C-ITS status in Europe

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CODECS webinar
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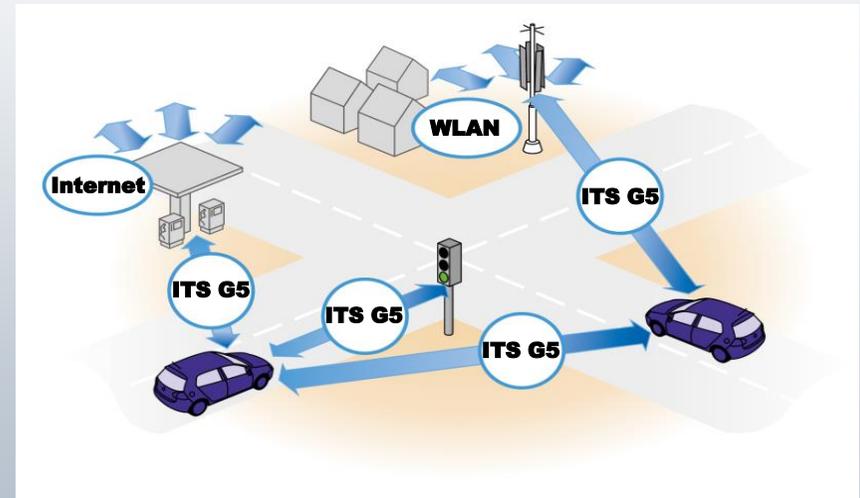# Outline

- Background
- Political and regulatory framework
- Deployment activities
- Status and challenges
- Outlook

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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*

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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

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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 publicily available for an administrative subscription fee 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

Status for C-ITS

- Technology is ready for deployment of the first applications – Research projects, demonstrations and trials since 2008

- Framework for deployment is under way allowing a common European deployment - Delegated act under the ITS Directive is under preparation

- Key focus areas to enable deployment
  - Compliance Assessment
  - Security
  - Spectrum
  - Privacy

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Status for C-ITS

- Compliance Assessment
  - Number of test cases exists
  - Framework not yet in place but described in the phase1 & 2 reports of the EU C-ITS deployment platform

- Spectrum
  - 30 MHz allocated for safety – study on additional 20 MHz shared with Urban Rail
  - CEPT mandate to study co-existence of ITS G5 / Urban Rail / C-V2X

- Security (additional information in following slides)
  - Certification Policy and Security Policy finished end 2017* - First 4 year operation of the basic PKI elements will be be founded
  - New version of standard aligning with Certification Policy published, but there is a need across stakeholder to coordinate transition to new version !!

- Privacy (see following slides)

* Minor update expected

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Privacy - Background

- C-ITS as specified by ETSI has been aiming of Privacy already in the earlier specification phase and thus can be considered privacy by design.

- As C-ITS fundamentally is based on short term tracking of vehicles to obtain the desired functionalities, the focus has not been to make tracking impossible but to remove the possibility of identifying the vehicle/driver through

  - Static information in messages, e.g., accuracy of vehicle length has been chosen to disallow identification of specific car model
  - Change of identities during the trip
  - Signing messages with pseudonyms (Authorisation Tickets, AT)
  - System designed to prevent re-linking pseudonyms to permanent identities
  - Etc.

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Privacy - Background

- In Europe CAM and DENM is considered to contain personal data and therefore the GDPR applies.

- In general C2C-CC and other stakeholders work on finding solutions to the privacy challenge and the requirement of the driver giving consent to share data.

- An data privacy opinion on C-ITS from the Article 29 WP – European Data Protection Advisory Board - was issued on 23 October 2017. We are still analysing the potential impact. A summary of the recommendations are provided for information in the next slides

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Article 29 WP Opinion (published 23 October 2017)

Required actions (legal part)

- The Commission should identify a roadmap for lawful processing of location data of EU citizens in the context of C-ITS applications, where the enactment of an EU-wide legal instrument is the final goal (art 6(1)c of the GDPR);

- The adoption of these legal instruments should start with an assessment of necessity and proportionality of its provisions; moreover, a data protection impact assessment (art. 35(10) of GDPR) should be mandated in the course of the legislative process to clarify risks and mitigating measures from the start;

- The other legal bases envisaged in the C-ITS Working Group Document (namely, consent, performance of a contractor legitimate interest) could be relied upon only if the critical issues identified for each of them in this Opinion can be solved

- In any of the selected legal bases, the default setting of all installed C-ITS functionality must be switched off.

