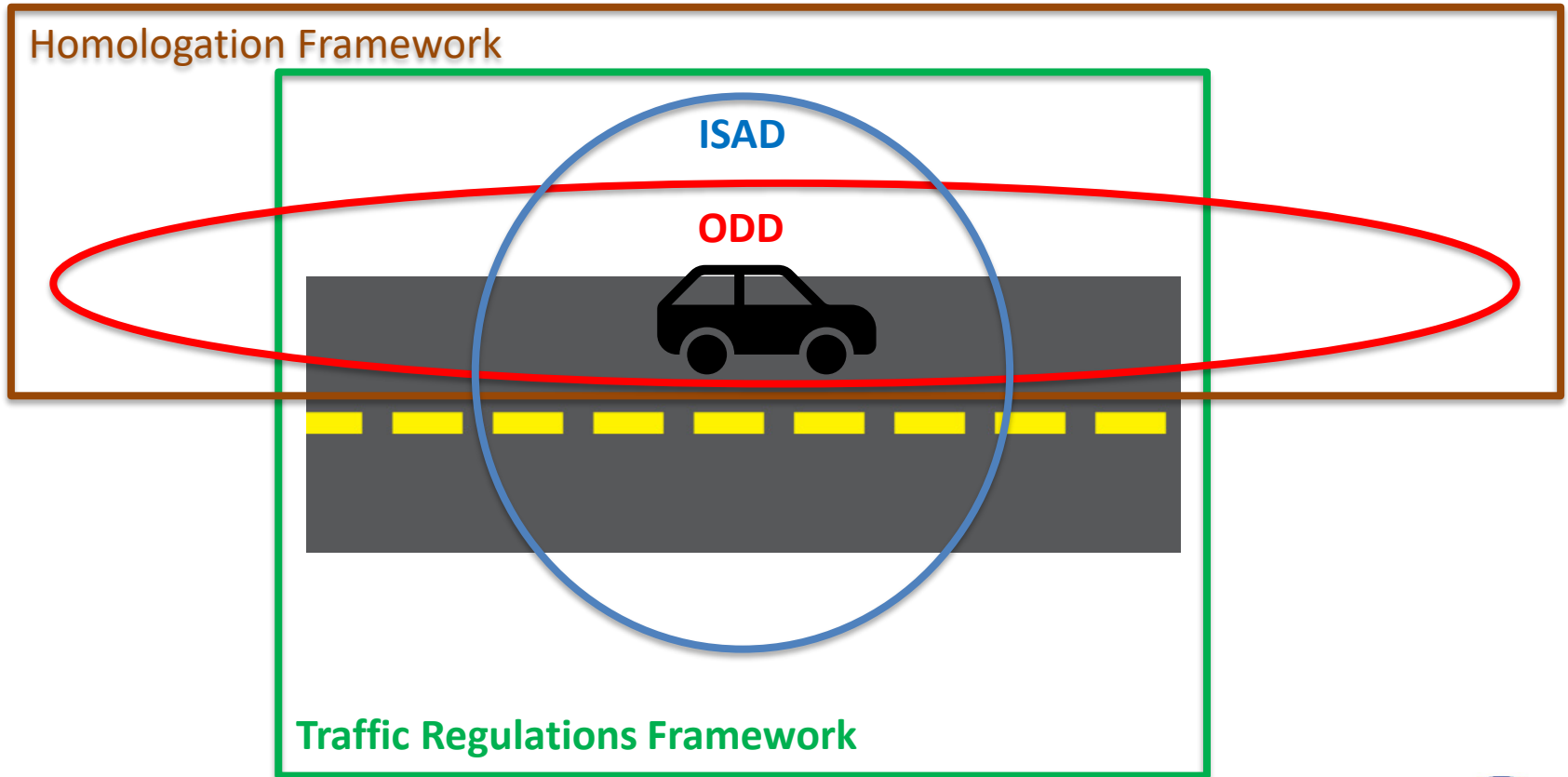




Specific focus of the updated roadmap on Infrastructure and Connectivity sections

