



Driver Coach

A driving coach for everyone
to make driving safer

Supported by an ECO system to reduce traffic accidents

Contents

- Introduction
 - Purpose and scope of this presentation
- Traffic accidents don't just happen, they have causes
- Vehicle Driving Safety monitoring system
 - Distracted driving and dangerous behaviour increase risk
 - How to identify and prevent risky situations
 - Providing feedback to driver to reduce accidents
- Road safety ECO system
 - Multi party information sharing can make driving safer
 - Signalling dangerous situations without fear for repercussion
 - How drivers and organisations work together to improve their environment
 - How to restore trust and get parties involved
- What to do next



feedback



Personal driver coach

Purpose and scope of this presentation

- To provide insights
- To show what is possible
- To start a discussion
- To inspire
- To move you into action
- It's an active working document
- It's part of a greater project
- This is not a design poured in concrete
- Its open for discussion

We need your expertise to make it happen

What really matters in life

Safety

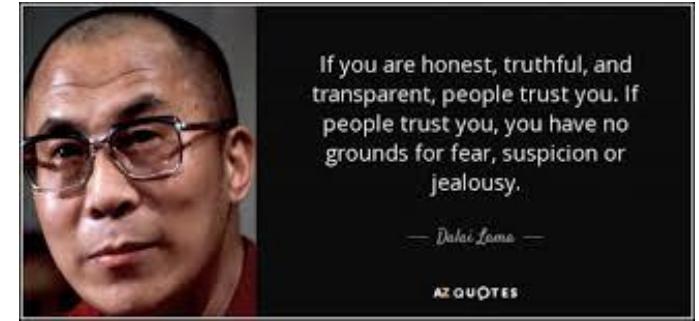


Privacy



Transparency

Trust



We all have our own responsibility to take action

You drive the same road every day

- You know it by heart
- Every turn
- Every tree
- Nothing special
- That's when you start daydreaming

"It came out of nowhere!"



We are all perfect drivers, but

We sometimes forget what we have learned

We are so hungry

We are so busy

We get tired



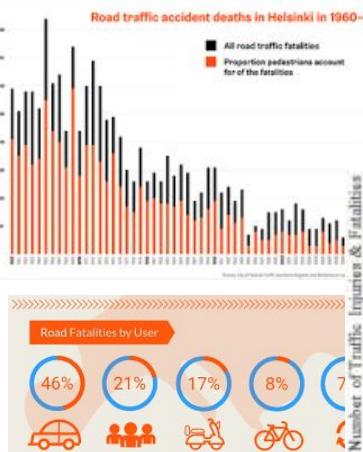
So human, so busy, totally unaware



It came out of nowhere

This results in Road Accident Statistics

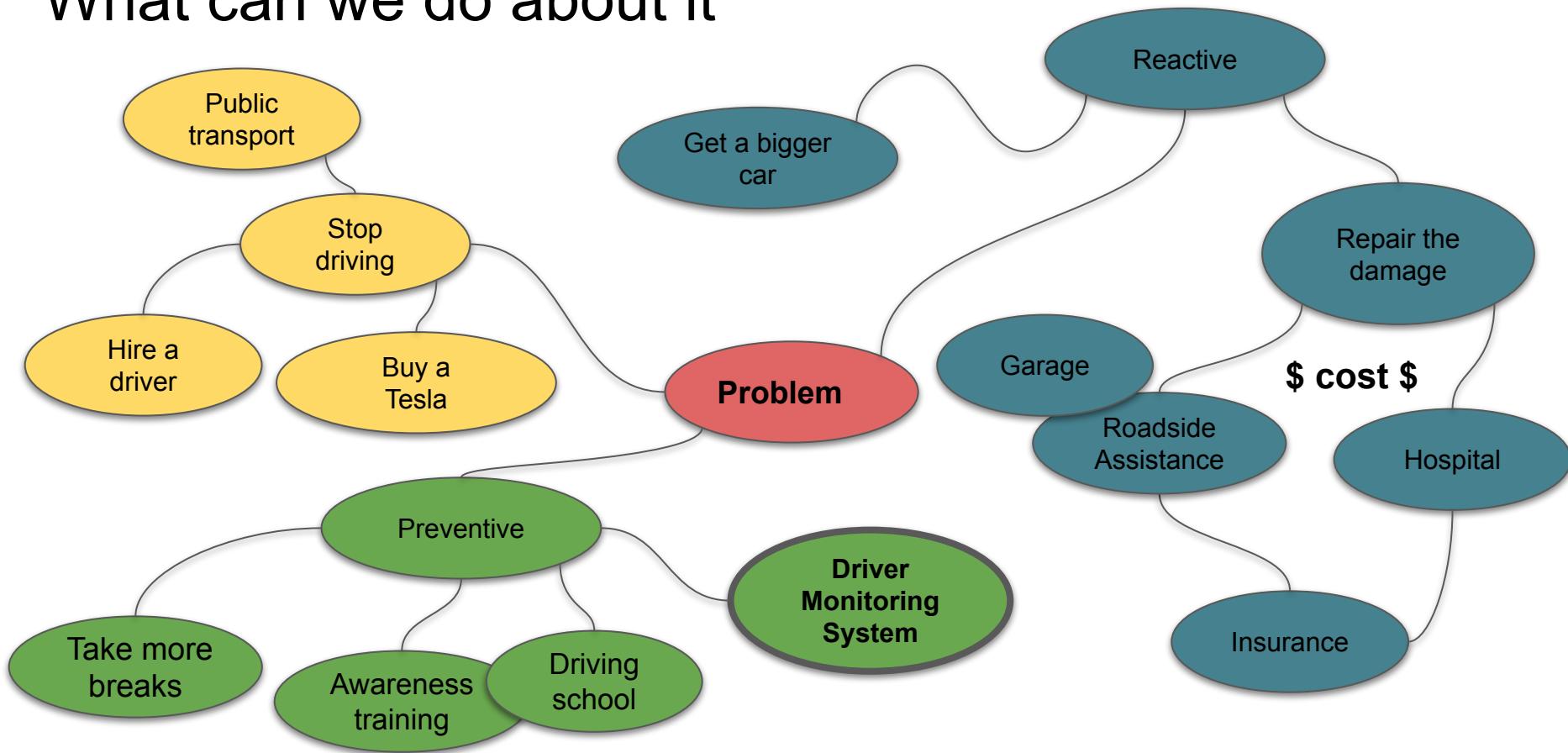
According to the [British Royal Society for the Prevention of Accidents](#), driver fatigue contributes up to 20% of road accidents and up to a quarter of fatal and serious accidents. The [statistics](#) are that an estimated 1,550 deaths, 71,000 injuries, and \$12.5 billion in monetary losses each year due to driver fatigue.



's ranging from



What can we do about it



Source: AAPA near miss reporting

The collage includes:

- A large banner for the "2014 AAPA National Workshop Series SAFETY AT ROADWORKS". The banner features a large yellow 'N' logo, the text "2014 AAPA National Workshop Series SAFETY AT ROADWORKS", a yellow hazard stripe graphic, and the slogan "Taking Responsibility". Below the banner, the text "Effective near miss reporting and driving behavioural change" is displayed, along with "Learnings from 6,000 incidents" and the name "Jim Appleby".
- The Australian Asphalt Pavement Association (AAPA) logo, which consists of the letters "AAPA" in blue with four stars above them, and the text "AUSTRALIAN ASPHALT PAVEMENT ASSOCIATION" below it.
- A portrait of a smiling man with short brown hair, wearing a denim jacket over a white shirt.
- A digital sign or screen showing statistics: "5007 NEAR MISS LOGGED" and "4763 ACTIONED".
- A large, faint background image of a road construction site with a worker visible.
- A large, faint background image of a road sign that reads "PREPARE TO STOP".