Article 29 WP Opinion (published 23 October 2017)

Required actions (technical part)

- Users should be allowed to select the tracking options (timing, frequency, locations) that best fit their preferences;

- Generalization or noise injection should be introduced in order to limit any unnecessary exposure or long term tracking of the driver;

- The frequency with which the certificates are changed should be arranged in order to create a fair balance between efficiency and the risks of long term tracking.

- Data quality should be carefully assessed in order to mitigate any risk of non-neutral use of C-ITS, the generation of false alarms or, on the contrary, the misinterpretation of real emergency situations;

- The PKI mechanism for certificate distribution should be publically documented in a detailed way and strictly monitored, in order to limit the risk of collusions between certification authorities and peers, or the intrusion of malicious players;

- The retention periods of the processed data by all the parties involved in the C-ITS platform should be clearly indicated, and it should be prohibited to create a centralised database of the exchanged messages by any of the actors of C-ITS.

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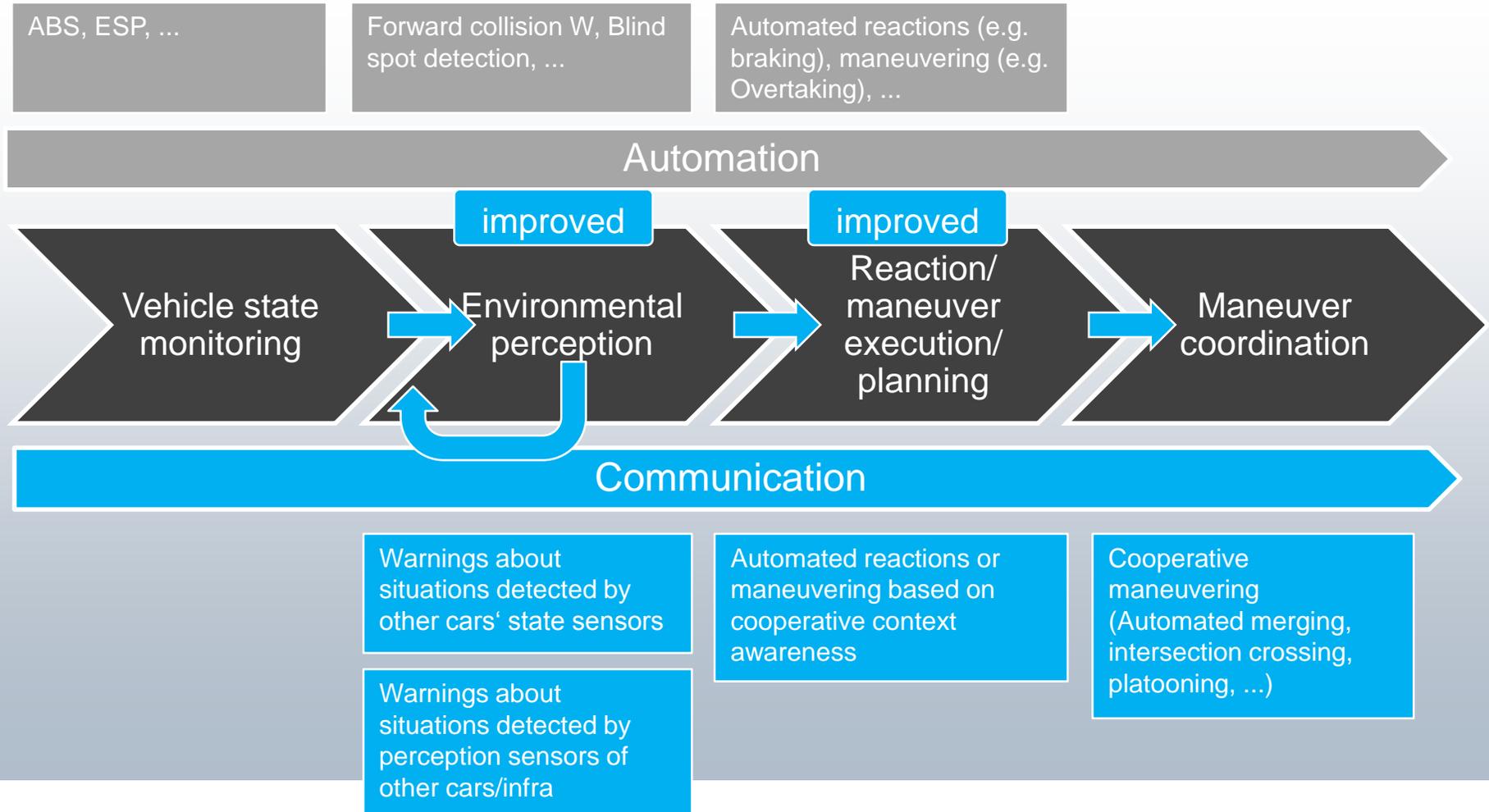# Is there a conflict in EU between road safety and privacy goals?

