



# Operational Design Domain (ODD) management for automated driving

Jaap Vreeswijk

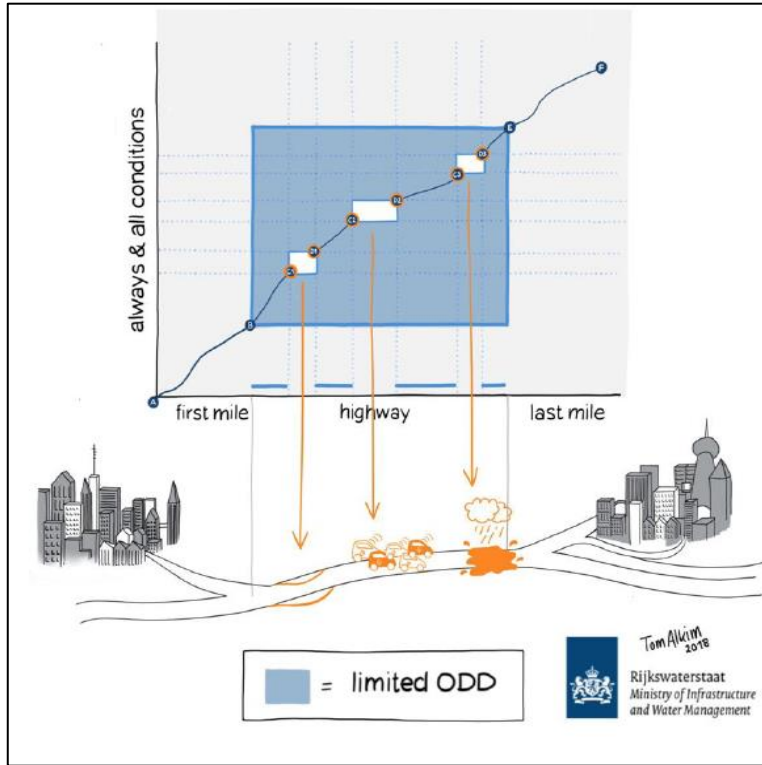


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# Managing the ODD



- An ODD has boundaries and gaps.
- What happens if an automated vehicle is unable to solve the situation ahead?
- ...what if, this happens not to single vehicles only, but to several?
- ...what if, it systematically happens on the same spot or in similar circumstances?
- ...what if, this affects traffic flow, traffic safety, etc.