AAPA: How the program works

Zero Harm Coordinator to populate							
Ref. Numbr	Company	Location	State (auto filled)	Details	Business Unit	Cause or Agency	Open/Closed
4240	Downer	Bellbird Road	QLD	An operator was using the broom or sweeping inside the cabin. The broom was moving too fast and the broom was still the time. The crew have been trained to move the broom outside the cabin. The operator was asking for a month now. While the broom is sweeping it showers the bobcat in stones and could have smashed a windscreens but didn't. We really need to get	Strathpine	Equipment	Closed
4241	Downer	Logan City Council	QLD	Green roller was parked on the invert on the shoulder. Was lighting tower. The lighting tower was up against the roller. The roller driver started his roller up and went to back away from the lighting tower and move the roller all together. The lighting tower wasn't available. As the roller driver drove away the lighting tower fell onto the invert and the roller hit the lighting tower.	Strathpine	Equipment	Closed
4242	Downer	Great Western Hwy Penrith	NSW	I was getting calls from last night. TC started tapper letter truck and of the job site one was unaware or wasn't concentrating. A car & motorbike came through the site. I spoke to the team leader to make sure he was aware of the new rules.	Rosehill	Traffic Control - General	Open
4243	Downer	Queens Rd Redcliffe	QLD	Evolution TC uti pulled in to the dead lane nearly collecting the workute. No warning. I spoke to the TC team leader & driver for positive communication.	Bli Bli	Traffic Control - General	Closed
4244	Downer	M4 Crew D Westbound	NSW	Still a lot of cars speeding through the site & plus they've got another Downer job running at Penrith. We've got a lot of trucks from that site coming to our site. They should set an example & stick to the speed limit cause there's a lot of traffic on the road. I spoke to the team leader to make sure he was aware of the new rules.	Sydney Surfacing	Traffic Control - General	Closed
4245	Downer	M5 Hwy A Taree	NSW	Reporting a broken tailgate due to the truck rolling out & him stopping making a sharp turn. Just a quick fix and it's back on the road.	Sydney Surfacing	Equipment	Closed
4246	Downer	Cairns	QLD	We had a set of frames yesterday for loading the material excavation on to the back of the truck. One of them had split down through one of the slits in the alloy steel. It was sent to the workshop & repaired to make it back in to a safe condition.	North QLD	Traffic Control - General	Closed
4247	Downer	AVV Addisons	NSW	Speaking to the supervisor about the site. Some of the drivers reported to the site on 4373000000. I spoke to the supervisor and he said he had no idea what was wrong. He said he would speak to the driver.	Bli Bli	Traffic Control - General	Closed
4248	Downer	Teralba Depot	Country NSW	Just doing an audit and found two trucks unlocked overnight. We'll talk to the foreman to make sure the guys lock up all vehicles overnight.	Teralba	Other	Open
4249	Downer	Glenwill St Grays	NSW	W.C. 20 minute VMP & docketed. I was driving down Hume Street from the Hume Hwy, level 1, Reg. 1.6. There is a long turn to the right. Once again the VMP & docket is wrong. If you can't enter that way you have to go around the block.	Sydney Surfacing	Communication	Open
4250	John	Job# 216 Downer Yard	NSW	Truck being parked on a walkway	Sydney Surfacing	Traffic Control - General	Closed
4251	Downer	Hurstville	NSW	Truck #215: I was cleaning up at the clean up sign and I was told to move	Sydney Surfacing	Other	Open

What we can learn from near misses

Small errors, mistakes and dangerous behaviour are predictors for more serious events.

We should keep track of every incident (no matter how small) and learn from it.

We should be more aware of our own behaviour. This may feel intrusive but injuries hurt a lot more!



Causes of near misses

The chart below shows some of the top behaviors

and how they contribute to near collisions

most causes are caused by the driver

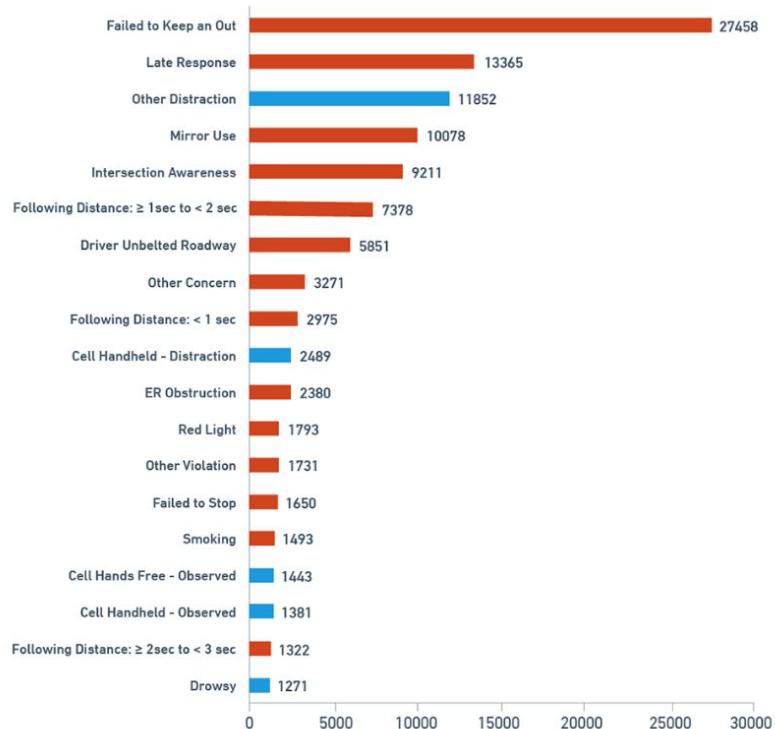
we can measure and detect most causes

we can provide feedback to the driver

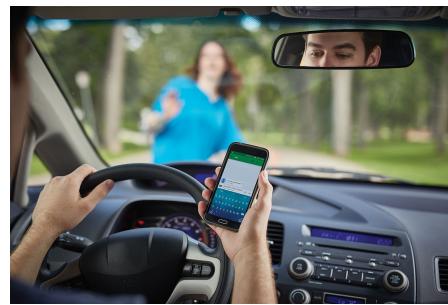
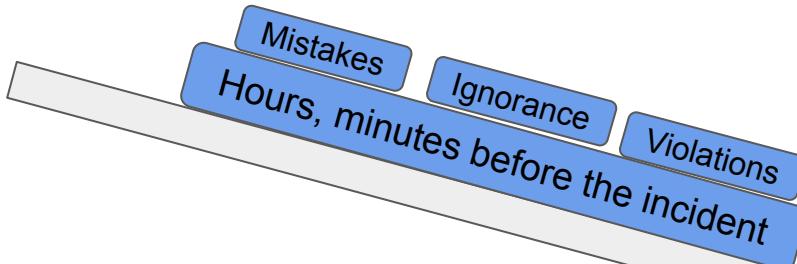
the driver can stop making errors

therefore we can reduce the risk of accidents

What would happen if we reduce
some of these causes?



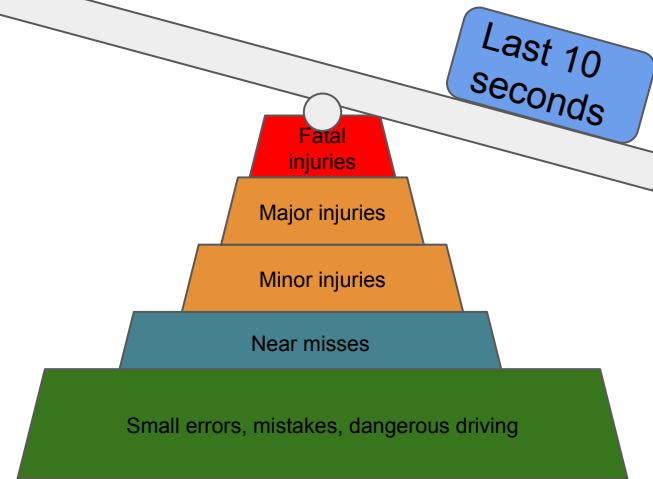
Can we prevent accidents from happening?



Most safety measures focus on the last 10 seconds (warn, break, reduce impact of an accident)

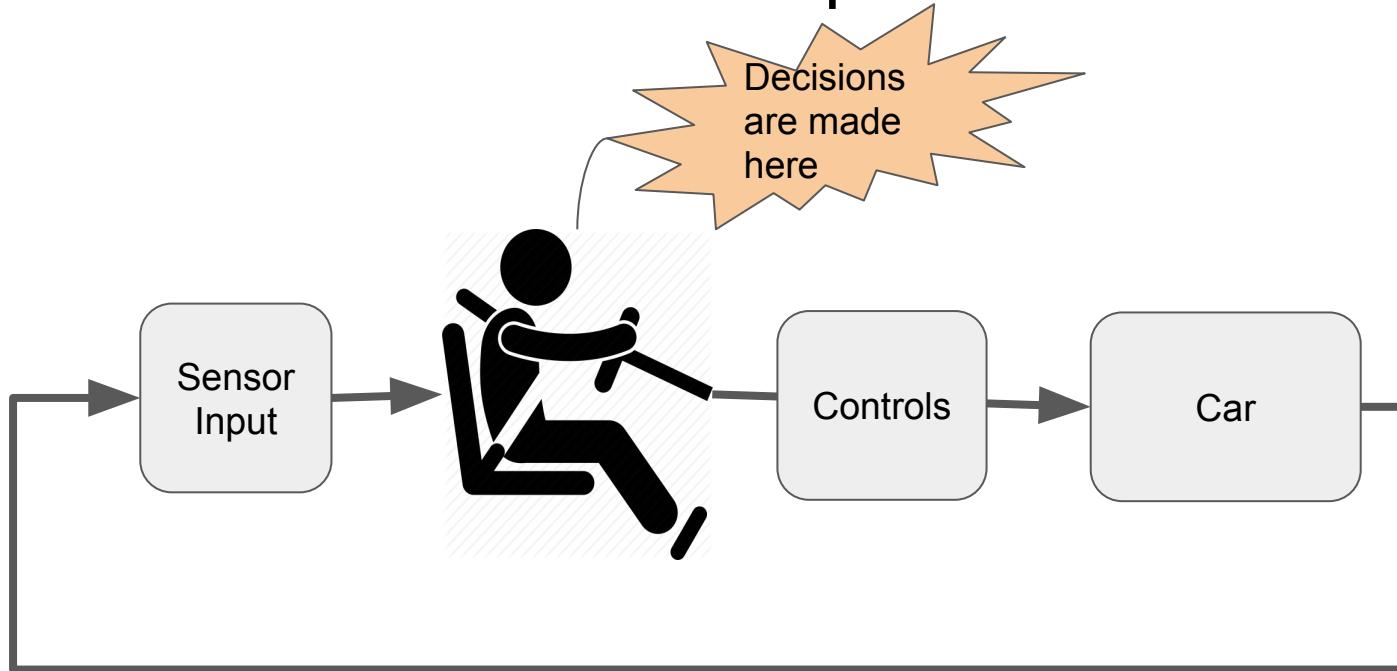
We should put more weight and focus on what happened before the incident.

