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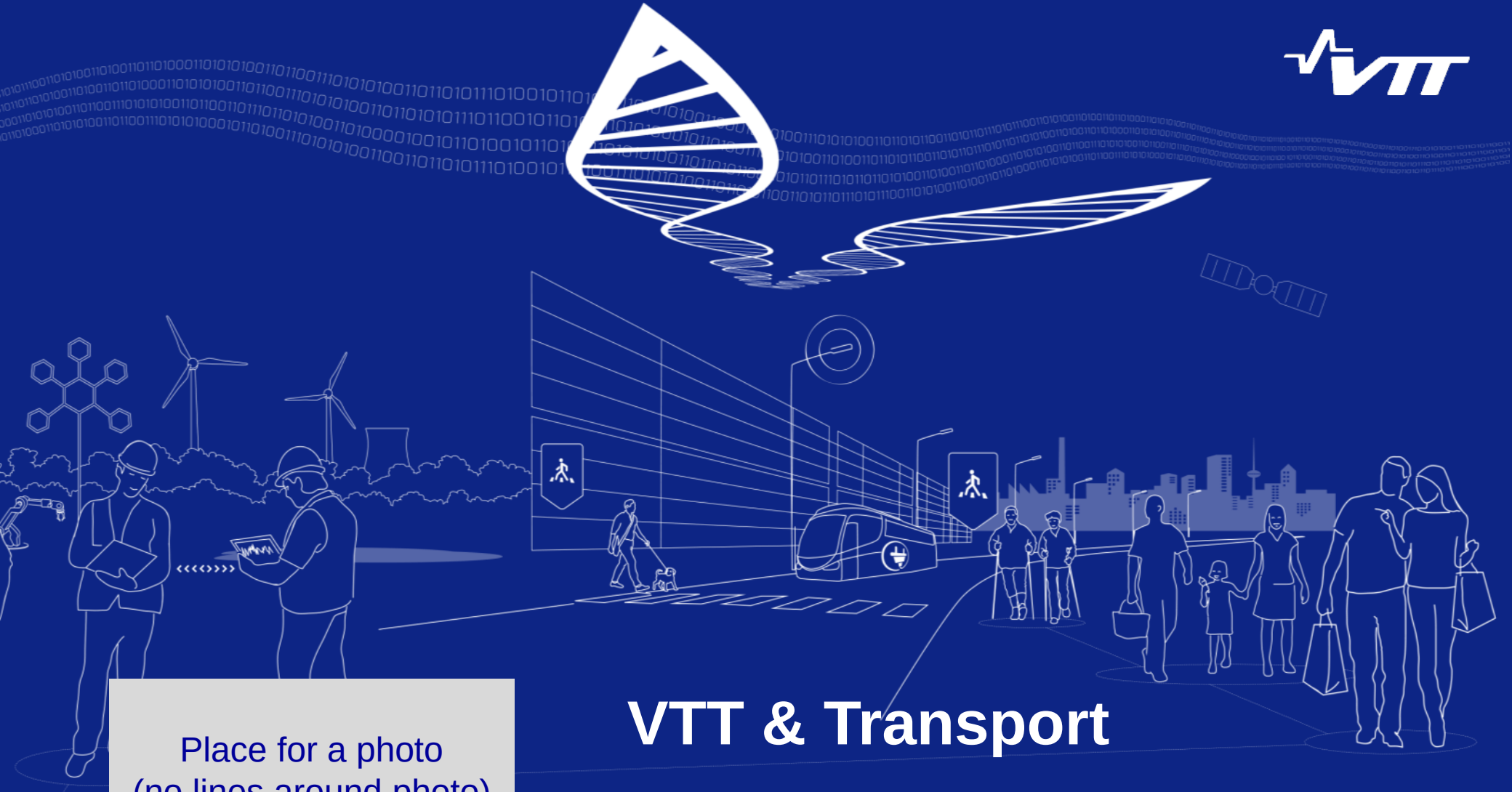
Testing and deploying new solutions through collaboration

IEA Mobility Workshop Oct 27, 2016
Juho Kostiainen
VTT Technical Research Centre of Finland Ltd



VTT & Transport

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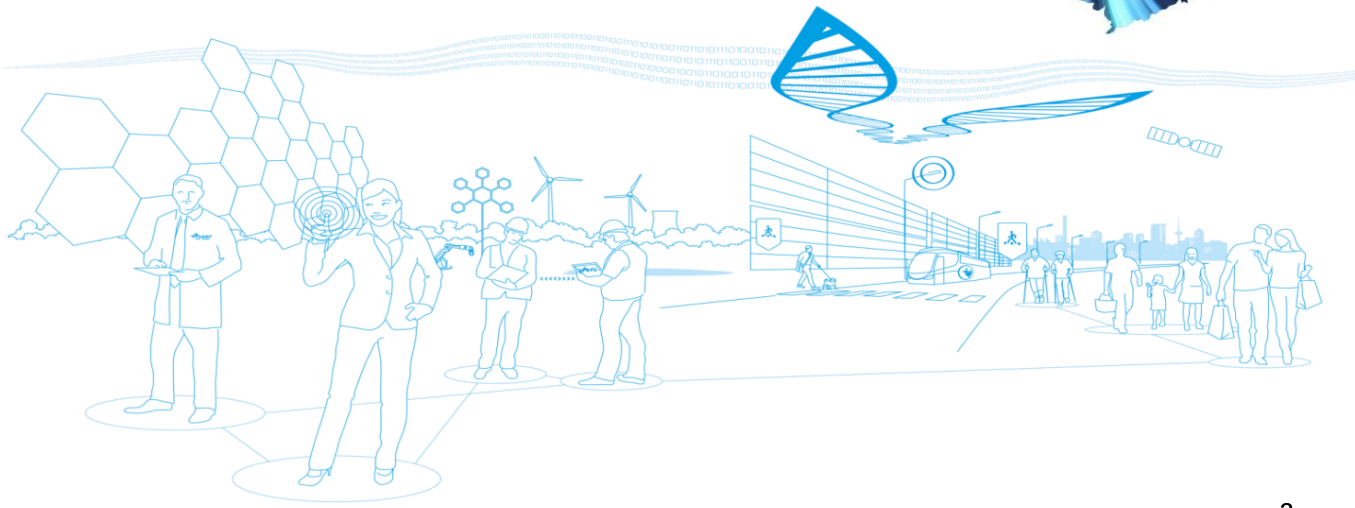
VTT Technical Research Centre of Finland Ltd

VTT Technical Research Centre of Finland Ltd is the leading research and technology company in the Nordic countries. We provide expert services for our domestic and international customers and partners, and for both private and public sectors.

We develop new smart technologies, profitable solutions and innovative services. We cooperate with our customers to produce technology for business and build success and well-being for the benefit of society.

VTT is part of Finland's innovation system and operates under the mandate of the Ministry of Employment and the Economy.



VTT’s status as performer of R&D work

BASIC RESEARCH

UNIVERSITIES

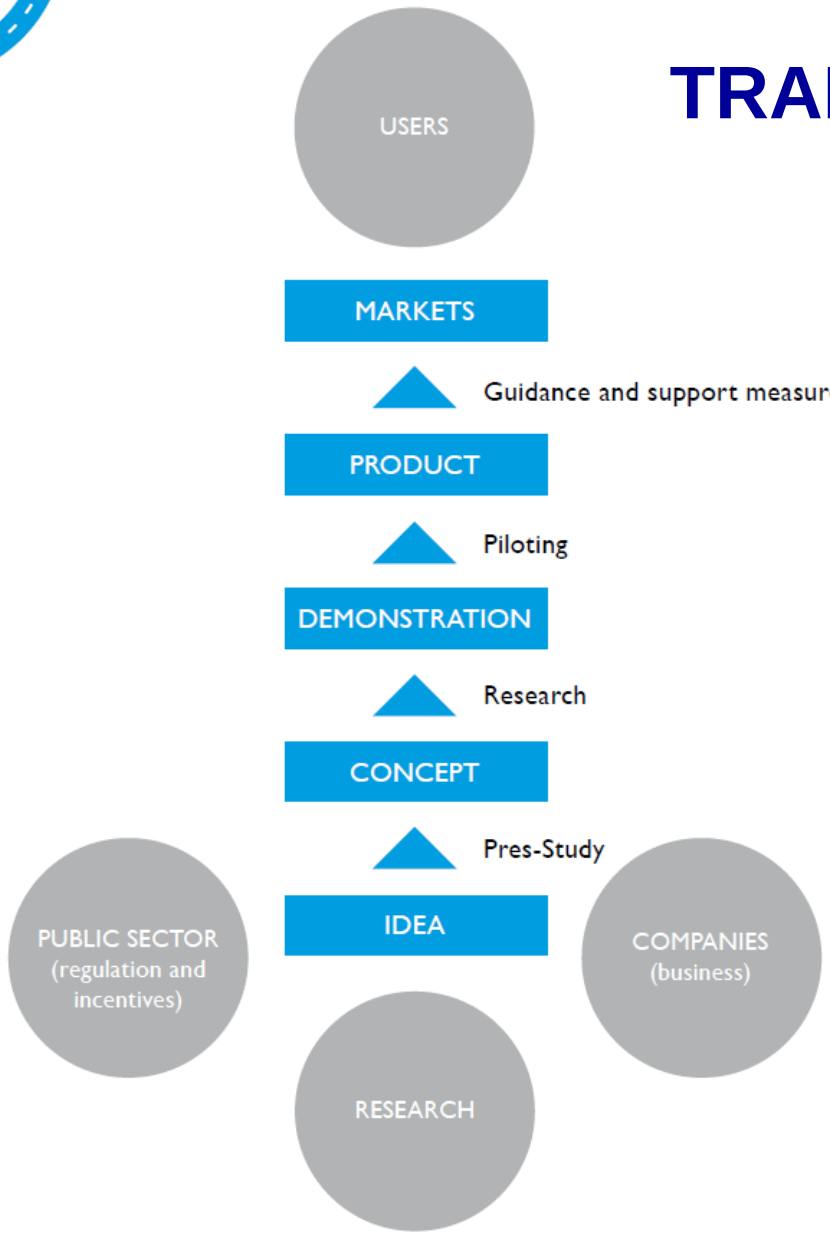
APPLIED RESEARCH

VTT

DEVELOPMENT

INDUSTRY

TRANSSMART

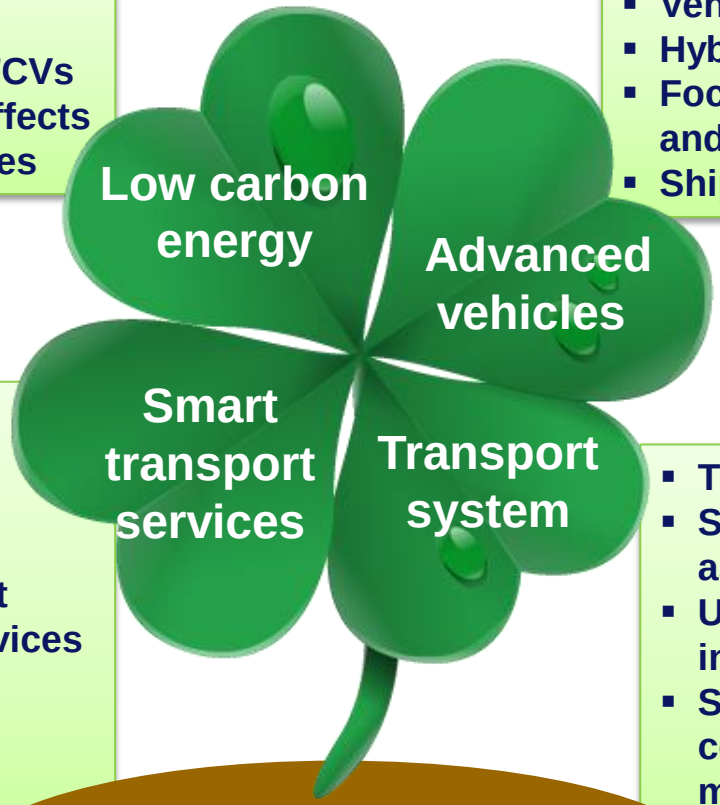


- VTT's spearhead programme *TransSmart* is a collaboration platform for the development of smooth-running, cost-efficient and environmentally friendly transport systems.
  - Public sector
  - Private sector
  - Research organisations

