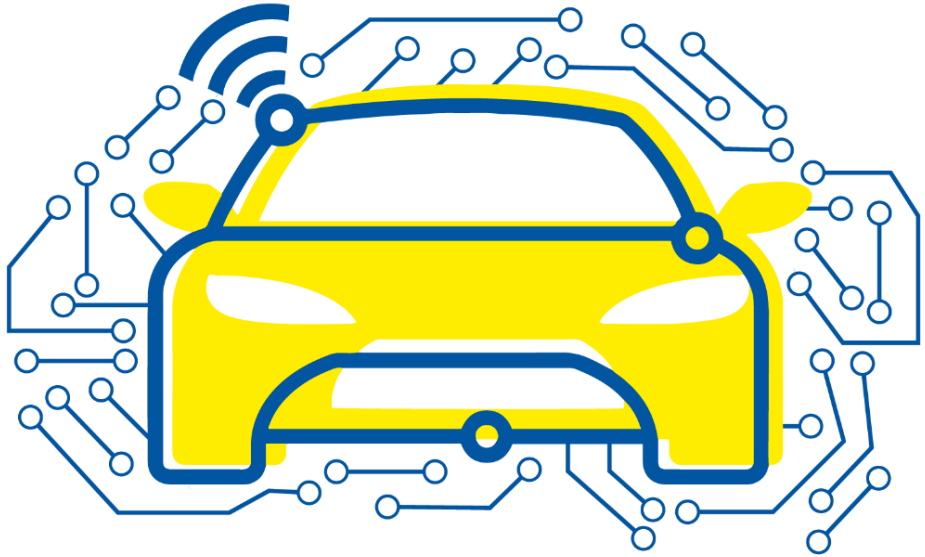
Automated and Connected Driving Challenges

Section 5 – Connected Driving

Infrastructure to Vehicle Communication

SPATEM & MAPEM



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I2V-Communication – SPATEM & MAPEM

Message overview

- Direct relationship between SPATEM and MAPEM

MAPEM

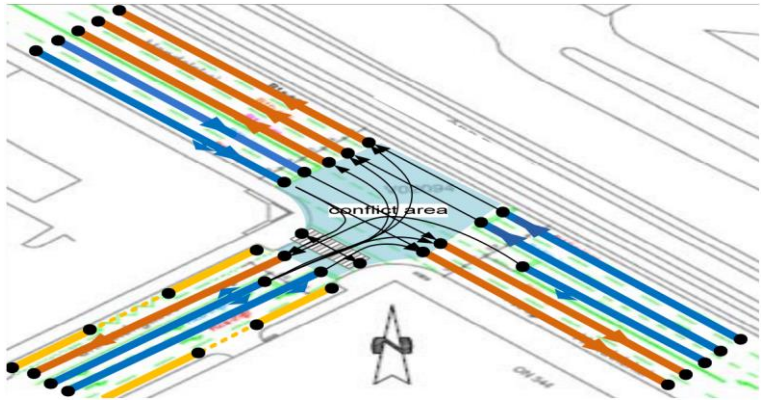
Contains **intersection topology** and **position** of traffic lights

Payload changes very rarely
→ **low frequency** is sufficient

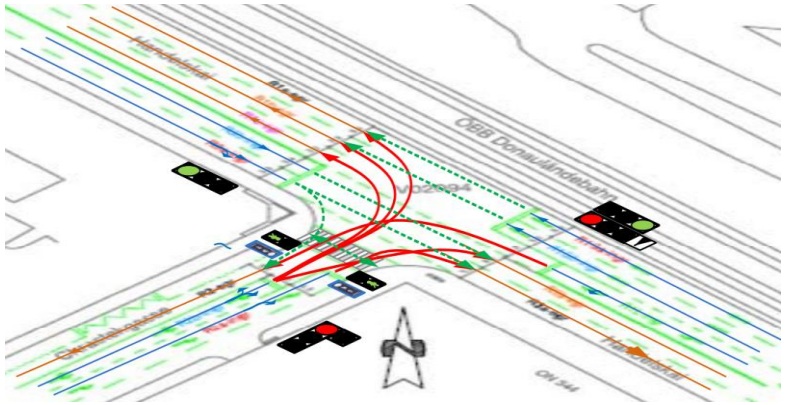
SPATEM

Contains information about **current** and **future states** of traffic lights

dynamic, **safety relevant** payload
→ **high frequency** is needed



Source: ETSI TS 103 301



Source: ETSI TS 103 301

I2V-Communication – SPATEM & MAPEM

SPATEM payload and possible use-cases

- A SPATEM can include information about multiple intersections
- Each intersection can contain multiple signal groups
  - Traffic lights that always have an equal state

intersection:
- **id:** for clear assignment
- **timestamp:** time at which the message was generated
- **signalGroup:** id of the considered signal group
  - **eventState:** current state of the traffic light
  - **timing_likelyTime:** time at which the state is likely to change

```
eventState ::= ENUMERATED {
  unavailable (0),
  dark (1),
  stop-Then-Proceed (2),
  stop-And-Remain (3),
  pre-Movement (4),
  permissive-Movement-Allowed (5),
  protected-Movement-Allowed (6),
  permissive-clearance (7),
  protected-clearance (8),
  caution-Conflicting-Traffic (9)
}
```

I2V-Communication – SPATEM & MAPEM

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➡ Central instances can process the data and optimize the global traffic flow

➡ Motion planning algorithms can consider the state and prediction of traffic lights at an early stage