Let's try to prevent accidents



Decrease fatalities

Focus on the human in the loop



Full self driving cars are not here and
still too expensive for the majority

We are all perfect drivers, but

Research

- We miss what happens around us
- By tracking head and eye movement we can evaluate our level of situational awareness



What are our major distractions?

Distractions

1. We get distracted by our phone
2. We are hungry or tired
3. We get day dreaming

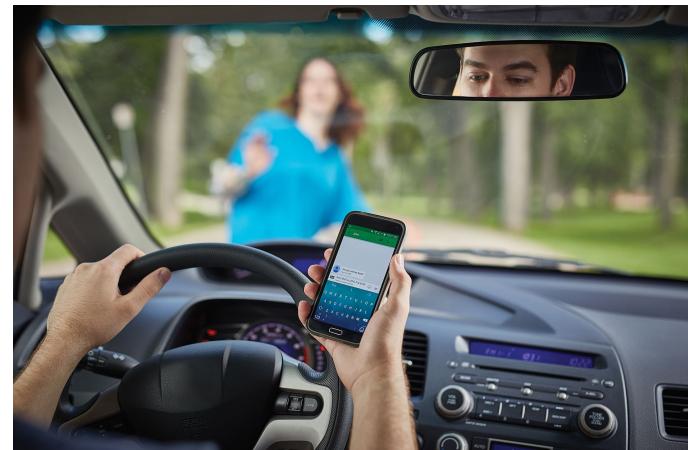
Resolutions

1. We should disable the phone
2. We should be in good physical shape
3. We should be focused

There are four types of driver distraction:

- Visual – looking at something other than the road.
- Auditory – hearing something not related to **driving**.
- Manual – manipulating something other than the steering wheel.
- Cognitive – thinking about something other than **driving**.

With so many potential distractions we tend to easily forget how we should drive safely. Hence we should be constantly reminded of that.



360 degree awareness

Good driving habits

- Wearing seat belt
- Active driving posture
- Hands on the steering wheel
- Looking in the general driving direction
- Checking for traffic from all directions
- Left/right/rear mirror checking
- Signalling direction changes to other drivers



Bad driving habits

- Operating the console (NAV / media / airco)
- Talking to passengers
- Eating or drinking
- Other activities (reaching for something, singing)

Ugly driving habits

- Falling asleep
- Mobile phone usage (handheld, call, texting)

Driver Monitoring System (drowsiness)

- Warns when driver is tired
- Detects only drowsiness
- Build-in in expensive cars
- Most regular cars don't have this feature
- Effect on safety is limited



ADAS system to detect drowsiness

Driver Monitoring System (distractions)

Detects:

- Drowsiness
- Wearing a seatbelt
- Distractions
 - Holding a phone
 - Smoking

Effect on safety is better but still
not complete



ADAS system to detect drowsiness and
distracted driving

Driver Monitoring System (driving skills and style)

Fully automated system detects:

- Drowsiness
- Distraction
- Driving skills
 - Steering
 - Acceleration/ Deceleration
 - Braking (timing)
 - Gear (timing, gear selection)
- Driving style
 - Driver alertness
 - Mirror checking
 - Over the shoulder checking
 - Indicator lights usage
 - Stop signs / traffic lights
 - Right of way



Driver Coach: having a personal coach in your car can make driving safer

Example: making a proper left turn

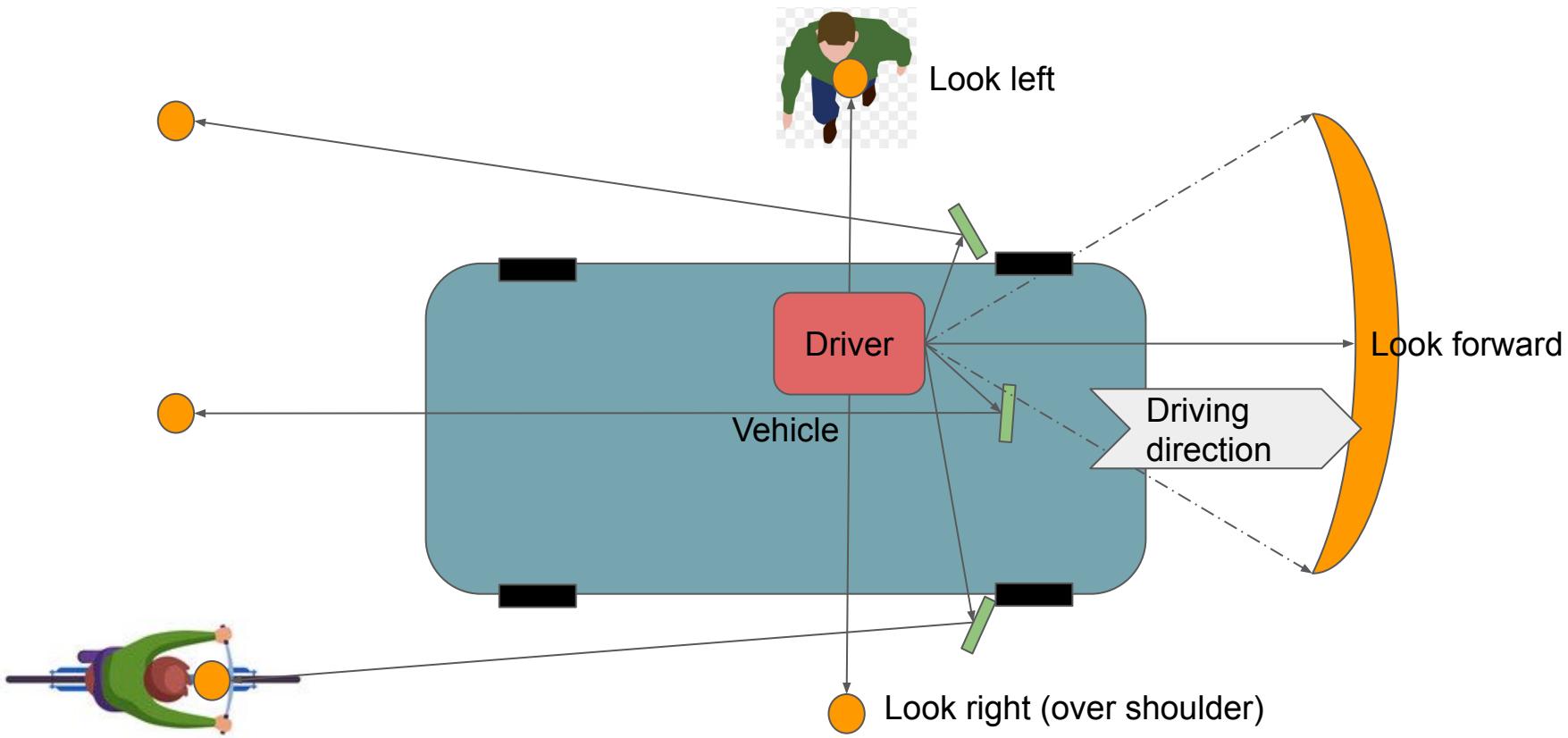
- Assess the traffic situation
 - Allowed to do (legal, traffic rules)
 - Should i do (is it safe, sensible)
- Check rear mirror
- Use direction indicator lights
- Slow down
- Come to a full stop
- Watch out for other traffic
- When traffic allows
- Check side and mirrors
- Turn left



