MAVEN (Managing Automated Vehicles Enhances Network)

MAVEN use cases

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Stakeholder Workshop
Barcelona

MAVEN is funded by the EC Horizon 2020 Research and Innovation Framework Programme, under Grant Agreement No. 690727

Agenda

1. **Definition of MAVEN scope**
2. **Presentation of major Use Cases**
3. **Discussion**

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Objectives

- **To achieve a common understanding with respect to the MAVEN's scope and coverage**

- **Basis for discussions / questionnaires**

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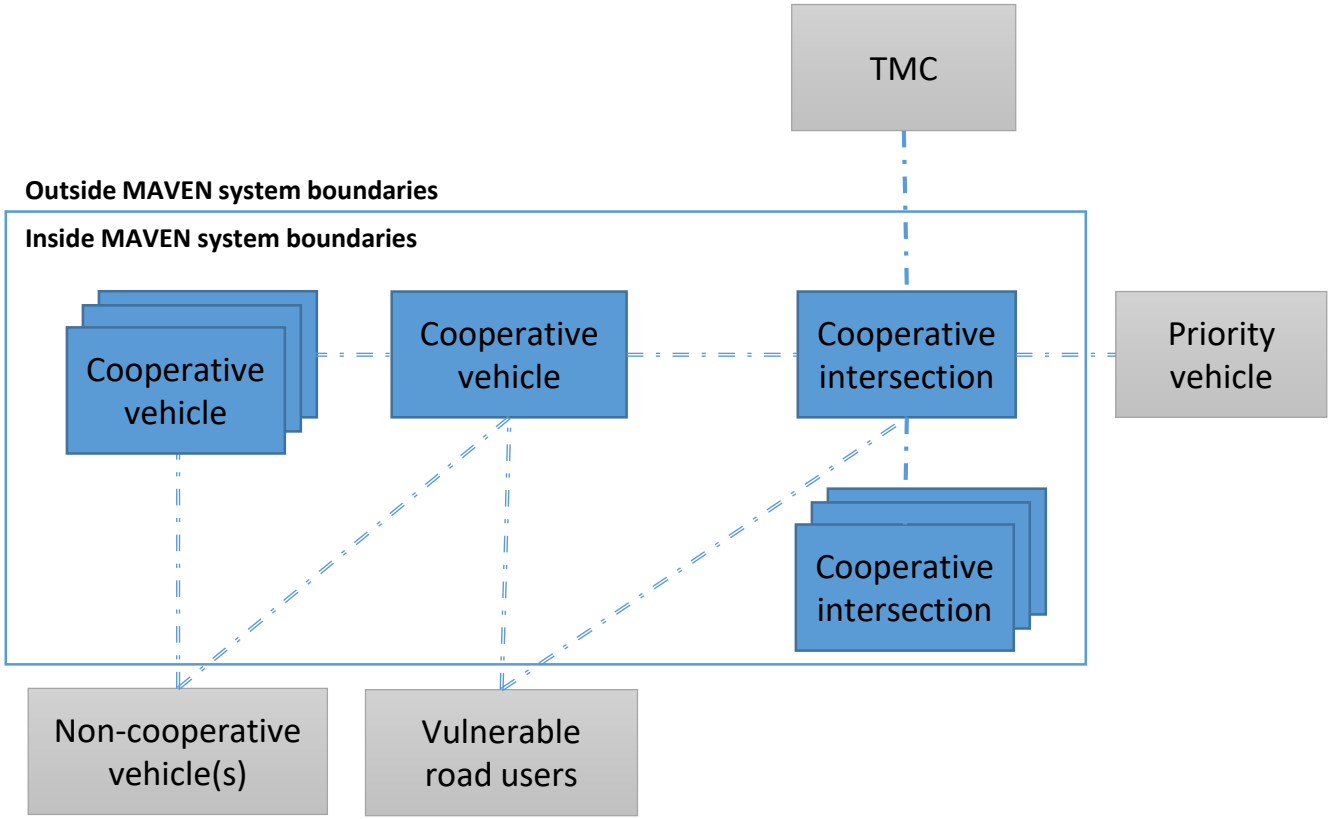
MAVEN - High level system decomposition



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Use case definition

- Describes (high-level) behaviour of a system
- and interaction with actors to achieve an objective in a specific context.

