

C-ITS status in Europe and Outlook

Car 2 Car Communication Consortium

ITU Seminar
7th June 2018

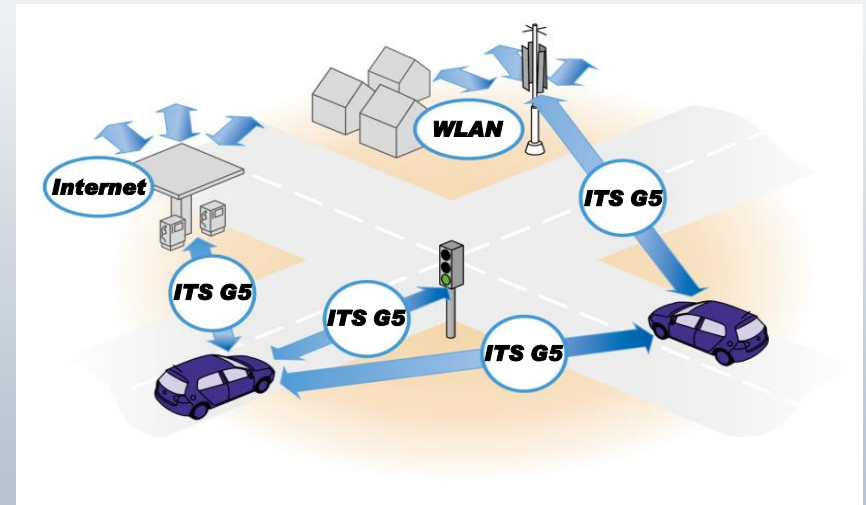
Car 2 Car Communication Consortium

Communication Technology Basis – ITS-G5

- Dedicated Short-Range Communication for exchanging messages between vehicles, and between vehicles and road-side units
- NO communication costs to access the frequency band with equal access
- 5,9 GHz frequency band allocated in EU and US
- Enhancement of the IEEE 802.11 (802.11p) standard

- Standardized at ETSI (as ITS-G5)

- Short range: specifically tailored for cooperative safety
 - Communication latency < 5 ms
 - Information dissemination rates up to 10 times-per-second (10 Hz), but prepared for rates of >50Hz, e.g. for platooning
 - Ad-hoc Sensor network – No repetitions – oversampling is used
- *C2C-CC is welcoming improvement of the access layer, either through technology upgrades and new technologies, as long as interoperability is ensured*



Political and Regulatory Framework

- ITS Directive in 2010 (Directive 2010/40/EU)
- Standardisation mandate M/453 for a set of interoperable standards which lead to current set of ETSI specification based on an access layer based on 802.11p
- 2014 EU Commission created the C-ITS Deployment platform. Report of phase 1 completed autumn 2016. Report of phase 2 completed autumn 2017
- November 2016 the EU Commission Communication COM(2016) 766 - *A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility*
- March 2018: EU Parliament approves ITS report

In summary the recommended way forward is using the already available technologies, to get started now (2019 target) and ensure that evolution is interoperable and backwards compatible

C-Roads Platform

- The C-Roads platform was setup by EU and member states to aid deployment of C-ITS
- The C-Roads Platform was set up with the aim of
 - linking all C-ITS deployments develop, share and publish common technical specifications (including the common communication profiles), planning intensive cross-testing to verify interoperability develop system tests based on the common communication profiles by focusing on hybrid communication mix, which is a combination of ETSI ITS G5 and operational cellular networks.
 - and by doing so C-Roads will pave the ground for making Cooperative, Connected and Automated Driving reality in Europe
- C-Roads and C2C-CC signed an cooperation agreement during the European ITS Conference in June 2017
- Profiles from C-Roads are publicly available at www.c-roads.eu

* Also the C2C-C profiles are publicly available for an administrative subscription fee contact contact@car-2-car.org

