
# Towards Deployment of Automated Freight Transport

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ERTRAC WG Connected Automated Transport

# 2018 CEF-T Action

TENtec no. 2018-SE-TM-0102-S

*Smart, Electronic and Autonomous Multimodal Transportation System and Port Operations*

Digital Transport Days

- Session on Digitalization of TEN-T from research to deployment

Helsinki, 9 October 2019



Co-financed by the Connecting Europe Facility of the European Union

# Project Objectives

- ***Development and implementation of innovative technology*** by securing the necessary conditions for smart vehicles, the implementation of new safe technology can be ensured
- ***Increased interoperability*** through creating smart solutions which enhance the quality of deliveries, the supply chains will become more flexible and accessible for different models
- ***Improved safety*** through developing a safety network of digital solutions with a vision of zero accidents
- ***Generating resp. becoming "best practice"*** by performing the pilot Action the technologies and smart solutions will be deployed and the result will contribute to the industry as well as further research
- ***Deploying smart ports***, i.e. design the port to have the ability to receive, handle, unload, charge, reload, and return of autonomous, electric vehicles with zero handling errors and emissions
- ***In principal eliminating the environmental footprint*** by deploying an electrified solution which enables reduction of air pollutants, $CO_2$ emission and noise
- ***Increase and develop multimodality*** by increasing the share of uncombined transport on terminal throughput and develop level of automation along transport chains

# Expected results

- ***Piloting an autonomous and connected transportation of containers*** *to and within a terminal, including autonomous gate passages and communication between control towers (e.g. transport solution control tower and terminal control tower)*



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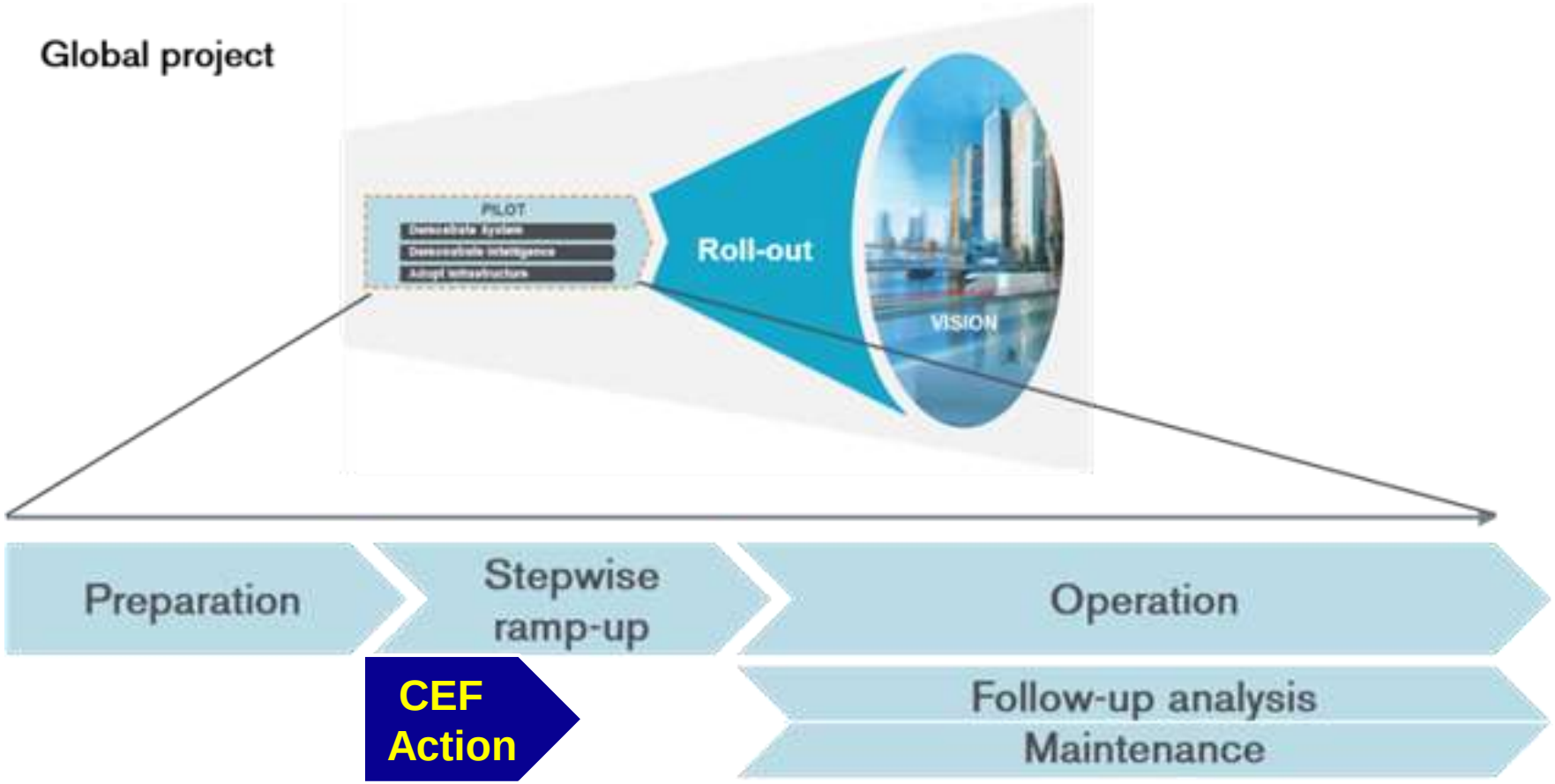
# Pilot towards Deployment