Interaction: ODD / ISAD / Traffic Regulations / Homologation Framework

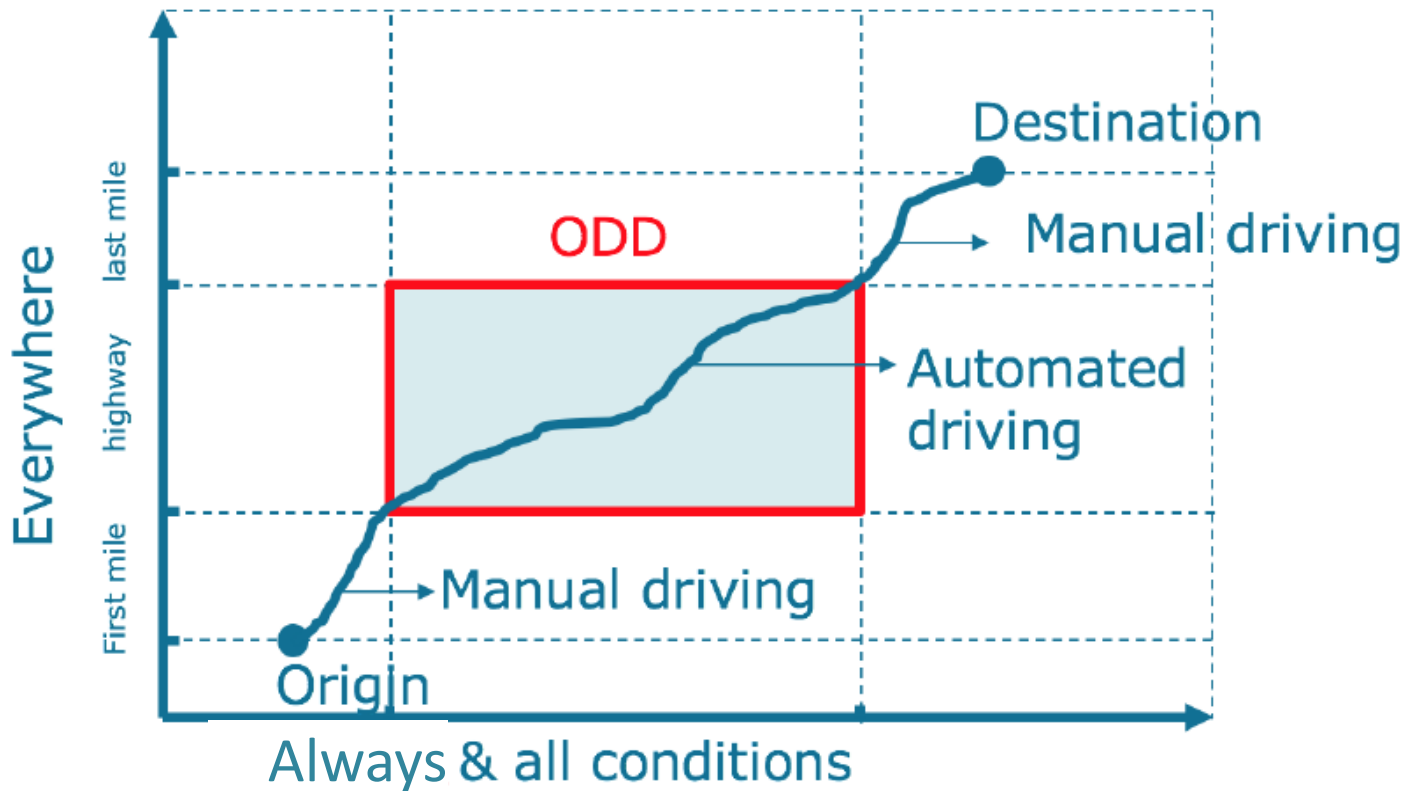


ODD definition

- ODD is a description of the specific operating conditions in which the automated driving system is designed to properly operate, including but not limited to roadway types, speed range, environmental conditions (weather, daytime/nighttime, etc.), prevailing traffic law and regulations, and other domain constraints (*Waymo 2017*)
- Long term vision is to align infrastructure support with automotive safety integrity level.
- Visualize automated driving quality and availability, driving/travel experience from a user perspective
- To further provide input from CEDR CAD: what are the prerequisites towards the infrastructure from vehicle side?