TRANSSMART THEMES AND CONTENTS

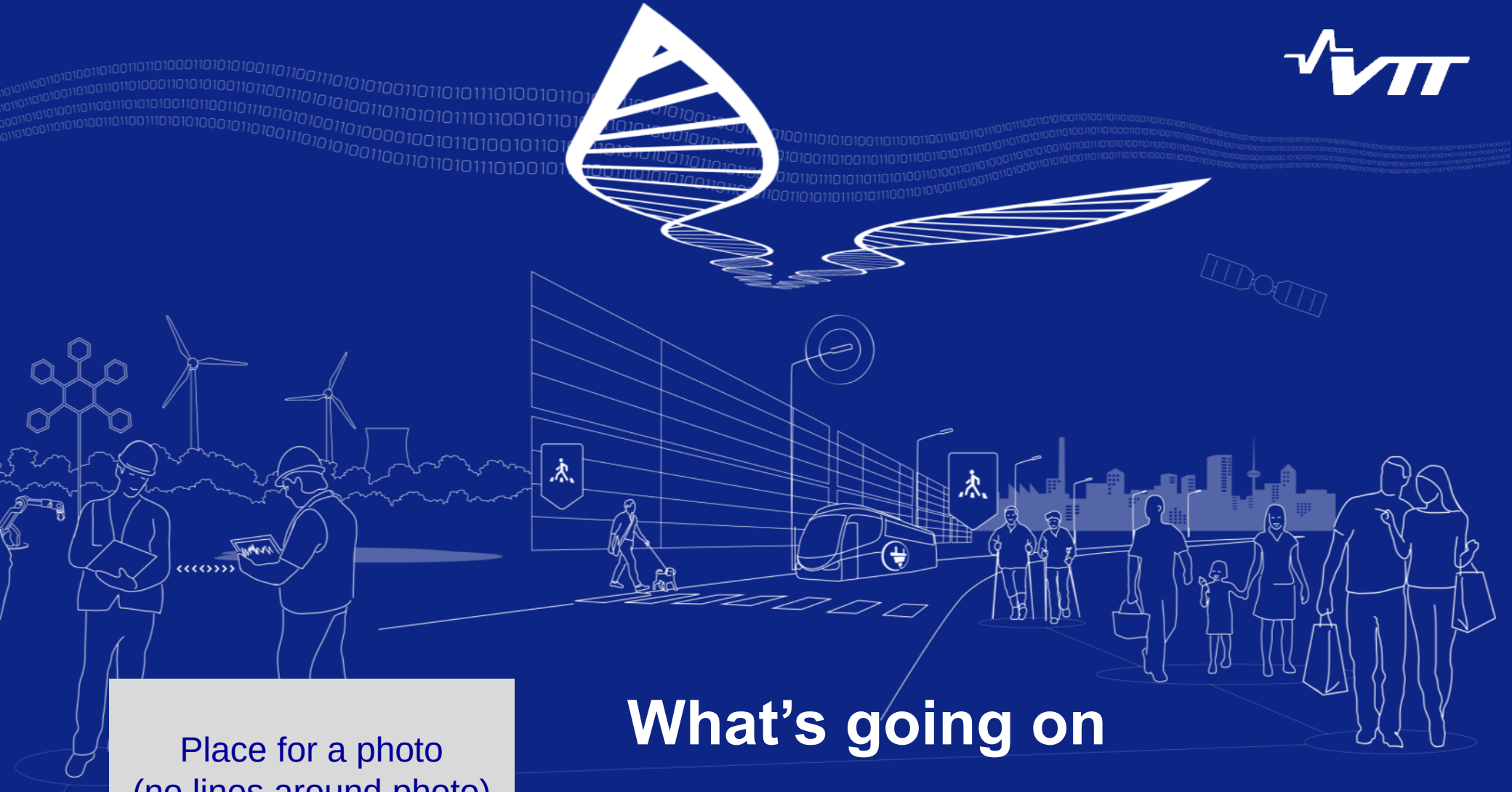
- Biofuels for transport
- Low-carbon fuels
- Infrastructure for EVs & FCVs
- EV fast charging & grid effects
- Energy storage for vehicles

- Efficient use of vehicles
- Vehicle technology
- Hybrids, EVs & FCVs
- Focus on commercial vehicles and mobile machinery
- Ship propulsion



- Smart cooperative systems and services
- Business ecosystems, business models and foresight
- Advanced multimodal transport management systems and services
- Service concepts, testing and technology platform demonstrations

- Transport system foresight
- Systemic policies and impact assessment
- User values, demands, intentions and acceptance
- Stakeholder networks, communities and their management



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What’s going on

Acronym of the day

SECAV

…or ACES, CAVES or however you want to scramble the letters…

SECAV

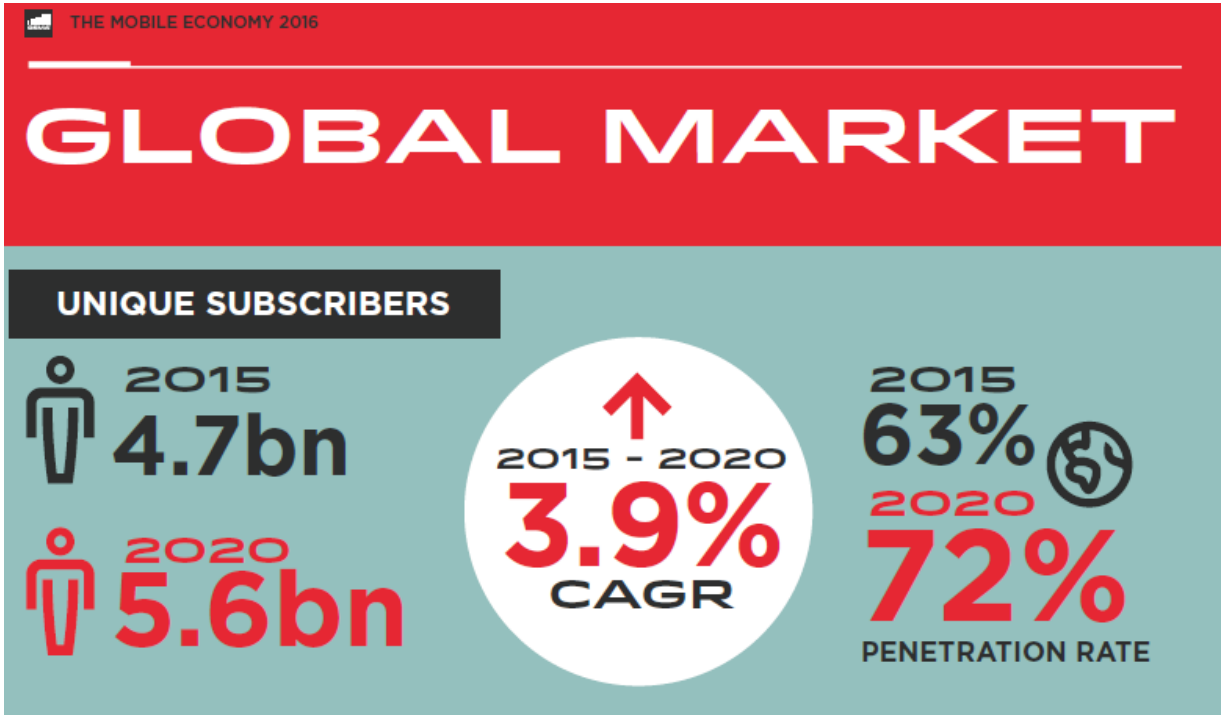
- UberPOOL

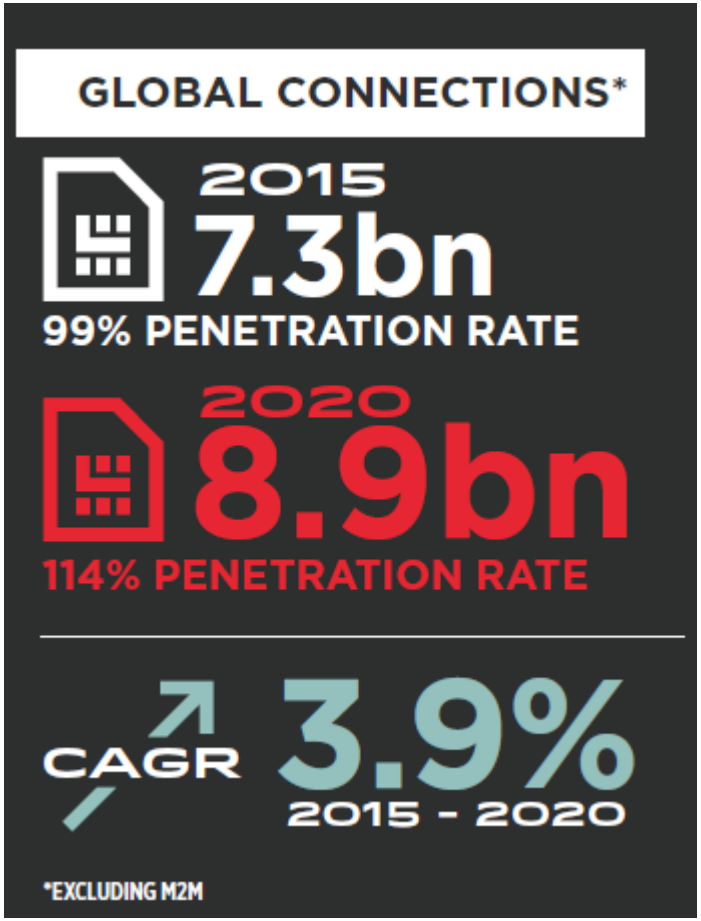
- Car Sharing
  - *"…one-way carsharing is almost certainly reducing VMT overall..."*
    (Martin E, Shaheen S (2016) Impacts of Car2Go on vehicle ownership, modal shift, vehicle miles traveled, and greenhouse gas emissions. Working paper July 2016.)

