The Dutch Effort in Automated Driving

Steps in implementation

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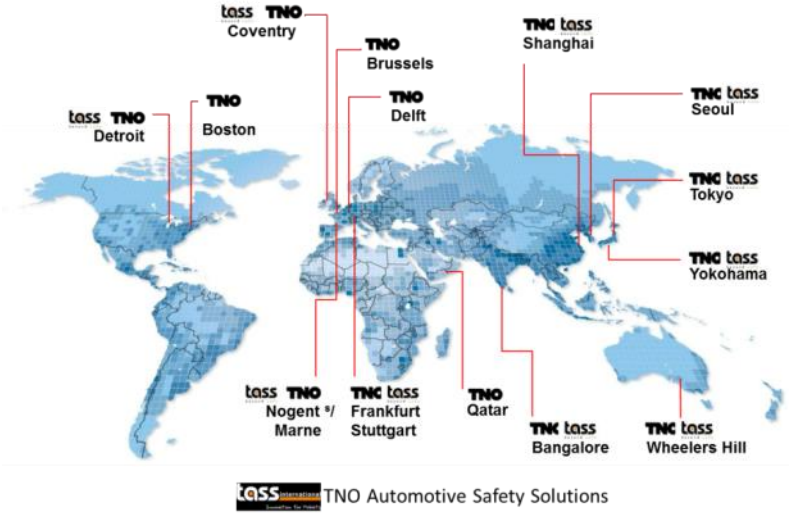
Japan, October 2014

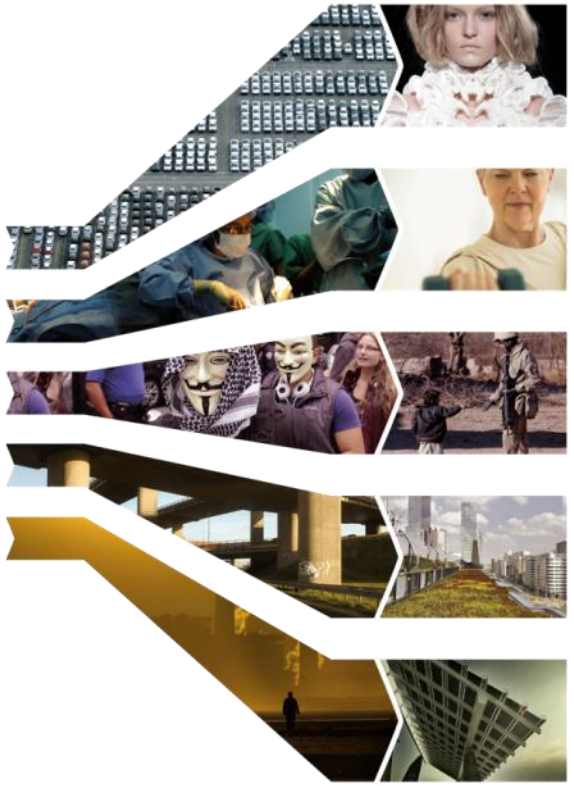
TNO in a Nutshell

- Netherlands' Organization for Applied Research
- R&D institute with over 80 years of experience
- Appr. 4,000 employees world-wide
- Annual turnover approx. 600 M€
- International offices



TNO HQ in Delft, the Netherlands

Our vision: themes & roadmaps



INDUSTRY

- FLEXIBLE & FREE-FORM PRODUCTS
- SPACE & SCIENTIFIC INSTRUMENTATION
- SUSTAINABLE CHEMICAL INDUSTRY
- SEMICONDUCTOR EQUIPMENT
- NETWORKED INFORMATION

HEALTHY LIVING

- FOOD & NUTRITION
- PREDICTIVE HEALTH TECHNOLOGIES
- PREVENTION, WORK & HEALTH

DEFENCE, SAFETY & SECURITY

- MISSIONS & OPERATIONS
- FORCE PROTECTION
- INFORMATION SUPERIORITY
- HUMAN EFFECTIVENESS
- CYBER SECURITY & RESILIENCE
- NATIONAL SECURITY & CRISIS MANAGEMENT