- At the outset yes, but taking the positive attitude on this:
  It is because the new General Data Protection Regulation takes it outset in Facebook and Google and it's a likes where the roles of data subject and data controller is a clear, it does not foresee the many to many relation.
  So fundamentally the problem is the regulation was design for 'round holes' and C-ITS consistent of squares. So our challenge is how to avoid chopping all the useful corners to fit the square in the round hole
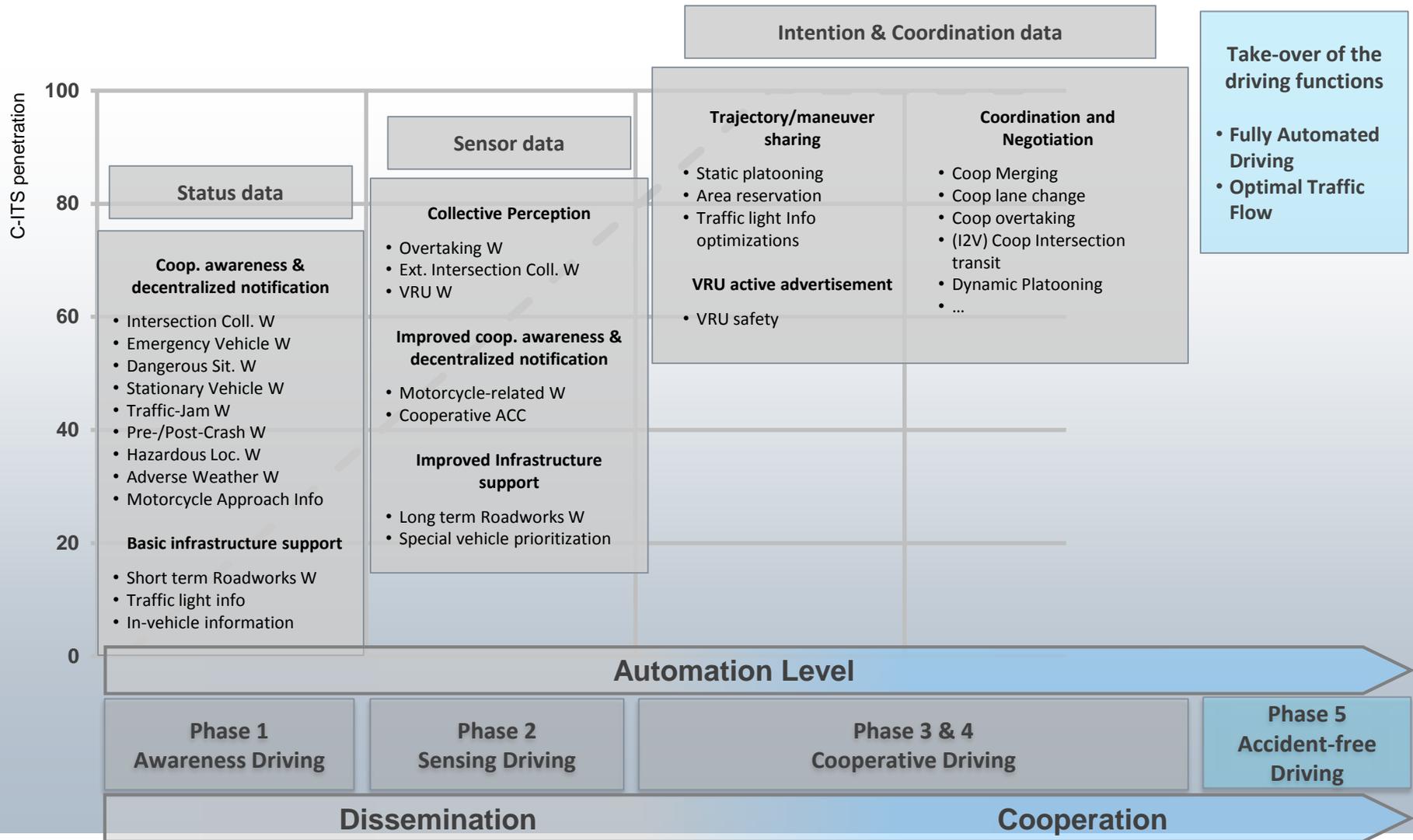
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Introduction