- Sharing and new services provide options and reduce the need to own (at least a second) car

SECAV

- Cars getting there…
- … (smart) mobile phones already there.





SECAV

NordicWay / connected driving

- Deployment of **C-ITS (Cooperative ITS) utilising cellular networks**
- Extended to corridor between **Finland, Sweden, Norway and Denmark**
- **Highway and inter-urban** connected driving

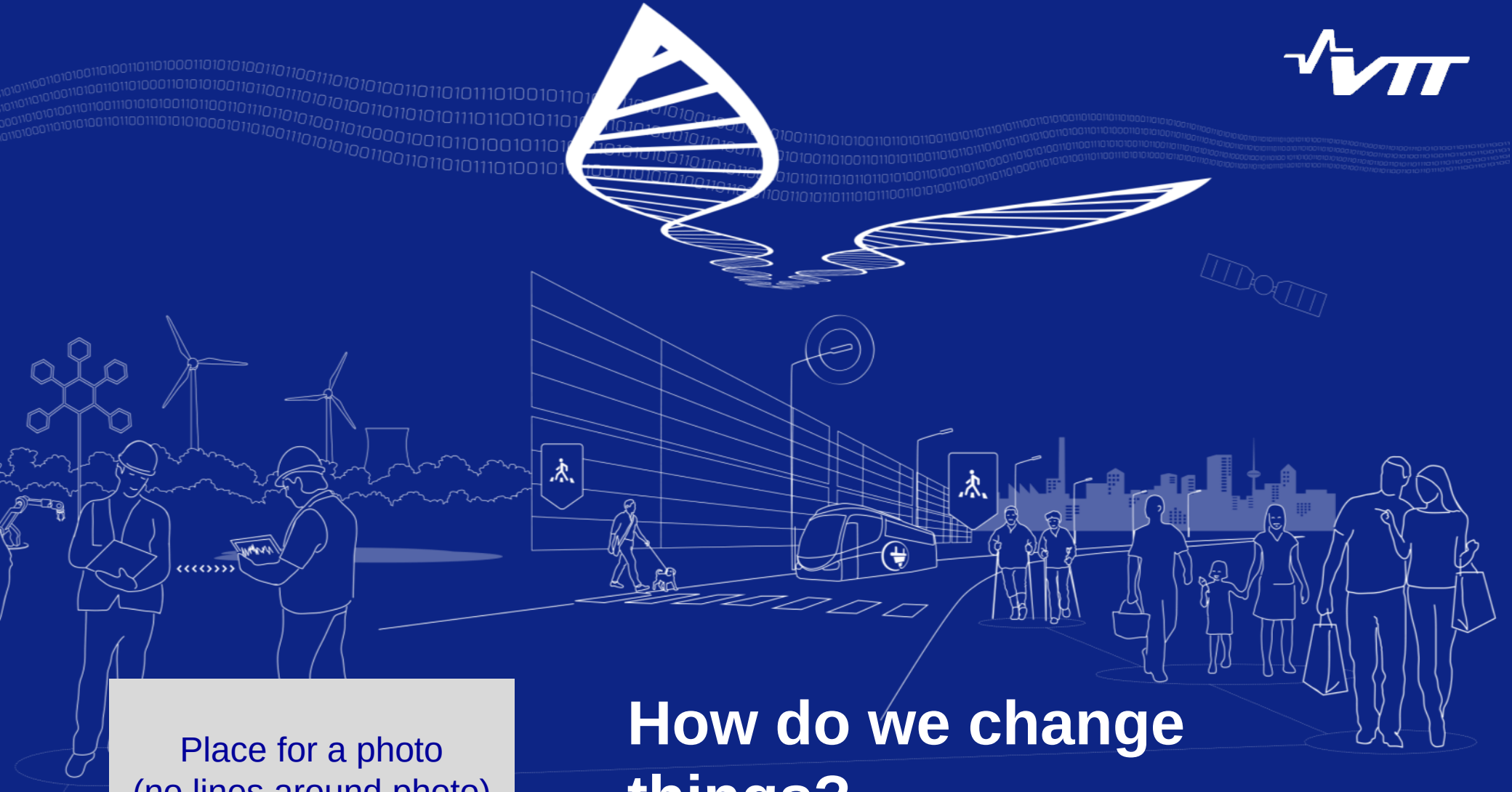
- C-ITS trial applications
  - *hazardous location warnings (slippery road, adverse weather)*
  - *road works warning*
  - *probe vehicle data*

here

Liikennevirasto Finnish Transport Agency

TraFi

infoTripla



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How do we change things?

Killer Apps

- Widely deployed services to enable other solutions, e.g.
  - Grab, Uber, Waze, … → FCD data, traffic management
  - Electronic Toll Service → eTag for other purposes

- User acceptance (value for the user) and good business case needed…
  - GPS tracking of citizens?

…as well as acceptance by authorities

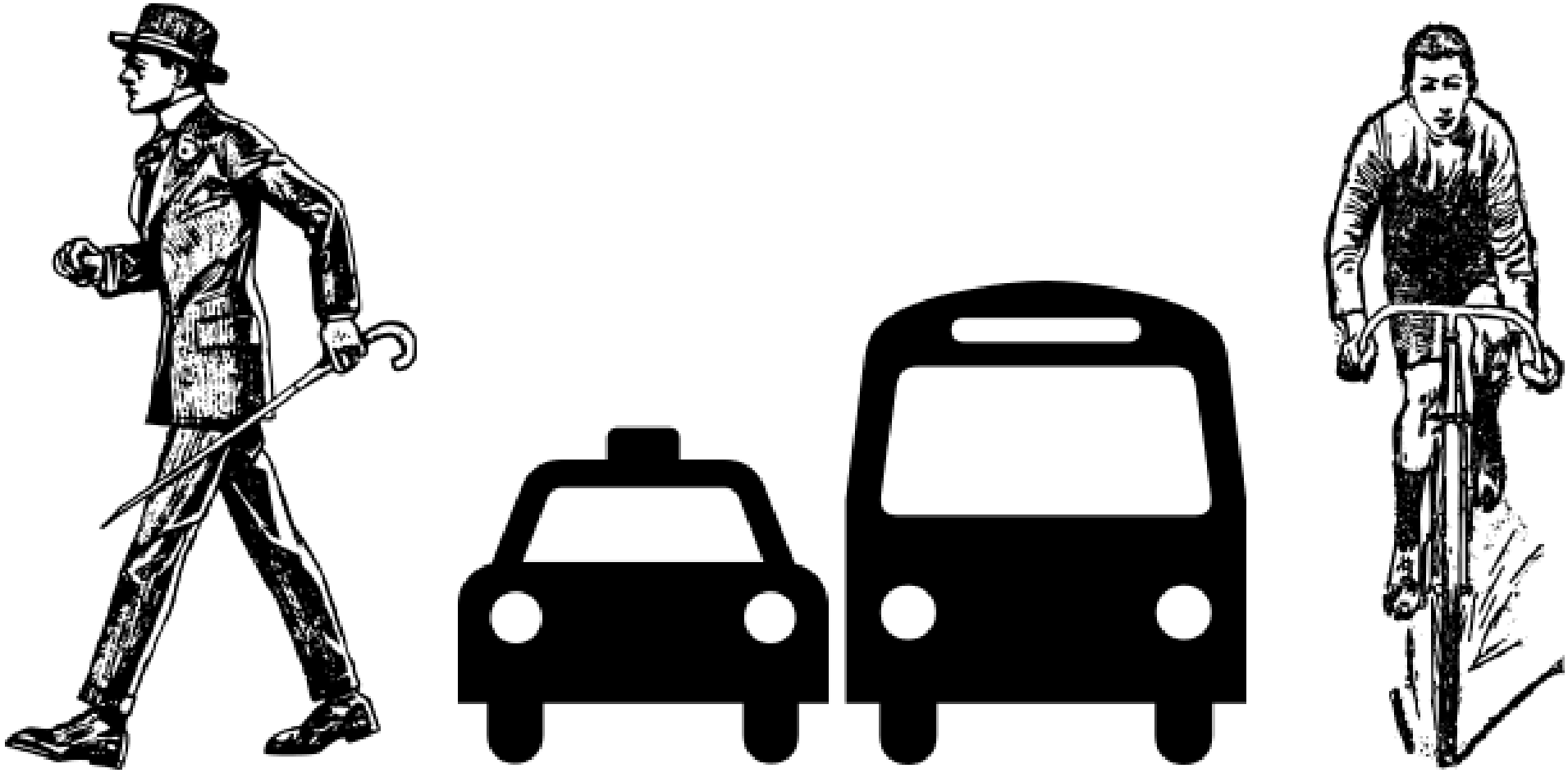
In January 2012, a law was passed in France to forbid the ownership or use of all systems which indicate the presence of speed cameras

By Nick Trend

22 JUNE 2012 • 12:00AM

http://www.telegraph.co.uk/travel/destinations/europe/france/articles/What-are-the-rules-for-using-satnavs-in-France/

Changing/nudging/incentivizing user behaviour



If the conditions are right…

- *"…the most cited reports put Oulu's overall bicycle modal share at around 22% (32% in summer, 12% in winter)…"*

In Oulu, Finland, cycling in the snow is seen as unremarkable. Photograph: Anders Swanson

https://www.theguardian.com/cities/2016/feb/12/ice-cycles-northerly-world-cities-winter-bicycle-revolution