C-Roads Members

- Core Members 2016

Austria

Belgium/Flanders

Czech Republic

France

Germany

Slovenia

The Netherlands

UK

- *Associated Members*

Ireland

Switzerland

- Core Members 2017

Belgium/Wallonia

Denmark

Finland

Hungary

Italy

Norway

Portugal

Spain

Sweden

Australia

New Zealand

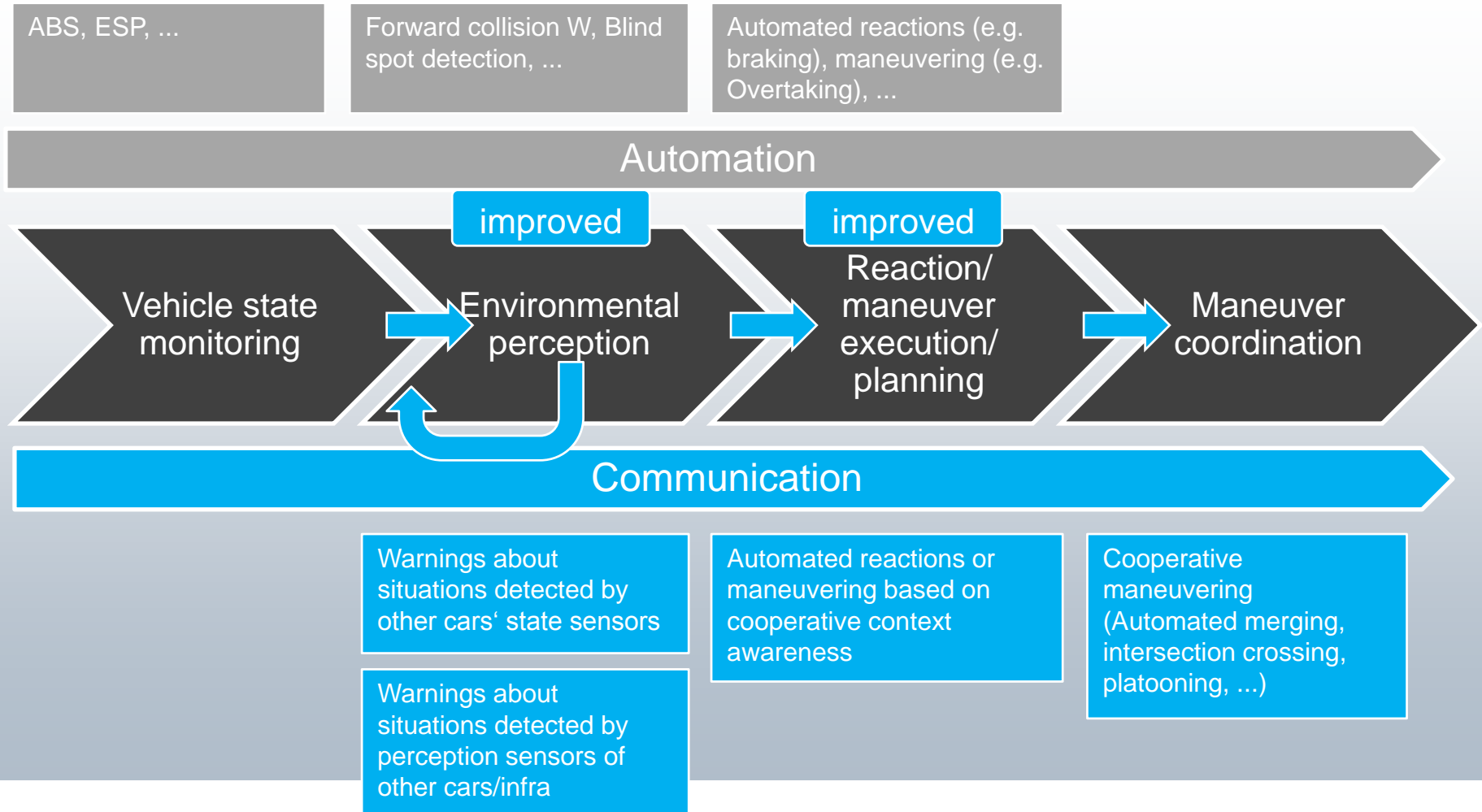
ITS-G5 deployment is happening in Europe

