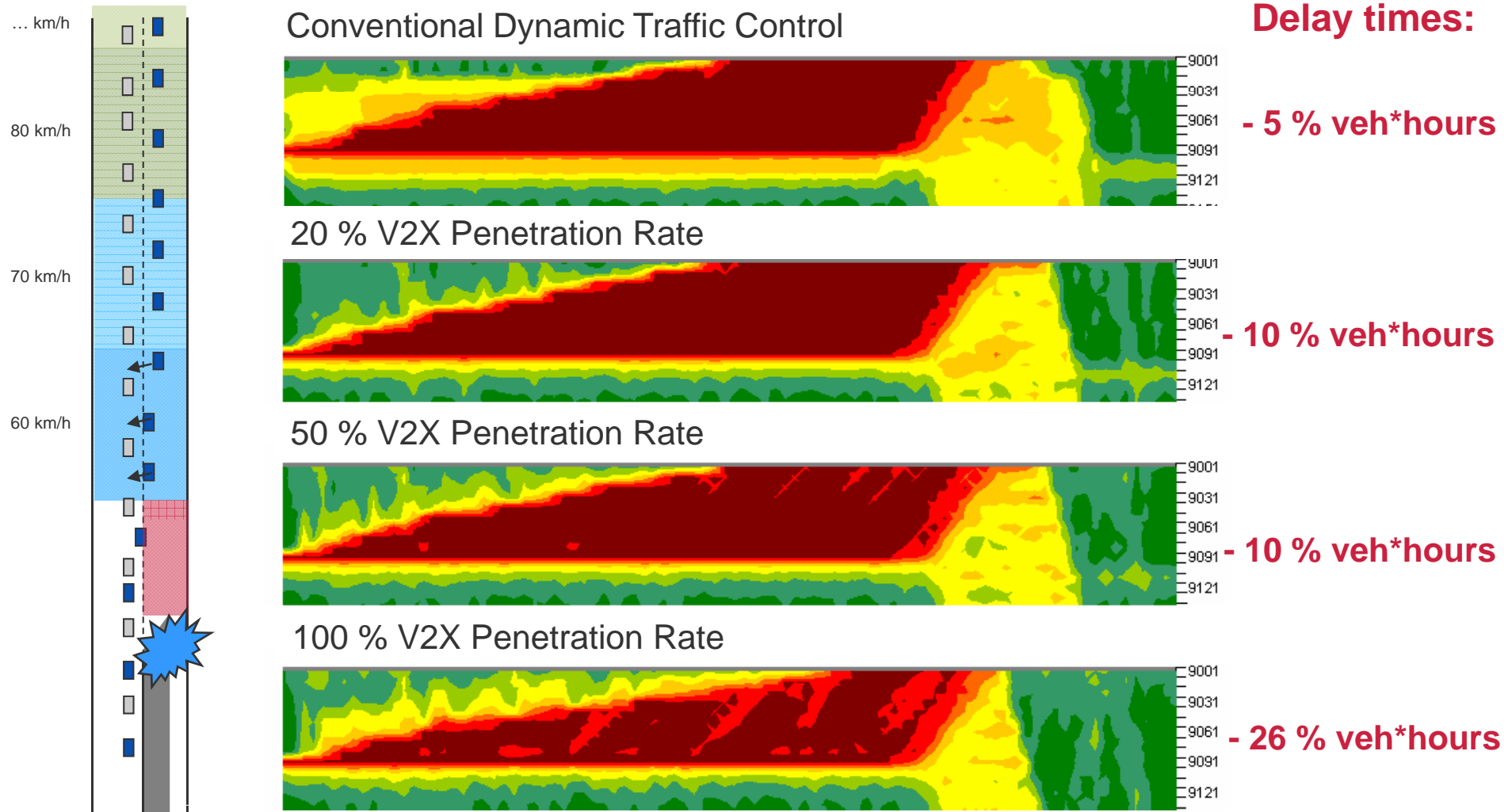
Conventional Dynamic Traffic Control



- Delay times:**
- 5 % veh*hours
 - 10 % veh*hours
 - 10 % veh*hours
 - 26 % veh*hours