URBANISATION

- MOBILITY & LOGISTICS
- ENVIRONMENT & SUSTAINABILITY
- BUILDINGS & INFRASTRUCTURES
- SMART CITIES

ENERGY

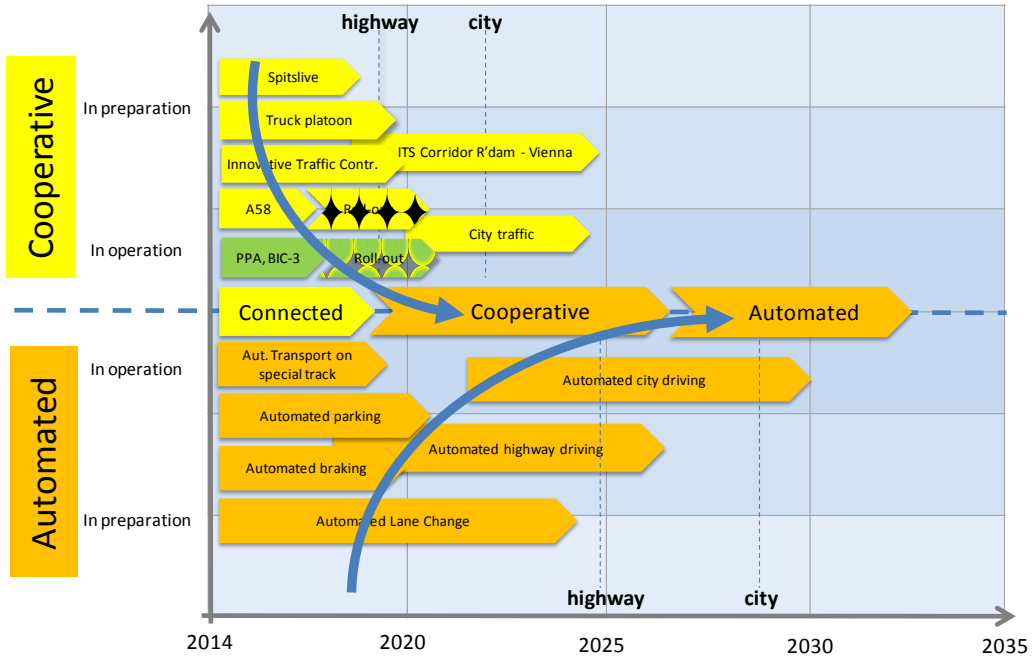
- SUSTAINABLE ENERGY
- GEO ENERGY
- GEOLOGICAL SURVEY OF THE NETHERLANDS
- MARITIME & OFFSHORE

Automated Driving in the Netherlands

- Automation in the Netherlands is driven by strong transport & logistic sector
- The Netherlands offers history and strength through niches in Automation
- “Living labs” are common practice in the Netherlands; mature infrastructures and R&D facilities for large scale real life validation of mobility concepts
- Target: implementation Automation similar to Electric Mobility in NL




Dutch Roadmap



informed → cooperative → automated and cooperative

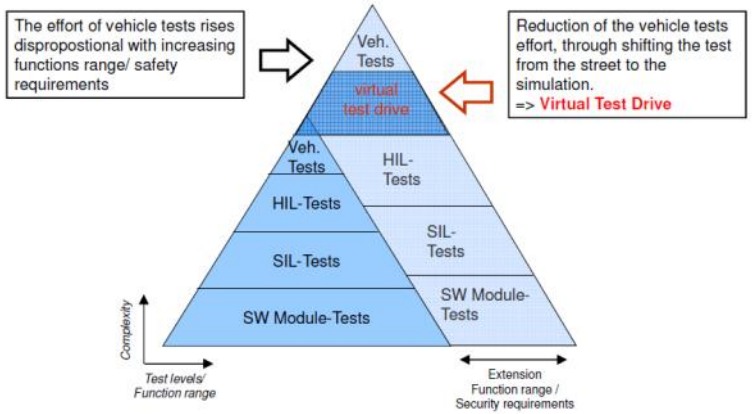




Challenges for automated driving

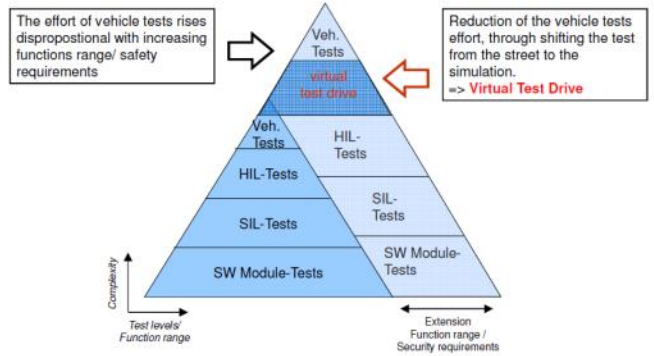
- Many research and deployment questions, both technical and non-technical and they are inter-related.
  - E.g. controls, environmental perception, V2X, liability, legal, acceptance

- **Key challenge**: how can we make the effort of design, testing, validation and certification feasible. E.g. validation of an automated vehicle would require 200 Mio km: This is *unaffordable*.



