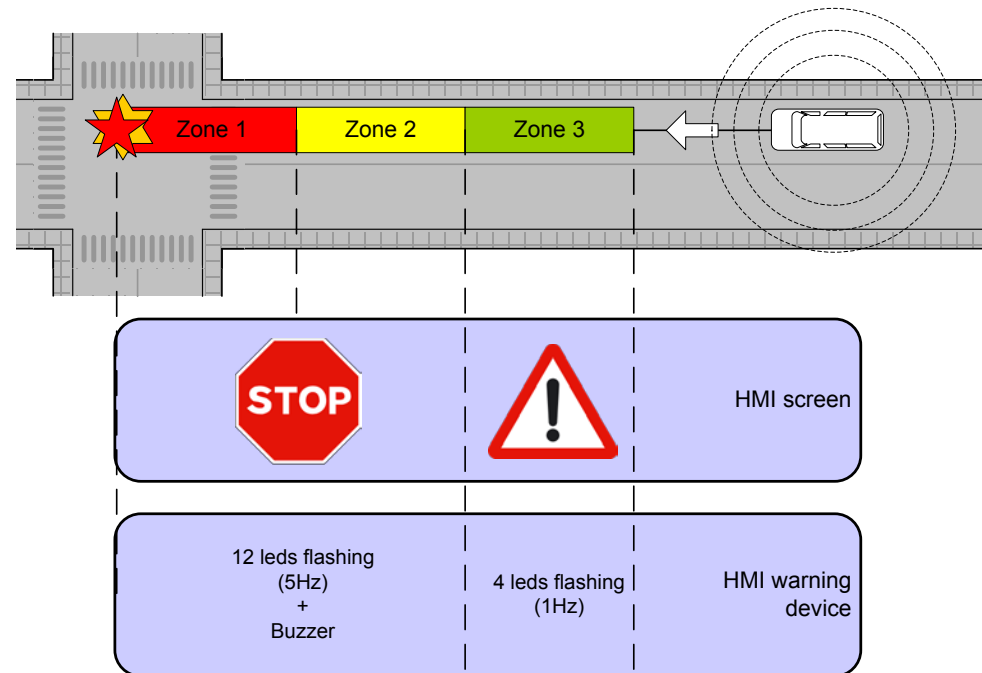
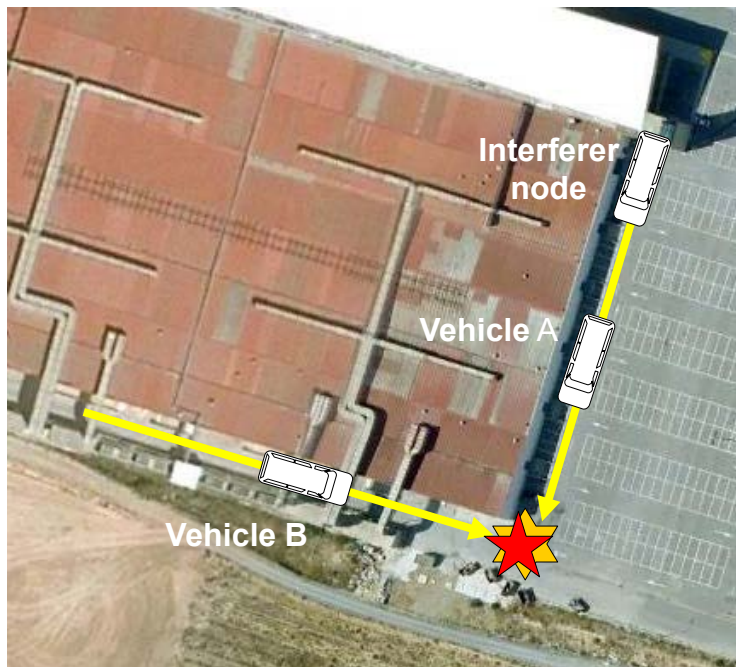