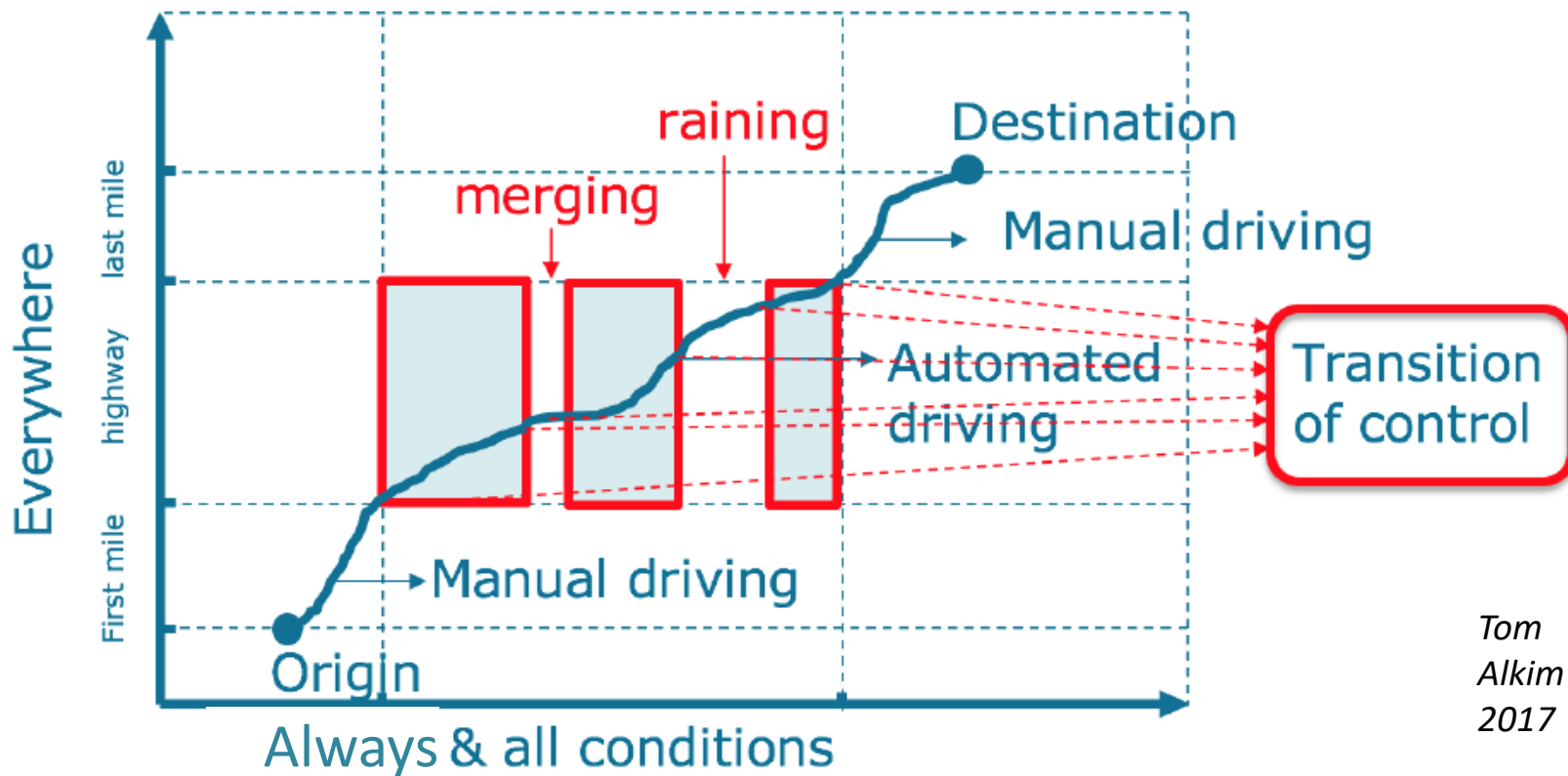
ODD – Example #1



Tom
Alkim
2017



ODD – Example #2



Tom
Alkim
2017



Input - How the infrastructure can (and should) support CAD

- Road infrastructure can provide additional information for on-board decisions of CAVs
- A classification of infrastructure support is needed:
 - Common understanding between OEMs, automotive industry and road operators is to be established
 - More use-cases have to be defined to understand the potential of ISAD in mixed traffic
 - Long transition period with mixed traffic is expected
- The workgroup's feedback was incorporated in the approach and classification of this infrastructure support levels, please find the related information on the next slides



Infrastructure Support levels for Automated Driving (ISAD)