Solution: methodological and model based safety approach!

The Dutch effort: dealing with the challenges



Measures to control the big data effort for development and validation

- **Shared knowledge and methodology approach** for design, validation and certification as **enabler for cost and time efficient development**
  - Integrated use of simulation and experiments (reduce effort)
  - Modular approach: reusability of validation for certification and safety case

- **Framework for implementation (policy, legislation, user, liability) in place**
  - Strong collaboration with industry, policy/legislation, authorities and users
  - Knowledge sharing and cross fertilization over different application domains

Shared Innovation Program focus on 4 domains (step by step)

with concrete applications to focus research and deployment and to identify sound BCs for early adaptors

Private transport (passenger car)
Cooperative automated driving (e.g. C-ACC, C-AEB)
Automated traffic management

Public transport (bus)
Automated docking, LKA

Commercial transport (truck)
Truck Platooning
Automated docking, BLIND spot- (C)-AEB

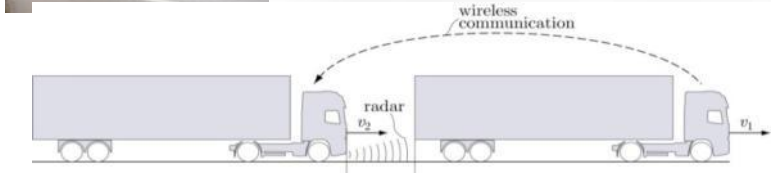
Port logistics (AGV)
Next generation AGVs

Current activities

- Focus on deployment (technology, legal framework, acceptance) within the application domains together with stakeholders (industry, government, users)
  - Private transport (C-ACC with passenger cars)
  - Commercial transport (2-truck platooning concept)

Zelfrijdende auto voor het eerst op de Nederlandse weg

Minister Schultz reed als eerste in een automatisch bestuurde auto op de snelweg in Nederland. De eerste testrit op de openbare weg met automatisch rijdende auto's betekent volgens de minister een belangrijke stap op weg naar grootschalige inzet van nieuwe autotechnieken die bijdragen aan een betere doorstroming van het verkeer en de verkeersveiligheid.



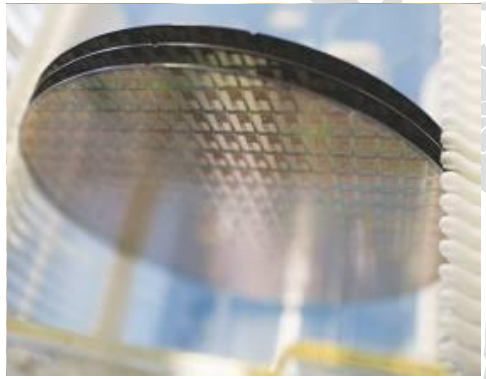
NXP – a global innovator

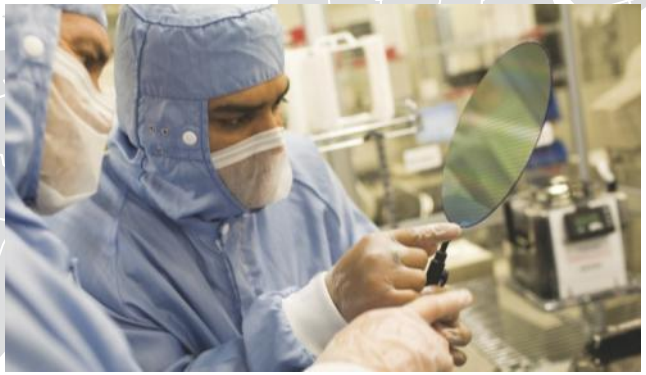
Established in 2006
(formerly a division of Royal Philips)
Net sales: $4.8 billion in 2013, >60% in Asia
Employee base:
~ 25,000 employees in more than 25 countries
Manufacturing in Asia and Europe

Strong Innovation Pipeline:

- R&D in Asia, Europe and US
- $2M / day in R&D
- 3,200 engineers
- 11,000 patents