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Use cases – An Overivew

Platoon management

- UC1: Platoon initialisation
- UC2: Joining a platoon
- UC3: Leaving a platoon
- UC4: Platoon break-up

UC5: Speed change advisory (GLOSA)

UC6: Departure from intersection

UC7: Lane change advisory

UC8: Emergency situations

Signal optimisation

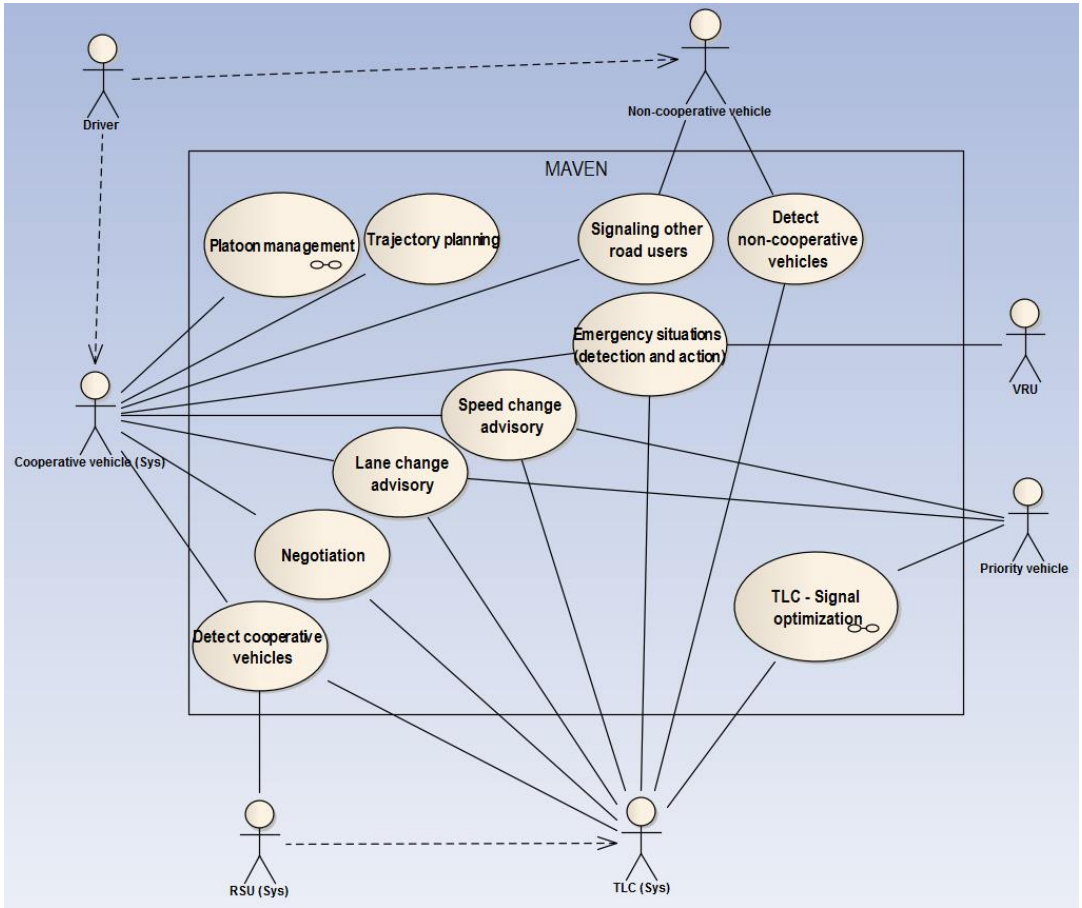
- UC9: Priority management
- UC10: Queue length estimation
- UC11: Local level routing
- UC12: Network coordination – green wave
- UC13: Signal optimisation