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# **EU** FP7/H2020 Research & Innovation project contribution examples; **CONNECTED AUTOMATED DRIVING & ADAS**

**Connected Cooperative Automated Driving**
Collaboration, Network, Demonstration, Pilots
Field Operational Tests (FOT), Test verification and validation, Platooning, V2x, Cooperative Driving, …

EUROFOT | VRA | CARTRE | ARCADE
SAFESPOT | CVIS | DRIVE-C2X | HeadStart
SARTRE | ENSEMBLE

**Advanced Driver Assistance Systems**
Advanced systems for Lane Change Support, Lane Keeping Support and Adaptive Cruise Control. Drowsiness detection. Driver Interaction. Emergency Brake, Distance Alert, …

AIDE | PReVent | ADAPTIVE
HAVEit | XCYCLE

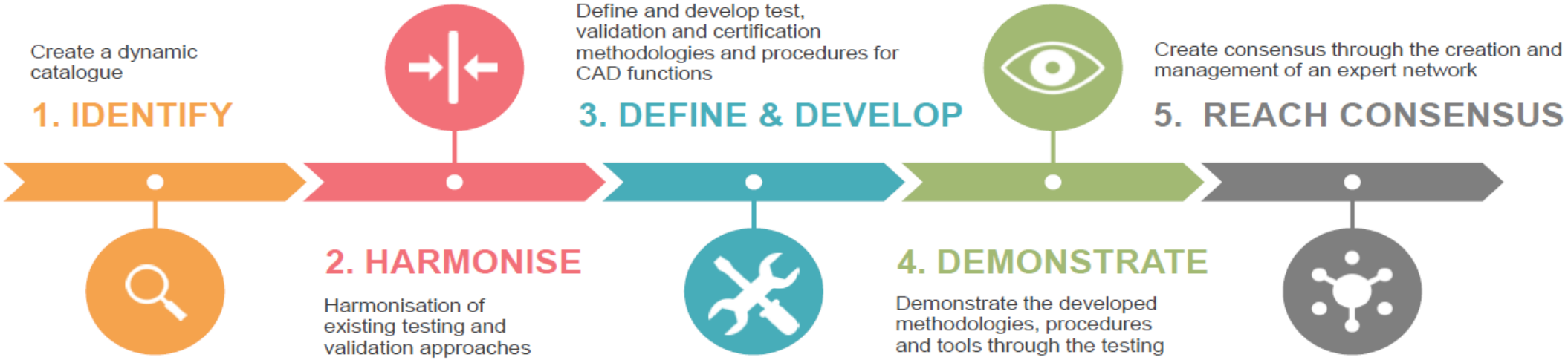
Results brought into products e.g. Volvo Trucks