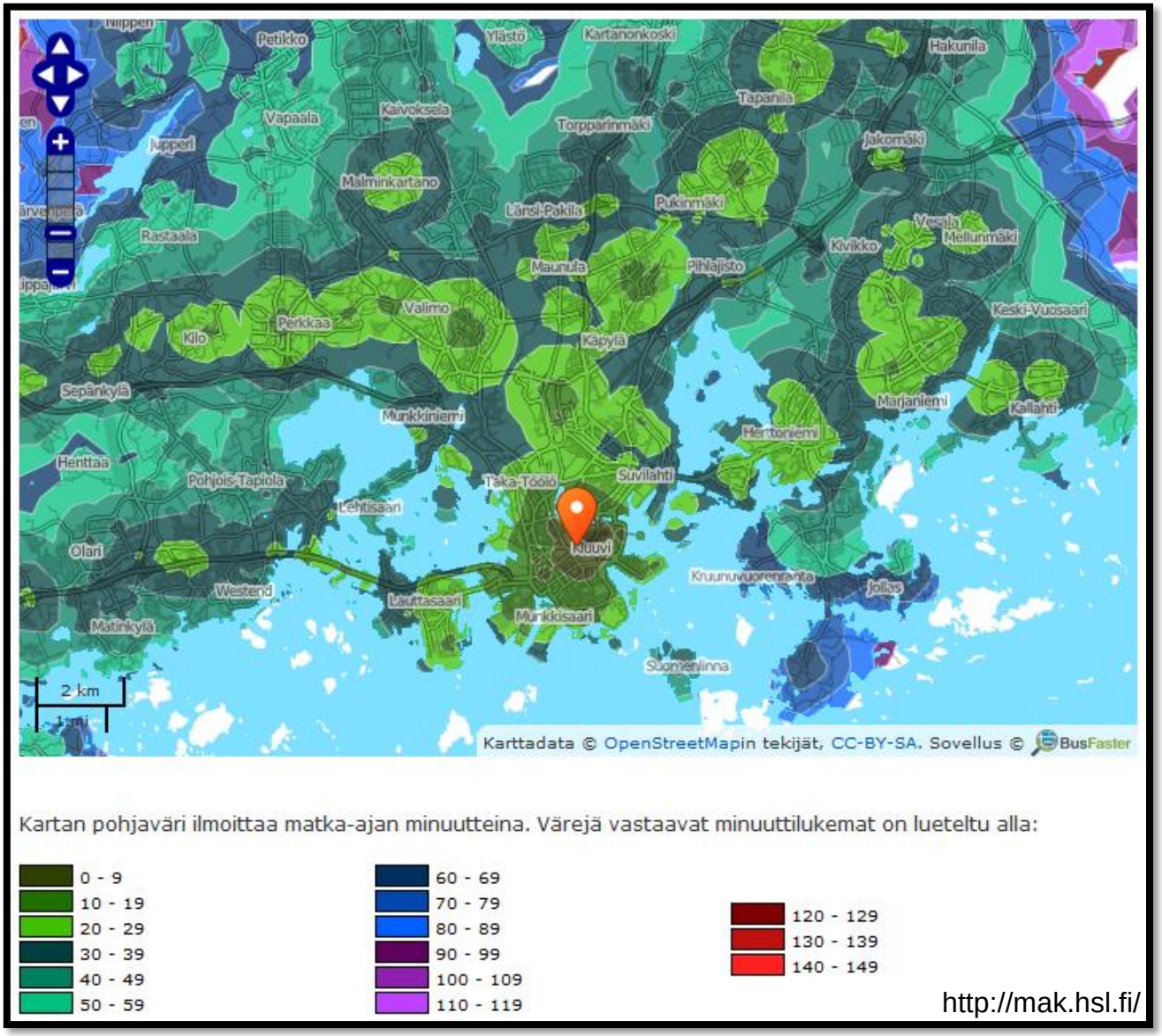
Rewarding scrapping of old cars

- Test: 1500€ discount on a new car when scrapping an old one
  - 1000€ (gov) + 500€ (industry)
- Results:
  - 8000 new vehicles with lower emissions (replacing avg. 19yo cars)
    - -8 M€ cost for government
  - +17 M€ vehicle taxes and +16,5 M€ VAT from what would not have been bought otherwise (60% of total)

  = +25,5 M€ + reduced emissions and safety improvements

http://www.trafi.fi/liikennelabra/kokeilut/romutuspalkkiokokeilu

Public Transport as realistic alternative



Changing user behaviour

- Even the simple things like…

USB charging for bus passengers

Free internet connectivity abroad

Gamification

Image: http://www.pokemongo.com/

Developing and implementing smart systems and services

- Wider take-up of new solutions requires them to first be tested and proven – **pilots, tests and demonstrations!**

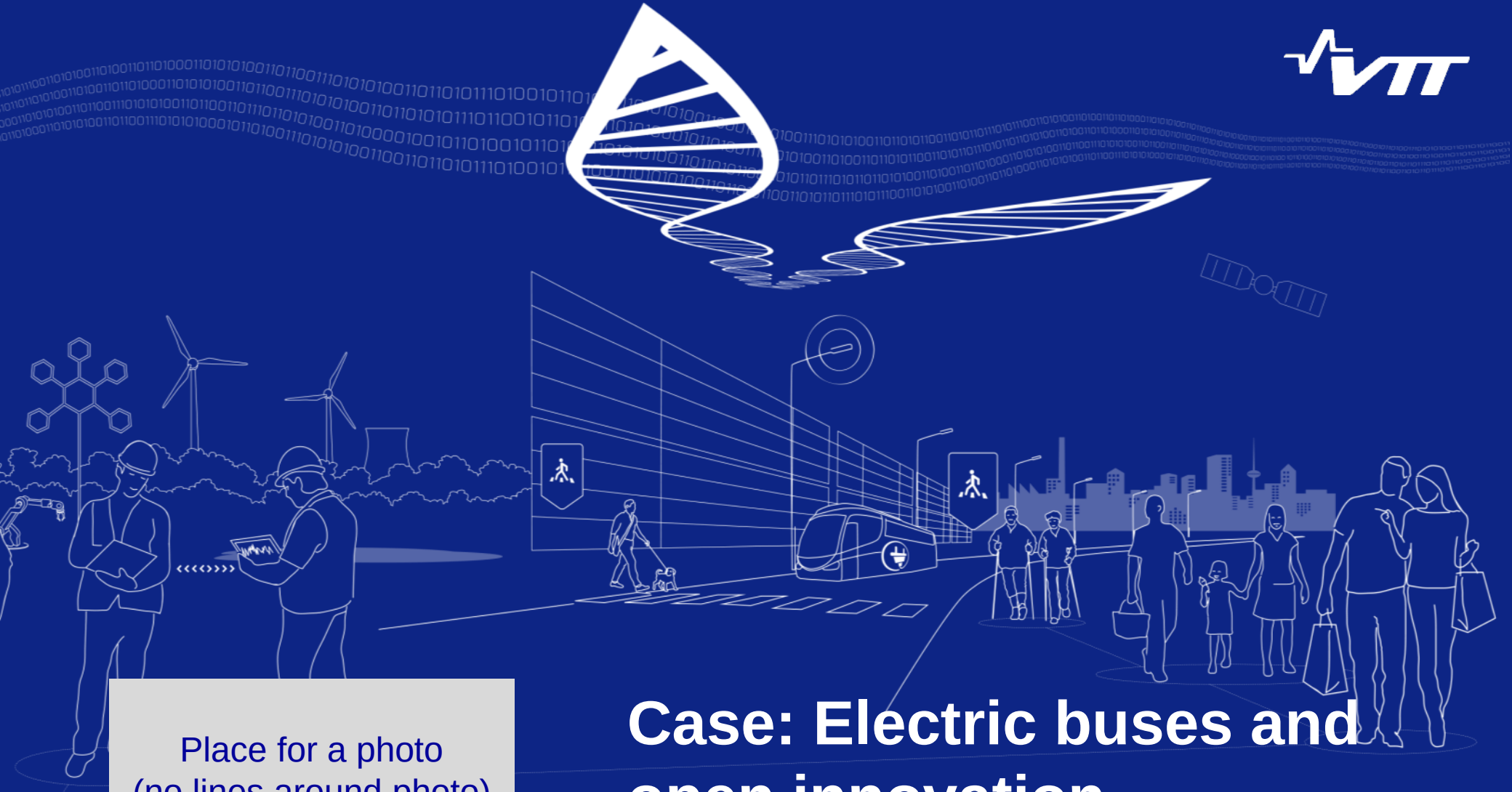
Traffic Lab – Finland is a traffic lab

Smart 'n' Clean HELSINKI

Helsinki is a hotspot for integrating smart and clean solutions into the city structure

aurora snowbox.fi

Aurora to become the first Arctic testing ecosystem for intelligent transport



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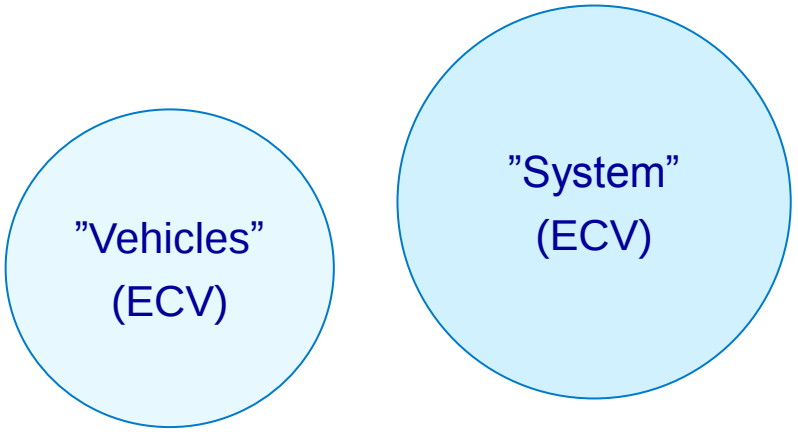
Case: Electric buses and open innovation

Steps towards an electric bus system (HRT)



- Components
- Powertrain
- Single vehicles

- Systemic view
- Charging technology
- Operation concepts
- A few vehicles

HRT timeline: 2012 2014

”Vehicles”: ECV-eBus project

- The aim is to find out usability of electric buses in commercial transport
- Field study and laboratory research
  - Electric bus test line 11 Tapiola-Friisilänaukio
  - Four commercial eBuses in operation
  - Vehicle technology analysis
    - Full-size VTT-owned electric bus prototype as a development platform
  - Battery laboratory
    - climatic chambers for components
  - Simulation tools
- Challenging weather conditions
- Part of Tekes EVE programme
  - A major section of ECV national R&D network (Electric Commercial Vehicles)

The prototype bus became so good it was operating one week in commercial passenger traffic in 5/2014

”System”: eBusSystem – the Espoo demonstration

Public sector
Private sector
Bus operator
Research

The transport system

How do electric buses fit into the public transport system?

- Ministry of Transport
- Helsinki Region Transport
- City of Espoo
- Veolia, Aalto University

Green Public E-Mobility

The vehicle

How do electric buses perform?