UC14: Negotiation

UC15: Signalling to other road users

UC16: Detect cooperative vehicles

UC17: Detect non-cooperative vehicles



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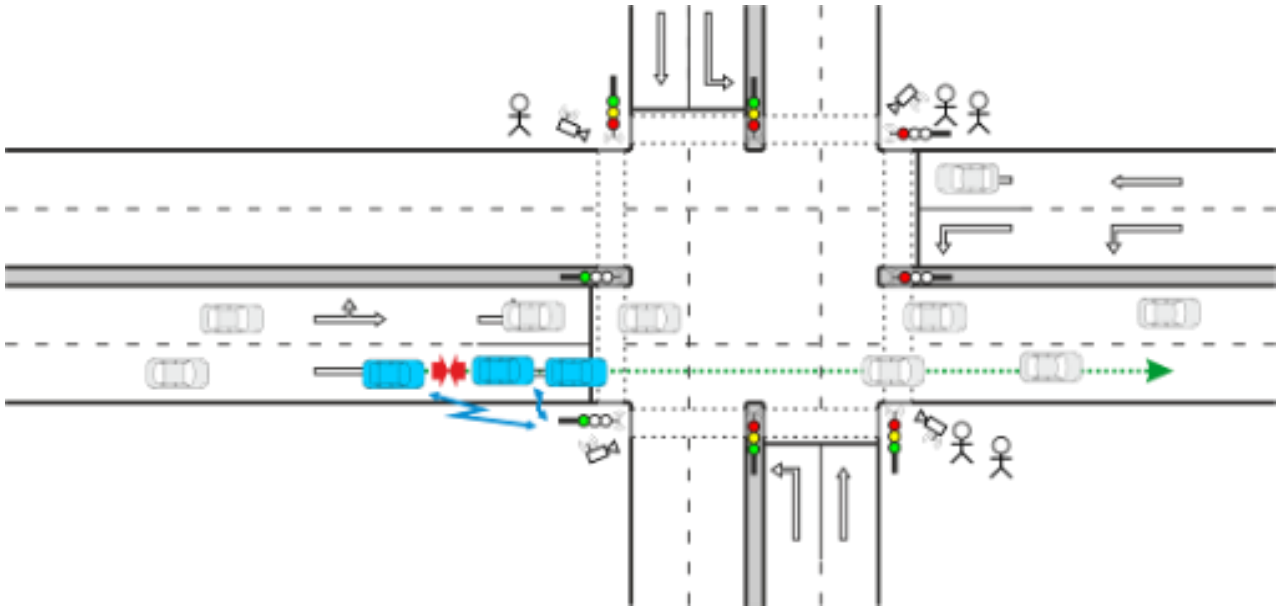
UC1: Platoon initialisation

Objectives

- A cooperative vehicle is triggered to form a platoon with a another cooperative vehicle



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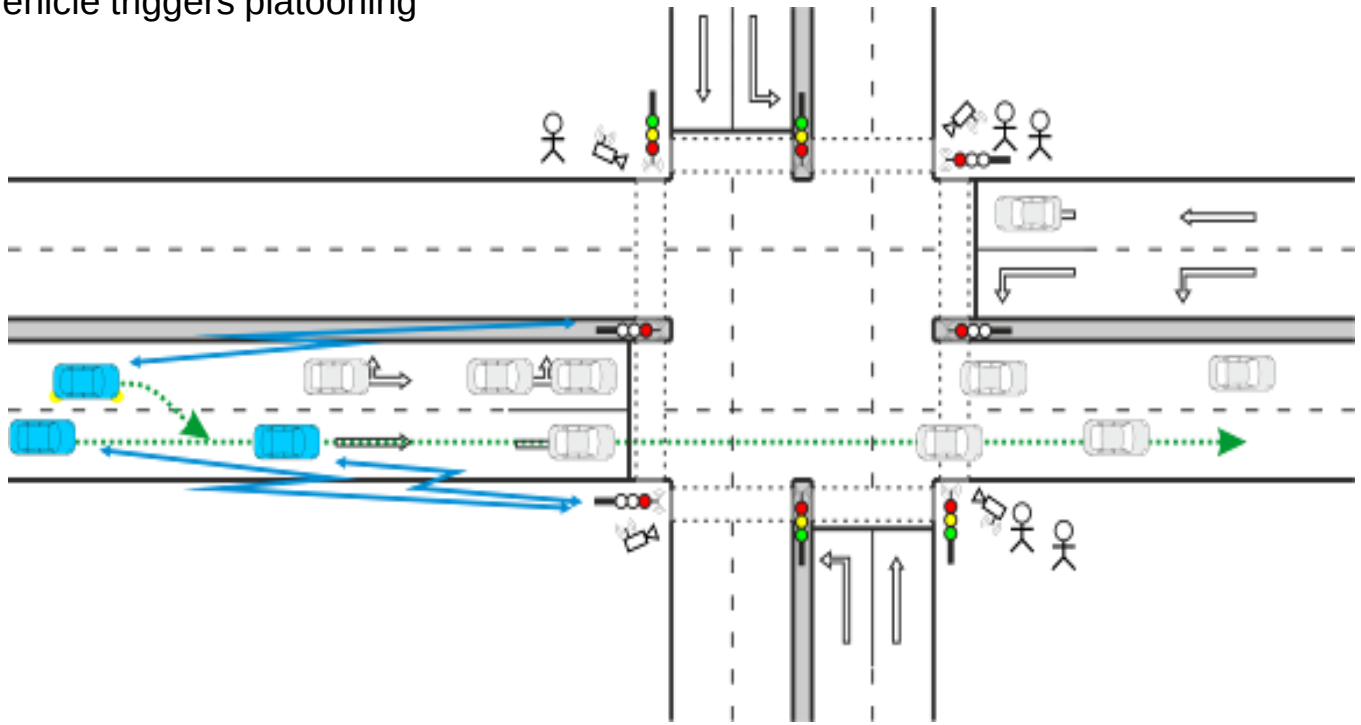
UC2: Joining a platoon