# HEADSTART Consortium

# Project's Objectives

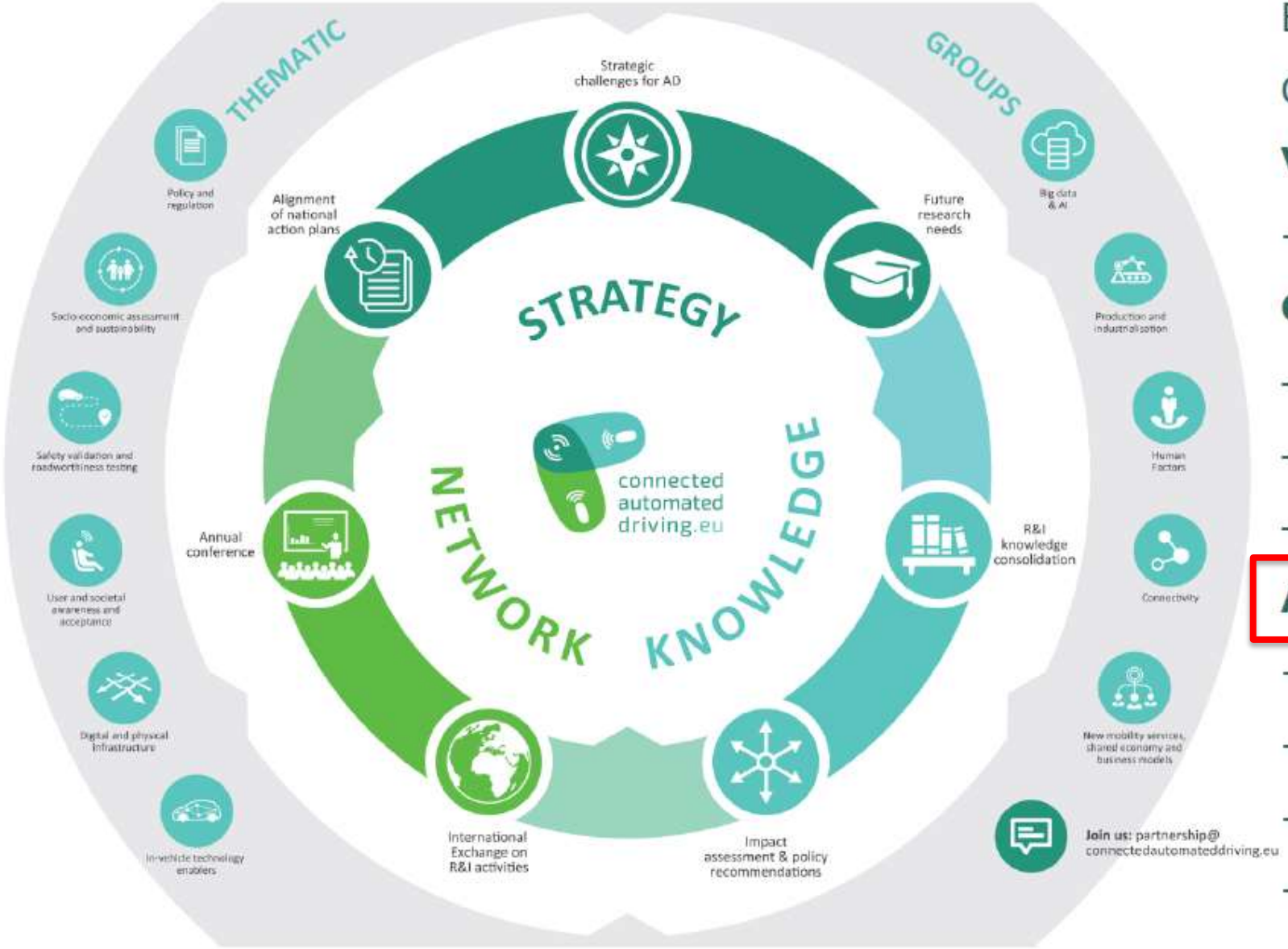
HEADSTART will define testing and validation procedures of CAD functions including:

- its key enabling technologies (i.e. communication, cyber-security, positioning)
- by cross-linking of all test instances such as simulation, proving ground and real world field tests
- to validate safety and security performance according to the needs of key user groups (technology developers, consumer testing and type approval)



# Coordination of Automated Road Transport For Europe

## Objective: Support faster deployment of connected and automated driving across Europe




European Commission funded

Coordination & Support Actions

**VRA**

- July 2013 – Dec 2016

**CARTRE**

- Oct 2016 – Sep 2018
- 36 consortium partners
- 51 associated partners

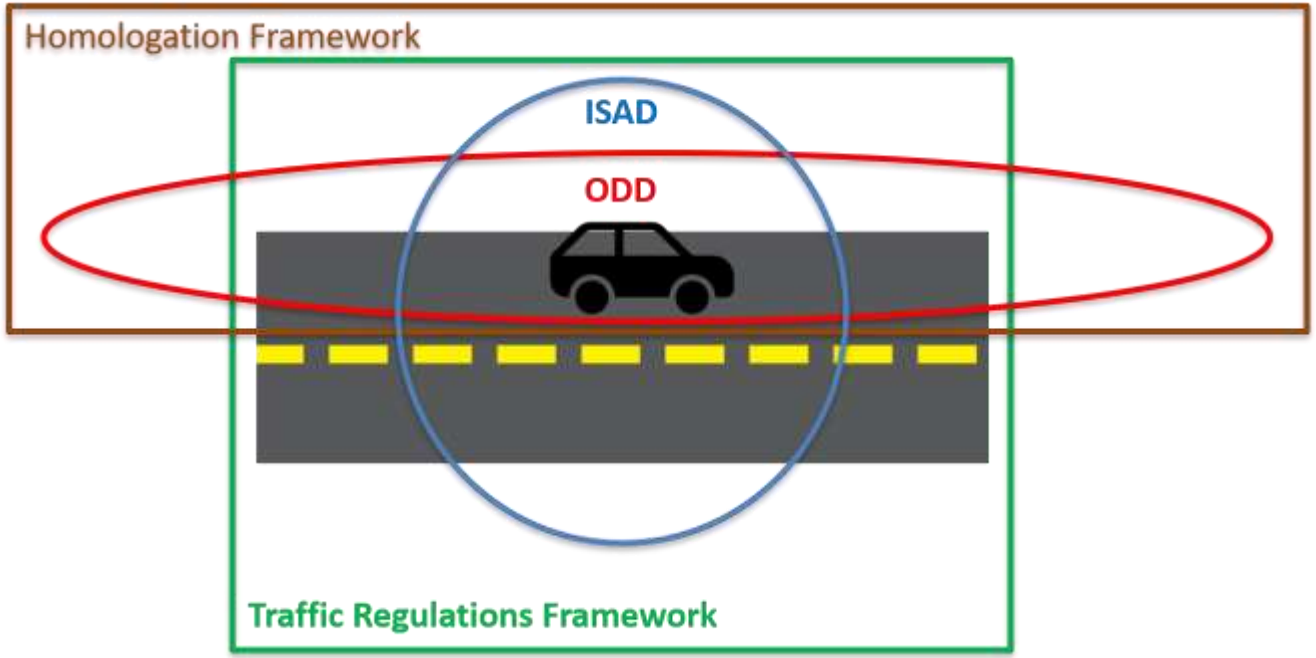
**ARCADE**

- Oct 2018 – Sep 2021
- 23 partners from 11 States
- 30 associated partners
- 2000 subscribers