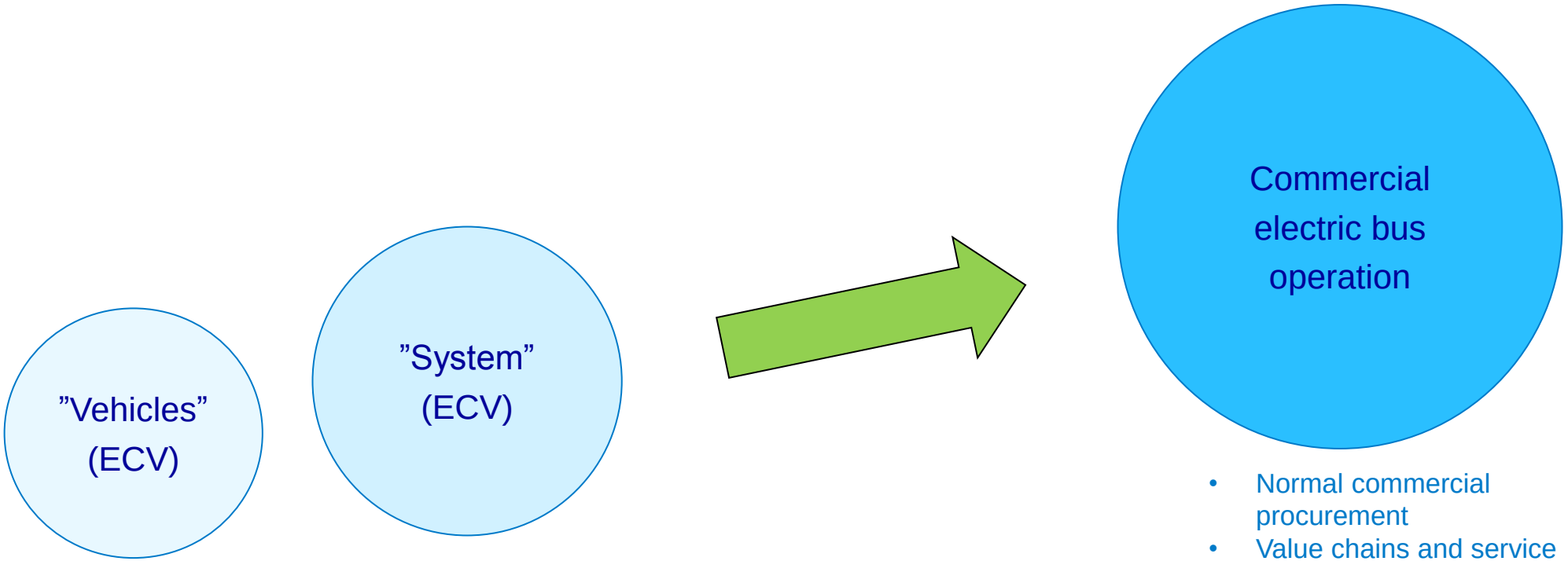
- Veolia, VTT
- Bus manufacturers (BYD, Caetano, Ebusco, VDL)
- Component manufacturers (Visedo, Tamware, Vacon)
- Transport Safety Agency

The energy supply

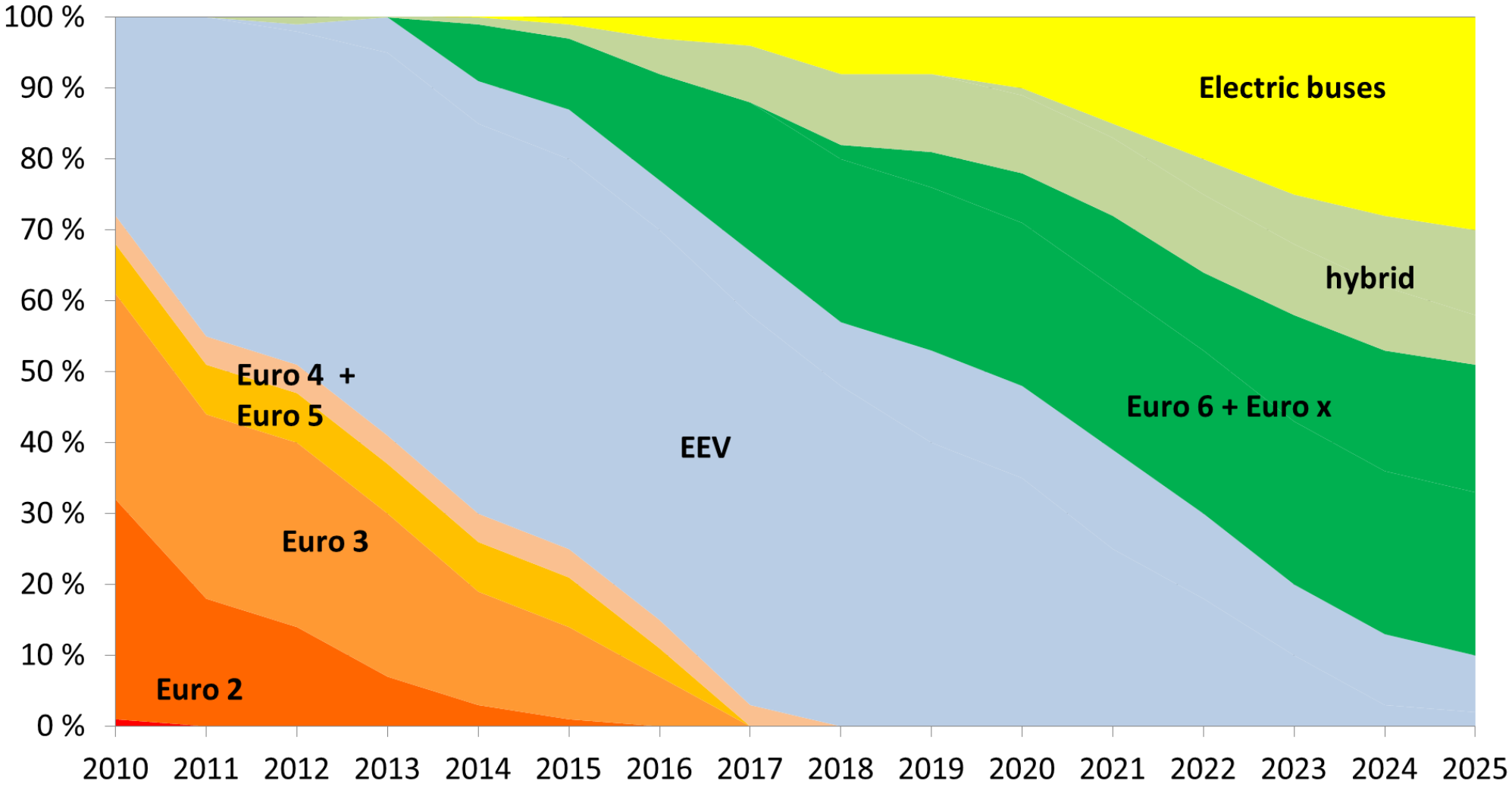
How can electric buses be charged and how is the grid affected?

- Smart grid, grid services and smart bus depot
- Utilities (Fortum), Siemens, charger manufacturers
- Rail traffic synergy, cities
- VTT, TUT, LUT

Steps towards an electric bus system (HRT)



Helsinki Region Transport – fleet strategy 2025



Estimated effect on emissions by 2025 (compared to 2010): reduction of NO_x (-92%), PM (-95%), CO_2 (-90%)

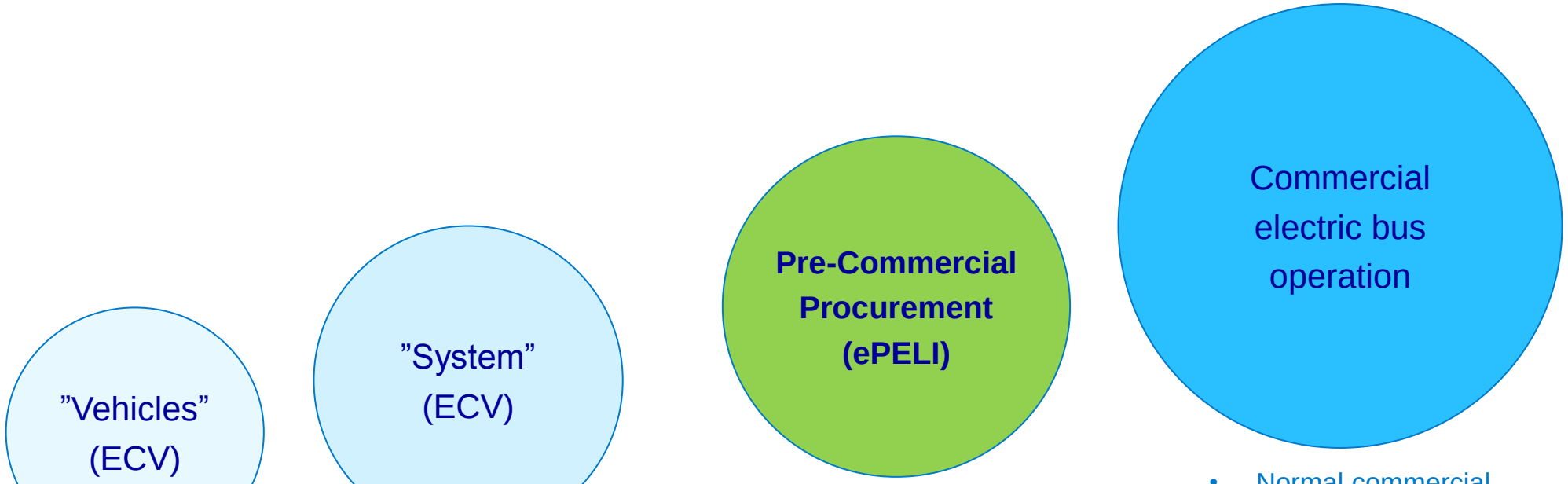
- For conventional buses, biofuels are phased in and constitute 100% from 2020 onwards

Transition to operation

- Challenges and worries for investment decisions (operators, PTAs, cities)
  - Operators' investment in electric buses
  - Reliability of new technologies
  - Infrastructure required for electric buses

Beginning requires sharing of risks and resources – innovative procurement

Steps towards an electric bus system (HRT)



- Components
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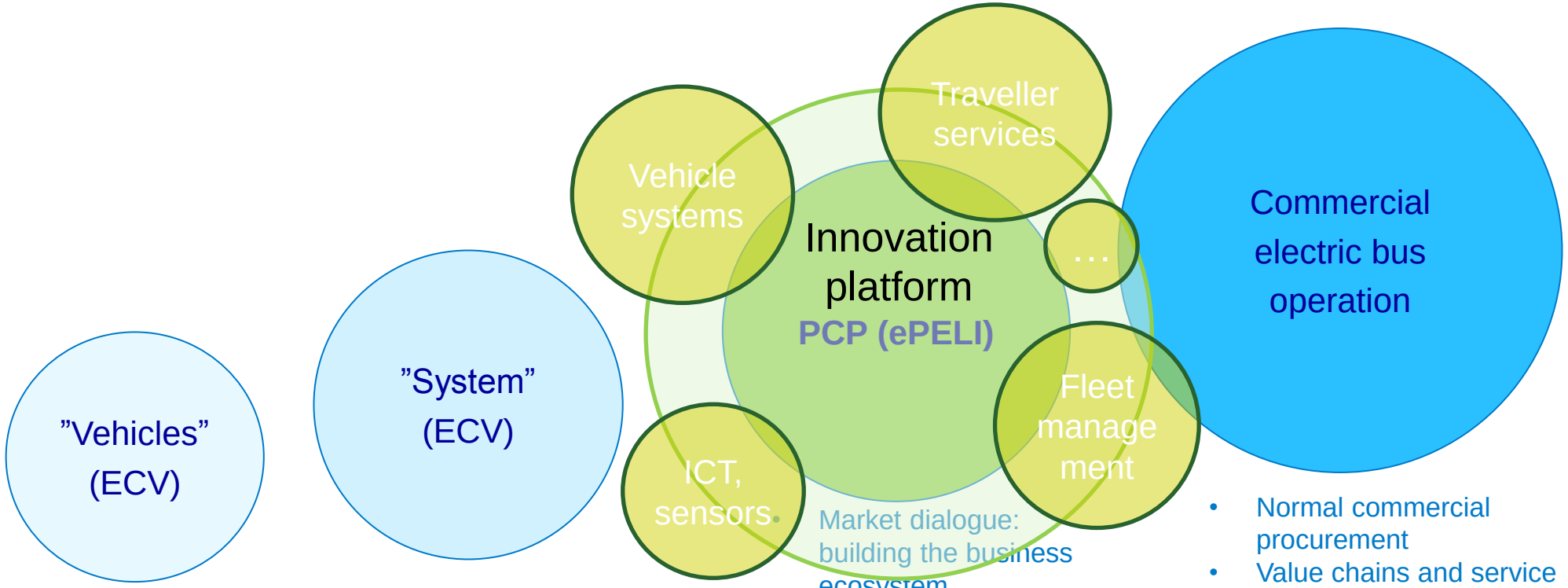
- Operation concepts
- A few vehicles