Objectives

- After triggering, a non-platooning vehicle joins a platoon
  - ✓ Intersection triggers platooning
  - ✓ Vehicle triggers platooning



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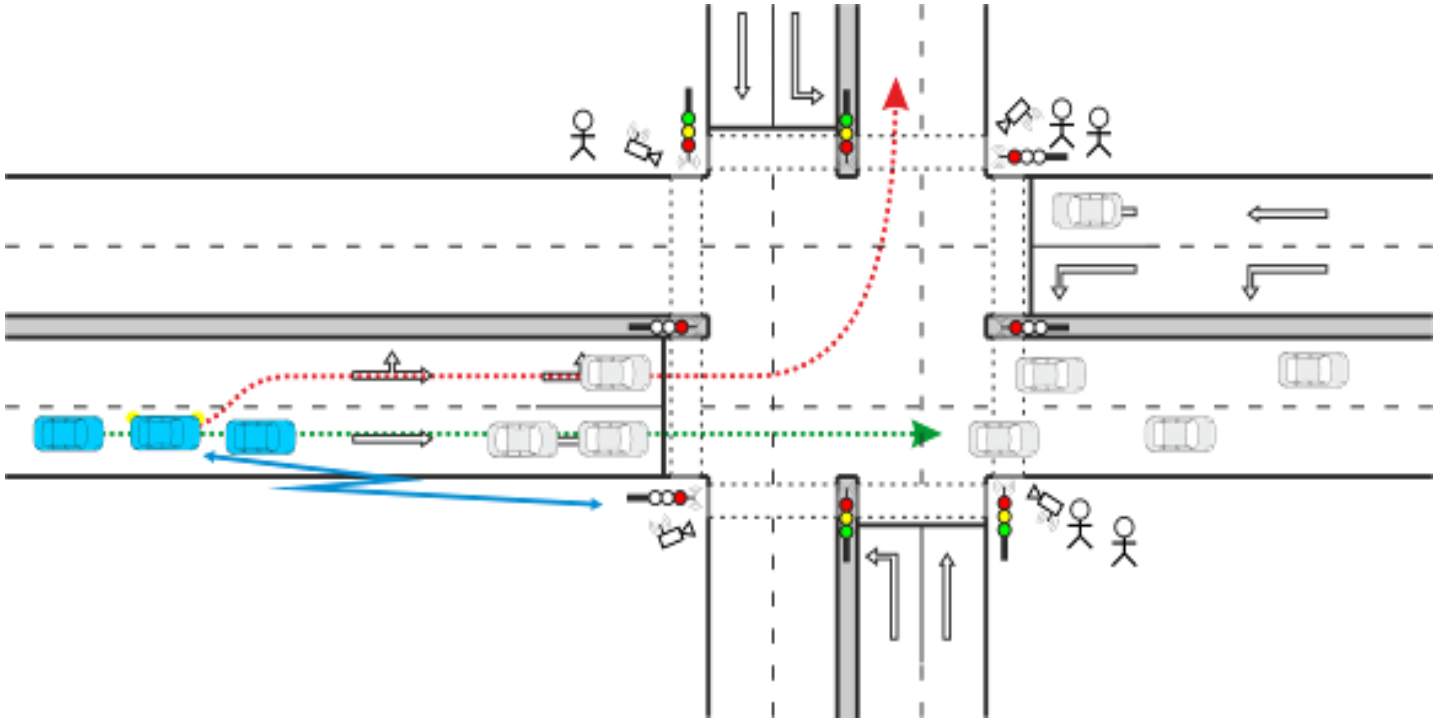
UC3: Leaving a platoon