- Vehicle communication and automation: an example of synergy

ABS, ESP, ...

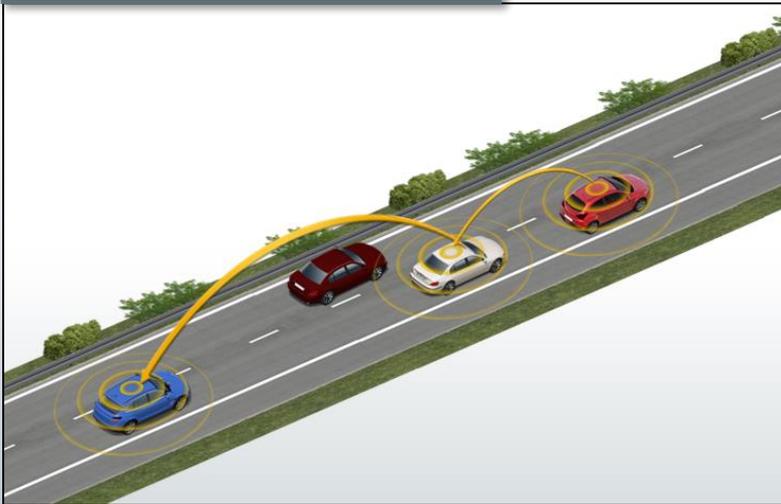Forward collision W, Blind spot detection, ...

Automated reactions (e.g. braking), maneuvering (e.g. Overtaking), ...

Automation

improved

improved

Vehicle state monitoring

Environmental perception

Reaction/ maneuver execution/ planning

Maneuver coordination

Communication

Warnings about situations detected by other cars' state sensors

Warnings about situations detected by perception sensors of other cars/infra

Automated reactions or maneuvering based on cooperative context awareness

Cooperative maneuvering (Automated merging, intersection crossing, platooning, ...)

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Roadmap: Services & sample use cases

C-ITS penetration

Intention & Coordination data

Take-over of the driving functions
- **Fully Automated Driving**
- **Optimal Traffic Flow**

Sensor data

Trajectory/maneuver sharing
- Static platooning
- Area reservation
- Traffic light Info optimizations

VRU active advertisement
- VRU safety

Coordination and Negotiation
- Coop Merging
- Coop lane change
- Coop overtaking
- (I2V) Coop Intersection transit
- Dynamic Platooning
- ...

Status data

Coop. awareness & decentralized notification
- Intersection Coll. W
- Emergency Vehicle W
- Dangerous Sit. W
- Stationary Vehicle W
- Traffic-Jam W
- Pre-/Post-Crash W
- Hazardous Loc. W
- Adverse Weather W
- Motorcycle Approach Info

Basic infrastructure support
- Short term Roadworks W
- Traffic light info
- In-vehicle information

Collective Perception
- Overtaking W
- Ext. Intersection Coll. W
- VRU W

Improved coop. awareness & decentralized notification
- Motorcycle-related W
- Cooperative ACC

Improved Infrastructure support
- Long term Roadworks W
- Special vehicle prioritization

Automation Level

| Phase 1 Awareness Driving | Phase 2 Sensing Driving | Phase 3 & 4 Cooperative Driving | Phase 5 Accident-free Driving |

