参考資料４　Automated driving in Finland

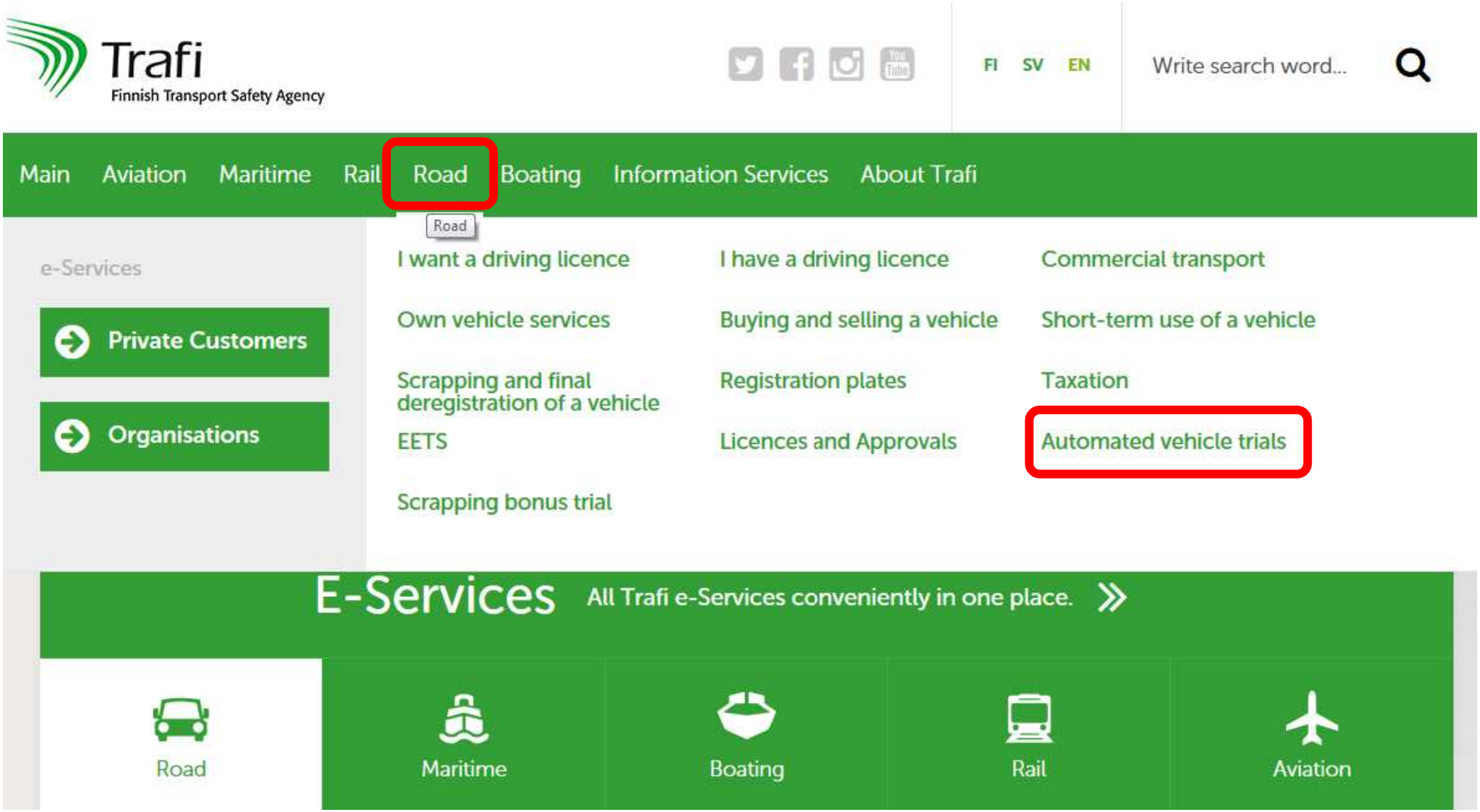
Trafi Finnish Transport Safety Agency

#trafficlab

Automated driving in Finland

Pilots & developments

Responsible traffic.
Courage and co-operation.