Global #1 Semiconductor Player in Security and Automotive Connectivity





Secure Connections for a Smarter World

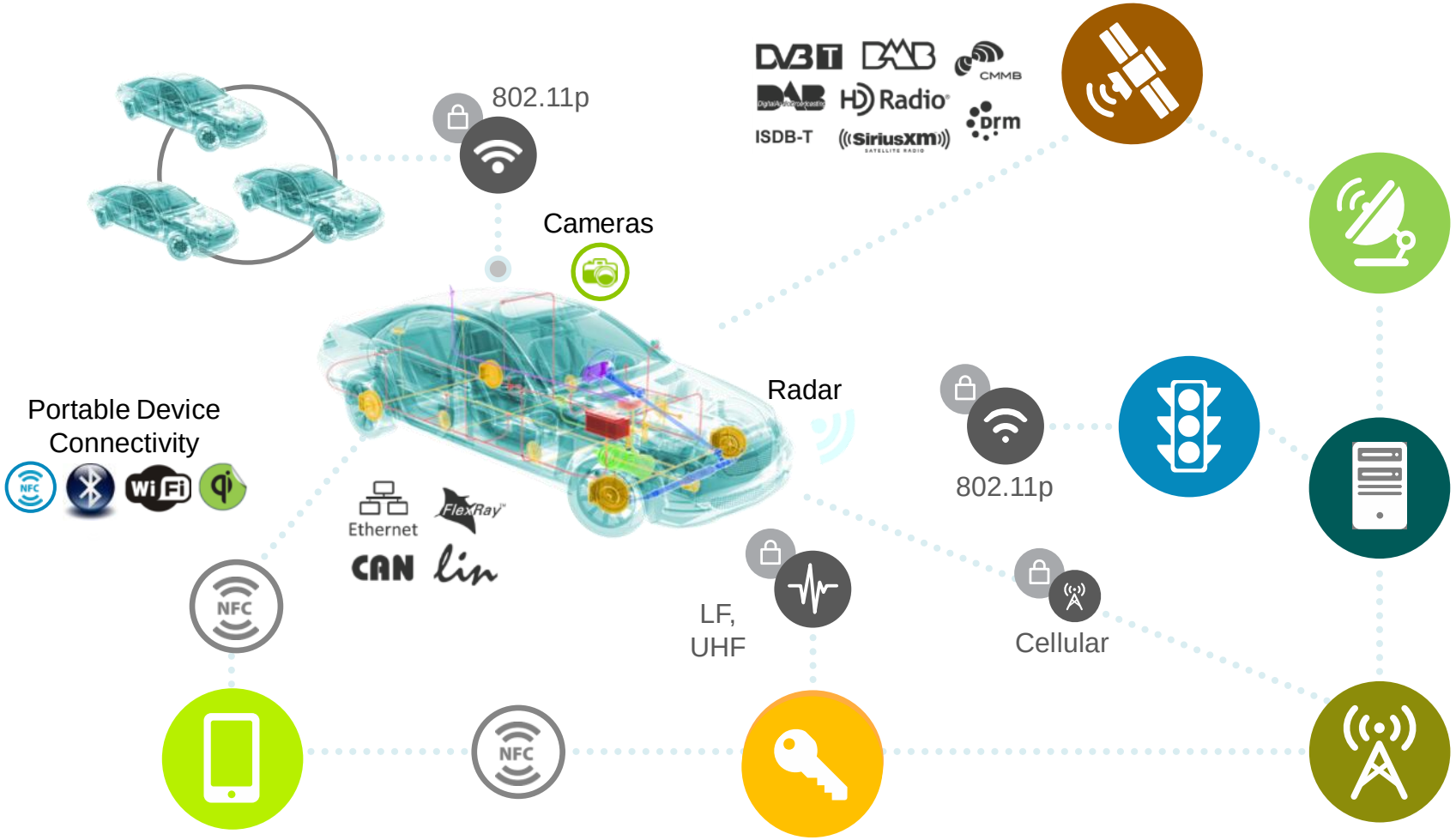
Four Mega Trends are shaping our Society …

and drive the Electronics Industry

Energy Efficiency, Connected Devices, Security, Health

NXP Connects the Car

… communication between cars, people, infrastructure



Imagine you TRUST your car so much, you will sit backwards to ENJOY entertainment @80mph

SEAMLESS CONSUMER ELECTRONICS EXPERIENCE

Passengers choose how to best use travel time (i.e., work, entertainment)

ENJOY

Connectivity couples CE & Auto cycles

ADVANCED DRIVER ASSISTANCE ➔ SELF-DRIVING

The car takes care of the driving

TRUST

Massive growth

ADAS towards Self-driving

The race towards fully automated cars in ’20-’25

Evolution (Conti ➔#1 Auto T1 player)

Evolution from **Active Safety** to **Advanced Driver Assistance Systems** to **Highly Automated by 2020** and **Fully Automated Cars by 2025**

Revolution (Google ➔ #1 Internet)