- VW Group has announced start of sales of ITS-G5 equipped cars from 2019
- Renault and PSA are selling cars with ITS-G5 (Dual channel) to customers as part of SCOOP@F (Limited numbers)
- SCOOP@F: Road Operators are deploying Road Side Units under the leadership of the French Ministry of Transport
- Original Corridor project - Austria, Germany and Netherlands have announced commercial tenders and already have equipment deployed
- Several other Member-States and non-Member-states are deploying - these deployments are accelerated by CEF support. C-Roads is initial deployment not just pilots

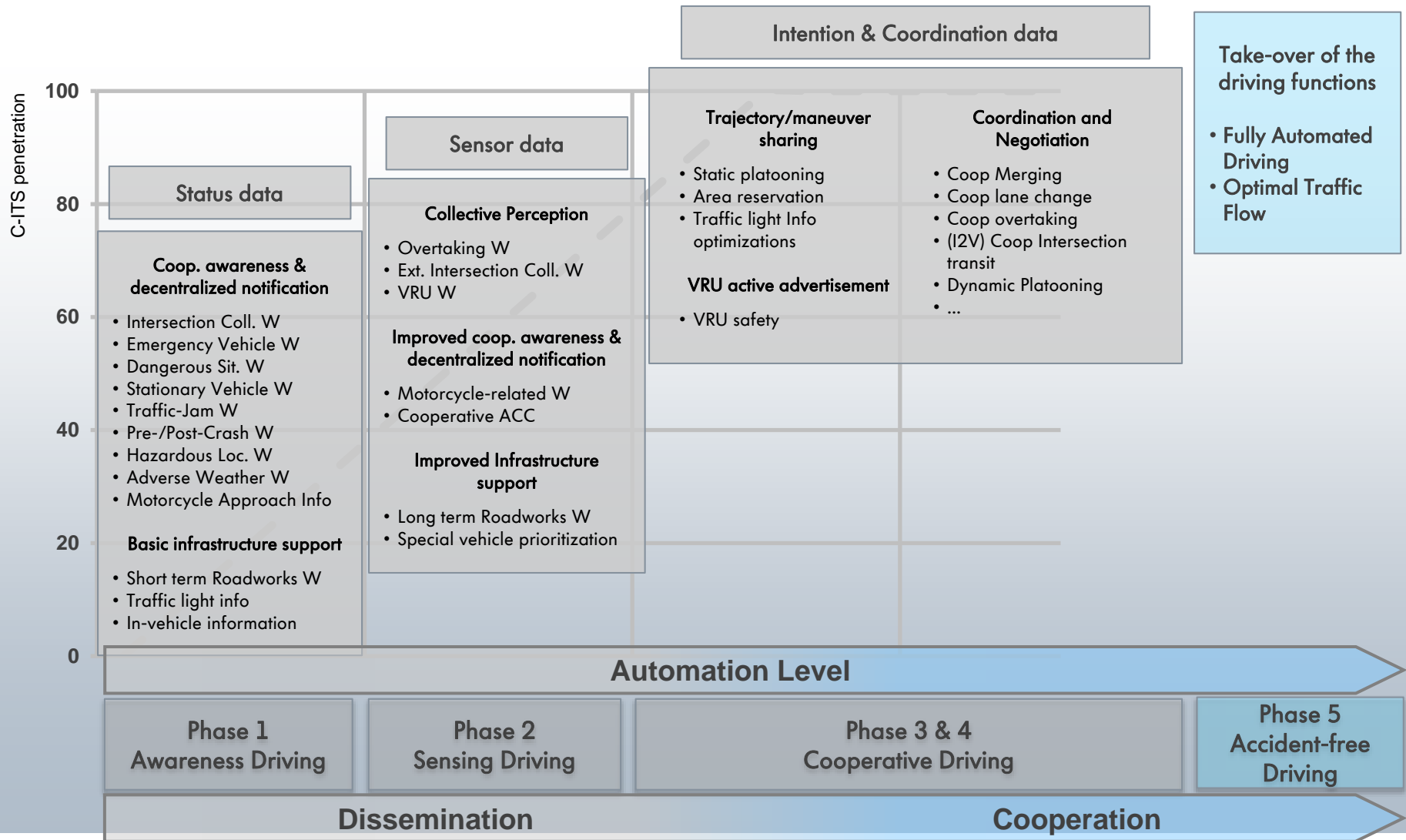
→ **Conclusion: ITS-G5 deployment is happening now!**