Trafi
Finnish Transport Safety Agency
FI SV EN
Write search word...
Main Aviation Maritime Rail Road Boating Information Services About Trafi
Road
e-Services
Private Customers
Organisations
I want a driving licence
I have a driving licence
Commercial transport
Own vehicle services
Buying and selling a vehicle
Short-term use of a vehicle
Scrapping and final deregistration of a vehicle
Registration plates
Taxation
EETS
Licences and Approvals
Automated vehicle trials
Scrapping bonus trial
E-Services
All Trafi e-Services conveniently in one place.
Road
Maritime
Boating
Rail
Aviation

Testing of automated vehicles

Trafi

#trafficlab

- Testing of all automated vehicles (**SAE levels 0–5**) is possible **on public roads** in Finland using **a test plate certificate**
- Vehicle under testing **must have a driver** either inside or outside the vehicle
- Focus on **responsible behaviour of the testing organisation**

How? Test plate certificates

Trafi

#trafficlab

- Valid for one year at a time
- Eligible applicants: companies, agencies or other R&D organisations
- Entitles the bearer to drive test vehicles, to a limited extent and on a temporary basis, **both in road traffic and off-road**
- For testing in road traffic, Trafi will issue **test plates**

Requirements for test permits

Trafi

#trafficlab

- *Trade register extract* from the company's country of incorporation
- *Trial plan* including:
  - a general description of the trials
  - technical specifications of the test vehicles
  - information on the road area where the trials are intended to be conducted
  - proof of insurance cover for third party liability
  - **description of how road safety will be ensured**

Follow-up: reporting

Trafi

#trafficlab

The test plate certificate holder must **submit a report** to Trafi on the trial results.

The report should describe:

- how the trial plan was implemented
- what kind of **deviations** from the plan were encountered

National strategy for transport automation

- **All modes of transport**
  - Air
  - Maritime
  - Rail
  - Road
- **Robots on land, in water and in the air** – Promoting intelligent automation in transport services; Publications of the Ministry of Transport and Communications 7/2015
  - "If it works in Finland, it will work anywhere!"
  - Simpler, smarter regulation in focus
- **A governmental resolution on robotisation** in May 2016

National AV activities in Finland

Trafi

1. Winter testing in Northern Finland

- Arctic Challenge pilots
- Aurora E8-highway: intelligent infrastructure testing environment