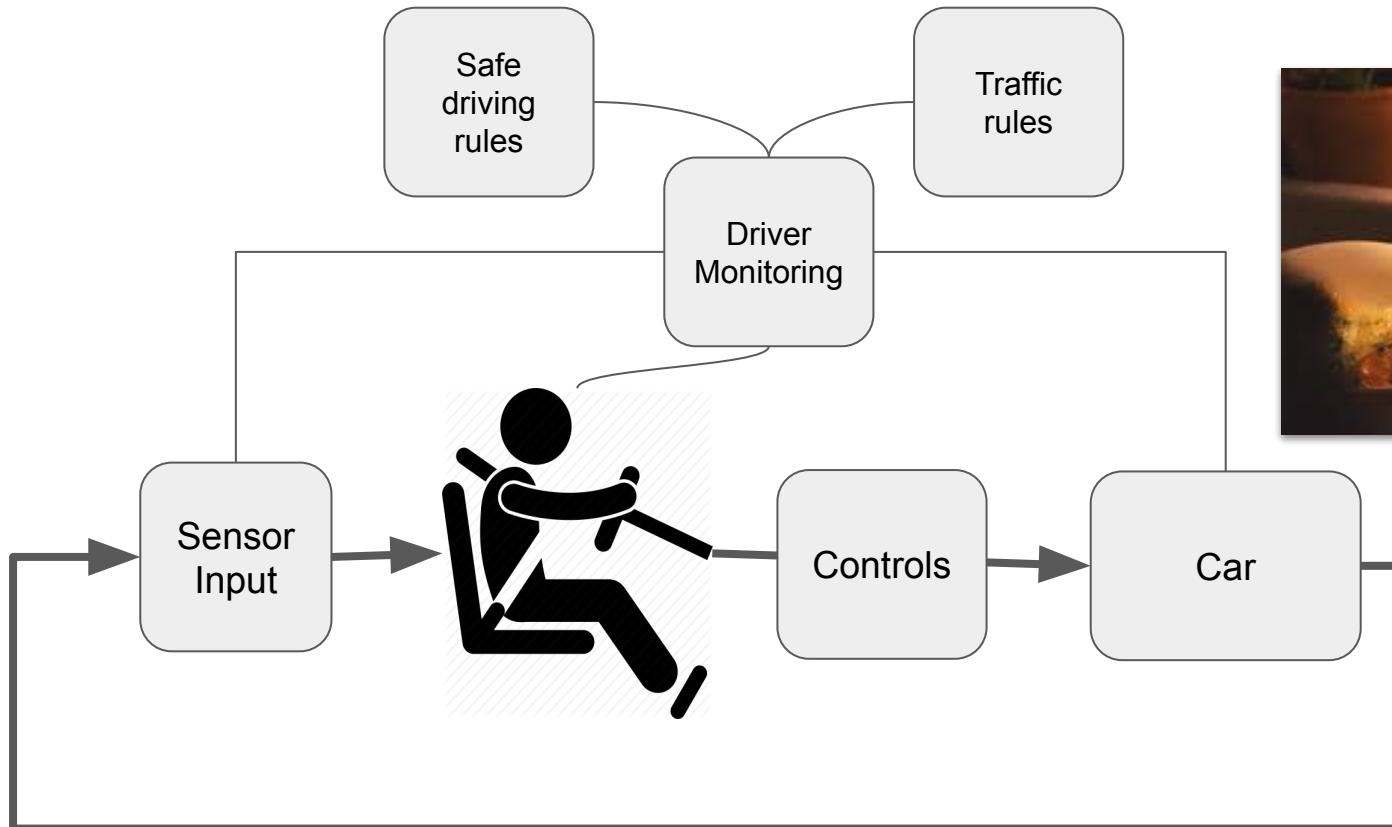
wikiHow to Make a Left Turn

Driving coach can help to assess each driving maneuver in detail

Driver situational awareness



Provide feedback to the human in the loop



Sensors

Camera

Infrared

Acceleration

Velocity

GPS
location

Indicator
lights

Features

Driver
recognition

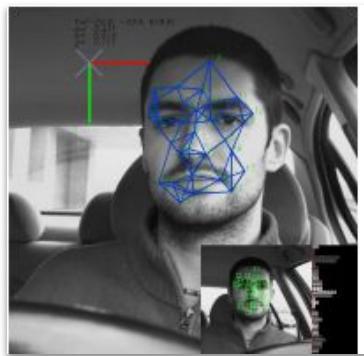
Head pose

Gaze direction

Eyes
closed / blink

Hand position

Distraction



Driver state

Alert

Distracted

Drowsy

Algorithm

Machine
learning

State
machine

Rules &
parameters

System services

Display

Buzzer

Processor

Memory

Storage

Network

System diagram

Might have

Must have

The 2ToDrive program (Netherlands)

Every year 300.000 young drivers get their driving license

2ToDrive allows 16 old to build up driving experience
accompanied by a licensed driver



Young Driver Coach

Every year 300.000 young drivers get their driving license

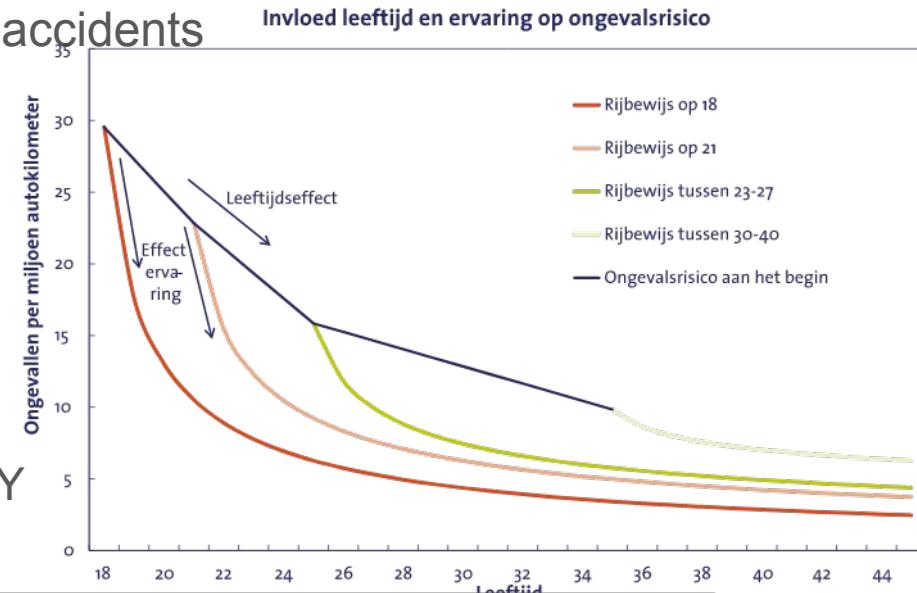


Young drivers (18-24) have higher risk of accidents

Driver Coach can help to

- Increase safety / reduce accidents
- Feedback / improve driving skills
- Increase peace of mind for parents

Parents lease driver coach device for 6M, 1Y



Driver Coach: having a personal coach in your car can make driving safer

The Driver Coach can be included in training programs

Added value

- Self review after each lesson (browser or App)
- Detailed feedback
 - Video feedback on specific maneuvers
 - Mirror checking / gear changes / breaking
 - Expert driver suggestions
- Share results with friends and family
- Improve yourself
 - driving skills
 - road safety awareness
 - probability to succeed examination



Dangerous driving

Every year 16.000 driver licenses revoked

- 12 to 15% caused by alcohol and drugs
- Dangerous driving (speeding)

Procedure

- License is revoked for a period of time
- Driver has to follow a course
- Driver gets license back
- Driver is monitored for a period of time



Driver Coach: used as an electronic safety measure
to ensure driver keeps improving driving style and does not violate again

Stimulating ADAS by defining standards

Maatregel 8 – Stimuleren, onder voorwaarden, van het veilig gebruik van rijtaakondersteunende systemen en diensten

In samenwerking met de ADAS Community (oa ANWB, RAI en RDW) wordt een visie opgesteld met randvoorwaarden voor ADAS-systemen en diensten. Het gaat om conceptuele randvoorwaarden, technische voorwaarden en voorwaarden aan het gebruik door bestuurders. Hiermee wordt richting gegeven aan de markt voor veilige systemen en kunnen kopers en verkopers beter geïnformeerd worden.

source: Landelijk Actieplan Verkeersveiligheid 2019-2021



RDW

Measure 8 - Encourage, under certain conditions, the safe use of driving support systems and services