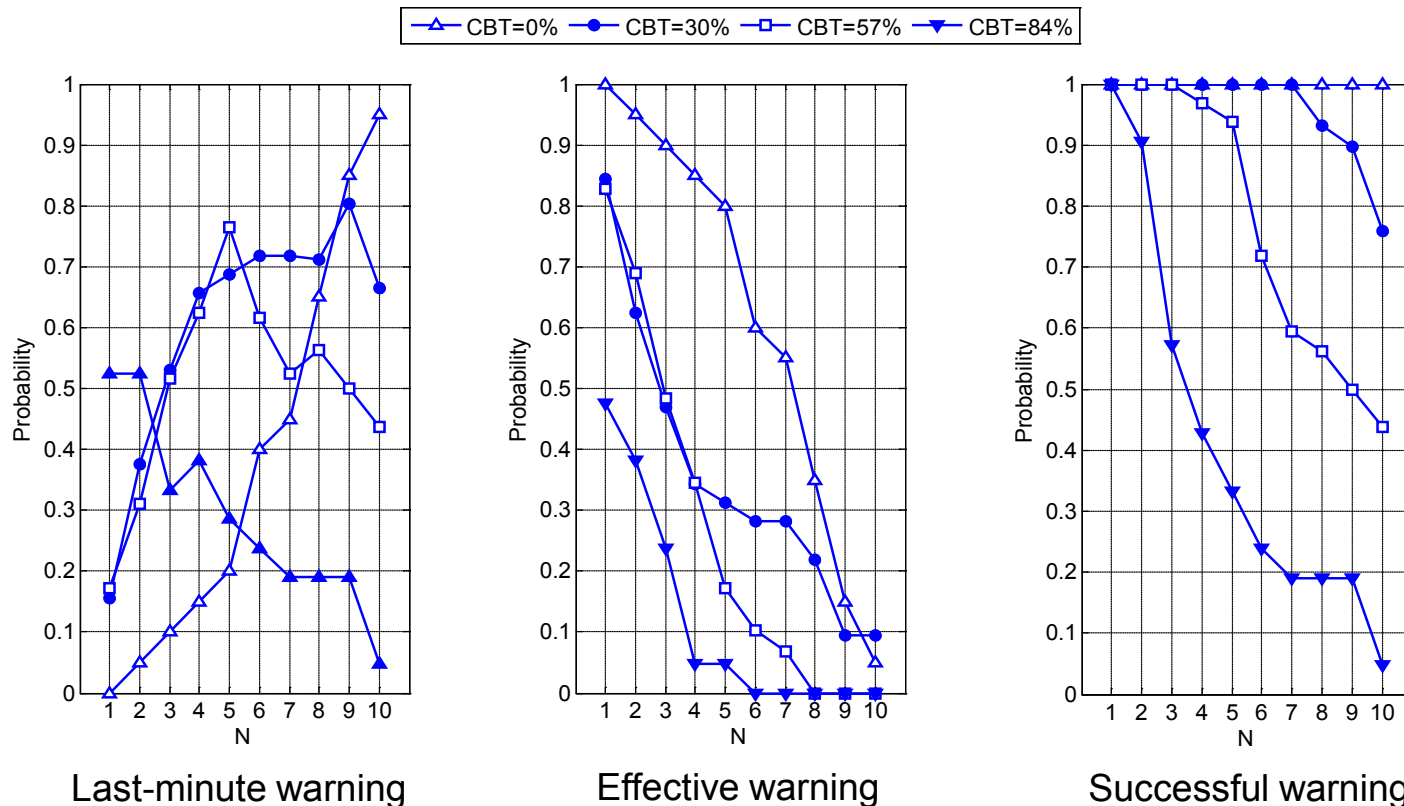