# CAD Roadmap version 8.0 - now available!


- Increased scope to better cover **Connected** Automated Driving, including cooperative and connected vehicles.
- Strengthen the link to the **Infrastructure**, through CEDR.
- Deeper dive into three use cases including requirements on ’connected & infrastructure’:
  - **Automated Passenger Cars Path**
  - **Automated Freight Vehicles Path**
  - **Urban Mobility Vehicles**
- Connect to the CARTRE (CSA) results and the ARCADE (CSA) project and provide **a EU wide overview** (and beyond).
- Incorporate the STRIA CAD actions (2018) via **Key Challenges and Objectives**.

# ODD / ISAD / Traffic regulations and Homologation Framework




- Explanation, common definition of Operational Design Domains (ODD)
- Vehicle and Infrastructure Interaction (e.g. ISAD)
- Regulatory and standardisation framework for Automation
- Connectivity as a requirement for vehicle-infrastructure interaction

# Automated Freight Vehicle Development Paths

| Automation Level | Established | 2018 | 2020 | 2022 | 2024 | 2026 | 2028 | 2030 | ... |
|---|---|---|---|---|---|---|---|---|---|
| **Level 5:** Full Automation | | | | | | | | | **Fully Automated Freight Vehicles** |
| **Level 4:** High Automation | | **Highly Automated Vehicles in Confined Areas** | | **Highly Automated Vehicles on Dedicated Roads** | | | **Highway Pilot Platooning** | **Highly Automated Vehicles on Open Roads** | |
| **Level 3:** Conditional Automation | | **Traffic Jam Chauffeur** | | **Highway Chauffeur** | | | | | |
| **Level 2:** Partial Automation | | **Traffic Jam Assist** | | **Automated Truck Platooning** | | | | | |
| **Level 1:** Driver Assistance | **Adaptive Cruise Control**<br>**Stop &Go**<br>**Lane Keeping Assist**<br>**Lane Change Assist** | | **C-ACC Truck Platoning** | | | | | | |
| **Level 0:** No Driving Automation, support beyond human capability to act | **Lane Departure Warning**<br>**Blind-spot Warning**<br>**Forward Collission Warning**<br>**ABS, ESC**<br>**Emergency Brake** | | | | | | | | |