# Manageable Paths

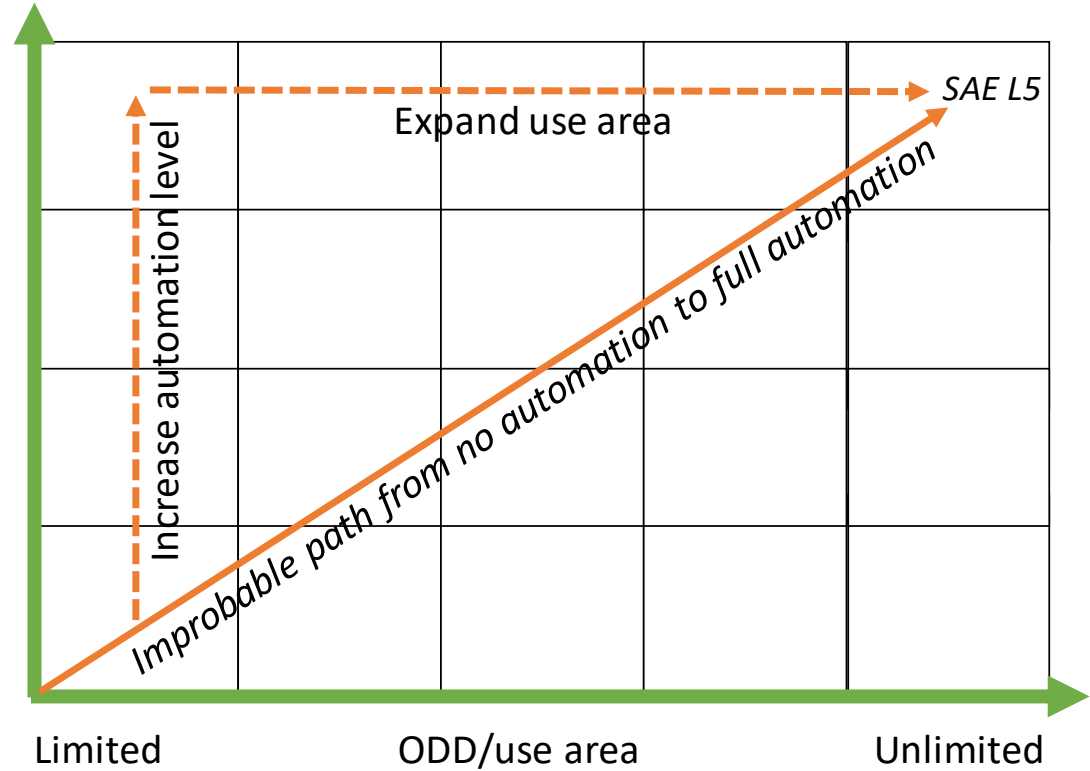


SAE L4

SAE L3

SAE L2

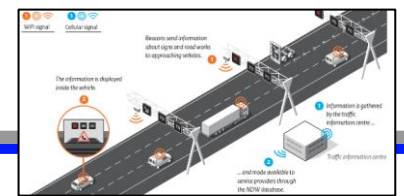
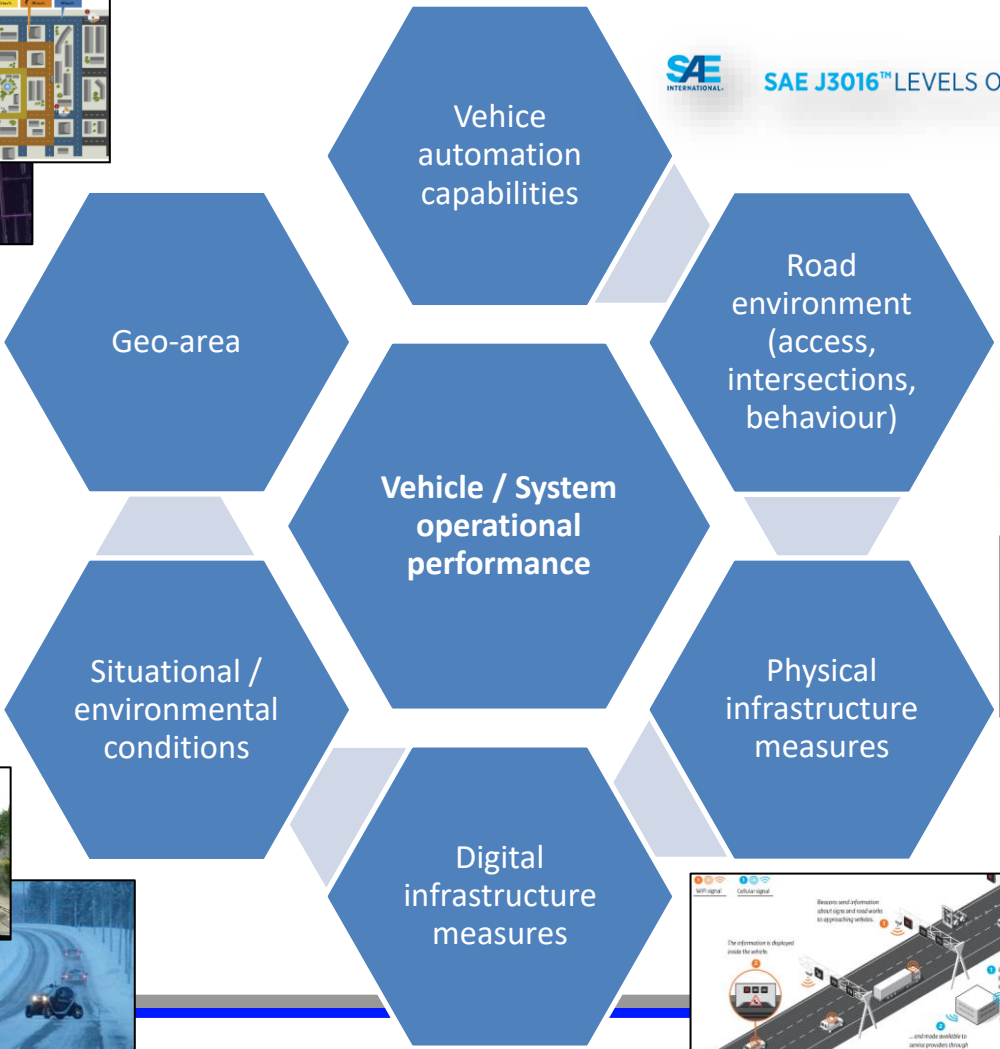
SAE L1