- Strong leadership from car manufacturers
 - Car 2 Car communications consortium
 - Focus on active safety
- Road infrastructure equipment providers and operators
 - Amsterdam Group
 - Eco-mobility & traffic efficiency
- Are we ready for gradual (or massive) deployment?

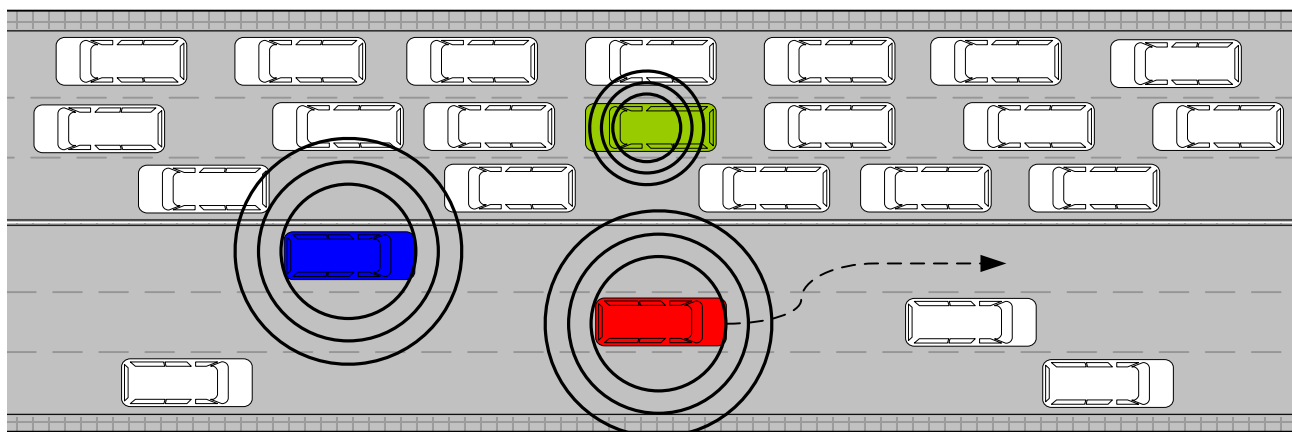
- Sufficient testing? Interference or RF jamming as a threat
 - M. Sepulcre, J. Gozalvez, and J. Hernandez, "Cooperative vehicle-to-vehicle active safety testing under challenging conditions", Transportation Research Part C: Emerging Technologies, January 2013.
 - O. Puñal; Aguiar, A.; J. Gross, "In VANETs we Trust? Characterizing RF Jamming in Vehicular Networks ", Proc ACM VANET 2012



- Intersection Collision Avoidance application
 - Effective and successful warning probabilities for different channel load levels. Interferer located at 95m from the intersection. Fixed parameters: P=17dBm, F=10Hz, R=6Mbps

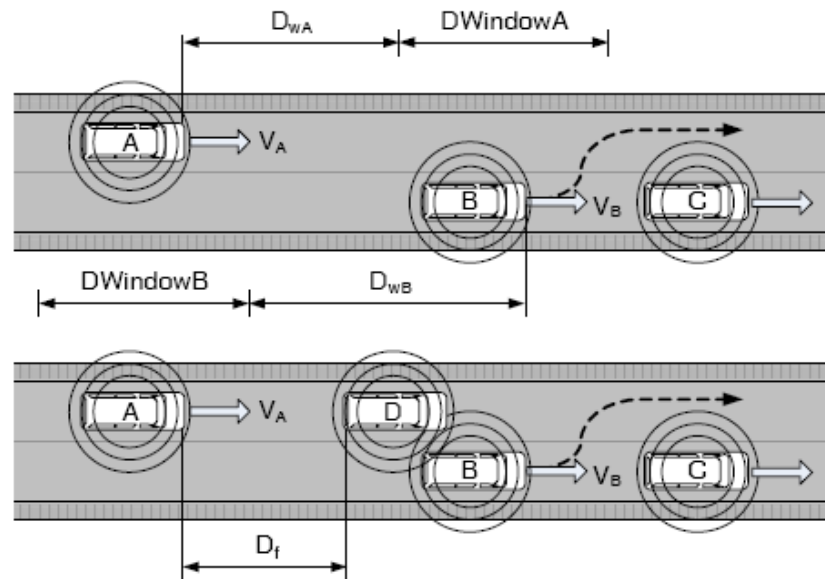


- Major concern is scalability: need for optimization
 - What is the value of a packet? Depends on the application



