13th ITS EUROPEAN CONGRESS

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Brainport Eindhoven, the Netherlands | 3-6 June 2019

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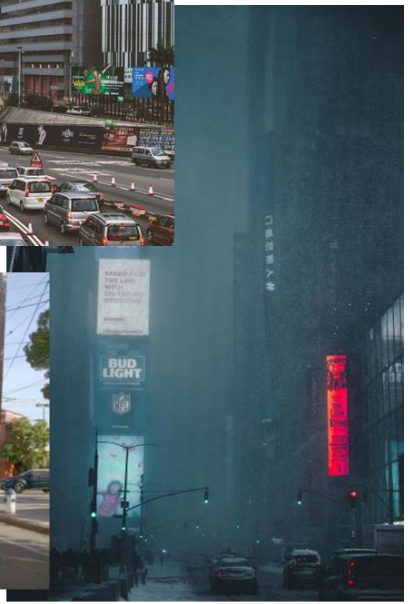
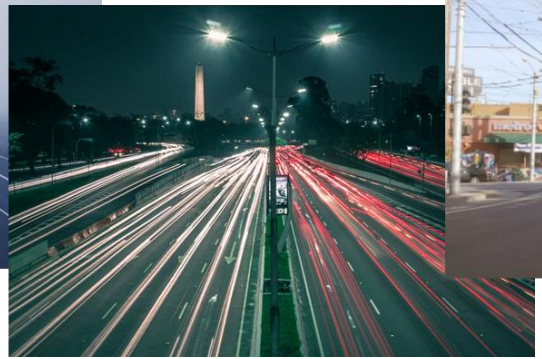
Cooperation aspects for infrastructure-assisted driving at transition areas

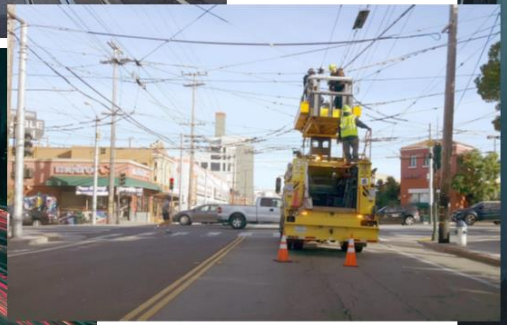
Anton Wijbenga
MAP traffic management, the Netherlands

TransAID is funded by the EC Horizon 2020 Research and Innovation Framework Programme, under Grant Agreement No. 723390

Automated Driving Limitations







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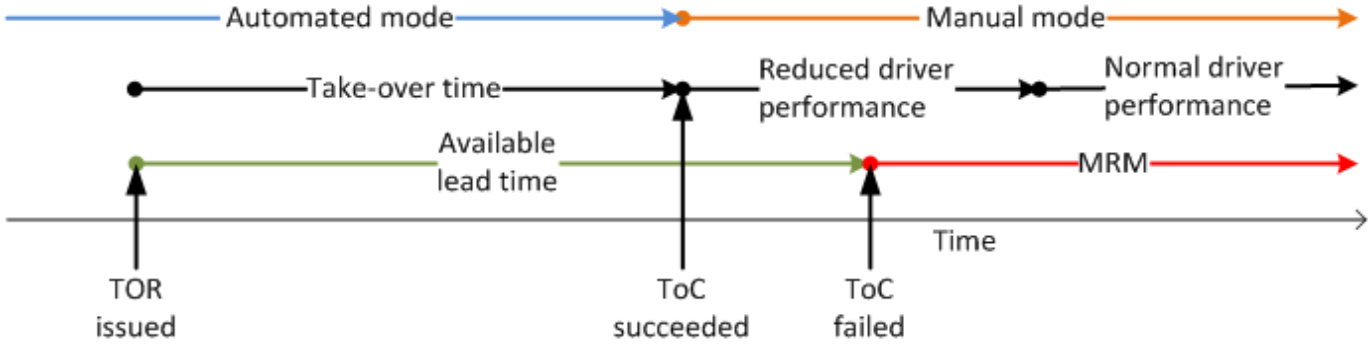
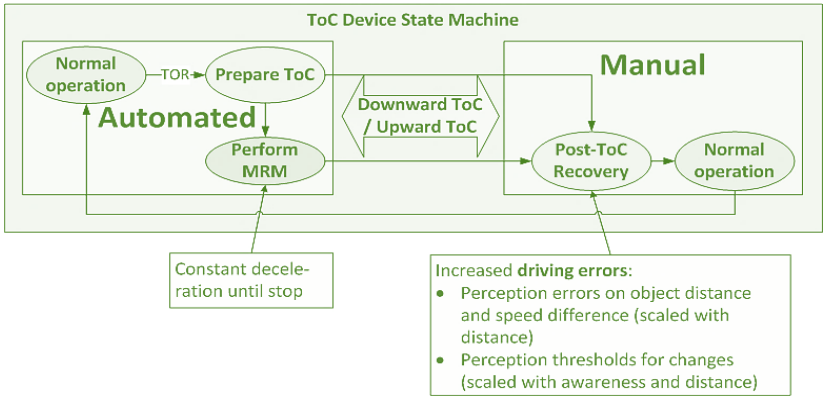
Transition of Control Process