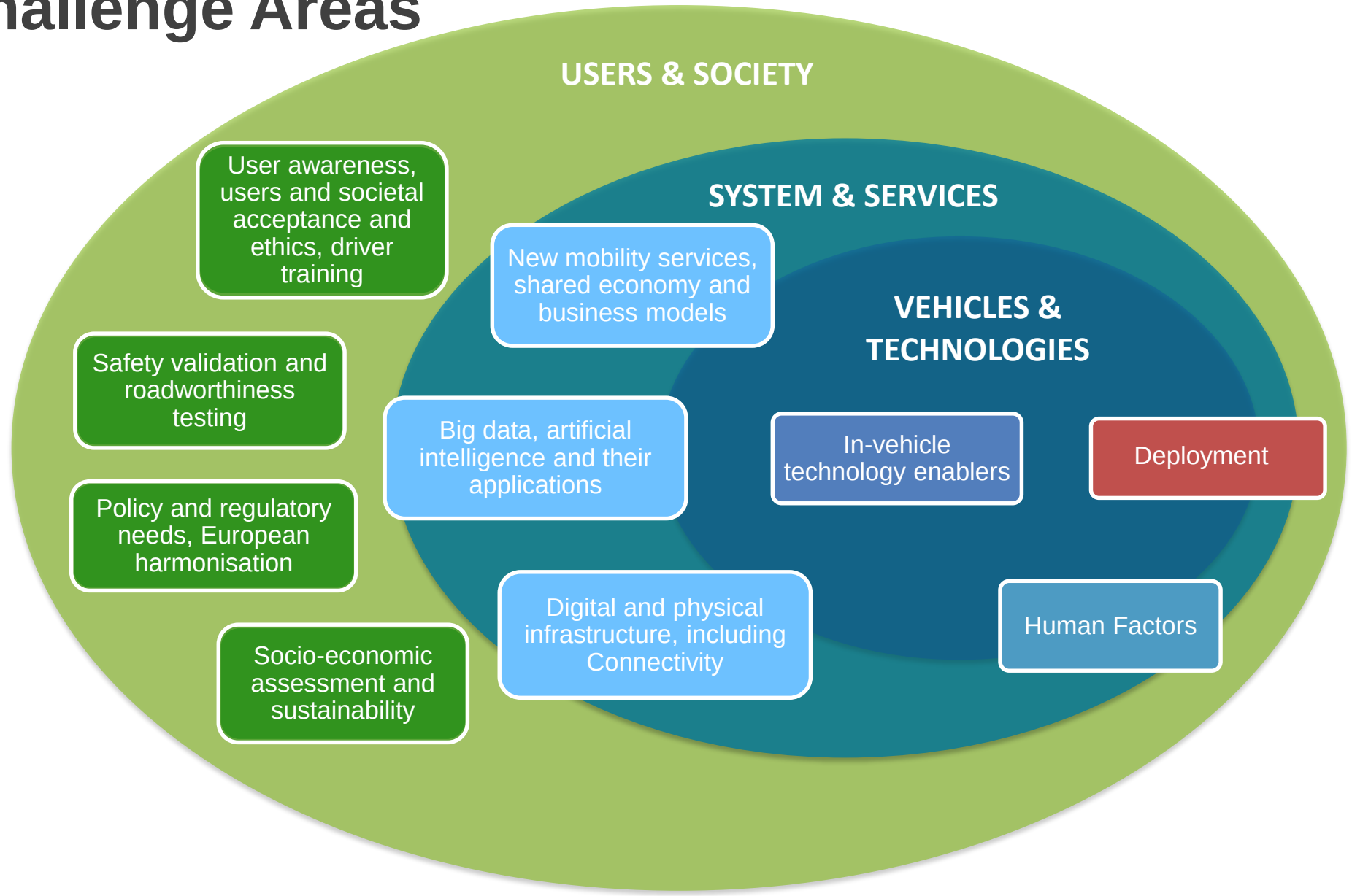
*Indicative development paths TRL 7-9*

*Highway chauffeur, open roads*


*Unmanned vehicles, confined and hub-to-hub*

Truck: Freight vehicle > 3.5 tonnes categorie N2 or N3

# Key Challenge Areas



# Collaboration and Exchange of Key Importance!

## Single platform for open road testing and pre-deployment of Cooperative, Connected, Automated and autonomous Mobility (CCAM)

**STRIA**

**R&I initiatives and Action Sheets:**

- In-vehicle enabler
- Vehicle validation
- Large scale demonstration pilots to enable deployment
- Shared and automated mobility services
- Human factors
- Physical and digital infrastructure
- Big data, Artificial Intelligence and their applications

*Strategic Transport Research and Innovation Agenda*

**Connected and Automated Transport**

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**ARCADE Project (CSA)**

- **Joint-stakeholder Workshops**
- **Roadmap** Consolidation
- **EUCAD** Conferences and Seminar
- **Tri-lateral** (Japan, USA, EU) and beyond
- **Thematic Areas** Clusters;
  - Society & Users
  - Systems & Services
  - Vehicle & Technology