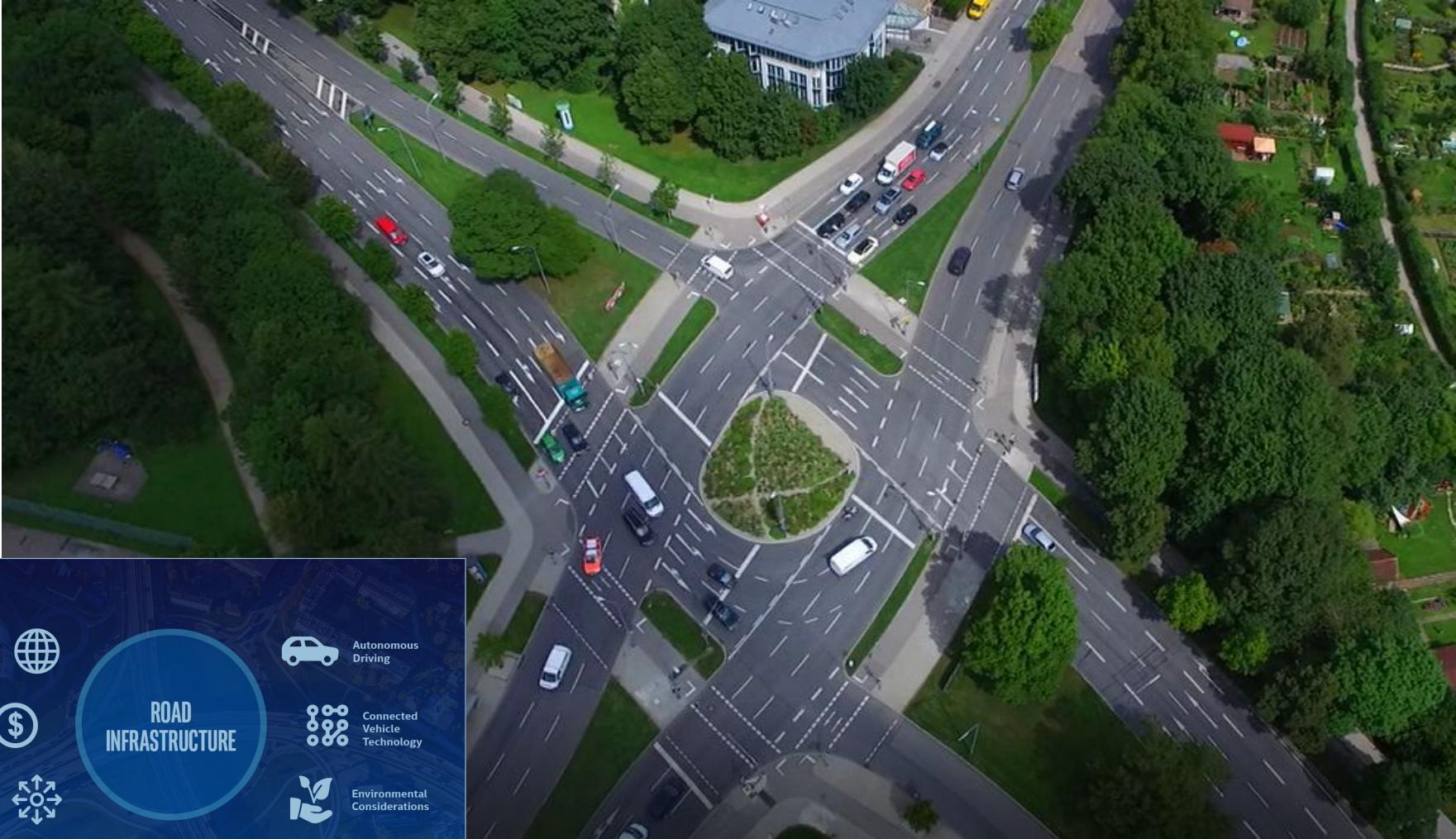
In collaboration with the ADAS Community (including ANWB, RAI and RDW) a vision is being drawn up with preconditions for ADAS systems and services. These are conceptual preconditions, technical conditions and conditions for use by drivers. This gives direction to the market for secure systems and enables buyers and sellers to be better informed.

source: National Road Safety Action Plan 2019-2021

The Netherlands: Dutch organisations work together to define standards and stimulate the development of ADAS systems

Let's take a step backward

And view it from a higher perspective

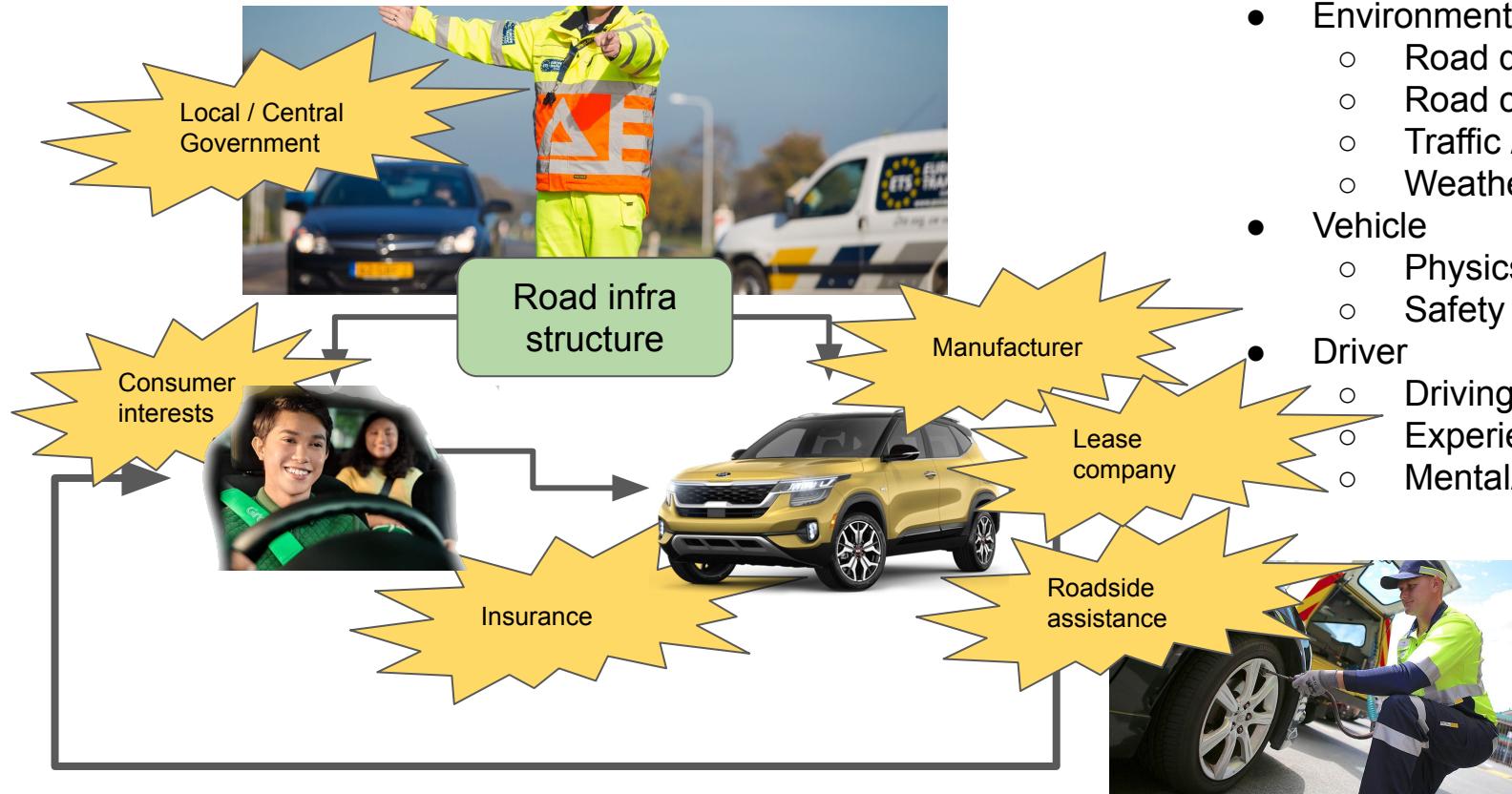


Trends & Forces impacting Road infrastructure

- Traffic Growth: doubling traffic volume by 2040
- New Monetization models: e-tolling, vehicle-miles-travelled taxes
- Evolving Funding Models: public-private partnerships
- Autonomous Driving: 5G, Edge compute, roadside units, intersection technology
- Connected Vehicle Technology: V2X technology, data management
- Environmental Considerations: Emission targets, EV charging stations

We need a road infrastructure that can support these requirements

Connected Car as part of an ECO system



Every vehicle can sense itself, its driver and its environment

Vehicle collects and shares data

- Trip destination / road conditions
- Vehicle / Driver
- Other road users

This data can provide valuable insights



- Trip data ⇒ traffic density, routing, environmental impact, economic revenue
- Road safety ⇒ unsafe situations, improve roads, make your neighborhood safer
- Driving style ⇒ improve your driving, reduce accidents, reduce insurance costs
- Other road users ⇒ Detect near misses

Share data to improve safety, economy and reduce impact on the environment

Why should we share data and learn to trust each other

- Working together on a common goal
 - To make driving safer
 - Raise driver awareness
 - Reduce number of traffic incidents
 - Because i want to make my neighborhood safer
 - To reduce cost for society as a whole
 - Reduce traffic jams,
 - Improve logistics
- We need to share data
 - To improve specific traffic situations (share data anonymously with local government)
 - To make vehicles safer (share driving data anonymously with car manufacturers)
 - To reduce insurance cost (share driving behaviour with insurance)
 - To improve my own driving style (calculate driving score and compare anonymously with other



Make driving safer by providing feedback to drivers, road owners and organisations