2. Urban testing facilities

- Tampere
- Developing testing tools & requirements for AVs

3. Automated electric buses/shuttles

- Helsinki, Espoo, Tampere
- Automated last-mile solutions & innovation platform

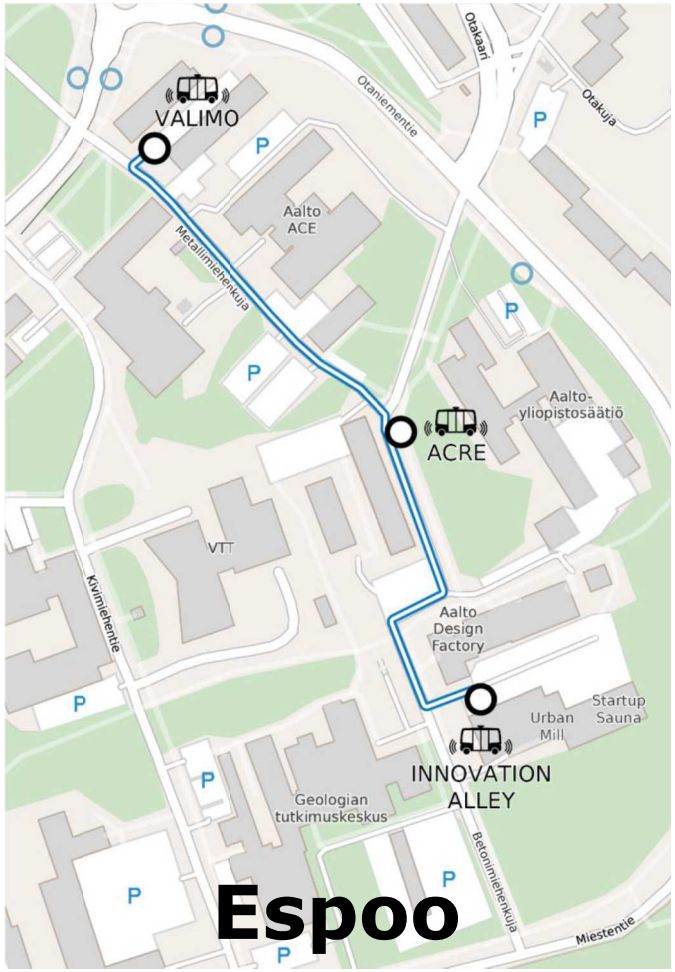
#trafficlab

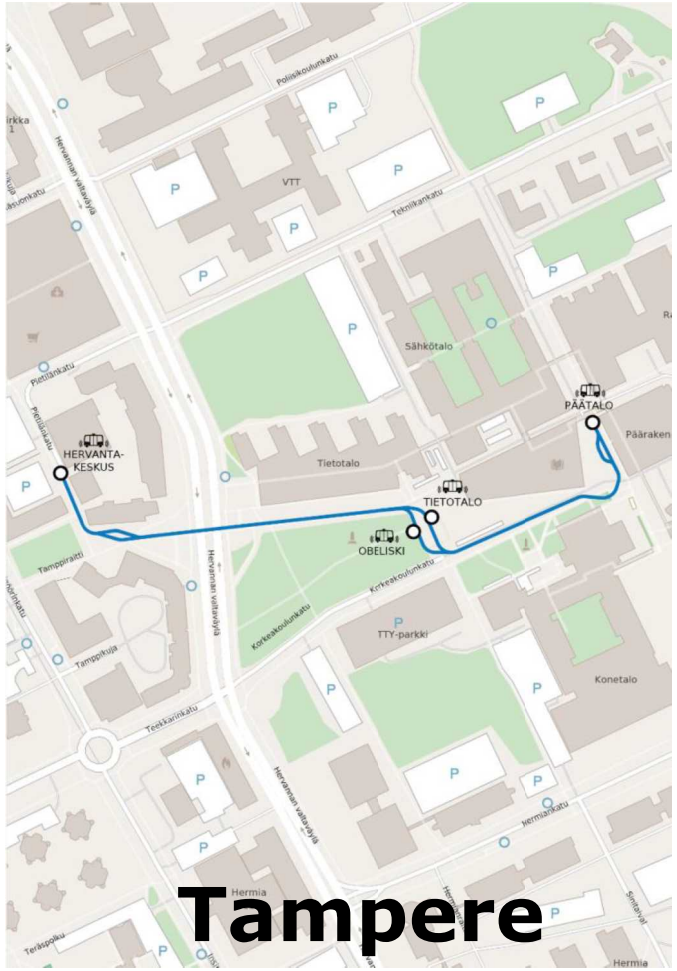
Finnish Transport Safety Agency


Trafi
SOHJOA
EZ10
Tekes
6Aika
DRIVERLESS VEHICLE

Sohjoa automated electric buses

- 2 EasyMile buses (SAE Level 4)
- Public streets
- Traffic lights, street markings
- Signs indicating AV testing





Challenges & lessons learned

Trafi

- Close and interactive cooperation between authorities and testing organisations is crucial already in the planning phase
  - In urban settings, city transport planners should be involved as early as possible