Dissemination

Cooperation

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Day 2: CAM/DENM extensions

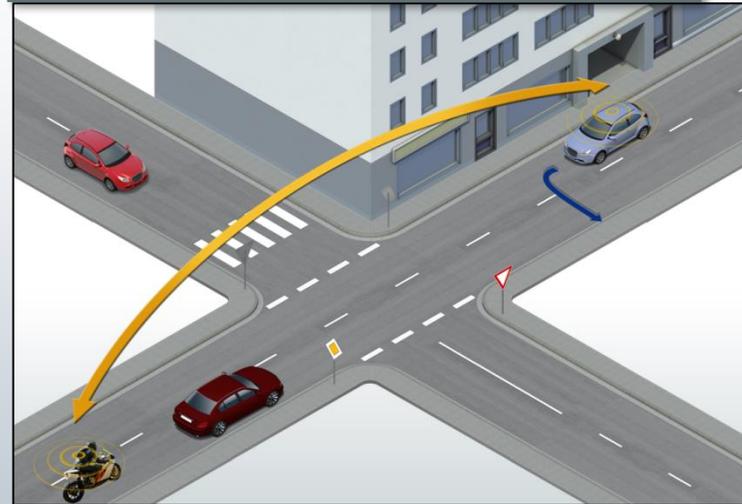- Convey data non included in Day1 release

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

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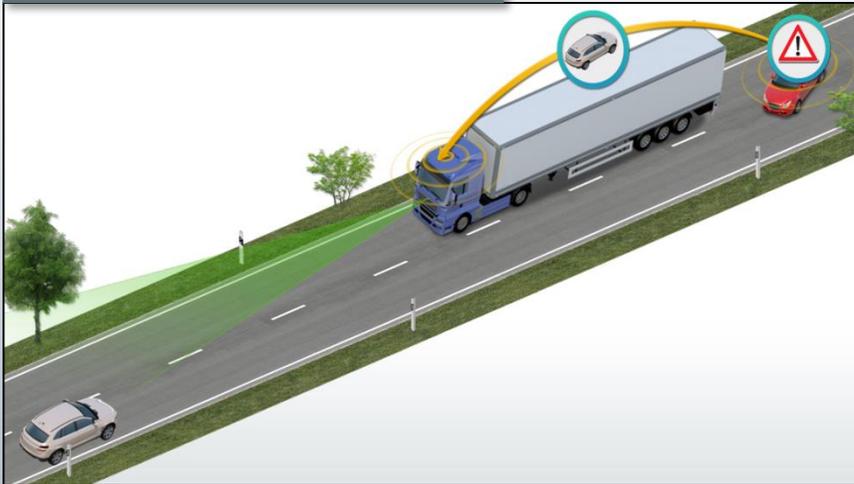
Overtaking car analyses the rx info and warn the driver if necessary

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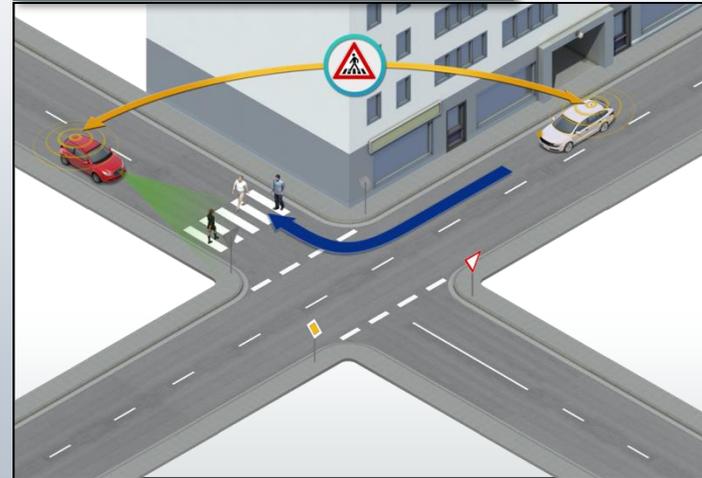
Turning car analyses the rx info and warns the driver if necessary