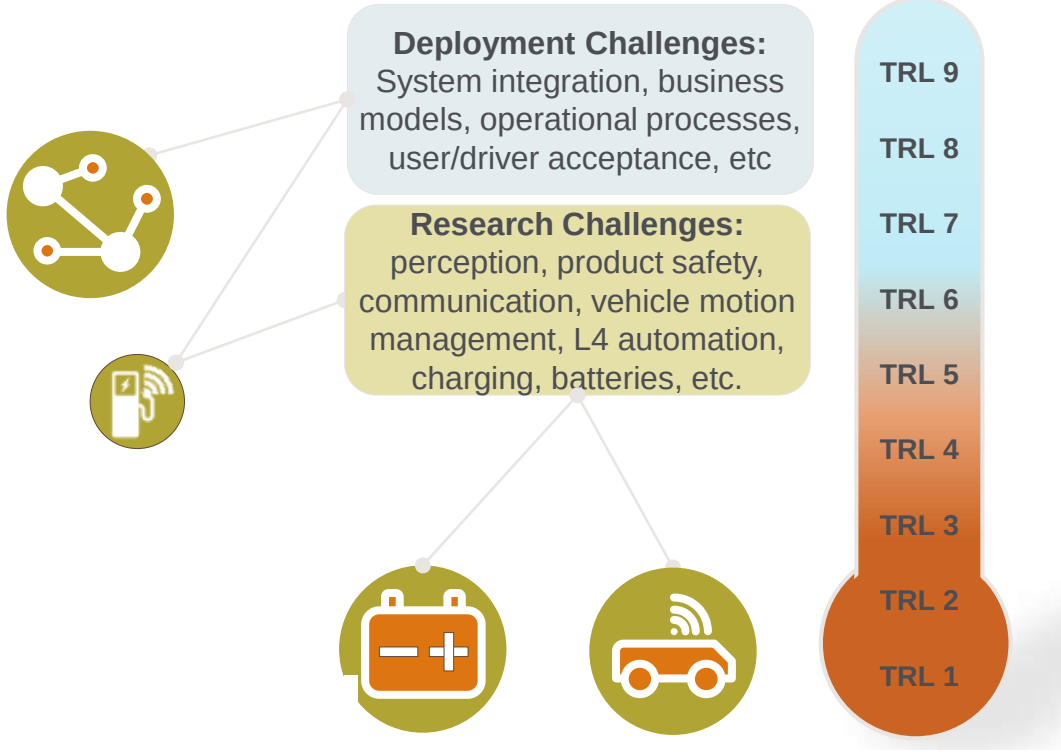
connected automated driving.eu

ARCADE is funded by the European Union Horizon 2020 Work Programme

ERTRAC

# Technology Readiness towards Industry Readiness

- Pilots ongoing – but there are still research questions to be answered!




**TRL 9** System proven through successful mission operations

-

**TRL 8** System completed and qualified through test and demonstration

-

**TRL 7** System prototype demonstration in an operational product/process environment

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**TRL 6** System/subsystem model or prototype demonstration in a relevant product/process environment *(platform, machine, vehicle…)*

**TRL 5** Component and/or breadboard validation in relevant environment

-

**TRL 4** Component and/or breadboard validation in laboratory environment

-

**TRL 3** Analytical and experimental critical function and/or characteristic proof of concept

-

**TRL 2** Technology concept and/or application formulated

-

**TRL 1** Basic principles observed and reported

# Conclusions: Research towards Deployment of Smart, Electric and Autonomous Multimodal Transport Systems

**Prepare for Deployment**

- Harmonization, Standardization
- Regulation, Certification, Homologation, Type Approval
- Road approval, test, pilots, deployment
- Ensure  appropriate funding to prepare infrastructure; i.e. traffic and transport control, charging, HD digital maps, connectivity (coverage, bandwidth, latency)

**Reseach & Innovation**

- Develop strategic technologies; AI, Cybersecurity, Control tower, Traffic Safety, User, etc.
- Strengthen key competences in strategic areas
- Extend network with key actors in the logistics sector
- Ensure funding for Research, Innovation, Coordination and Support