Objectives

- A cooperative platooning vehicle leaves a platoon



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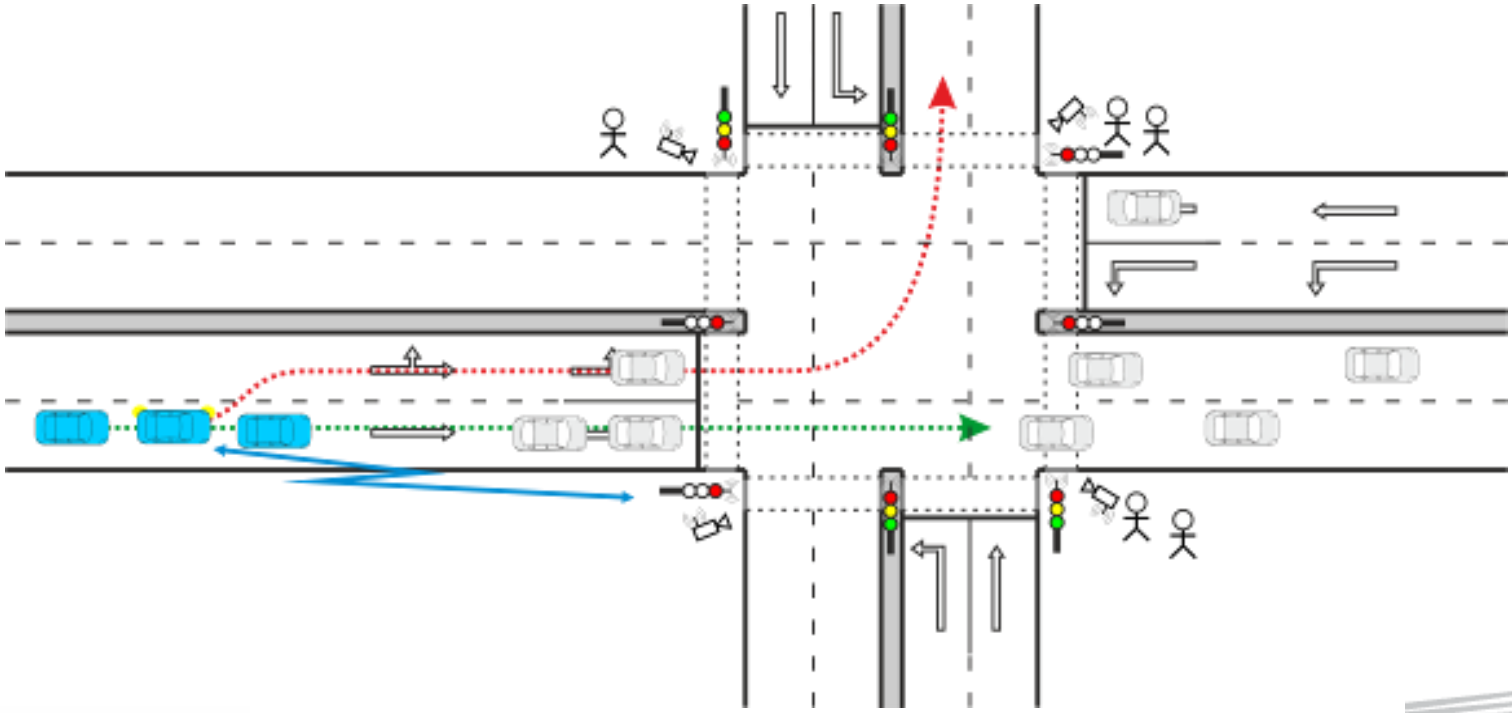
UC4: Platoon break-up

Objectives

- A platoon is triggered to stop platooning
- All vehicles will leave the platoon at a certain moment



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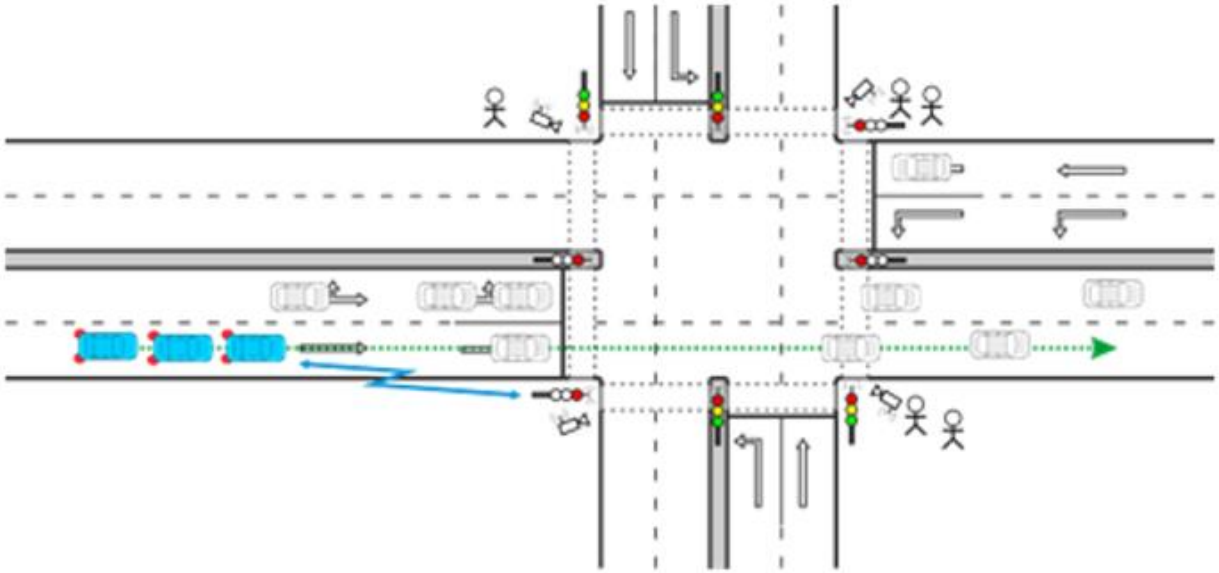
UC5: Speed change advisory (GLOSA)