Abbreviations

TOR: Take Over Request
ToC: Transition of Control
MRM: Minimum Risk Manoeuvre

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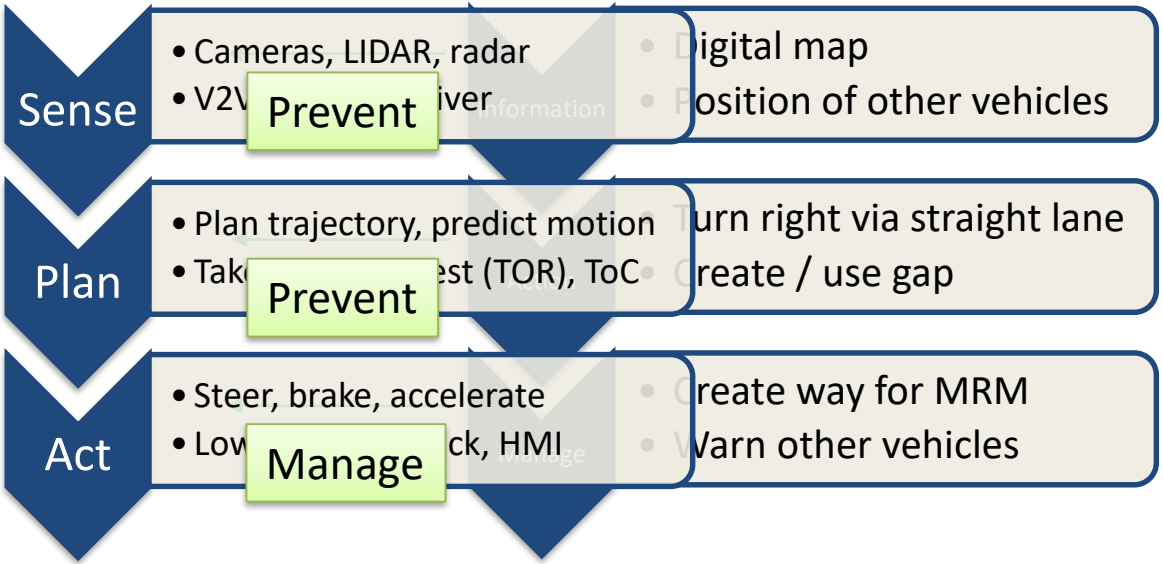
Assisting Automated Driving



+ when a ToC is not preventable, but predictable → spread the ToCs in time and space

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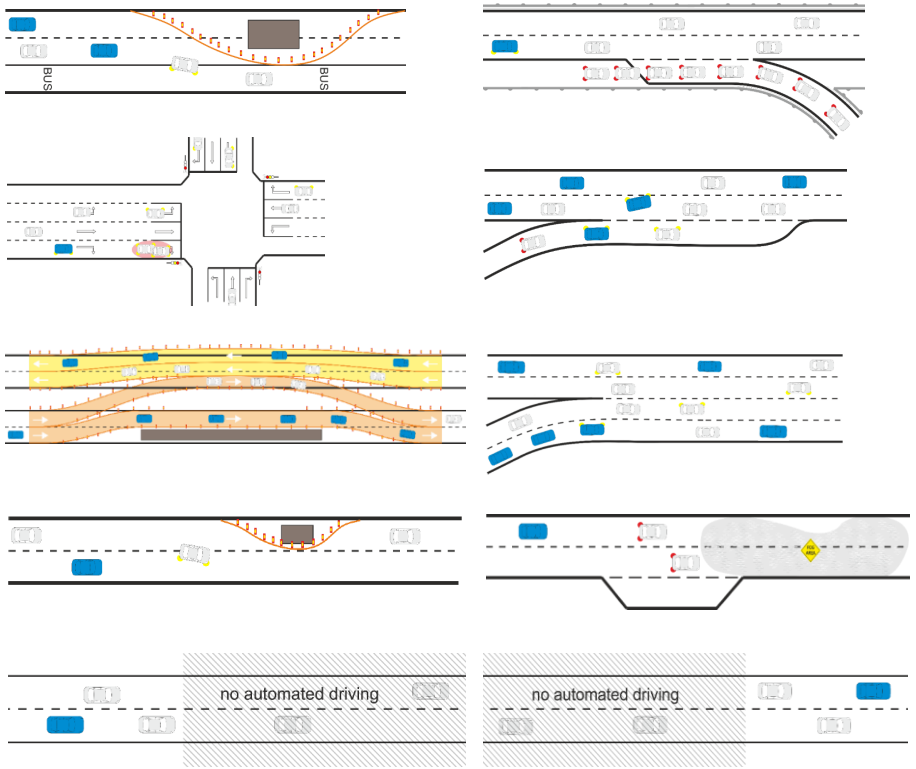
5 TransAID Services