- Market dialogue: building the business ecosystem
- PCP with operators
- Small fleet & charging infrastructure
- Innovation platform

- Normal commercial procurement
- Value chains and service providers established
- Several bus operators active
- Charging infrastructure available

HRT timeline: 2012 2014 2016 2016/2017? →

Seamless travel and user experience



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HRT timeline: 2012 | 2014 | 2016 | 2016/2017? →

LIVING LAB BUS

TAMPERE UNIVERSITY OF TECHNOLOGY

UNIVERSITY OF TAMPERE

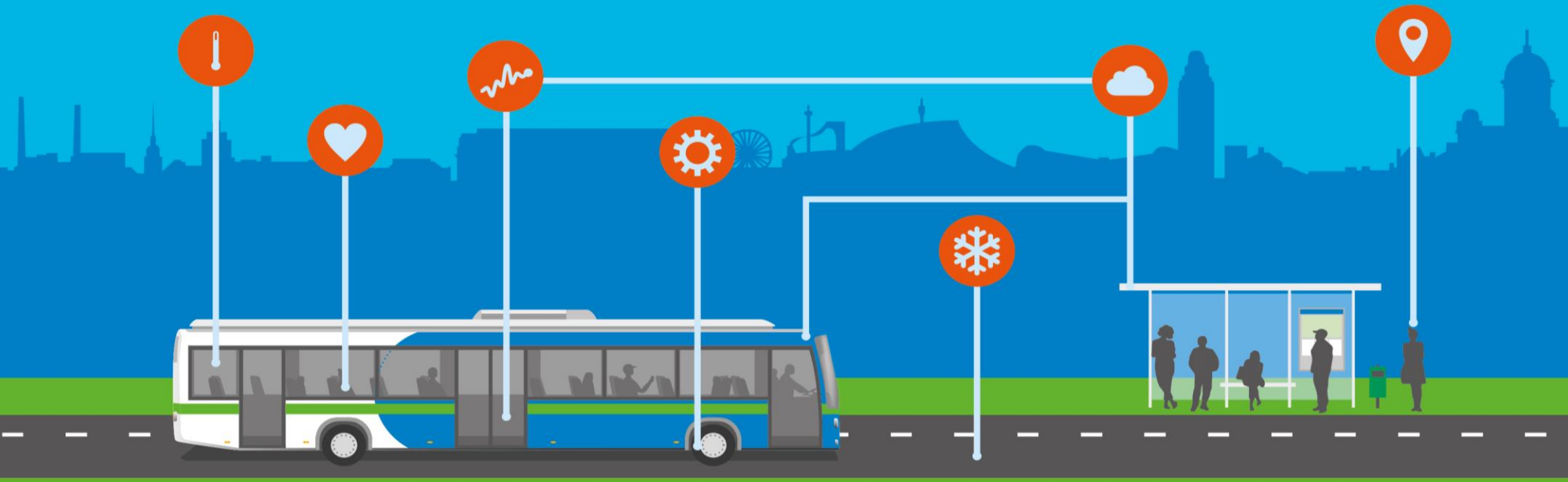
www.livinglabbus.fi

Living Lab Bus – Open innovation and test platform

Innovative electric buses serve as a test platform in real use environment.

Service and technology developers and providers are welcome to develop and test their solutions.

Real context and references – co-development and business ecosystem

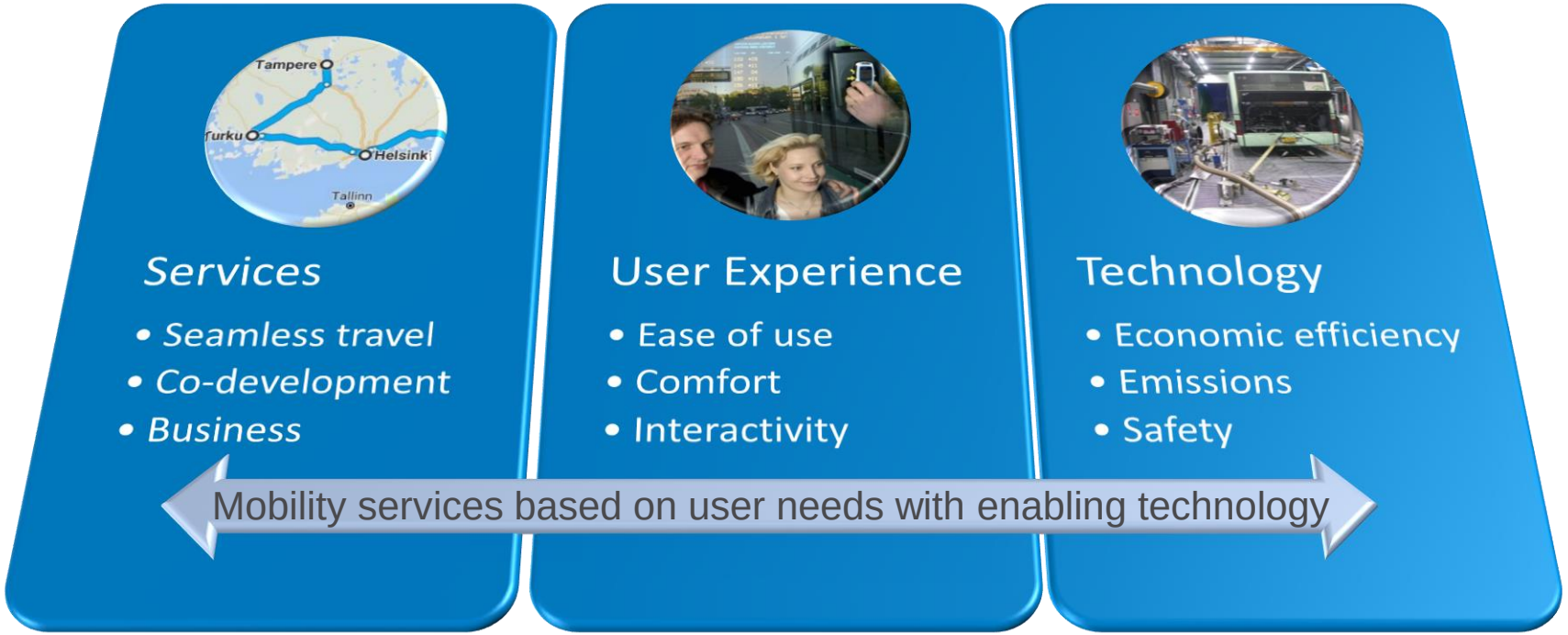


Contact: info@LivingLabBus.fi

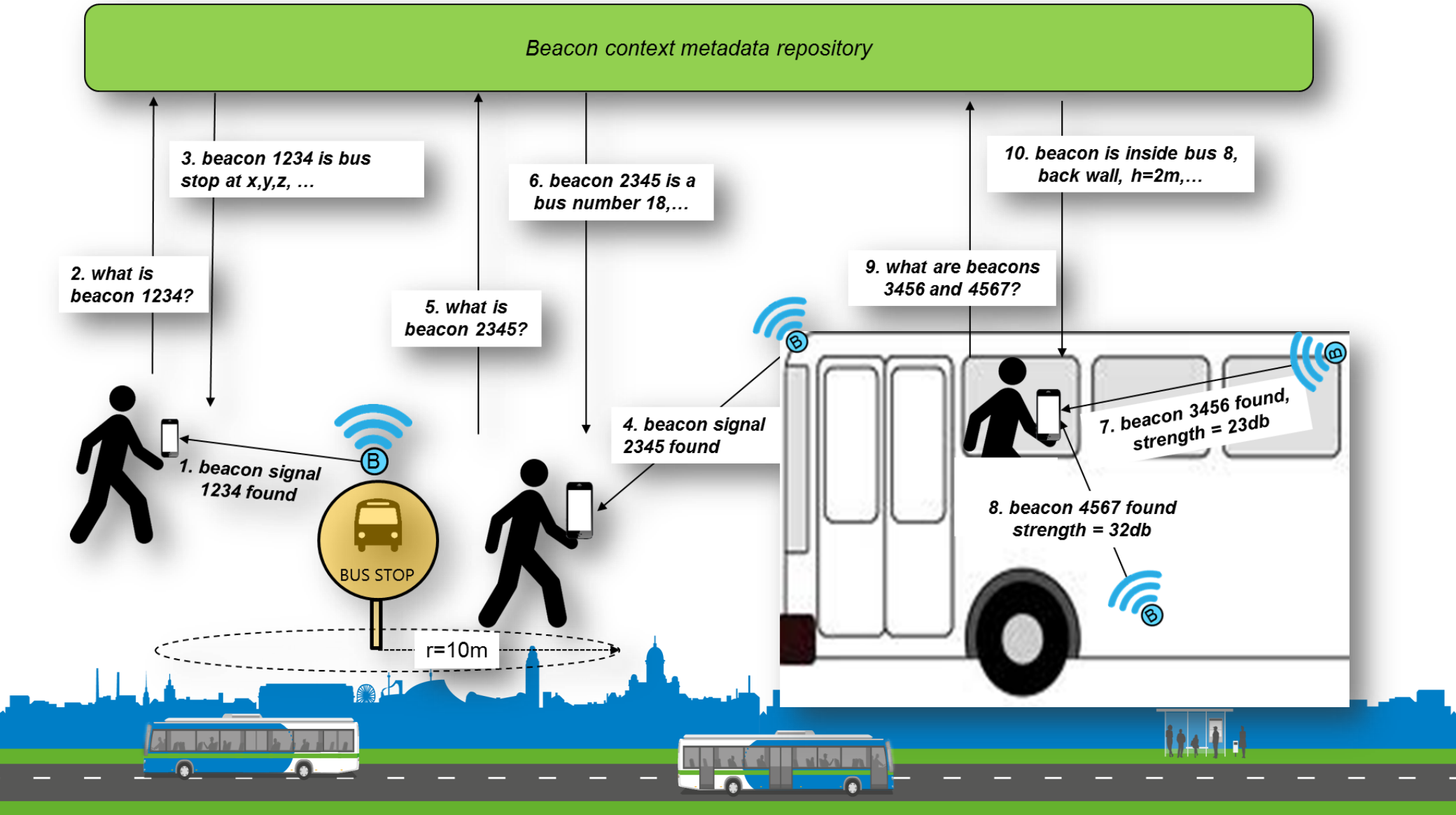
THE GOAL

*Enabling and supporting faster development of mobility services through a **concrete, open test environment** in a real public transport context.*