Objectives

- A vehicle is given a speed advice to approach an intersection at arrive at green.
- This use case is needed to give speed advice to the vehicles to optimize the usage of green time at a TLC controlled intersection.



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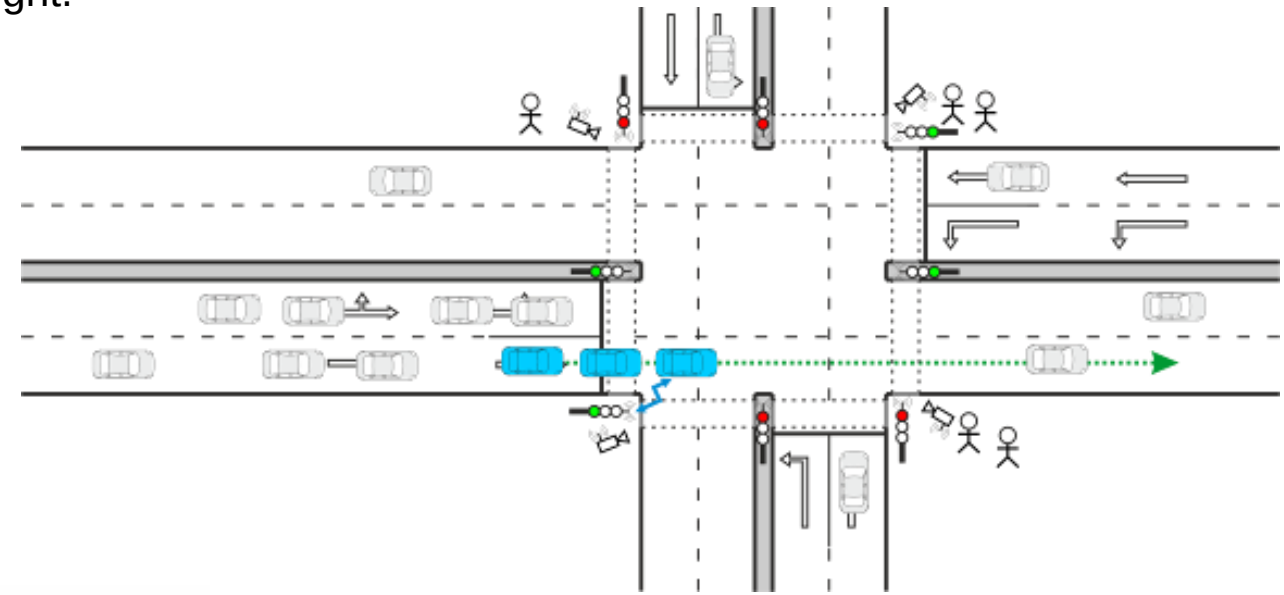
UC6: Departure from intersection

Objectives

- Coordinated movement of vehicles in the intersection zone to ensure quick clearance.
- This use case is needed for automated vehicles stopped at a traffic light to be directly or indirectly requested to depart from an intelligent traffic light.