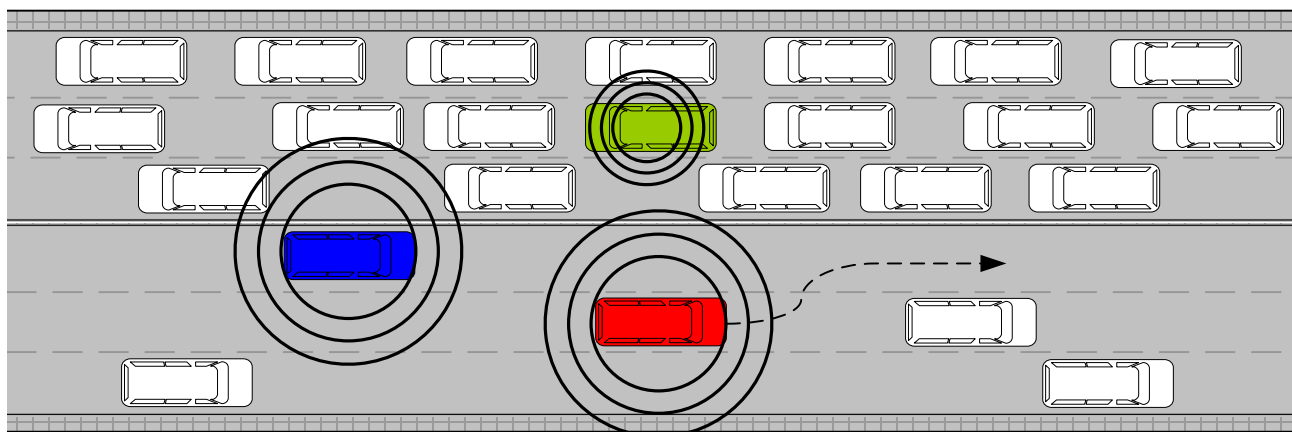
M. Sepulcre, J. Gozalvez, J. Harri, H. Hartenstein, "Application-Based Congestion Control Policy for the Communication Channel in VANETs", IEEE Communications Letters, October 2010

- Major concern is scalability: need for optimization
 - What is the value of a packet? Depends on the application and the context



M. Sepulcre, J. Gozalvez, J. Harri, H. Hartenstein, “Contextual Communications Congestion Control for Cooperative Vehicular Networks”, IEEE Transactions on Wireless Communications, 2011

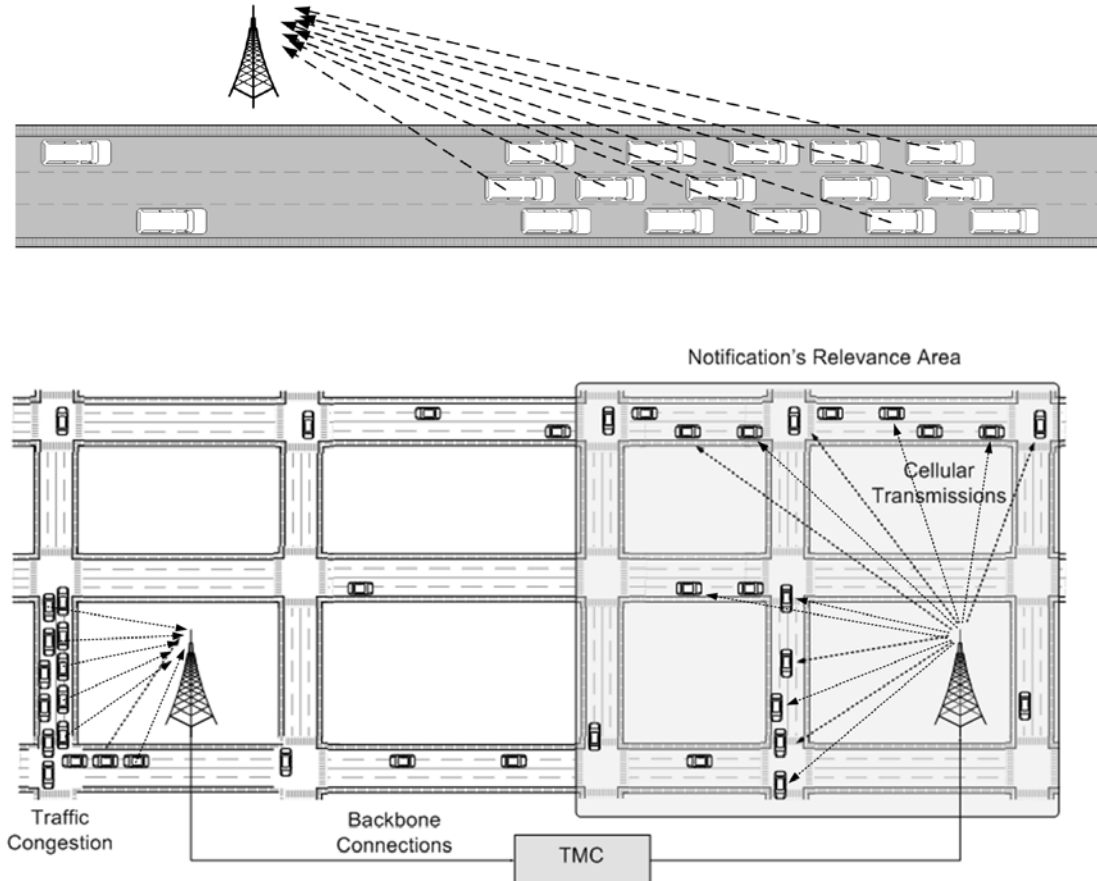
- Major concern is scalability: need for optimization
 - Value estimation at the receiver or the transmitter?