Outlook

- Vehicle communication and automation: an example of synergy



Roadmap: Services & sample use cases

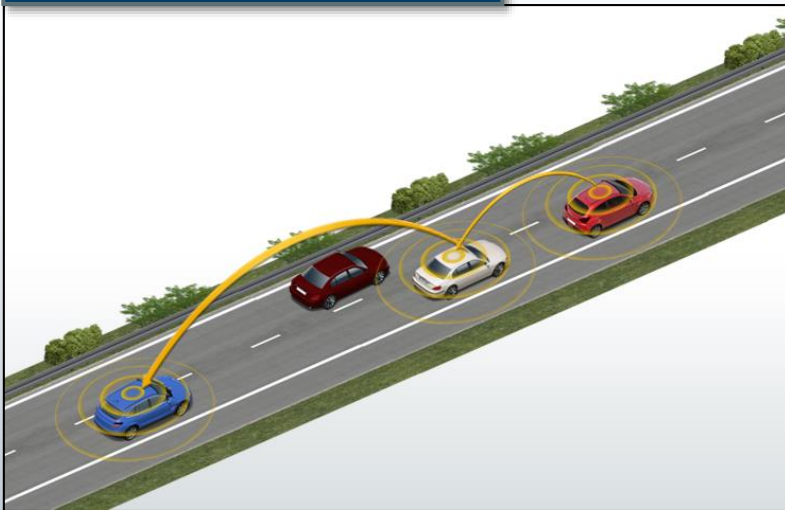


Day 2: CAM/DENM extensions

- Convey data non included in Day1 release

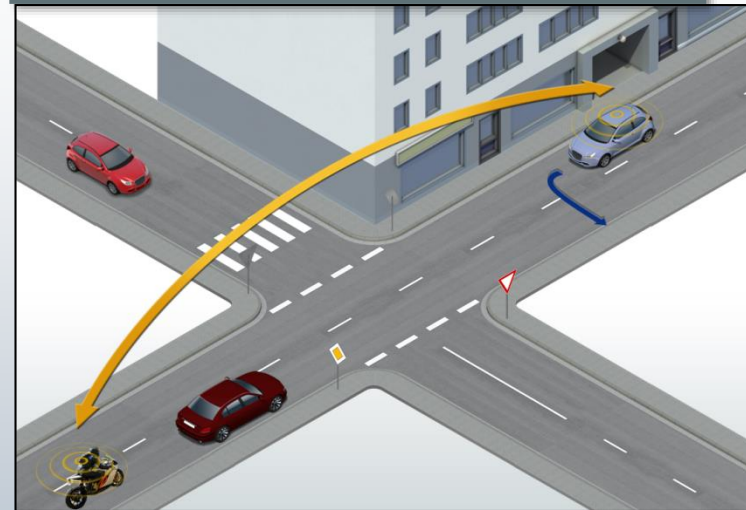
Examples:

Cooperative ACC



Rx vehicles analyze CACC status of tx vehicle/infra to modify communications & automation behavior (reduce gap/improve response to speed variations of preceding vehicle)