USER EXPECTATIONS AND EFFICIENCY



EXAMPLE: SEAMLESS INFORMATION



EXAMPLE: GREEN-DRIVING APPLICATION

Fig. 2 *Use cases: at target speed (left), driving too slowly (middle) and driving too fast (right)*

+ *Safety*
+ *Comfort*
+ *Timeliness*

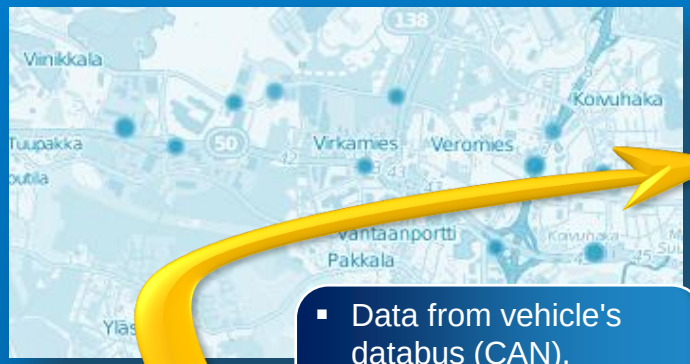
Table 1 Impact of application use on fuel consumption (l/100 km), summertime, novel users

Traffic condition	System use	Fuel consumption and change per speed limit area					
		Average	30 km/h	40 km/h	50 km/h	60 km/h	70 km/h
daytime	without	*42.5*	50.1	47.8	43.7	34.3	36.8
	with	*39.0*	35.1	45.5	40.4	36.5	37.5
	impact	*8.4%*	−30.0%**	−4.9%**	−7.7%**	+6.5%**	+2.0%
peak	without	*45.1*	49.5	51.6	45.4	37.8	41.3
	with	*40.9*	37.7	47.4	42.1	37.9	39.3
	impact	*9.4%*	−23.9%**	−8.1%**	−7.2%**	+0.3%	−4.9%**
average	*without*	*43.8*	*49.8*	*49.7*	*44.6*	*36.0*	*39.0*
	with	*39.9*	*36.4*	*46.4*	*41.2*	*37.2*	*38.4*
	impact	*8.9%*	*−27.0%*	*−6.6%*	*−7.4%*	*+3.2%*	*−1.6%*

Statistically significant results marked ** = $P<0.05$ and * = $P<0.10$, negative changes in yellow and positive in orange
Sample size 66–249 per speed limit area, traffic condition and system use combination

Innamaa, S. & Penttinen, M. (2014). Impacts of a green-driving application in city buses on fuel consumption, speeding and passenger comfort. IET Intelligent Transport Systems. The Institution of Engineering and Technology. Vol. 8 (2014) No: 5, 435-444.

EXAMPLE: SLIPPERINESS DETECTION

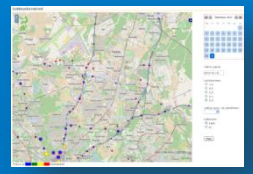


121	60.2808	24.978			
122	60.30205	4.936			
123	60.295364	953			
124	60.288054	76722	189.2	79.3	0.118
126	60.259324	381	189.1	78.1	0.121
131	60.2256	24.94445	189.2	75.1	0.122
				73.1	0.118
				73.1	0.104

- Data from vehicle's databus (CAN).
- Localisation of a slippery road section.

In vehicle detection of slippery road section. Instant warning to the driver.

Service provider



Real time map of slipperiness of roads (available for road users).

Road authority

Maintenance register

Road maintenance vehicle

Warning to the approaching vehicles

Real time friction monitoring and analysis during normal driving in thousands of heavy vehicles.

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Collaboration and convergence

Policies & Regulation

- Flexible policies to support thinking outside the box and testing – while still ensuring fairness

Black Market Ride-Sharing Explodes In Austin After Voters Drive Out Uber And Lyft

Now that Uber and Lyft have pulled out of Austin due to onerous new city regulations, drivers and riders are turning to black market ride-sharing.

MAY 23, 2016 By John Daniel Davidson

http://thefederalist.com/2016/05/23/black-market-ride-sharing-uber-lyft/

From Regulating Uber to Subsidizing It

By Jared Meyer | March 23, 2016 | 10:49 AM EDT

On March 21, the Orlando suburb Altamonte Springs is starting a pilot program that pays for part of riders' Uber fares. This misguided year-long initiative has a budget of $500,000 and will cover 20 percent of each fare for rides within the city's limits and 25 percent of each fare for rides that start or end at mass transit stations.

(AP Photo)

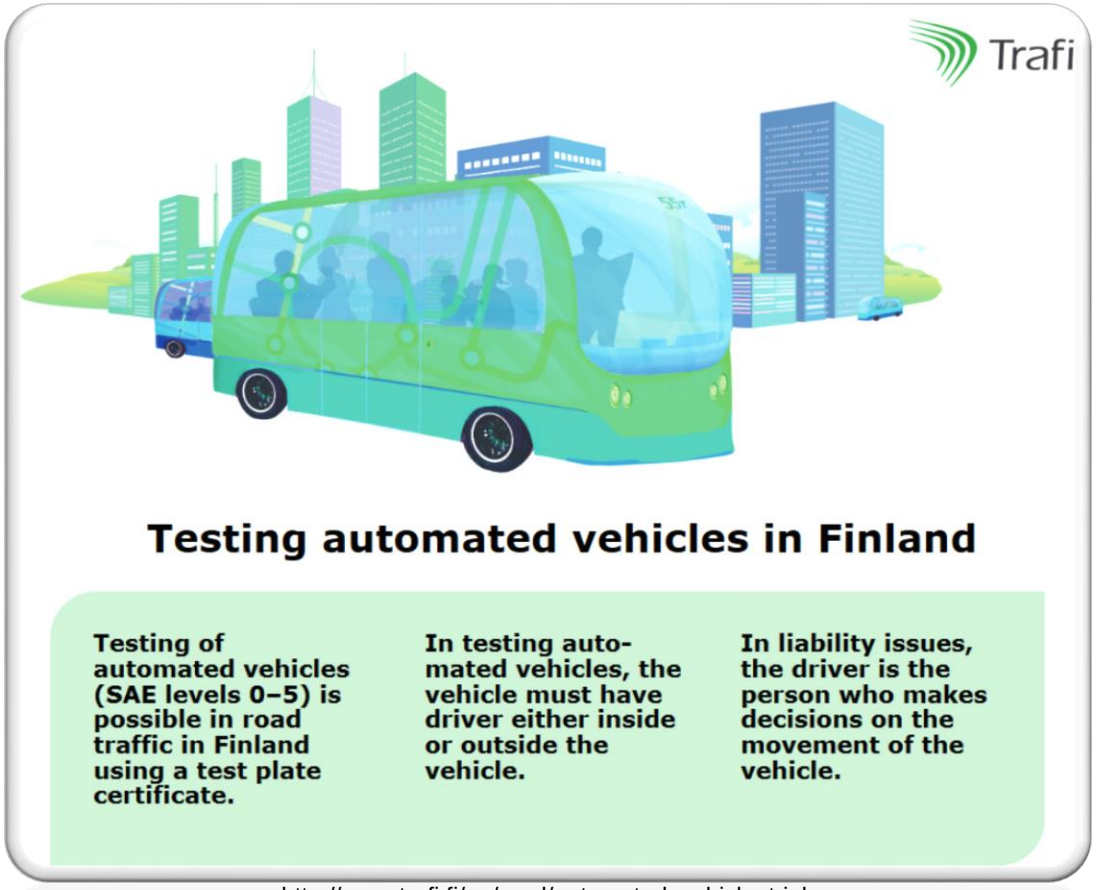
http://www.cnsnews.com/commentary/jared-meyer/regulating-uber-subsidizing-it

Policies & Regulation

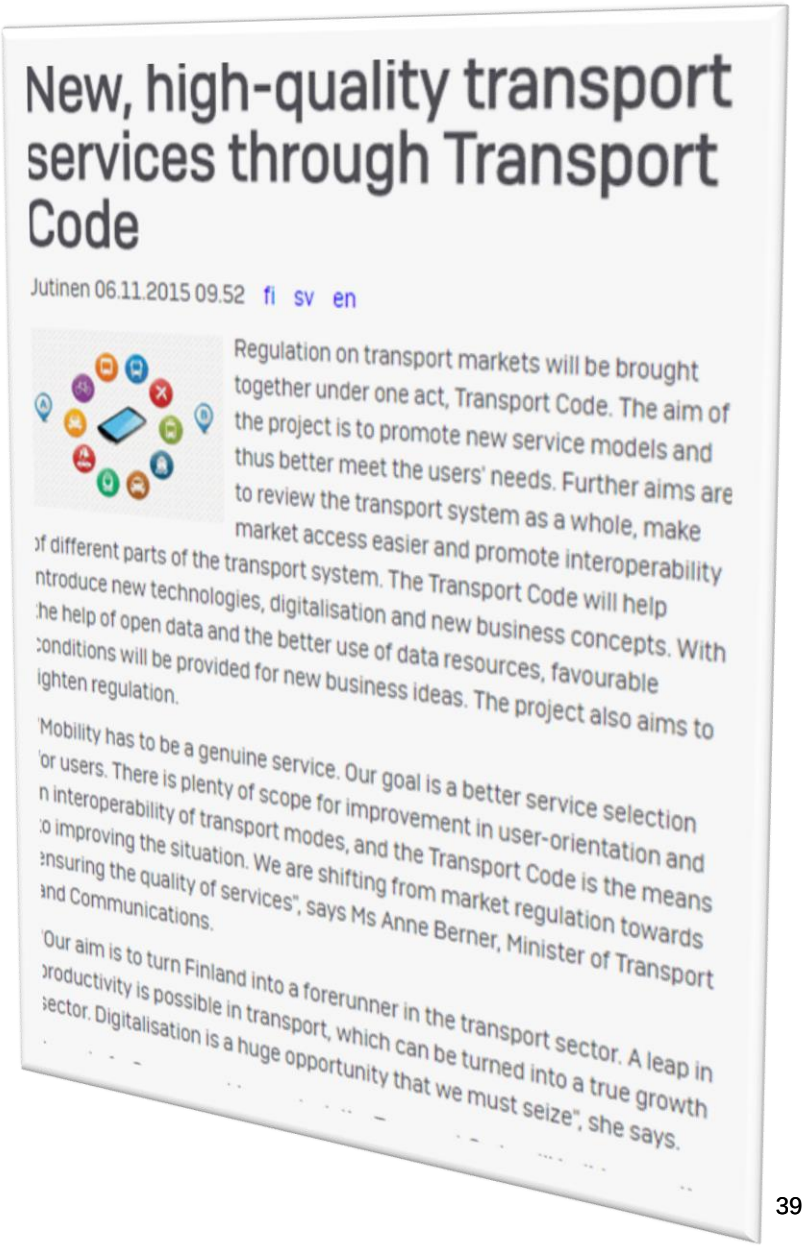
- Pre-empting or adjusting to new solutions?