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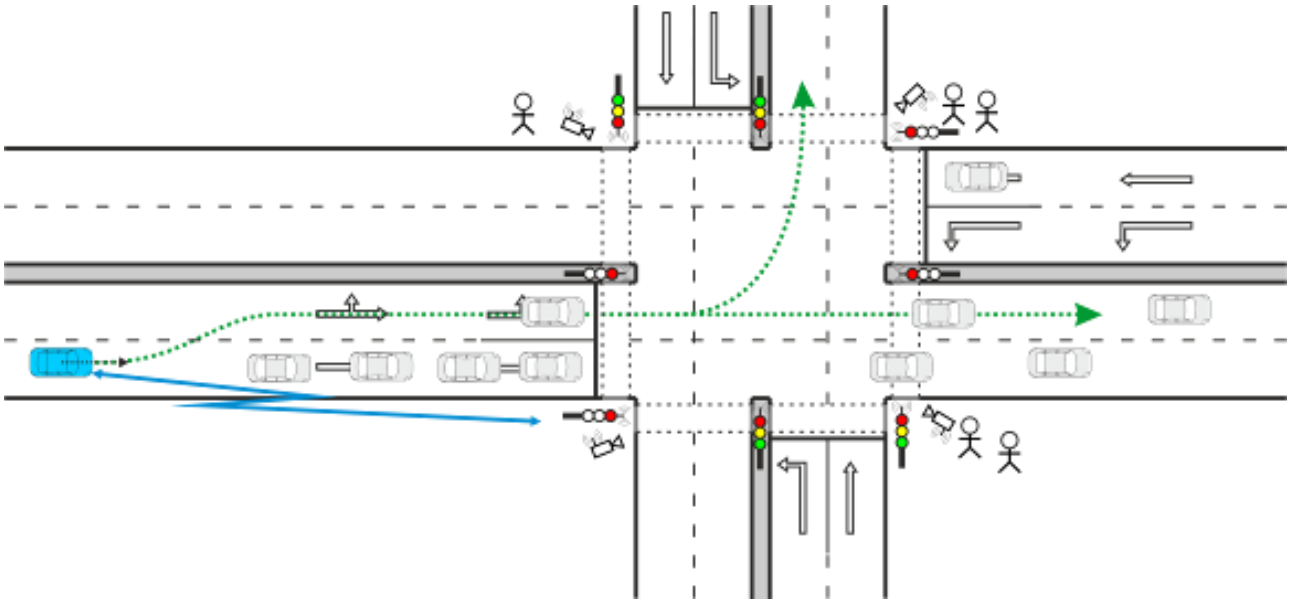
UC7: Lane change advisory

Objectives

- A vehicle is triggered to change lanes
- Traffic is distributed making optimal use of available capacity.
- Based on queue length estimation



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UC9: Emergency situations

Objectives

- Reaction to unexpected emergency situation
  - ✓ vulnerable road user entering the road
  - ✓ imminent crash on the lane
  - ✓ take-over situation, when one vehicle is not able to provide high automation and has to shift back control to the human driver urgently

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UC10: Priority management

Objectives

- The objective of this use case is to balance the priorities according to the policies set by the road operator

- Different roles
  - ✓ unequipped vehicles,
  - ✓ VRUs,
  - ✓ emergency vehicles,
  - ✓ trucks,
  - ✓ public transport,
  - ✓ equipped vehicles and
  - ✓ platoons

- Different policies
  - ✓ delay [seconds] * number of vehicles
  - ✓ Overall emissions
  - ✓ Sum of overall travel times
  - ✓ And others

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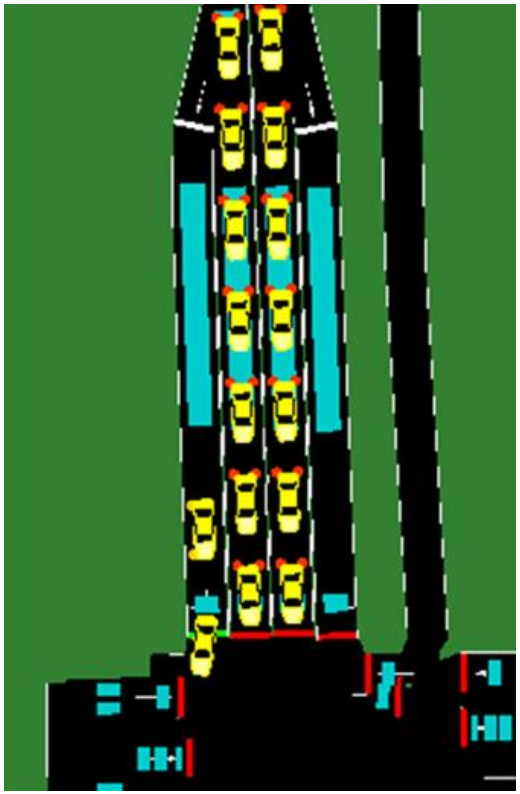
UC11: Queue length estimation

Objectives

- Estimate the length of queues with lane precision
- Based on traditional data sources
  - ✓ Inductive loops

  as well as additional ones, such as
  - ✓ Communication from cooperative vehicles
  - ✓ Floating car data
  - ✓ And others