  - Including police in the discussions from the start
- Real urban environments are always more complicated to test in than expected
  - Illegal parking issues, lots of pedestrians and cyclists
- For automated electric buses, conditions are still a limiting factor

ROBUSTA

Developing software platform for remote control of robot buses

Using 5G network as an enabler technology

Real-time sensor data

AI assisted human-machine communication

Development of a remote control room

Exploring how autonomous vehicles could be fitted to existing mobility ecosystem

Evaluating future business potential

Assessing the user experience of both passengers and remote operators

TRANSPORTATION

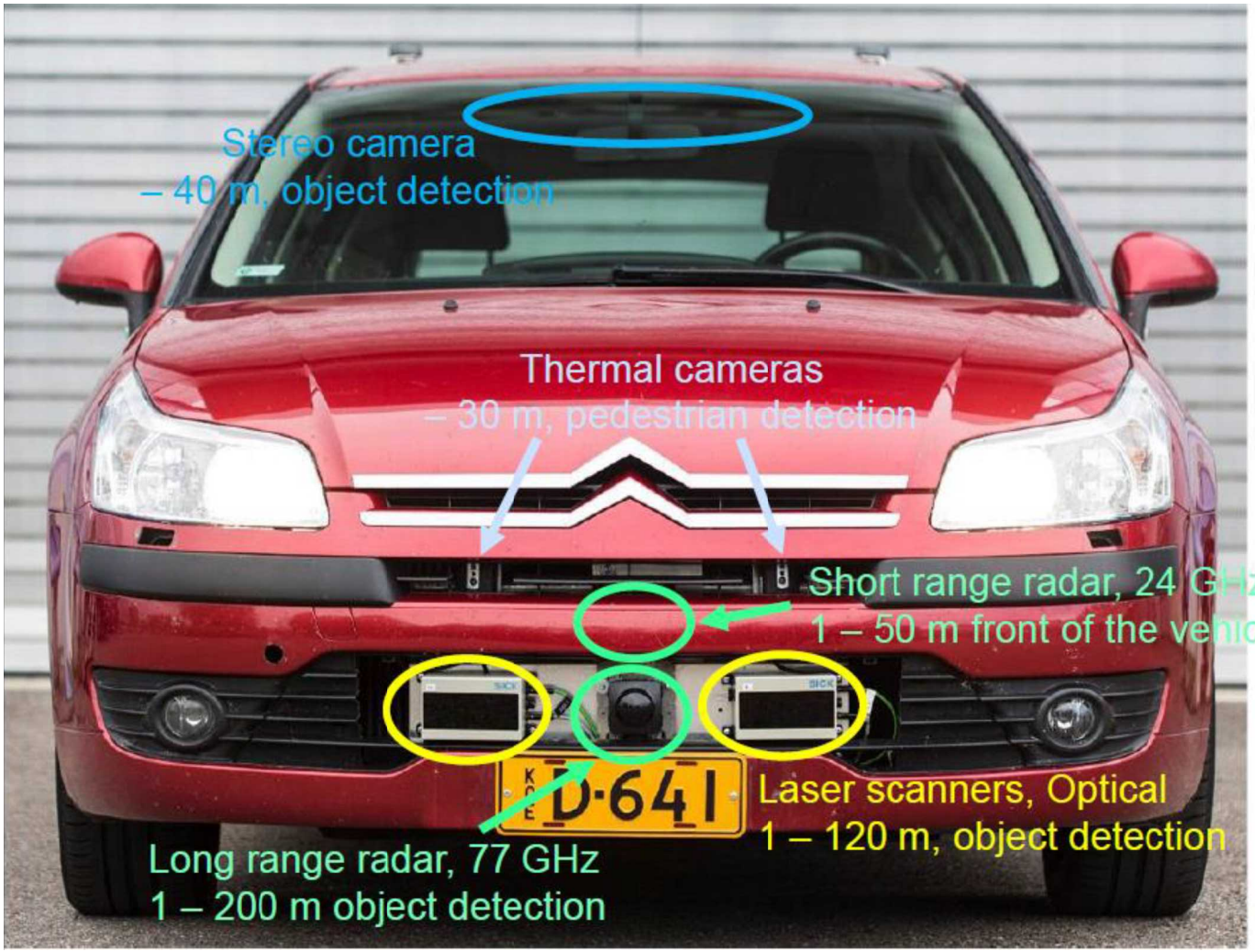
Driverless bus line coming to Helsinki this fall