- Pathways and accessibility

Policies & Regulation



http://www.trafi.fi/en/road/automated_vehicle_trials



New, high-quality transport services through Transport Code

Jutinen 06.11.2015 09.52 fi sv en

Regulation on transport markets will be brought together under one act, Transport Code. The aim of the project is to promote new service models and thus better meet the users' needs. Further aims are to review the transport system as a whole, make market access easier and promote interoperability of different parts of the transport system. The Transport Code will help introduce new technologies, digitalisation and new business concepts. With the help of open data and the better use of data resources, favourable conditions will be provided for new business ideas. The project also aims to lighten regulation.

"Mobility has to be a genuine service. Our goal is a better service selection for users. There is plenty of scope for improvement in user-orientation and in interoperability of transport modes, and the Transport Code is the means to improving the situation. We are shifting from market regulation towards ensuring the quality of services", says Ms Anne Berner, Minister of Transport and Communications.

"Our aim is to turn Finland into a forerunner in the transport sector. A leap in productivity is possible in transport, which can be turned into a true growth sector. Digitalisation is a huge opportunity that we must seize", she says.

It’s not just about us…

- Smart systems and cities need to collaborate across sectors
  - Transport
    - Resilience, management, …
  - Energy
    - Smart grids, charging, …
  - Information & Communications
    - Security, privacy, IoT, …
  - Land use planning
    - Parking, …
  - …

SERVICES

INFRASTRUCTURE

ENABLING GOVERNANCE AND REGULATION

Mobility as a Service

Mobility-as-a-Service operators (big & small),
Multiple customized services
All Transport modes with single User Interface, Internet of traffic.

Integrated online services and interfaces

Online services platform: Open Data, Interfaces and APIs, Cloud Services, Internet of Things

Intelligent traffic infrastructure

Traffic management systems
Digital ticketing, routing services
Seamless connectivity

Telecommunications and information infrastructure

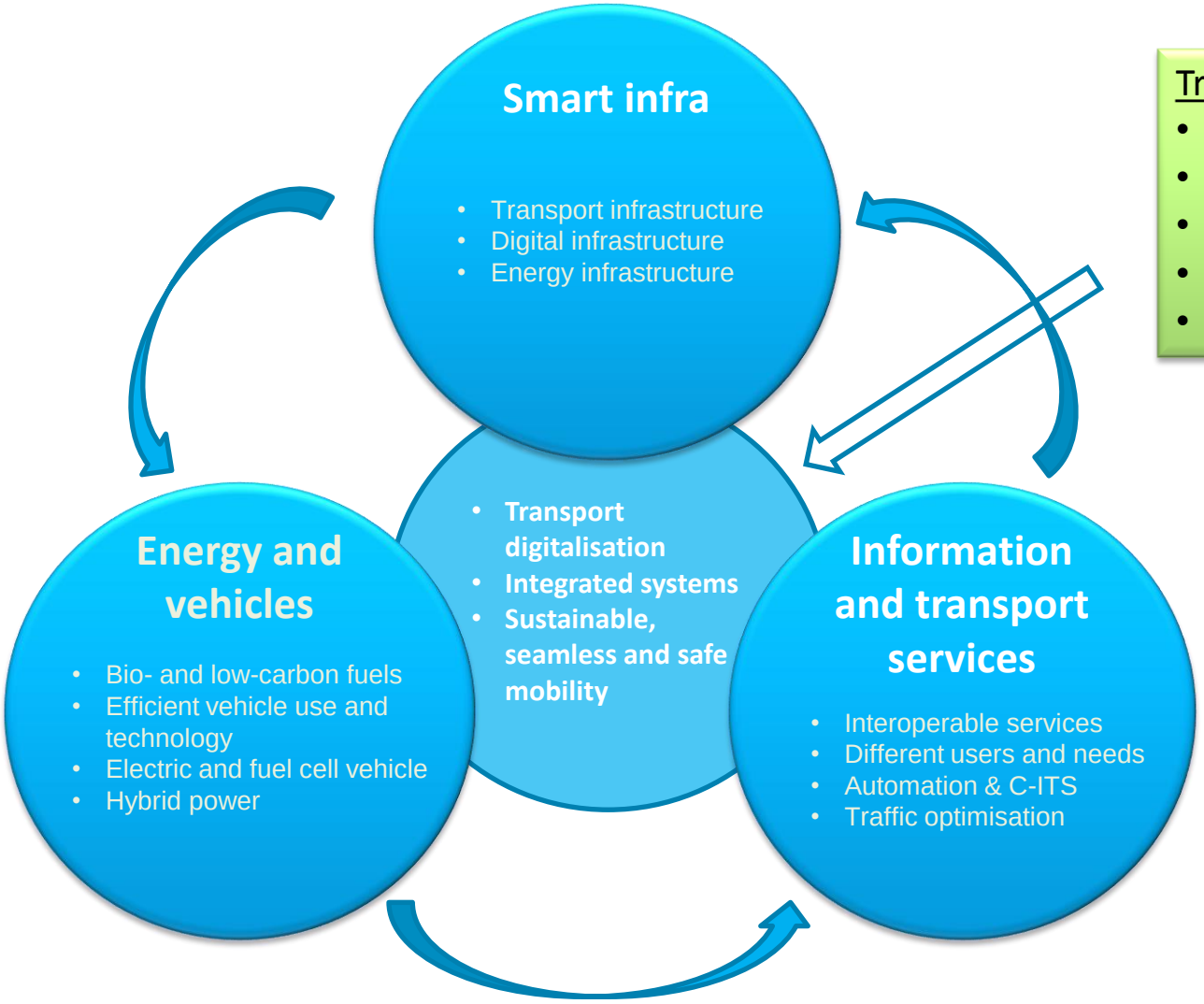
Mobile data networks 4G/5G
Static networks enabling international interoperability, broadband for all

Core infrastructure

Roads, rails, airports and ports.
Growth Corridors

Source: ITS Finland, 2016

FOCUS AREAS

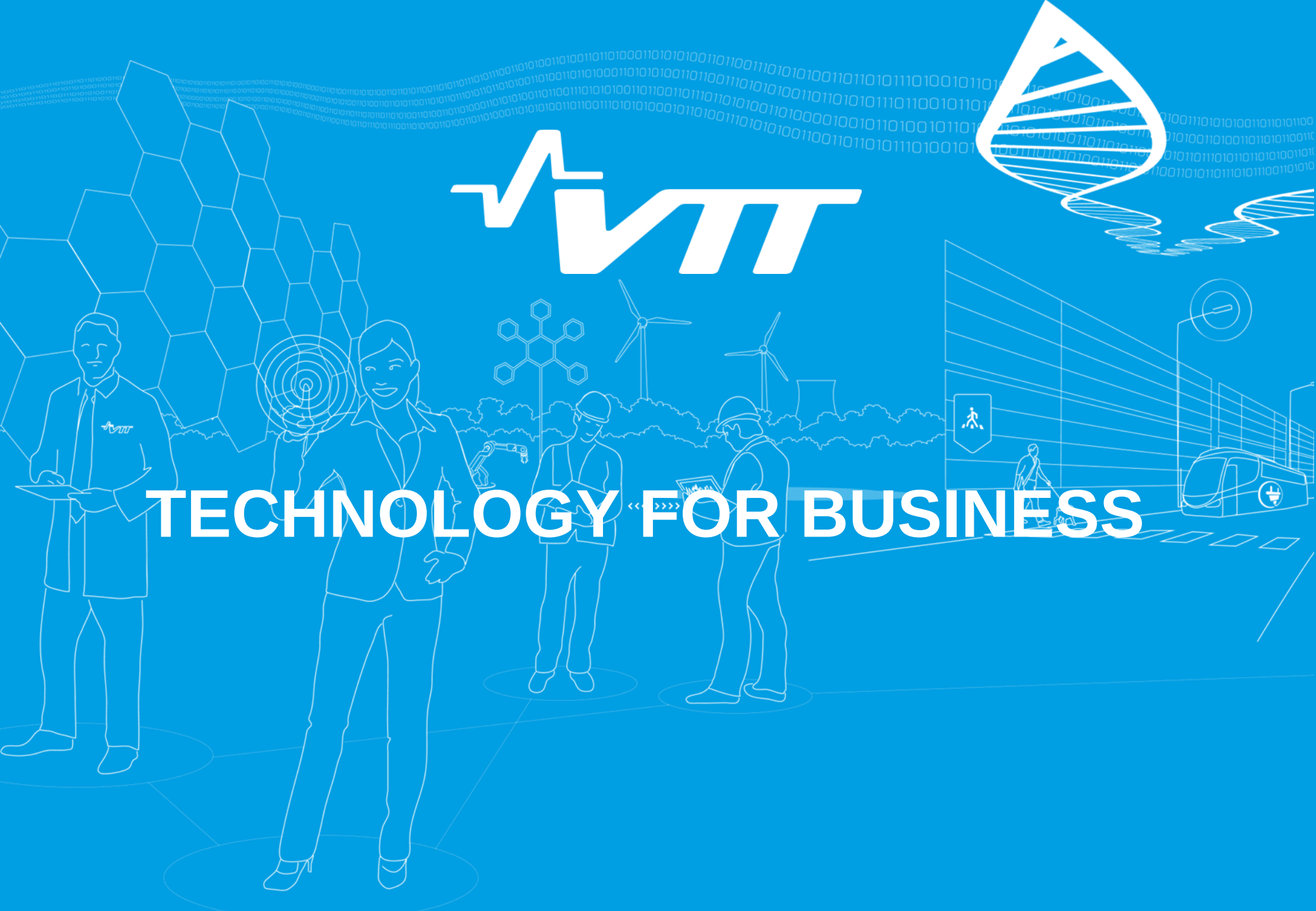


Transport system - Goals:

- Environmentally friendly
- Serving and intelligent
- Interoperable
- Resource efficient
- Resilient and safe

Line of Actions, R&D support:

- Decision making support & Helpdesk
- Impact assessment and forecasting
- User values, needs and acceptability
- Service concepts
- Test environments
- Verification and validation
- Technology and system development
- Co-development and ecosystems


TECHNOLOGY FOR BUSINESS