1. Prevent ToC/MRM by providing vehicle path information.
2. Prevent ToC/MRM by providing speed, headway and/or lane advice.
3. Prevent ToC/MRM by traffic separation.
4. Manage MRM by guidance to safe spot.
5. Distribute ToC/MRM by scheduling ToCs.



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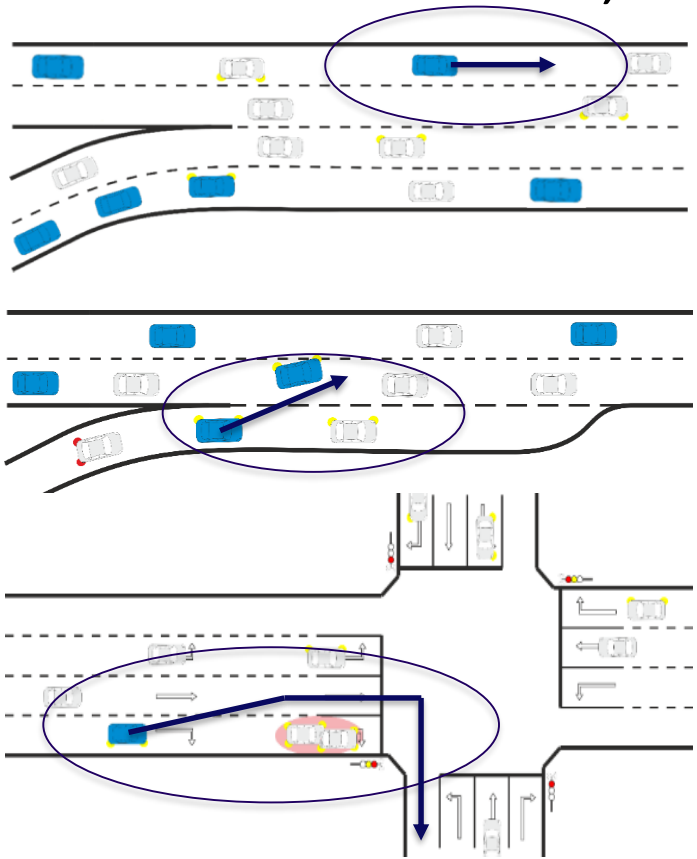
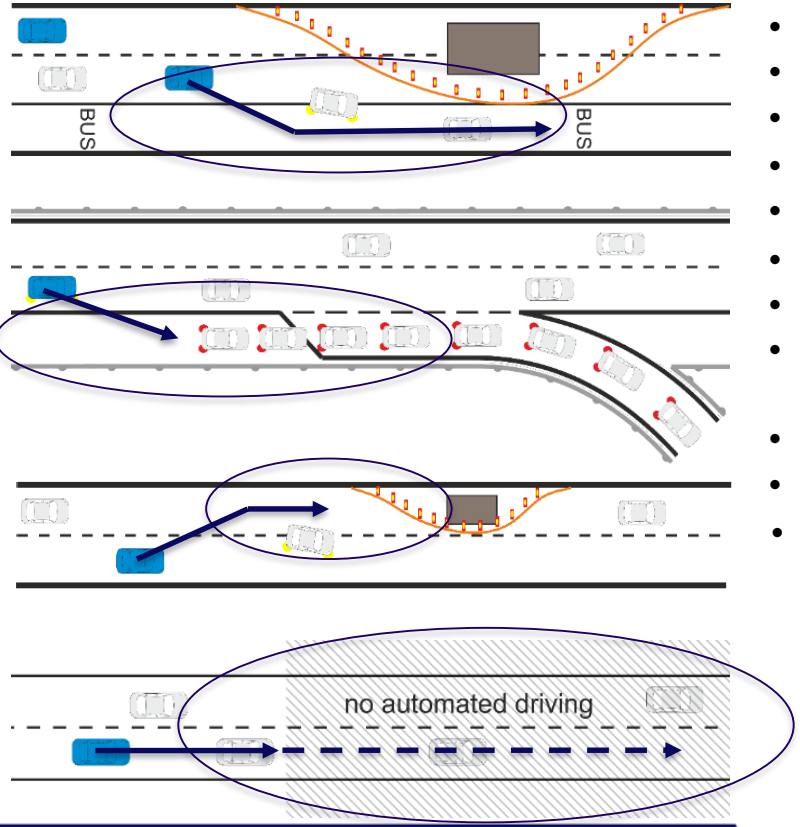
Trust, Safety and Legal Aspects