Developing **Fully Automated** cars from the start, targeting 2020 introduction

ADAS is getting momentum in the news and stock market

MOBILEYE

GM

Autonomous Driving enabled by complementary systems: C2X + Radar + Camera

I ♥ RADAR

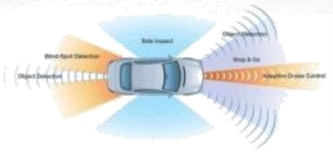
C2X

- Fast communication & cooperation (platoon)
- No vision necessary - Look around corners
- Long range – up to 2km
- 360° view
- Only works in connected infrastructure

Like Elephants in a platoon

Camera

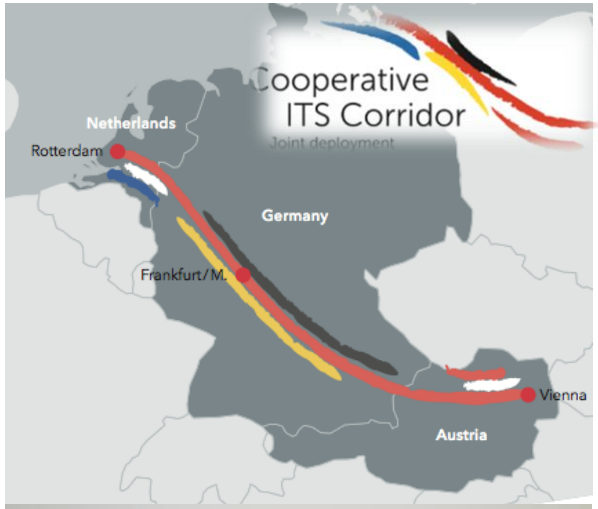
- Visionary identification of objects (e.g. people, cars, buildings etc.)
- Safety warnings
- Autarkic

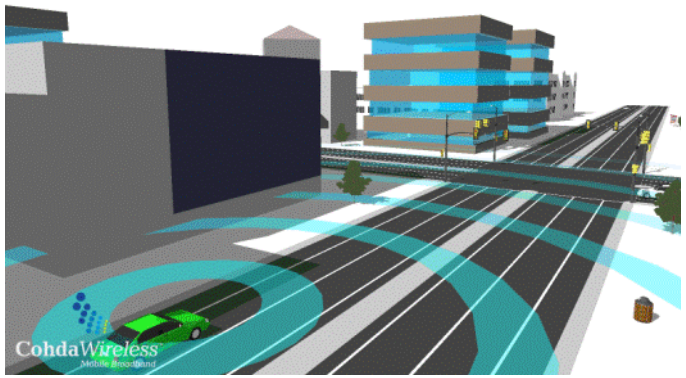


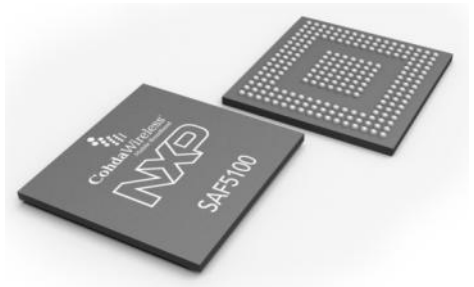
Radar

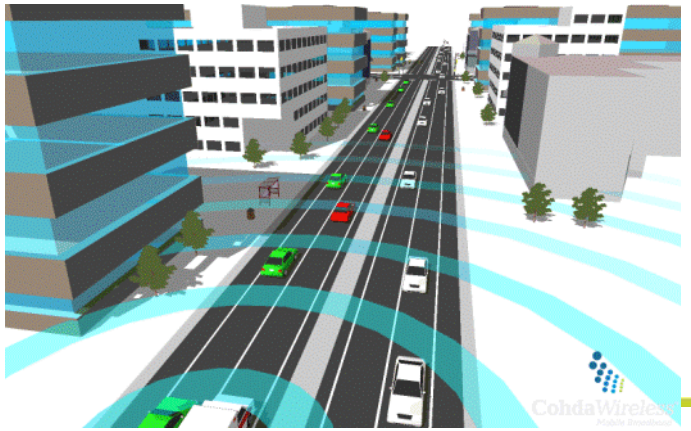
- Object detection to adjust speed/steering to situation
- Vision to objects needed
- Autarkic

What's Next: Cooperative Mobility









MOU between The Netherlands, Germany and Austria to deploy from 2015 onwards cooperative mobility on this corridor to improve traffic safety and reduce congestion

Potential security & privacy issues

Security:

- "Was the message **not modified**?"
- "Did it really **originate** from car A? Can I trust car A?"

➔ Solution: apply message **authentication**

Privacy:

- "Can someone **track** me while driving?"

➔ Solution: use **pseudonyms**