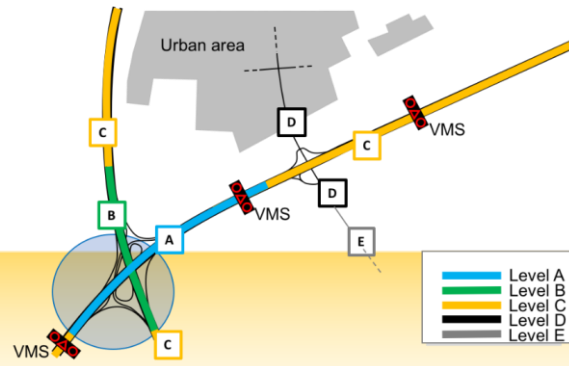


VIEW OF OUR GEO-FENCED SELF-DRIVING FLEET IN SAN FRANCISCO



SAE J3016™ LEVELS OF DRIVING AUTOMATION

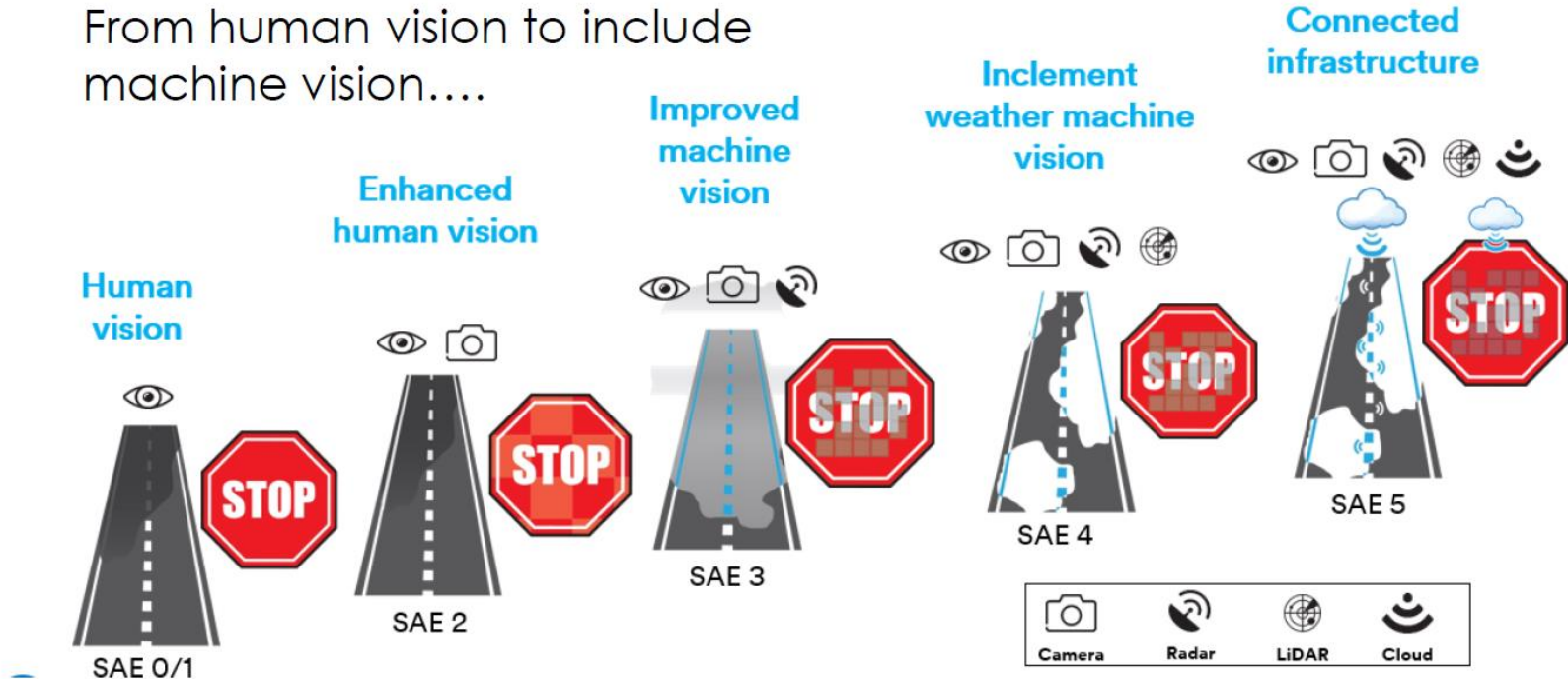




Level	Name	Description	Digital information provided to AVs			
			Digital map with static road signs	VMS, warnings, incidents, weather	Microscopic traffic situation	Guidance: speed, gap, lane advice
Digital infrastructure	A	Cooperative driving	Based on the real-time information on vehicles movements,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