- Drive left
- Cooperate
- Trust gap
- ‘Illegal’ turn
- Trust MAP + SPAT
- Drive on bus lane
- Trust RW info
- Drive on emergency lane
- Trust RSI
- ‘legal’ safe stop?
- Trust RSI about no AD zone

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Trust, Safety and Legal Aspects

- Trust and understanding are needed to support automated vehicles in challenging circumstances.
- This means trusting information about:
  - Road works, events, incidents, geofencing, digital maps, road signs, etc.
- Even when:
  - AVs cannot yet sense upcoming situations
  - Digital information conflicts with sensor data (i.e. traffic light colour, traffic signs, etc.)
  - Suggested actions are in conflict with traffic regulation
- But also: road authorities need to know the capabilities of AVs and trust those.
  - There will always be low-level safety critical automation (collision avoidance)
- Possibly revision of traffic laws and regulation

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Identifying and Monitoring Transition Areas

- Knowledge about Transition Areas improve:
  - Safety
  - Efficiency
  - Comfort

- Via the RSI road authorities can collect information about Transition Areas from many vehicles.

- Via the OEM backend, OEMs can collect information about Transition Areas as well.

- Road authorities can use the RSI to inform AVs about upcoming situations, particularly Transition Areas.

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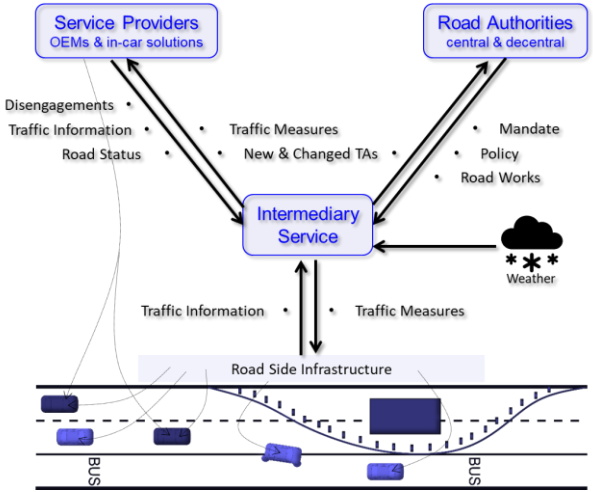
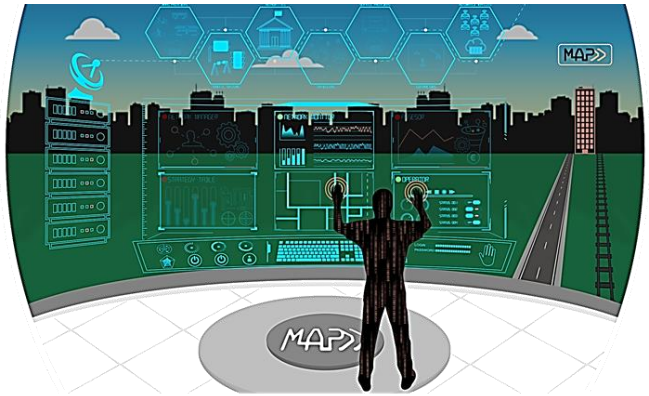
Intermediary Service

- RAs and OEMs cooperate through an intermediary service:
  - Generate trust
  - Create understanding
  - Align measures (space, time, type)

- Single point of access, possibly mandated by both RAs and OEMs
- Consolidate knowledge / experience.
- Apply across road authority borders
  - including those that have no TMC





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Many questions…

- Will there be no-automated-driving zones?
- Will there be automated-driving-only zones?
- Are OEMs willing to cooperate to identify transition areas / limitations of their automation?
- What possibilities are provided by OEM backends?
- Can road authorities provide advices which conflict with traffic regulation?
- Which circumstances result in a take-over request?
- What do AVs do when their route is blocked?
- What to do about non-connected AVs?
- What kind of minimum-risk manoeuvres can be expected?
- When situations are challenging, will AVs:
  - Behave like everyone else (sometimes egocentric, including breaking traffic laws)?
  - Behave exactly in line with traffic regulation?
  - Behave ‘optimally’?
- What if information from RSI is wrong?

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