Help the (local) government to improve road safety

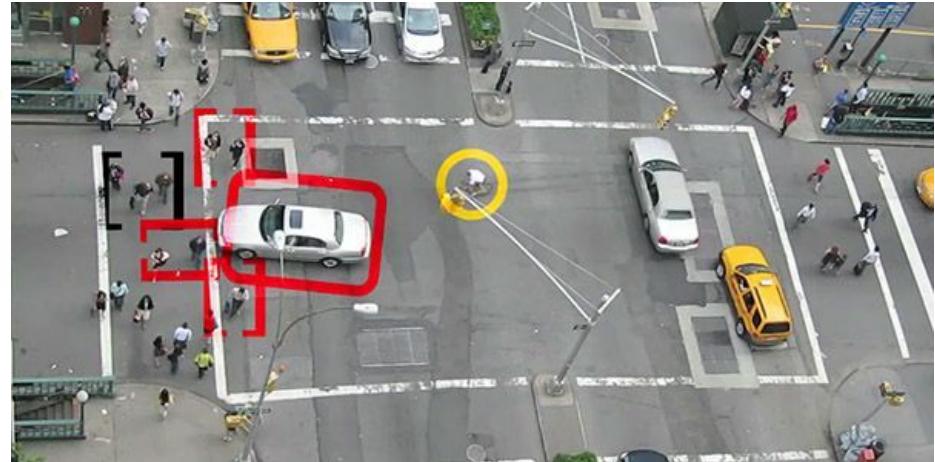
- Report to (local) government
 - traffic infrastructure (road signs, dangerous junctions, road conditions)
 - dangerous driving situations
- Prerequisites
 - Anonymous reporting (no legal consequences)
 - Incentives (benefits, kudos, money)
- Goal:
 - Improve safety / faster repair
 - Lower cost (social impact, road inspections)
 - Open data (traffic safety, road quality)



Data ownership, privacy and mutual trust between parties are key

Reporting potential dangerous traffic situations

- Accidents / near accidents
- Dangerous driving
- Confusing traffic situations
- Slippery roads
- Obstacles
- Obstructed traffic signs
- Dysfunctional (bicycle) lights



Anonymous reporting to gather road safety statistics for making driving safer, not for naming and shaming

Smart city: citizens make their neighborhood safer

- The process

- Citizens collect and share their data
- Government updates its maps and improves situation
- Citizens can follow and verify progress, see that their input makes a difference
- Neighborhood gets safer

- Benefits

- Better data leads to better decisions
- Build and restore trust in government
- Lower cost (less accidents, lower inspection costs)
- Cities and neighborhoods compete on quality and safety
- Up to date city infra maps

Road conditions - Location of aggressive manoeuvres



Colors code aggressive maneuvers: acceleration | brake | turn or lane change | bump (circle) | rough road surface (circle)

source: Nokia Driver Analytics

Citizens reported 5000 incidents last year

VVN Participatiepunt

Maak een melding

Inloggen

Home De kaart VVN Buurtacties Succesverhalen Maak een melding

FILTERS

SOORT GEDRAG

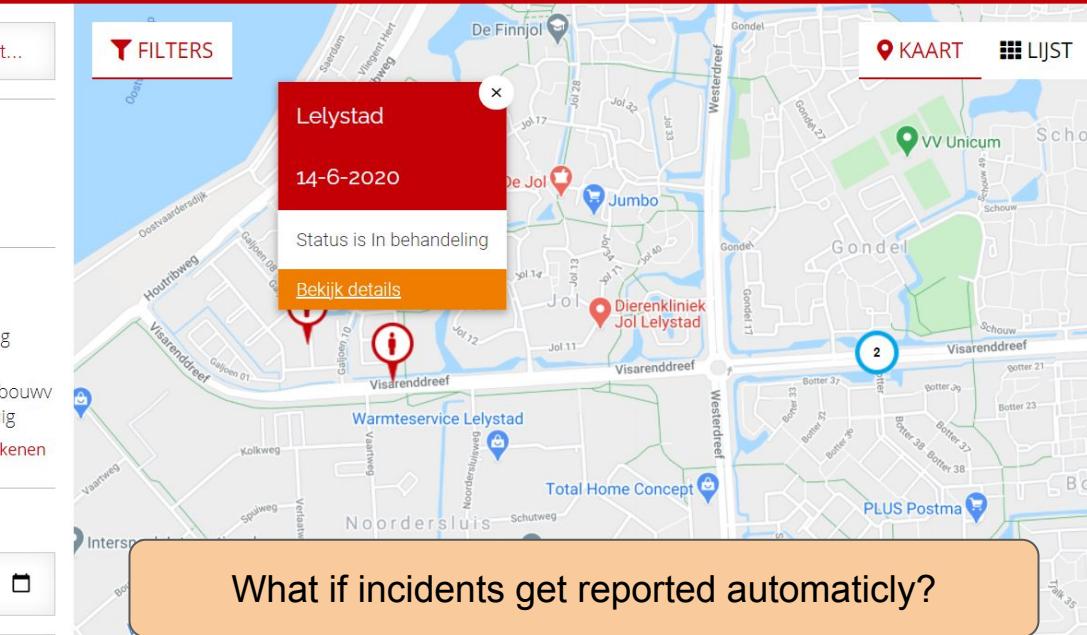
- Verkeersgedrag
- Een weg of omgeving

BETROKKENEN

- | | |
|--|--|
|  Bromfiets, - scooter |  Overig |
|  Elektrische fiets |  Landbouwvoertuig |
| + Alle betrokkenen | |

DATUM

05-01-2020



Maak een melding

Inloggen

MELDING

Lelystad

GEMEENTE

Lelystad

PROVINCIE

Provincie Flevoland

GEDUPEERDE

- Auto

VEROORZAKER

- Auto

Economy: share data with insurance / lease company

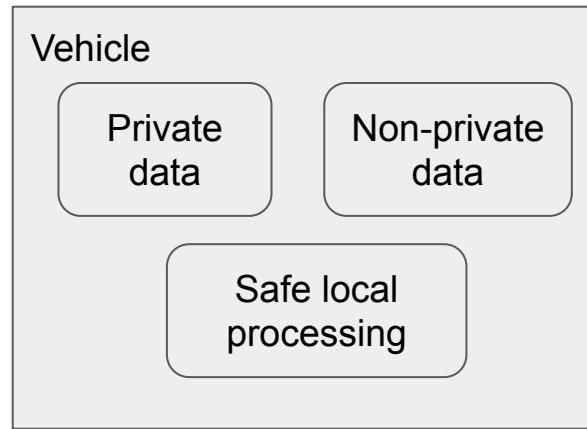
- Collect data on driving behaviour
 - Vehicle maneuvers
 - Driver behaviour
- Prerequisites
 - Privacy (GDPR minimize data)
 - Incentives (benefits, kudos, money)
- Goal:
 - Improve safety / less damage
 - Lower cost (social impact)
 - Common driver risk model
 - Open data (traffic safety, road quality)



Data ownership, privacy and mutual trust between parties are key

But how about security and privacy

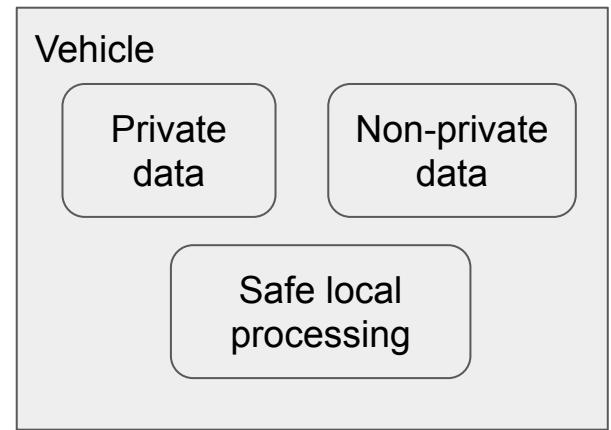
- Requirements
 - Data ownership
 - Assured privacy
 - Driver in control
- Local data processing
 - calculate driver safety score
 - calculate insurance risk
 - signal potential unsafe situations
- Be GDPR compliant
 - Share minimum amount of data
 - Share anonymised data anonymously
 - Crystal clear algorithms