Motorcycle Approach Warning



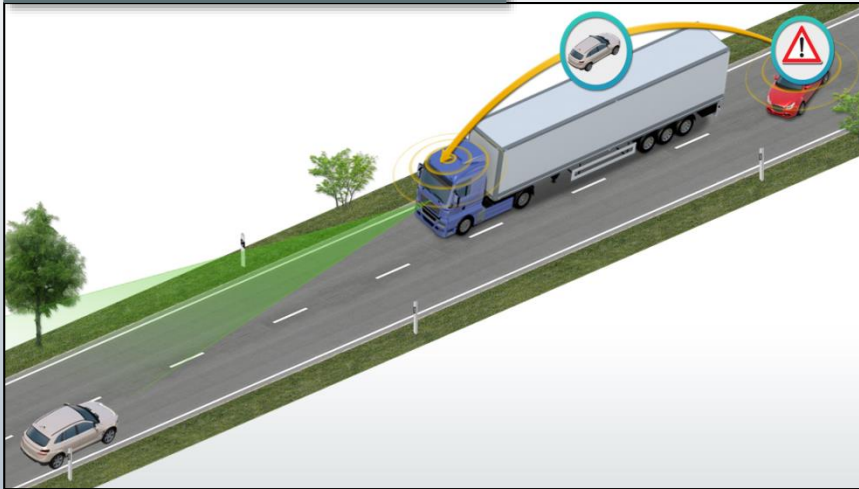
Rx cars and motorcycles analyze motorcycle dynamics info (e.g. lean angle) to evaluate collision risk and possibly generate warnings

Day 2: Collective perception

- Sharing abstract descriptions of objects detected by vehicle or infrastructure sensors.
- Creates improved awareness even with low C-ITS penetration

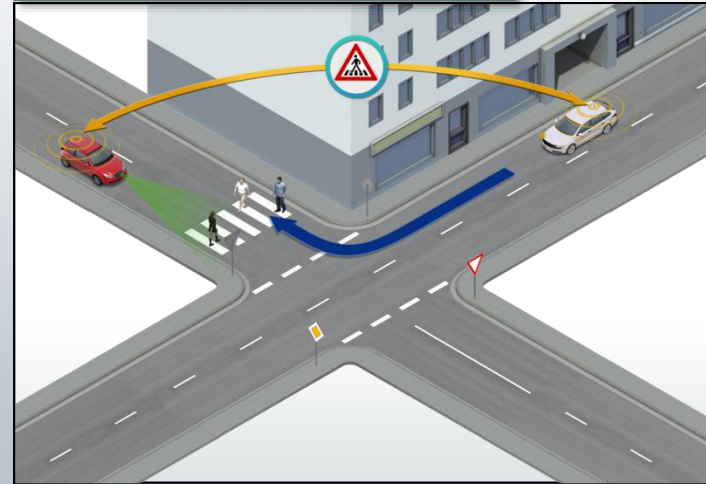
Examples:

Overtaking Warning



Overtaking car analyses the rx info and warn the driver if necessary

VRU Warning

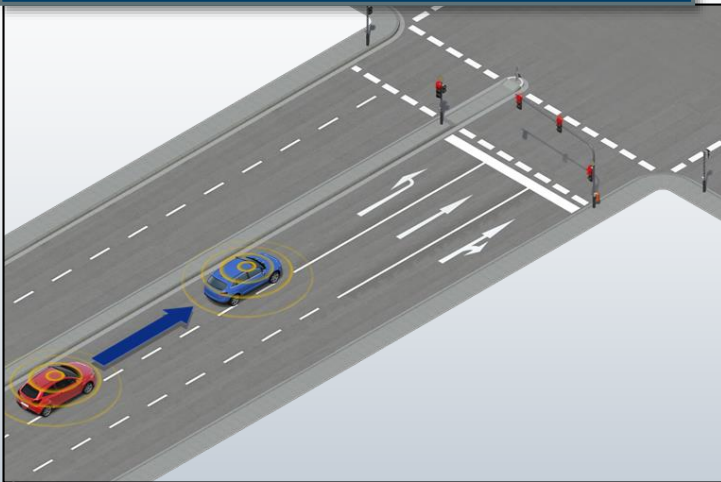


Turning car analyses the rx info and warns the driver if necessary

Day 3/4: Trajectory/maneuver sharing

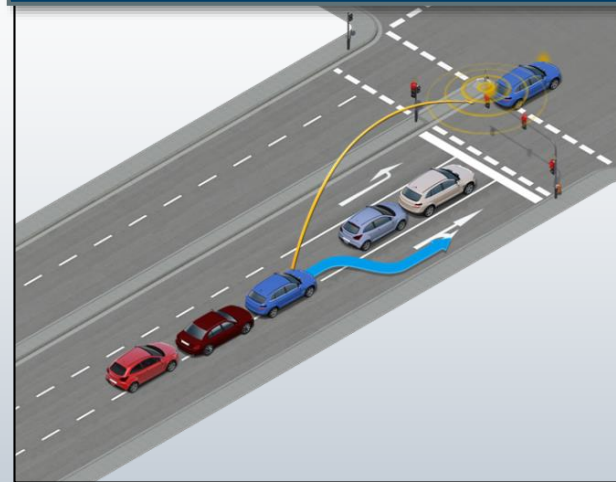
- Sharing automated vehicles' intended maneuvers and trajectories
- Examples (from EU H2020 MAVEN project):

Dynamic platooning



Based on intended maneuver at next intersection, vehicles assess the convenience of building small platoons, and keep them using exchanged trajectory

Traffic light info optimization

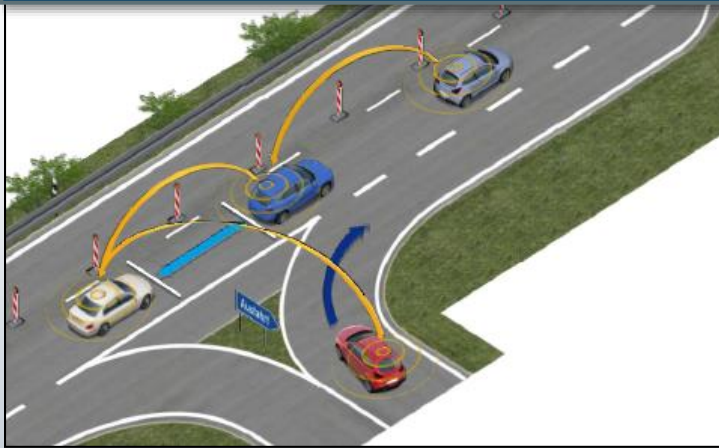


Based on rx intended maneuver at intersection, infra calculates and suggests optimization info such as lane-specific GLOSA or lane change advices

Day 3/4: Coordination/negotiation sharing

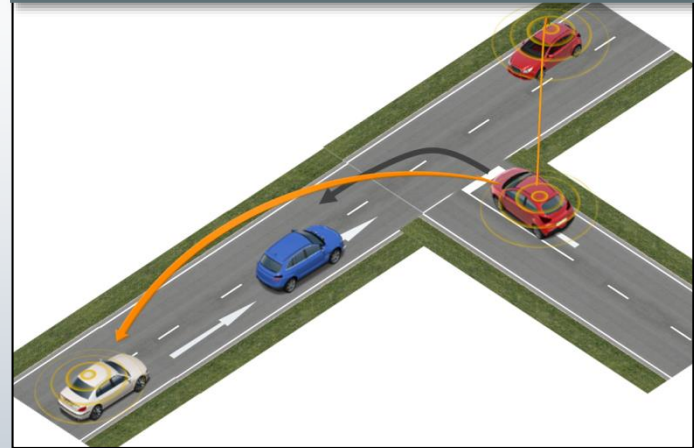
- Enabling vehicular interaction for coordinated maneuver execution
- Examples (from IMAGinE project):