With the RoboBusLine, autonomous transit will go from experiment to regular scheduled service

BY PATRICK SISSON | JUN 15, 2017, 1:32PM EDT

Trafi

URBANAUTO TEST



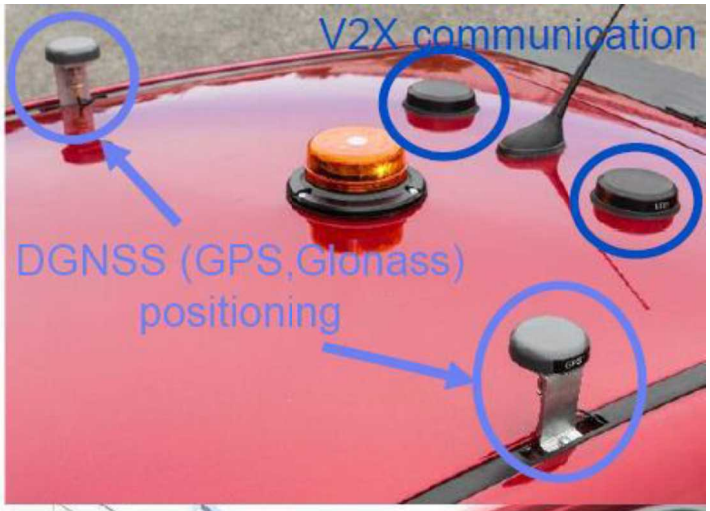
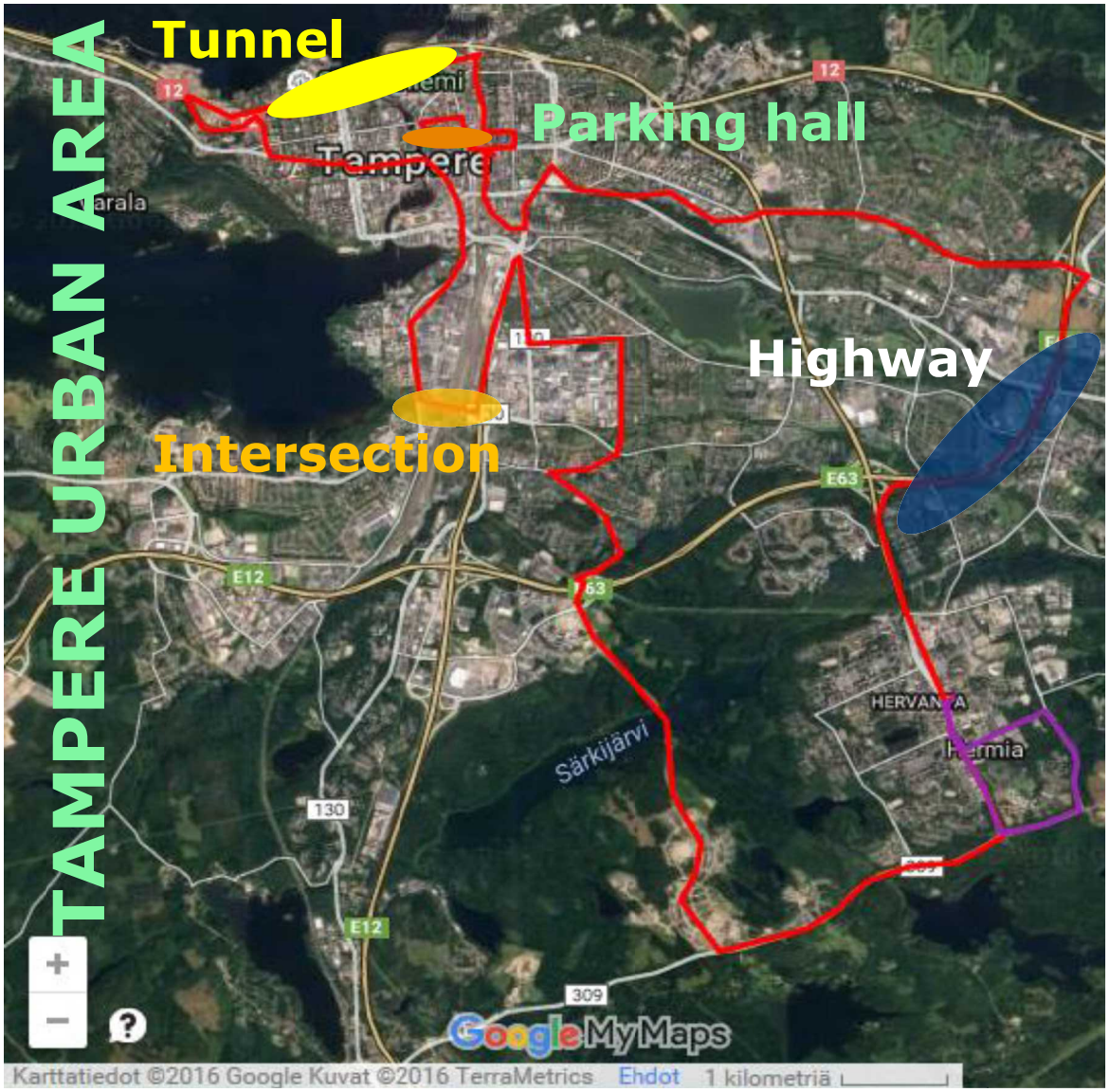