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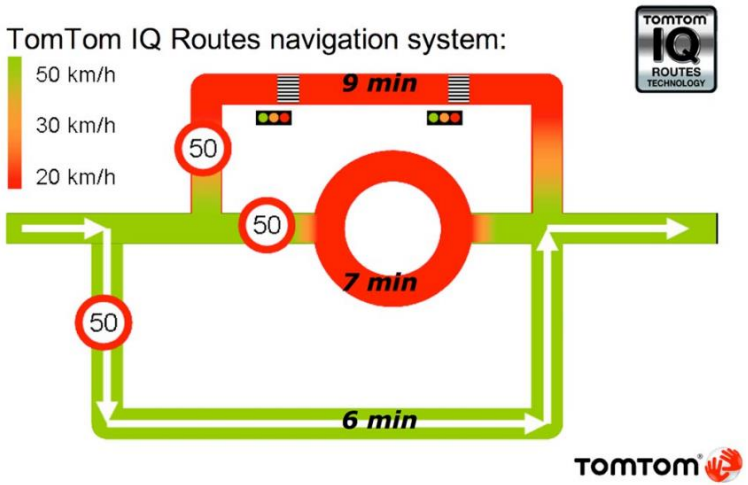
UC12: Local level routing

Objectives

- Knowing the traffic light plans in advance can be beneficial for routing when two routing alternatives are very similar on a macro-level (e.g. distance, average travel time).
- This can result in knowing whether it's likely to get a green wave on one route alternative or if a queue is about to grow beyond the capacity of one cycle.



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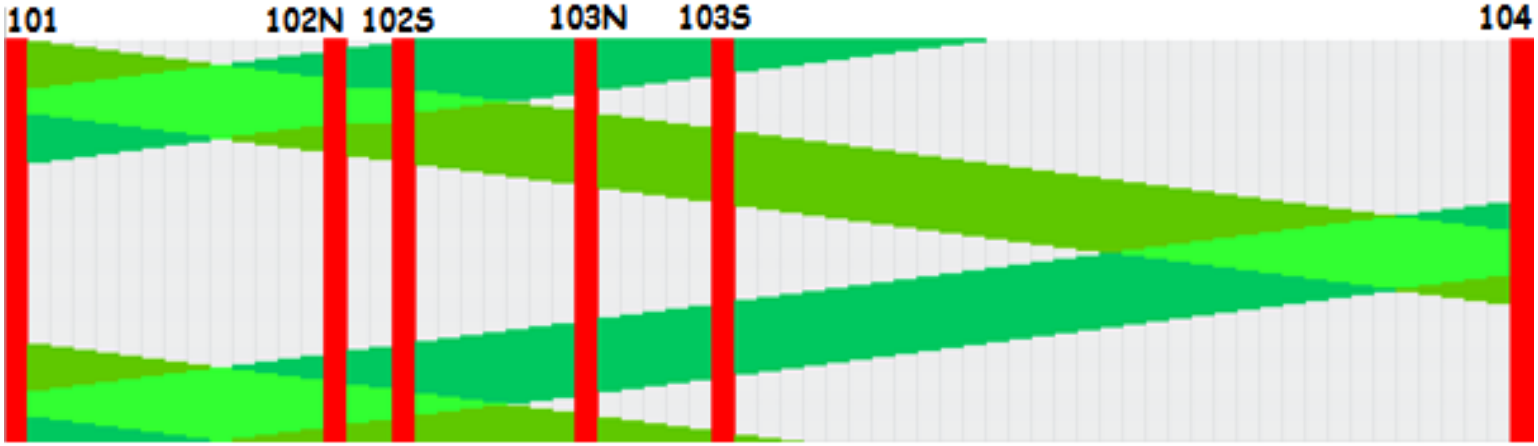
UC13: Network coordination – green wave

Objectives

- to create a dynamic green wave for autonomous and cooperative vehicles
- in close cooperation with GLOSA speed advice with less impact on other traffic than traditional green wave systems have
  - ✓ With the help of queue length estimations
  - ✓ Using Speed and Lane change advisory



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UC14: Signal optimisation

Objectives

- Improve controller performance (reduced average delay and stops for all traffic) by using new data
  - ✓ Data from cooperative vehicles
  - ✓ Lane based queue lengths
  - ✓ Routing knowledge
  - ✓ Dynamic priorities
- Stabilize the signal plan for approaching vehicles with speed advice

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UC15: Negotiation

Objectives

- C-ITS can enable negotiation strategies according to which cooperative automated vehicles and cooperative traffic lights exchange information about intentions and possibilities in a way to provide optimal traffic flows at intersections.
- Performing a bidirectional exchange of information for negotiations using communications from Infrastructure and vehicles and back.

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UC16: Signalling to other road users

Objectives

- A vehicle indicates his current cooperative status to any other vehicle.
  - ✓ Using V2V communication
  - ✓ Signaling to non-cooperative vehicles

UC17-18: Detect cooperative/non-cooperative vehicles

Objectives

- To detect presence of other vehicles as well as VRU in an intersection
- Based on different sensing and communication technologies

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Discussion ?!

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Thank you!

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