Cooperative Merging on Highways



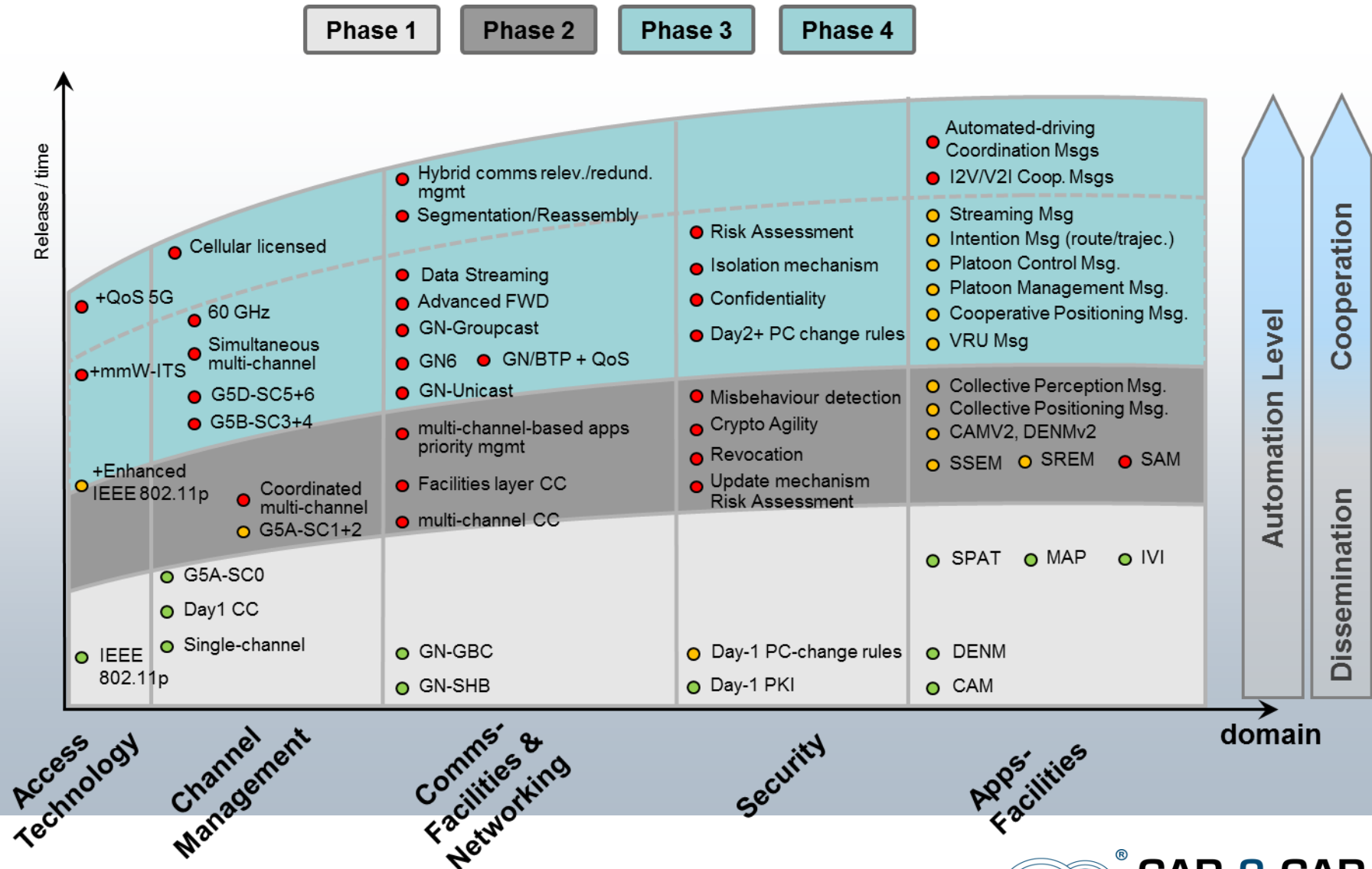
Based on notification of intended merging, interested vehicles exchange info to coordinate gap opening and merging maneuvers with increased time spans

Cooperative Turning at Junctions



Based on notifications of intended turning, interested vehicles exchange info to coordinate right of way and transit maneuvers with increased time spans

Roadmap: Supporting technology



Questions ?