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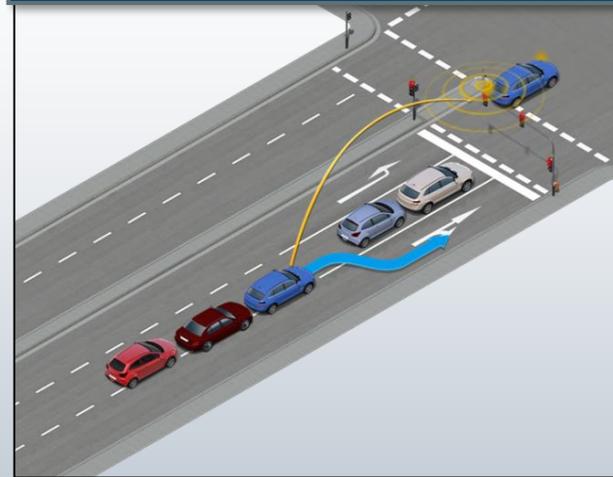
Day 3/4: Trajectory/maneuver sharing

- Sharing automated vehicles' intended maneuvers and trajectories
Examples (from EU H2020 MAVEN project):
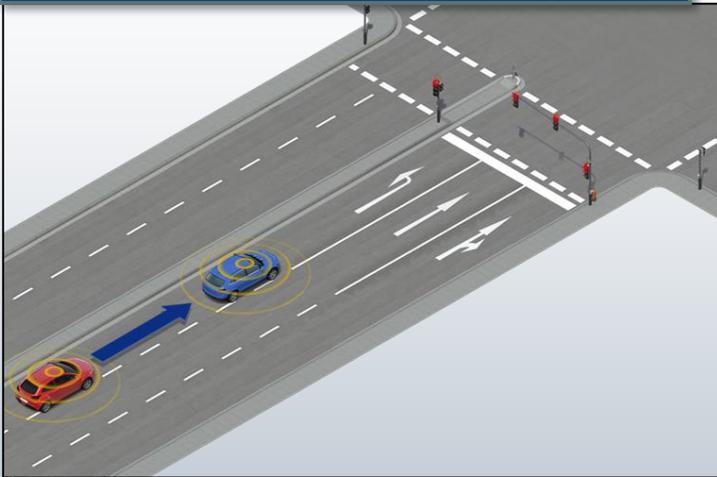
| Dynamic platooning	Traffic light info optimization
Based on intended maneuver at next intersection, vehicles assess the convenience of building small platoons, and keep them using exchanged trajectory	Based on rx intended maneuver at intersection, infra calculates and suggests optimization info such as lane-specific GLOSA or lane change advices

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Day 3/4: Coordination/negotiation sharing