Image: VTT Technical Research Centre of Finland

UrbanAutoTest – testbed for connected and automated driving

Trafi

- Develop urban test areas for C-ITS (public roads in Tampere)
- Based on existing industrial standards
- Test track includes tunnels and parking halls



Trafi

AUTOmated driving Progressed by the Internet Of Things

Use IoT technologies to move Automated Driving towards a new dimension

- ✓ Enhance driving environment perception with "IoT enabled" sensors
- ✓ Integrate IoT platforms in the vehicles
- ✓ Use Cloud and IoT platforms to
  - ✓ Share IoT sensor data
  - ✓ Create new Mobility Services with fully automated vehicles

2

AUTOPILOT

AUTOPILOT test sites

Trafi

Brainport, NL
- Automated Valet Parking
- Highway pilot
- Platooning

Tampere, FI
- Automated Valet Parking
- Urban Driving

Versailles, FR
- Automated Valet Parking
- Urban Driving
- Platooning

Daejeon, KR
- Urban Driving

Vigo, SP
- Urban Driving
- Automated Valet Parking

Livorno, IT
- Urban Driving
- Highway pilot

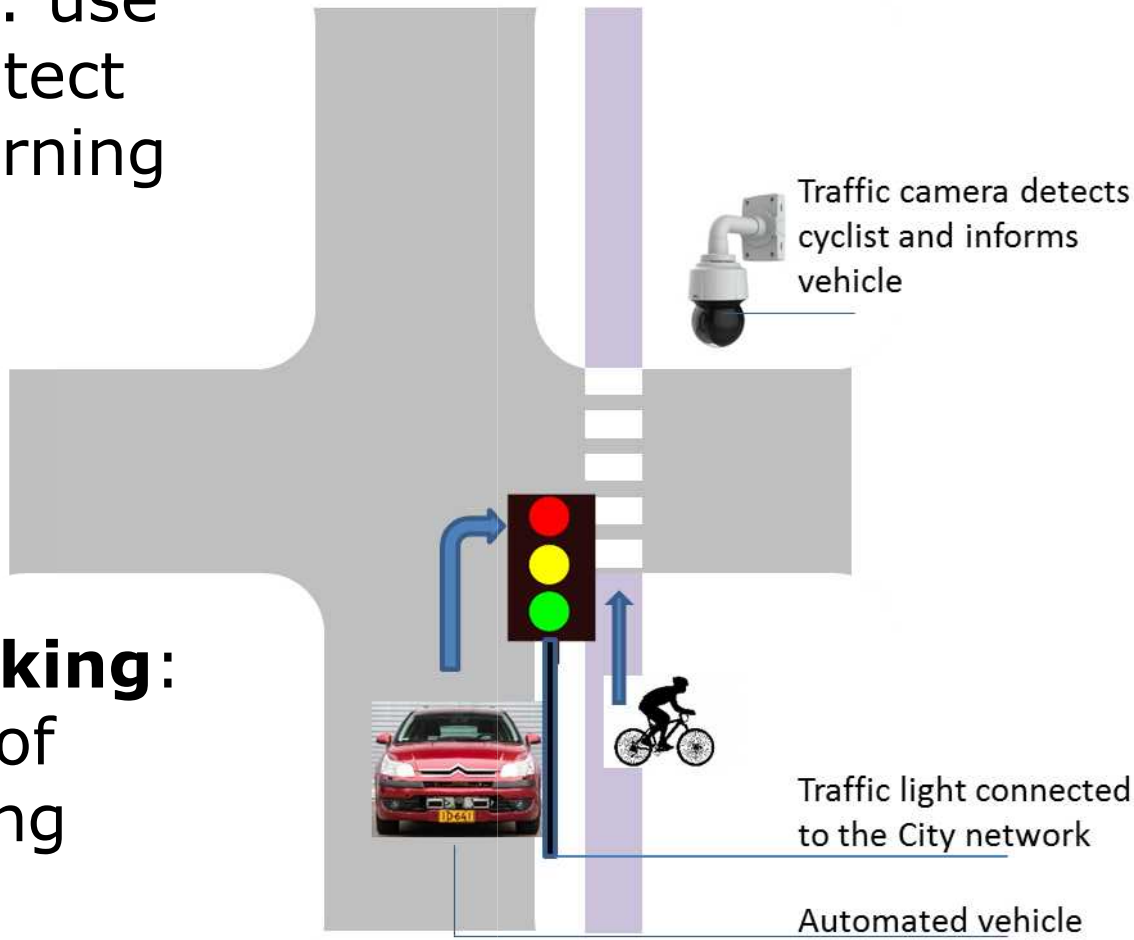
AUTOPILOT

Finnish Transport Safety Agency

AUTOPILOT test cases - Finland

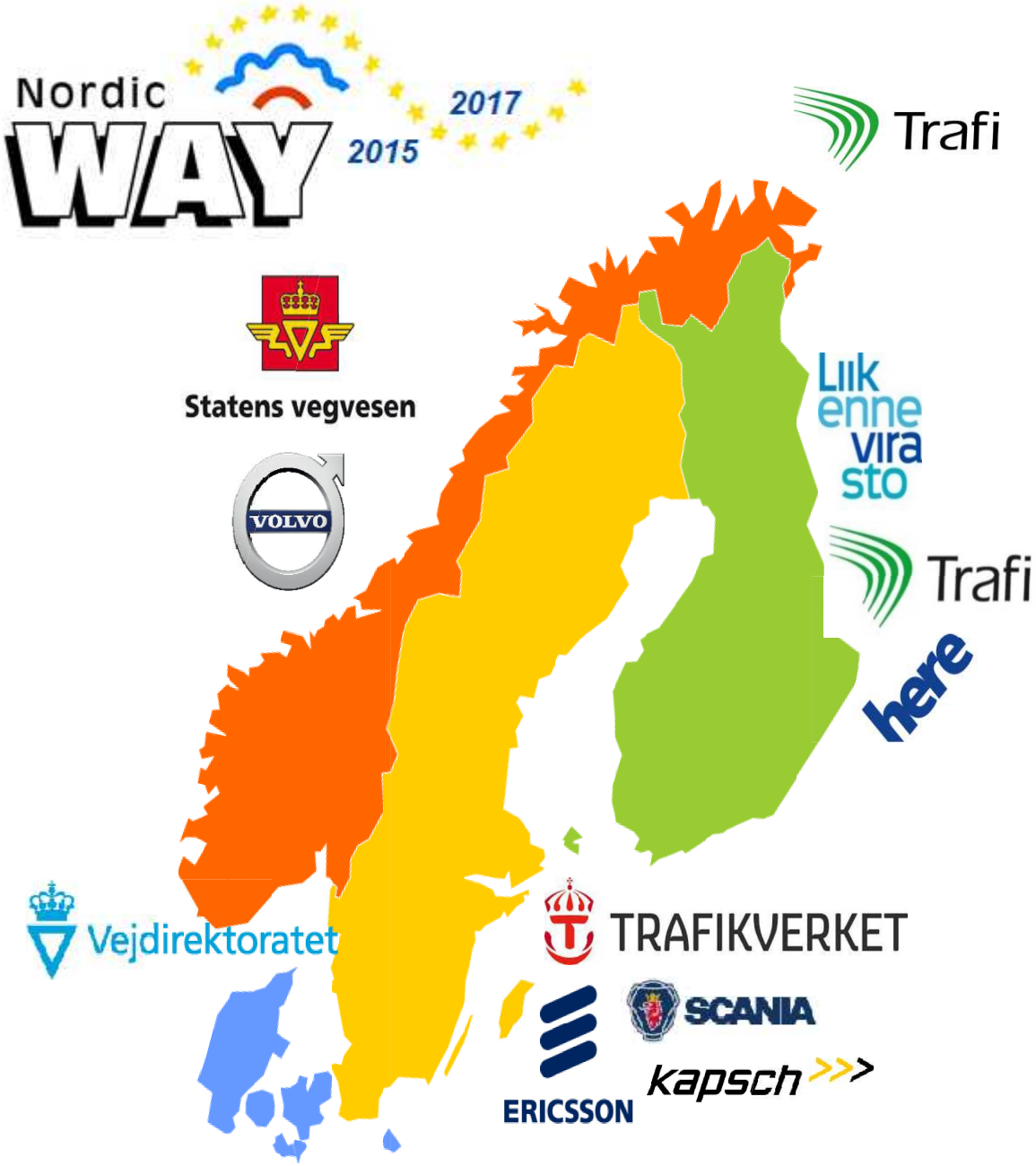
- **Intersection support**: use of traffic cameras to detect VRUs in conflict with turning pedestrians