M. Sepulcre, J. Gozalvez, J. Harri, H. Hartenstein, "Application-Based Congestion Control Policy for the Communication Channel in VANETs", IEEE Communications Letters, October 2010

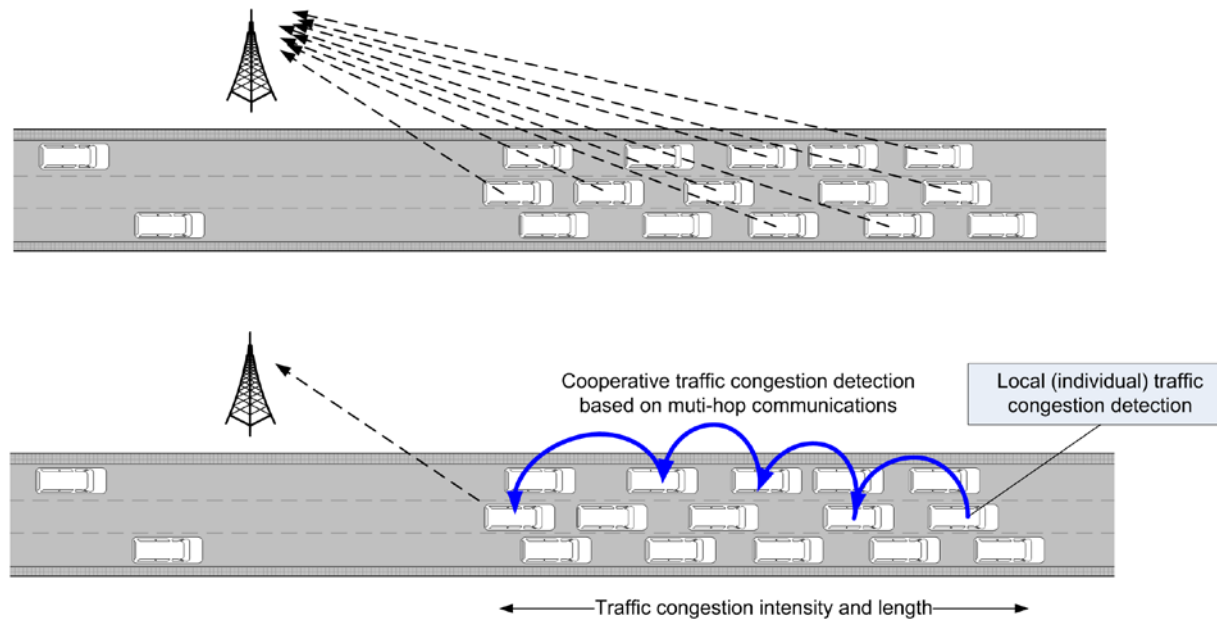
- Major achievement: placing comms as a relevant part of vehicles
 - Vehicles are no longer isolated but part of the Internet of Things (IoT)
 - Vehicles can provide very useful data...but will not be the unique actor
- Vehicular cyber physical cloud computing (CPCC): information acquisition from vehicles or personal devices interfacing with vehicle

- Vehicular CPCC: another scalability problem?