Data ownership, privacy and mutual trust between parties are key

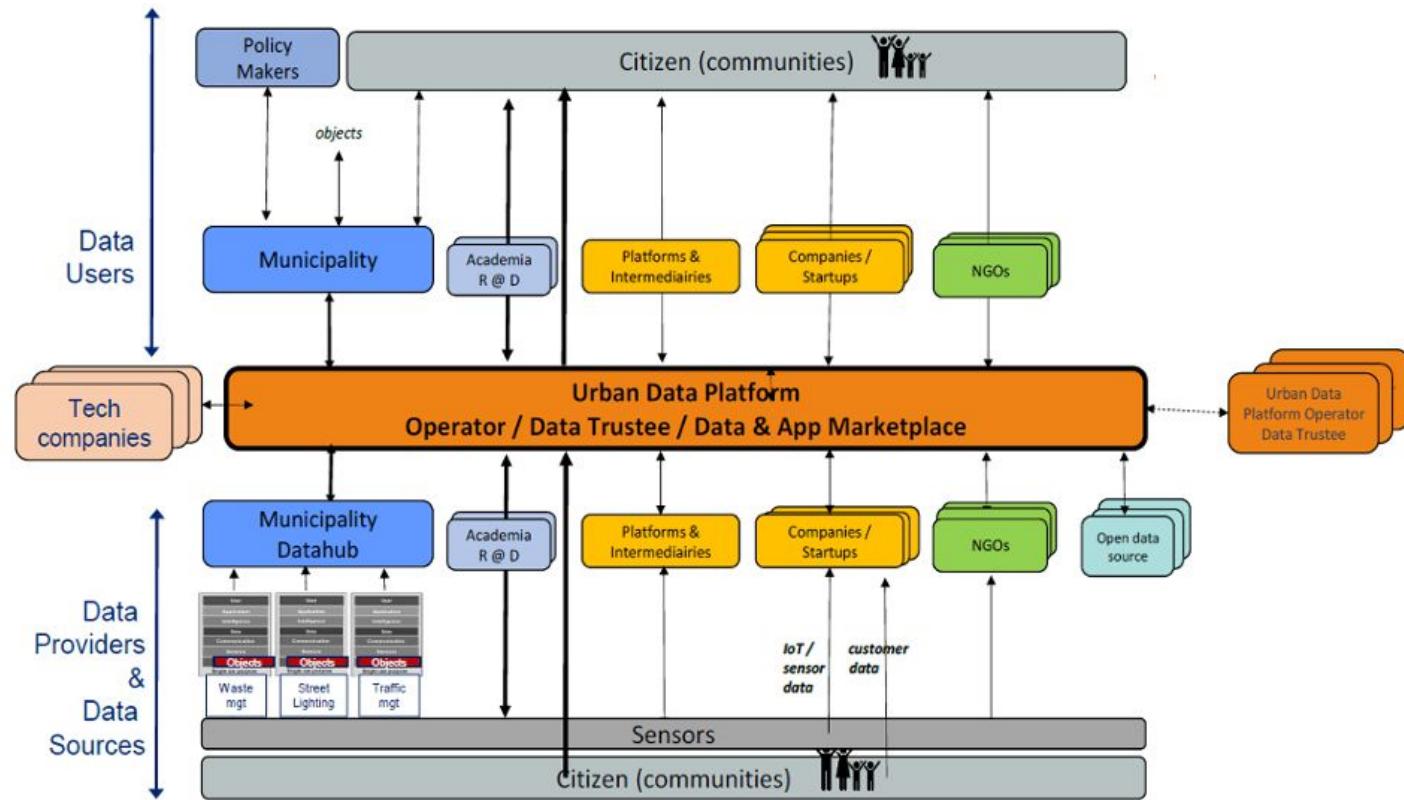
Smart mobility with multiple parties

- Parties
 - Driving schools
 - First responders
 - Roadside assistance
 - Insurance / lease company
 - Car Manufacturer
 - (Local) Government
- Equal playing field
 - Common infrastructure / architecture
 - Open interfaces / secured data exchange
 - All organisations have equal access
 - Vehicle driver chooses its partners
 - Open data whenever possible