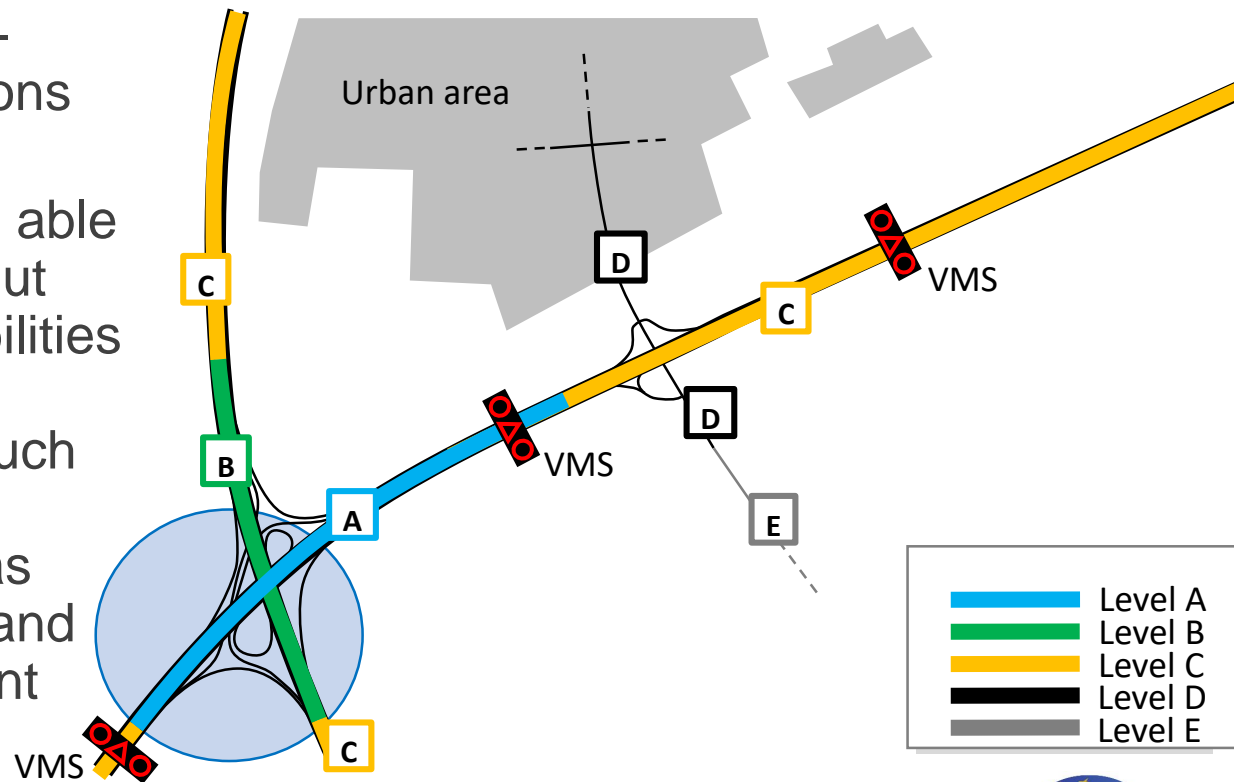
Elaborated in cooperation with INFRAMIX, see also ITS World Congress 2018 paper by AAE & ASFINAG

	Level	Name	Description	Digital information provided to AVs			
				Digital map with static road signs	VMS, warnings, incidents, weather	Microscopic traffic situation	Guidance: speed, gap, lane advice
Digital infrastructure	A	Cooperative driving	Based on the real-time information on vehicle movements, the infrastructure is able to guide AVs (groups of vehicles or single vehicles) in order to optimize the overall traffic flow.	X	X	X	X
	B	Cooperative perception	Infrastructure is capable of perceiving microscopic traffic situations and providing this data to AVs in real-time	X	X	X	
	C	Dynamic digital information	All dynamic and static infrastructure information is available in digital form and can be provided to AVs.	X	X		
Conventional infrastructure	D	Static digital information / Map support	Digital map data is available with static road signs. Map data could be complemented by physical reference points (landmarks signs). Traffic lights, short term road works and VMS need to be recognized by AVs.	X			
	E	Conventional infrastructure / no AV support	Conventional infrastructure without digital information. AVs need to recognise road geometry and road signs.				