- **Automated Valet Parking**: assistance and control of unmanned vehicle during parking



Hybrid C-ITS corridor

- ✓ Day 1 Safety Related Traffic Information with support of Day 1.5 and beyond services
- ✓ Interoperability demonstrated in 2017
- ✓ Ecosystem for the data value chain and stakeholders

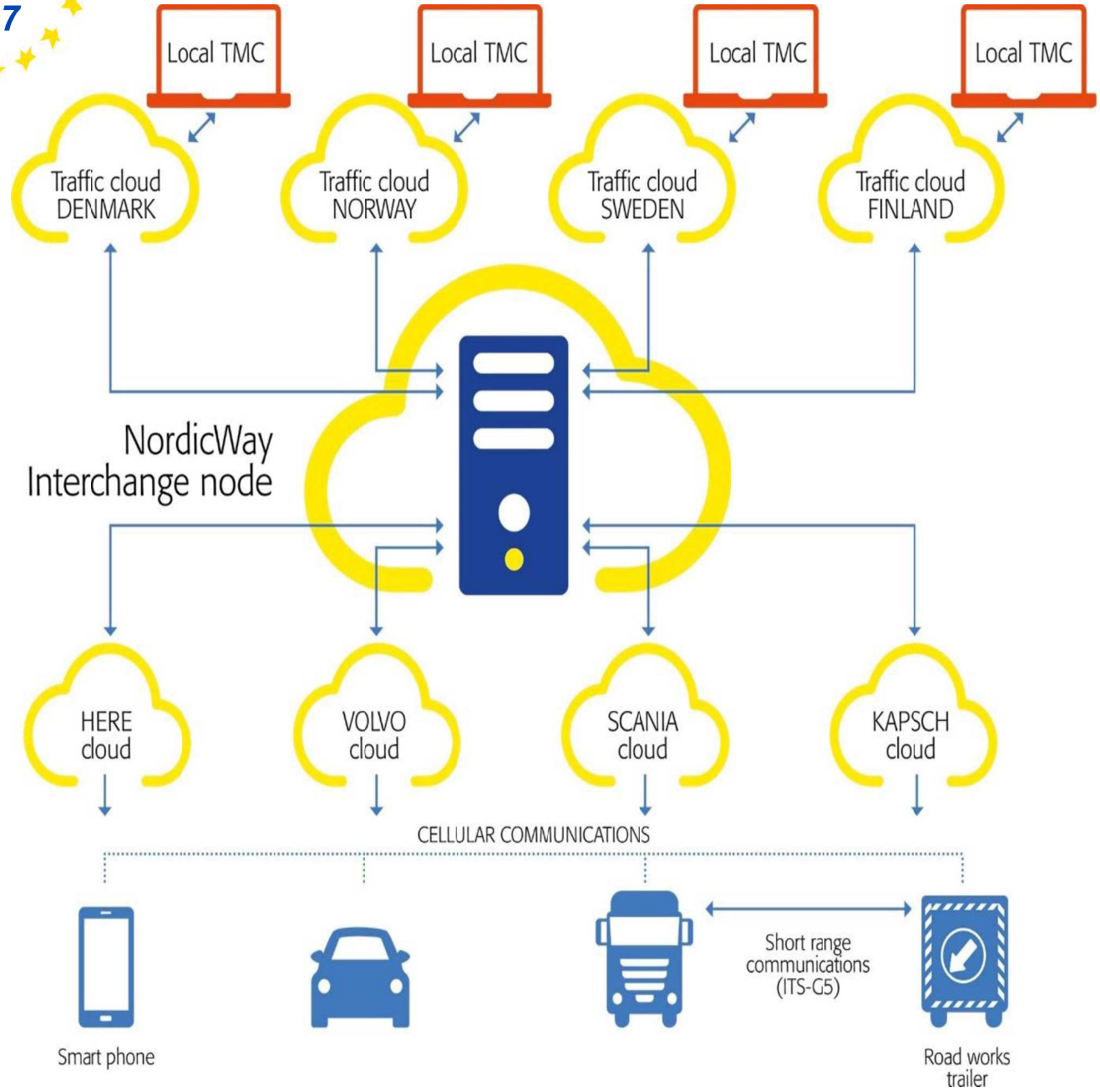


Co-financed by the European Union
Connecting Europe Facility

Hybrid C-ITS corridor

Nordic WAY 2015 2017

- ✓ NordicWay Intechange Node hybrid communication Safety Related Traffic Information demonstrated successfully in 10 May 2017 between SWE-NOR and SWE-DNK borders. Youtube links: short and long video from the demonstration
- ✓ NordicWay final results, including technical performance, user behavior and acceptance as well as socio-economic analysis is published in the final event at 21 November in Brussels (INEA)
- ✓ Architecture available at www.nordicway.net



Co-financed by the European Union
Connecting Europe Facility

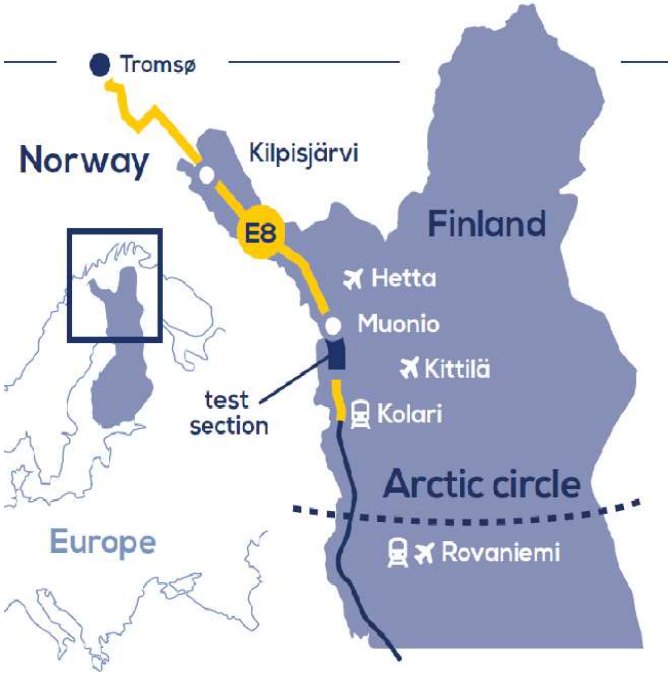
Arctic Challenge 2017-2019

- Pilot project examining opportunities in road transport automation and intelligent infrastructure and **their performance in snowy and icy conditions**
- Trafi and FTA research funding €1–2 million
- FTA infrastructure funding €2 million
- Based on the Road Transport Automation Road Map and Action Plan 2016–2020
  http://www2.liikennevirasto.fi/julkaisut/pdf8/lts_2016-19eng_road_transport_web.pdf

Arctic Challenge - research questions

- What **landmarks**, such as delineators and reflective posts, or snow poles and plot access marks, support automated driving? Where should these be located? What should they be like?
- How could the **C-ITS Day 1 hybrid services** improving traffic flow and safety be implemented?
- How does the **remote control and monitoring of vehicles** work in 4G and in the first stage of the 5G network in good/poor weather and road conditions?
- In what way and how accurately could a **vehicle be positioned** to fulfil the needs of automated driving at northern latitudes where no edge markings or roads can be recognised?

Public test section supports connected and automated driving trials in road traffic.



aurora

snowbox.fi

Testers can utilize a 10 km long test section on the main road E8.
The physical infrastructure of the test section is equipped to support test activities and extensive information services are available for test use.
In addition, a test vehicle can be used for trials done on the move.

Precise positioning down to 1 - 5 cm accuracy with professional GNSS-receivers.

5G test network

5G test network and extensive mobile network (3G, 4G, LTE 800/1800) in the region.

HD map of the test section available.

1010 0110

Data collected from the sensors and the equipment available as open data.

Fibre and electricity available throughout the test section.

Piping and crosspiping allow post-installations to physical infrastructure.

Ready-to-use device cabinets and facilities for testers.

Instrumentation supporting intelligent infrastructure asset management trials.