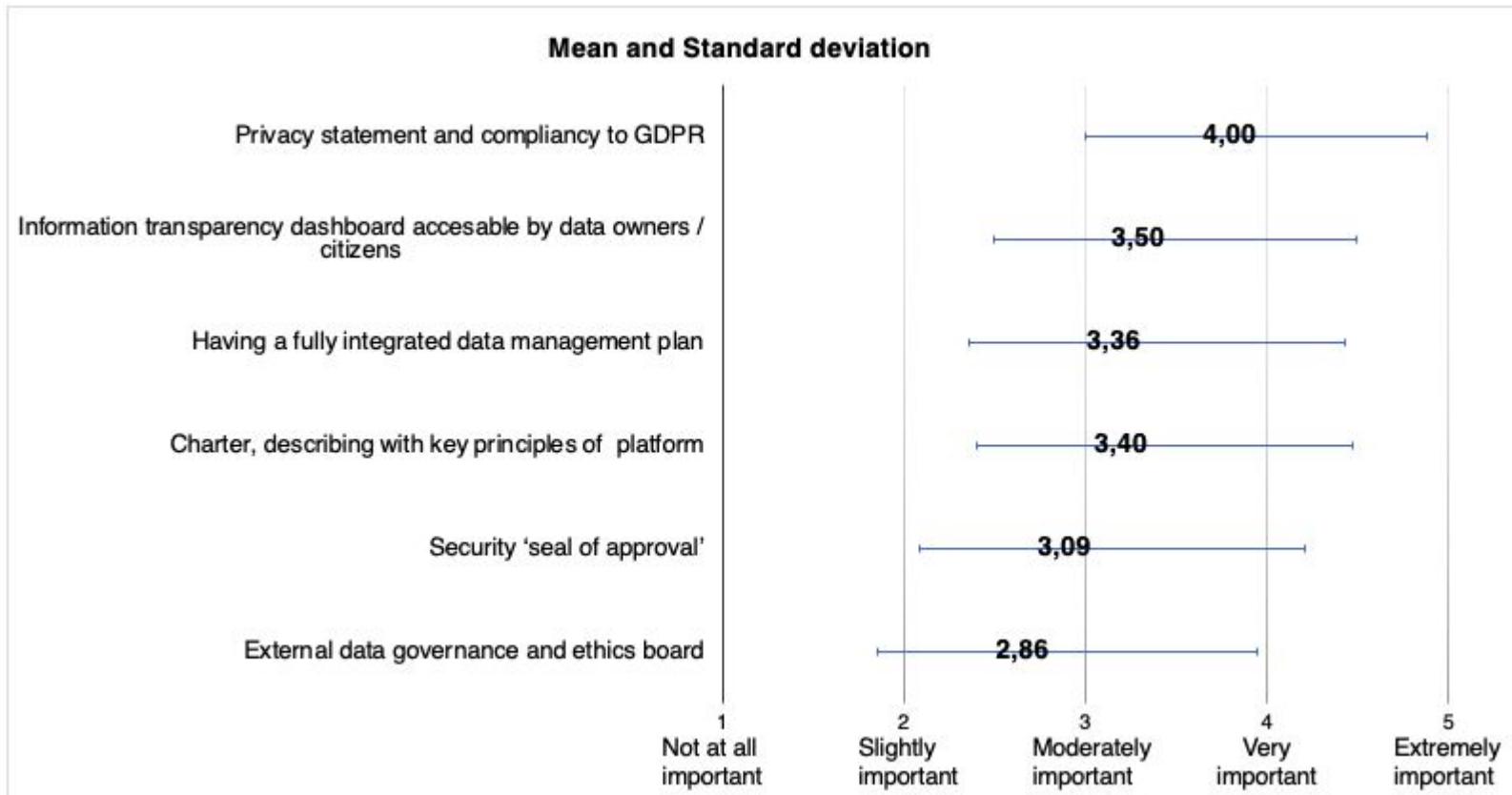


Data ownership, privacy and mutual trust between parties are key

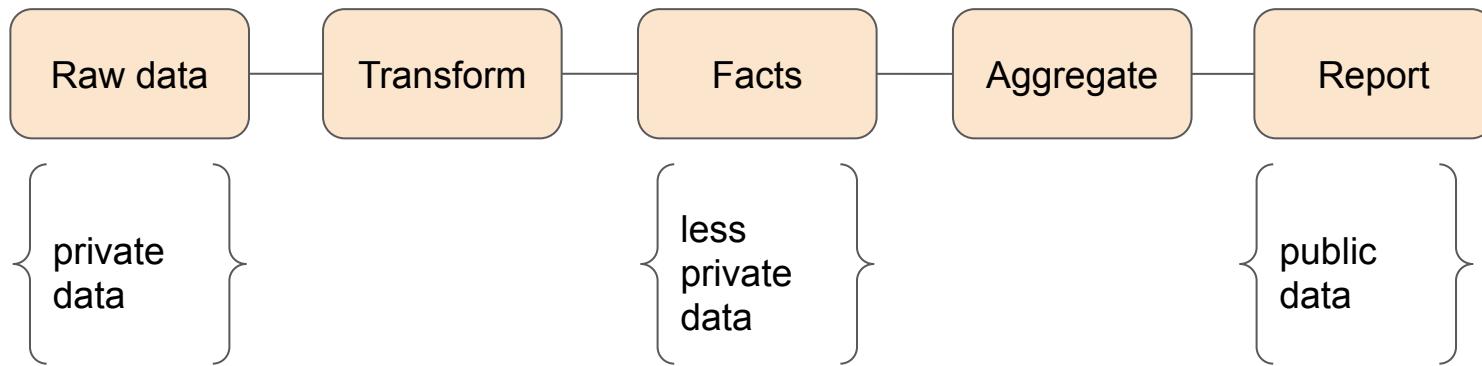
Urban Data Platform



Urban Data Platform

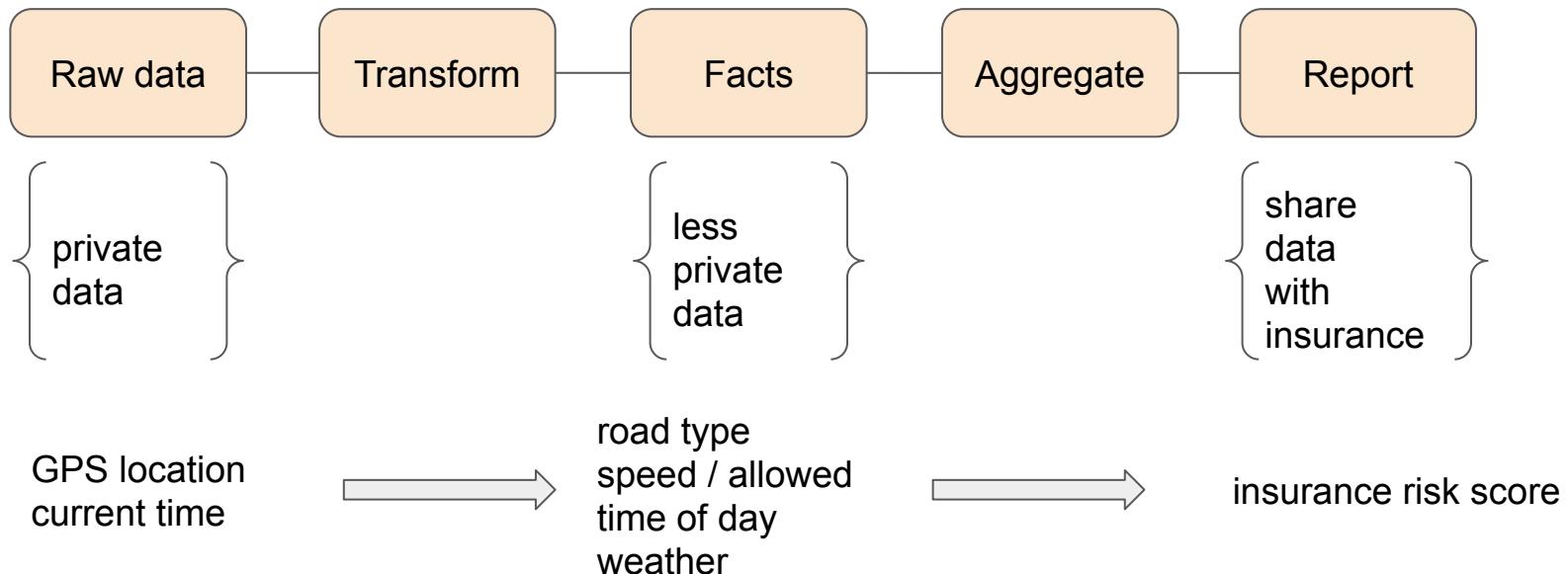


How to handle private data



Processing sensitive data early in the chain as close to the source as possible.
Transform raw data to facts in order to reduce data volume and minimize (GDPR).

How to handle private data



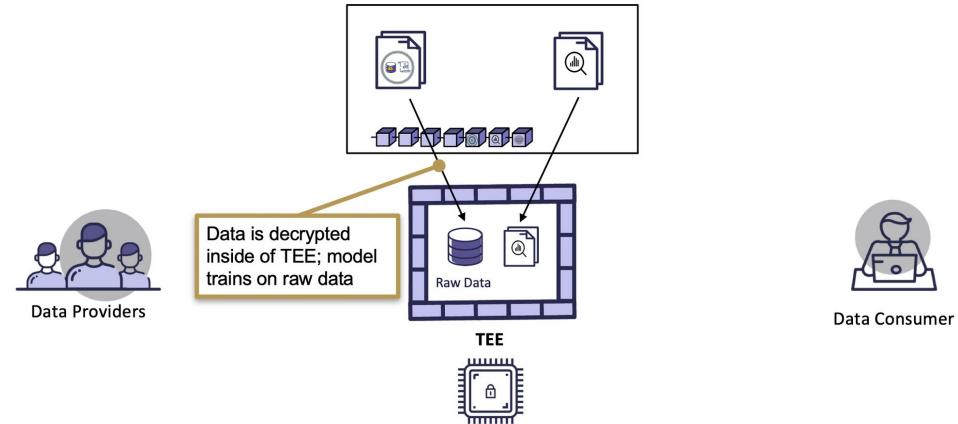
Transform sensitive data such as GPS location into less private facts (GDPR data minimization). Calculate insurance risk score

Confidential computing

Provides data ownership and control

Data is stored and processed fully encrypted in a Trusted Execution Environment. Access to data is regulated by Smart Contracts

Even with physical access no one can use the data without user consent



Data Providers can choose who (Data Consumer) can process their data

Data Consumers can process and extract results but not export the raw data.

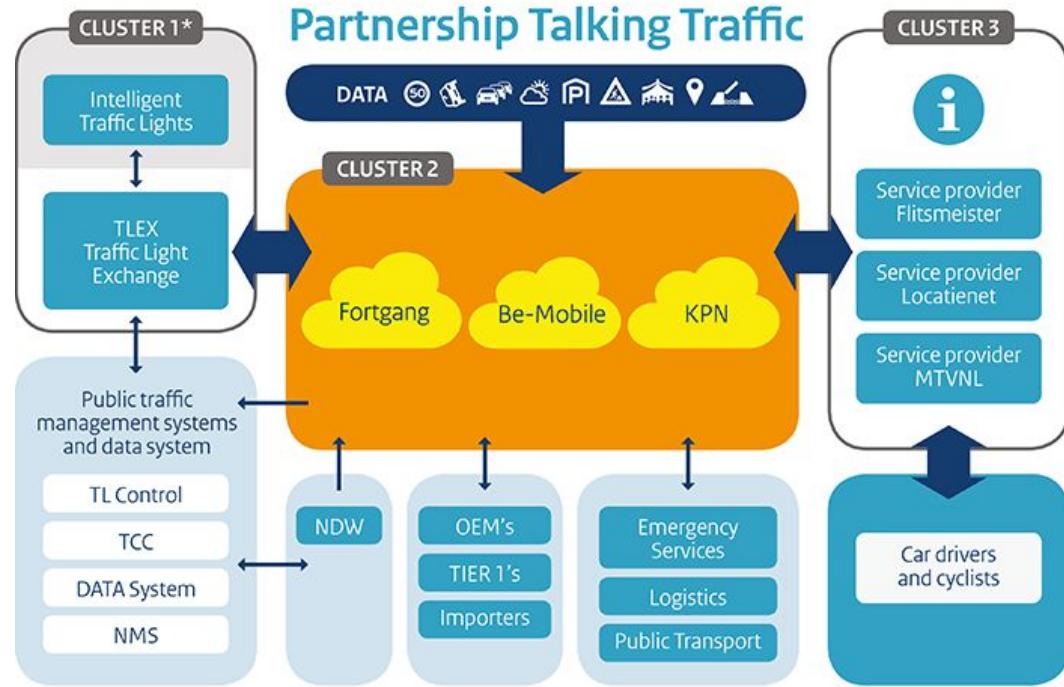
Smart Contracts define data access policies and revenue

Example: Talking Traffic Data Platform

Cooperation in the Netherlands:

The Partnership Talking Traffic is a collaboration between the Dutch Ministry of Infrastructure and Water Management, 60 regional and local government authorities and 20 nationally and internationally operating companies.

<https://www.talking-traffic.com/>



* Partners Cluster 1: Dynniq, Royal HaskoningDHV, Swarco, Sweco, Vialis, Ko Hartog Verkeerstechniek and Ziut.

TL Control: Traffic Light Control
TCC: Traffic Control Center
NMS: Network Management System

NDW: National Data Warehouse
OEM's: Original Equipment Manufacturers
TIER 1's: Direct suppliers to OEM's

Example: Intel Smart Road Infrastructure

Commercial solution offering by Intel: Vision, research projects and a list of 45 partner solutions

<https://www.intel.com/content/www/us/en/transportation/smart-road-infrastructure.html>

Mobileye camera tech



The road to success

- Start small with limited scope at the source
 - Driving Coach for young drivers
 - Feedback on driver behaviour
- Buildup experience and learn
- Combine multiple data sources:
 - Dynamic data (vehicle, traffic, weather)
 - Static data (Infrastructure, map data)
- Find suitable development and business partners (Academic, NGO, GO, Commercial)
- Connect to European road safety and science programmes for funding and knowledge sharing
- Focus on developing an open ECO-system to support the Smart Cities concept



What to do next, so many questions

- Questions for the audience:
 - Will this approach help to reduce road accidents and CO₂ emission?
 - Are there any major issues that hinder this and need to be addressed in more detail.
 - Are you in for a single box solution or go for the eco-system approach
 - Will data ownership, privacy and trust become an issue and how to handle that?
 - What direction will be more successful and how do you define success for your organisation and your customers
- The next step:
 - Share these ideas within our organisation, mobility partners
 - Discuss, investigate and experiment to learn more

Millions of euro's are spent each year on Road Safety and scientific research programmes

The average car has safety belts and airbags but does not communicate its story

Let see if we can use innovation to make the road safe and reduce CO₂!



Centraal Bureau
Rijvaardigheids-
bewijzen



Ministerie van Infrastructuur
en Waterstaat



Vereniging van
Nederlandse Gemeenten



Vereniging Rijschool Belang



kennis
netwerk
SPV Strategisch Plan
Verkeersveiligheid

Where to find more information

project website: <https://github.com/Tauvic/DriverAwareness>

discussions: Dutch mobility innovations

<https://dutchmobilityinnovations.com/spaces/86/dutch-mobility-innovations>