ISAD on schematic road segment

- Based on the ISAD Level of information and services different on-board vehicle decisions can be supported
- CAVs will have to be able to drive on E-level, but the additional possibilities provided by A-level sections enable a much higher customer satisfaction as well as support road safety and capacity management related goals

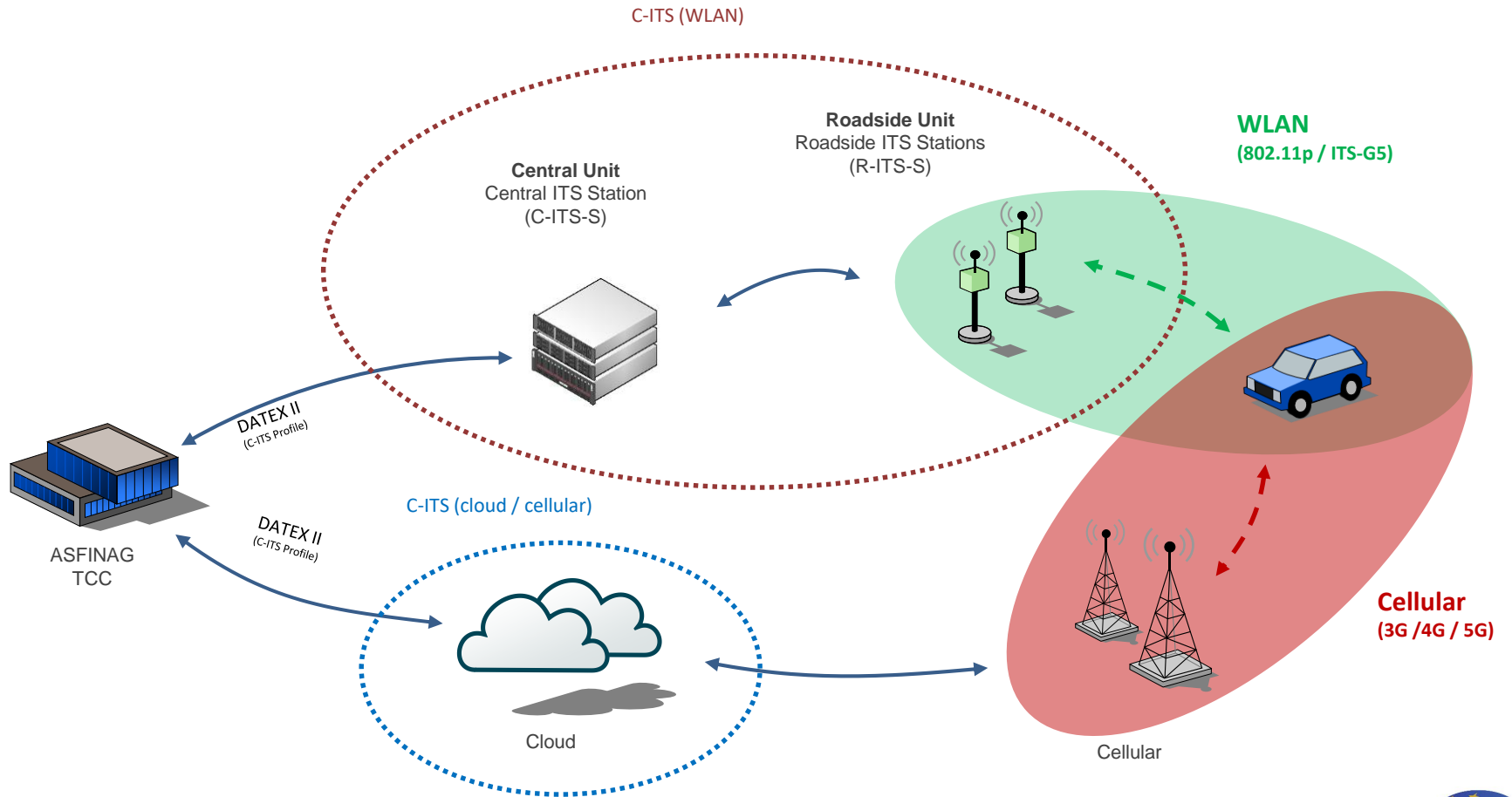


ISAD definition

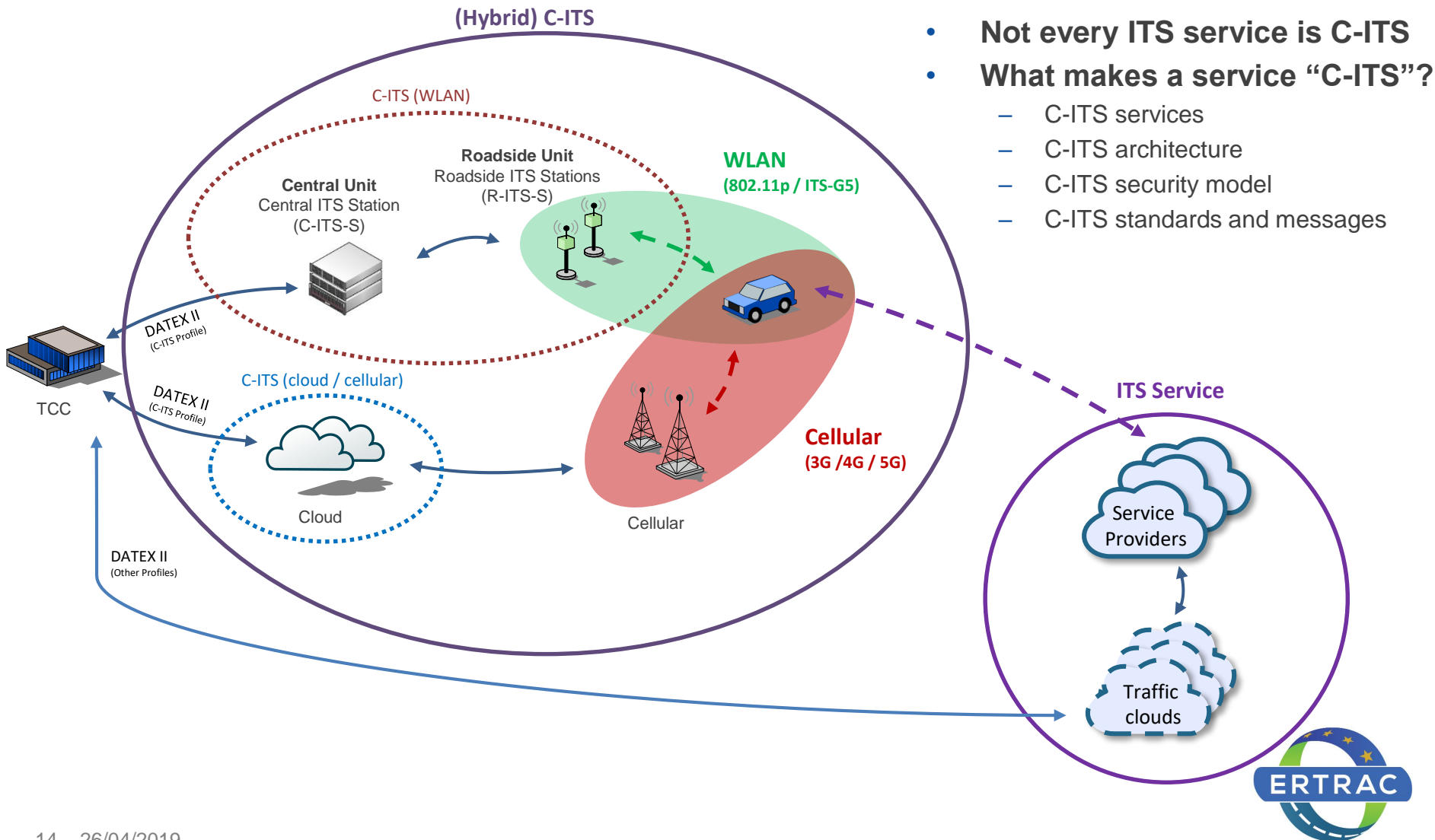
- 5 levels of infrastructure support for automated driving (ISAD) are established in order to structure the various means of support that infrastructure can provide towards automated vehicles.
- This is based on the idea of the SAE levels for vehicle capabilities. Infrastructure support levels are independent and not linked to SAE levels, i.e. an SAE-Level-3 automated vehicle does not need Infrastructure Support Level B to operate
- Infrastructure support levels are meant to describe road or highway sections rather than whole road networks.



Connectivity



Connectivity



- **Not every ITS service is C-ITS**
- **What makes a service “C-ITS”?**
 - C-ITS services
 - C-ITS architecture
 - C-ITS security model
 - C-ITS standards and messages