compared to reference szenario without any traffic control

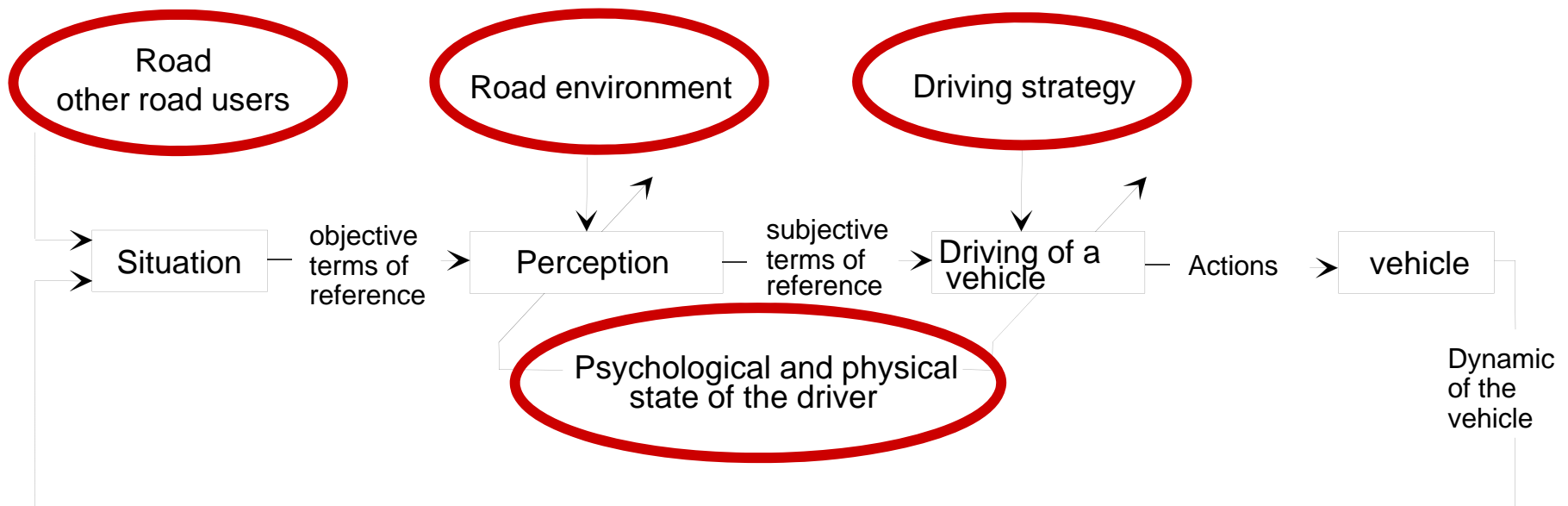
Simulative Approach – Application Example



compared to reference szenario without any traffic control

Processes driving a vehicle

How can V2X help?



What are the impacts of

- driver warning?
- driver information?

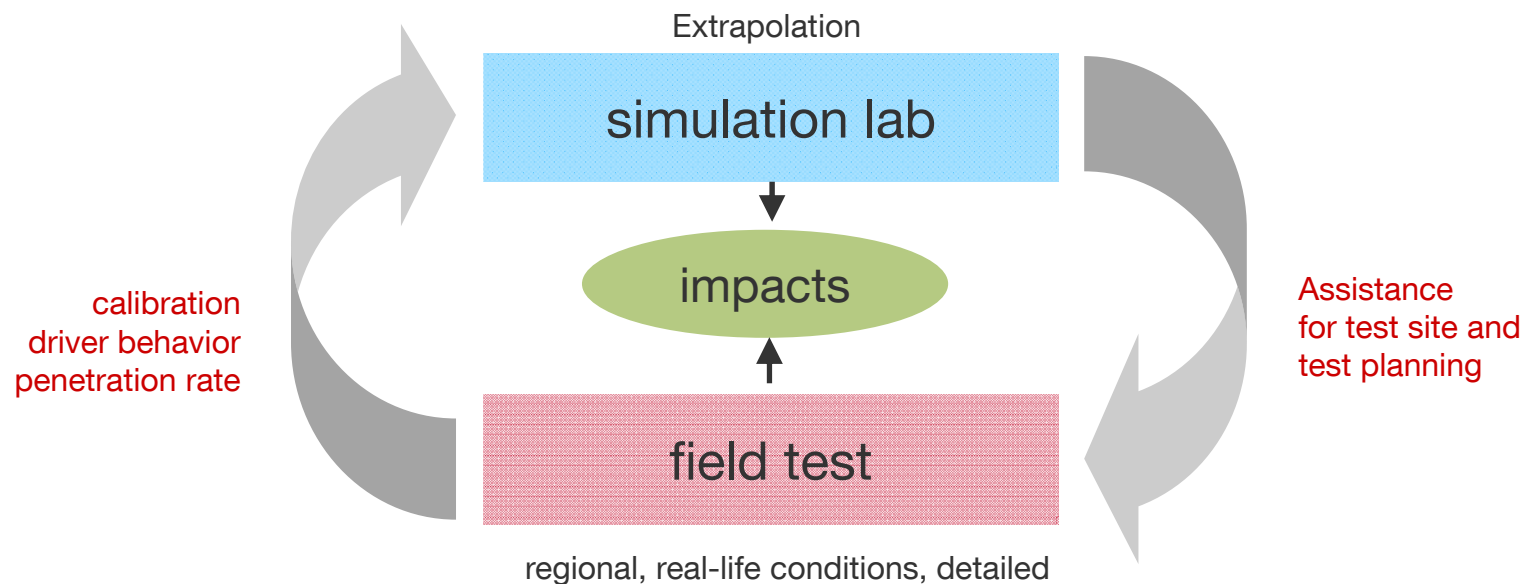
depending on the current v2x penetration rate

[based on Todoskoff et al., 1996]

➔ How do drivers react on advanced In-Vehicle Information Systems?

Conclusions & future prospects

- Large-scale v2x-scenarios can be tested and analyzed using this approach to assist investment decisions
 - Potentials concerning the simulation of traffic safety aspects
- ➔ **we need to learn more about tactical driving and driver reactions on information and warning**



Questions?



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Citation

- ASSENMACHER, S.; LEONHARDT, A.; SCHIMANDL, F.; BUSCH, F. „Simulative Identification of Possibilities and Impacts of V2X-Communication”, In Proceedings of Workshop on Traffic Modeling: Traffic Behavior and Simulation, Graz, June 30 - July 02, 2008