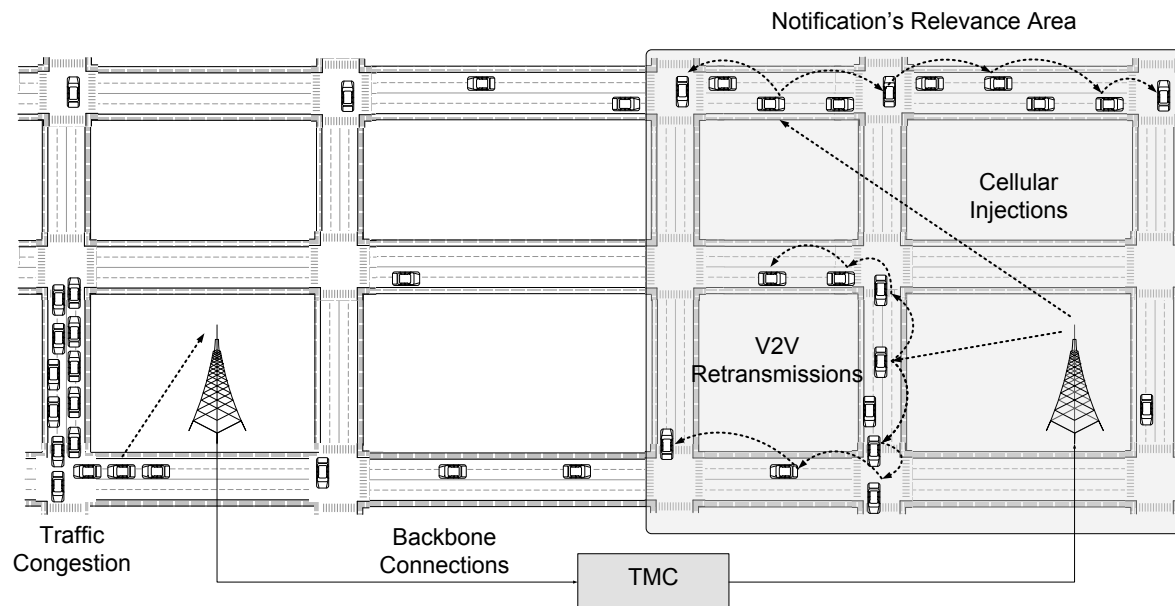
- Vehicular CPCC: another scalability problem?
 - How much data is really necessary for CPCC services?
 - How can we efficiently transmit the info from the cars?
 - Where is the intelligence taking place: where do we aggregate/fuse the information?
 - Where is the control of the data and who is responsible for effectiveness and consistency of info extracted and delivered?

- Vehicular CPCC: opportunities offered by heterogeneous comms



R. Bauza and J. Gozalvez, "Traffic congestion detection in large-scale scenarios using vehicle-to-vehicle communications", *Journal of Network and Computer Applications*, 2012

- Vehicular CPCC: opportunities offered by heterogeneous comms



M. Rondinone, J. Gozalvez, J. Leguay, V. Conan, “Exploiting Context Information for V2X Dissemination in Vehicular Networks”, Proc. of IEEE WoWMoM, 2013

- There is no single winning V2I technology...even for mobile/portable communications
 - Will it also be the case for V2V?
- Benefits from combining advantages of different technologies and communication modes
- Life cycle of comms and mobile devices vs cars
 - Open XC: ‘Democratization of innovation’ (K. Venkatesh Prasad, Ford Research and Innovation)
 - Sharing data allows discovering/building things that individually was not possible

- Time to further develop VC-based infrastructure nodes?



- Is it time to also start discussing about legislation, liability, insurance, etc?
 - An interactive environment (like societies) requires the definition of rules and responsibilities