# CAD : Evolution of Infrastructure

From human vision to include machine vision....



# Discussion

- ODD attributes: requirement from ADS to environment that **enables** automation *OR* **conditions** that the ADS should be able to handle.
- Isolate required capabilities, the underlying system functions and their needs. Prevent **overestimating the importance** of ODD attributes.
- **Interchangeability** of attributes (technologies) as seen from the perspective of driving tasks (e.g. lateral & longitudinal control) and ADS functions (e.g. perception).

# Discussion on making progress in defining Physical and Digital Infrastructure priorities

PDI attribute	?	?	?	?
Markings				
Static info				
Dynamic info				
Signage				
Localization				
V2X				
Etc.				
Etc.				

## ADS functions

- Localization
- Awareness
- Planning
- Actuation

## Driving task

- Lane change
- Merge
- Intersection

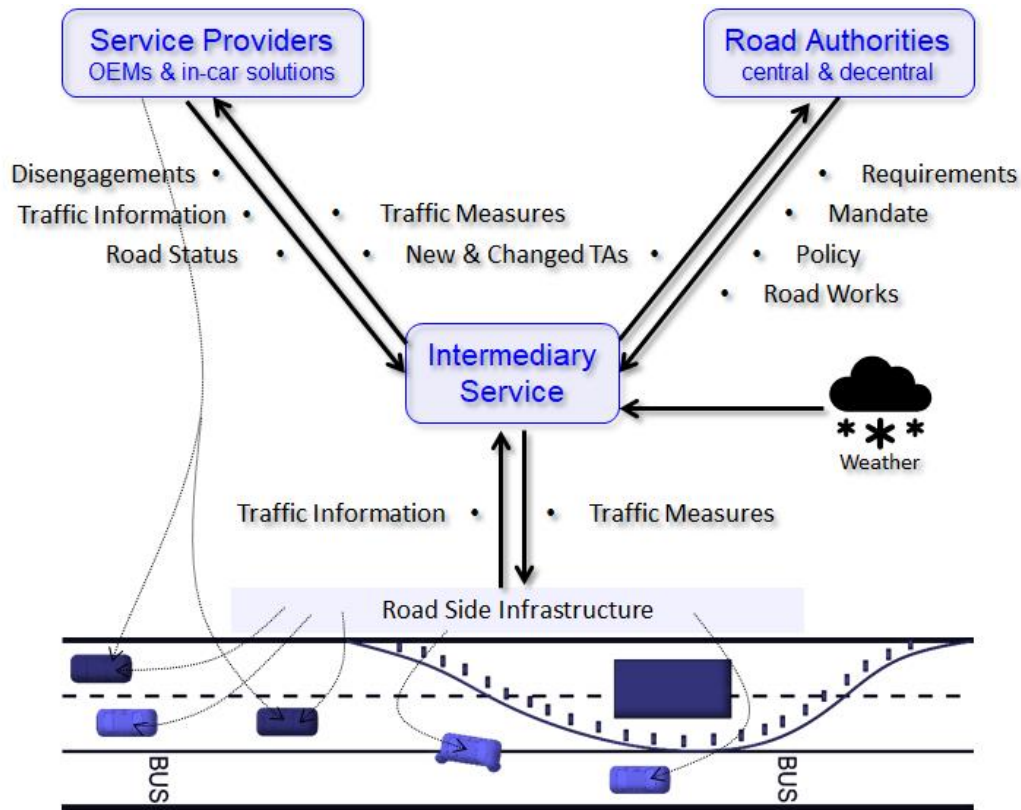
## Situation

- Many...



# Intermediary service

Connecting  
RAs and OEMs  
by linking  
*traffic management*  
and  
*fleet management*





## Any questions?

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