- Enabling vehicular interaction for coordinated maneuver execution
- Examples (from IMAGinE project):
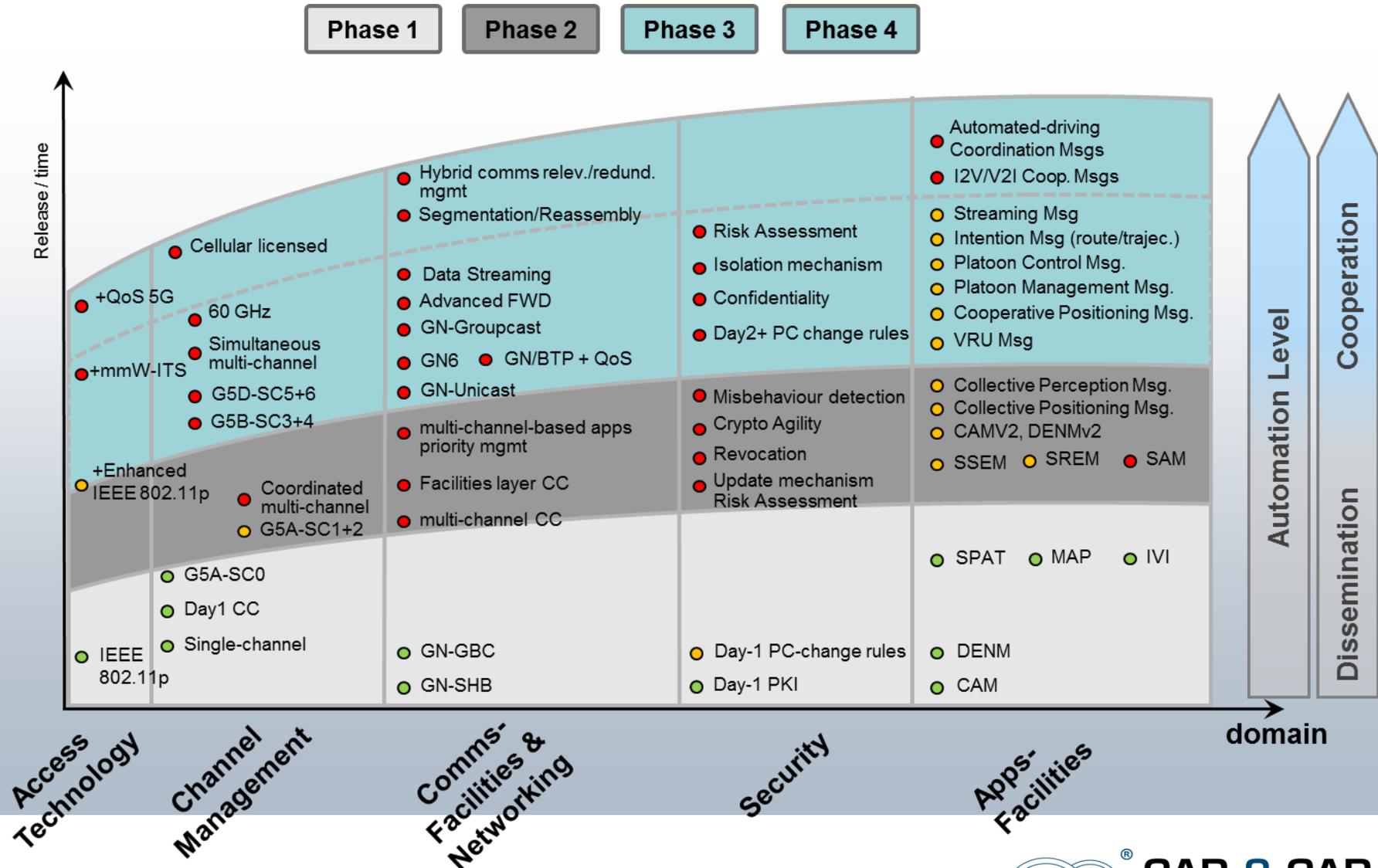
Cooperative Merging on Highways
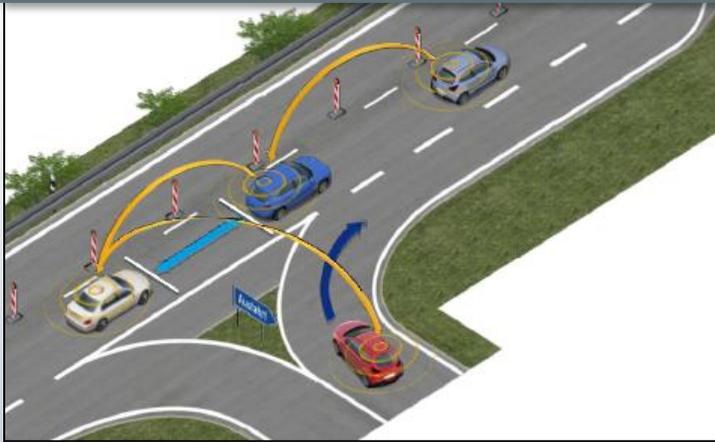
Based on notification of intended merging, interested vehicles exchange info to coordinate gap opening and merging maneuvers with increased time spans

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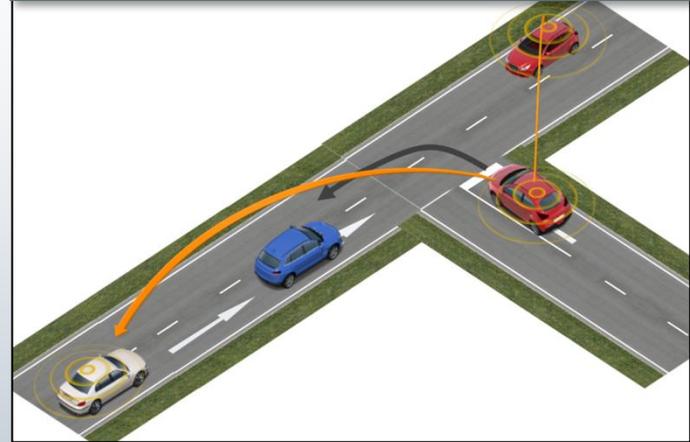
Based on notifications of intended turning, interested vehicles exchange info to coordinate right of way and transit maneuvers with increased time spans

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Roadmap: Supporting technology

Questions ?