ECSEL Joint Undertaking
Electronic Components and Systems for European Leadership

# NEXT PERCEPTION

PROJECT INTRODUCTION, SELECTED VTT RESULTS AND EXPERIENCES

BUSINESS FINLAND EU FUNDING FOR HEALTH COMPANIES SEMINAR 22.9.2022

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VTT

# Motivation

We put our lives increasingly in the hands of smart complex systems making decisions that directly affect our health and wellbeing. This is very evident in healthcare – where systems watch over your health – as well as in traffic – where autonomous driving solutions are gradually taking over control of the car. The accuracy and timeliness of the decisions depend on the systems' ability to build a good understanding of both you and your environment, which relies on observations and the ability to reason on them.

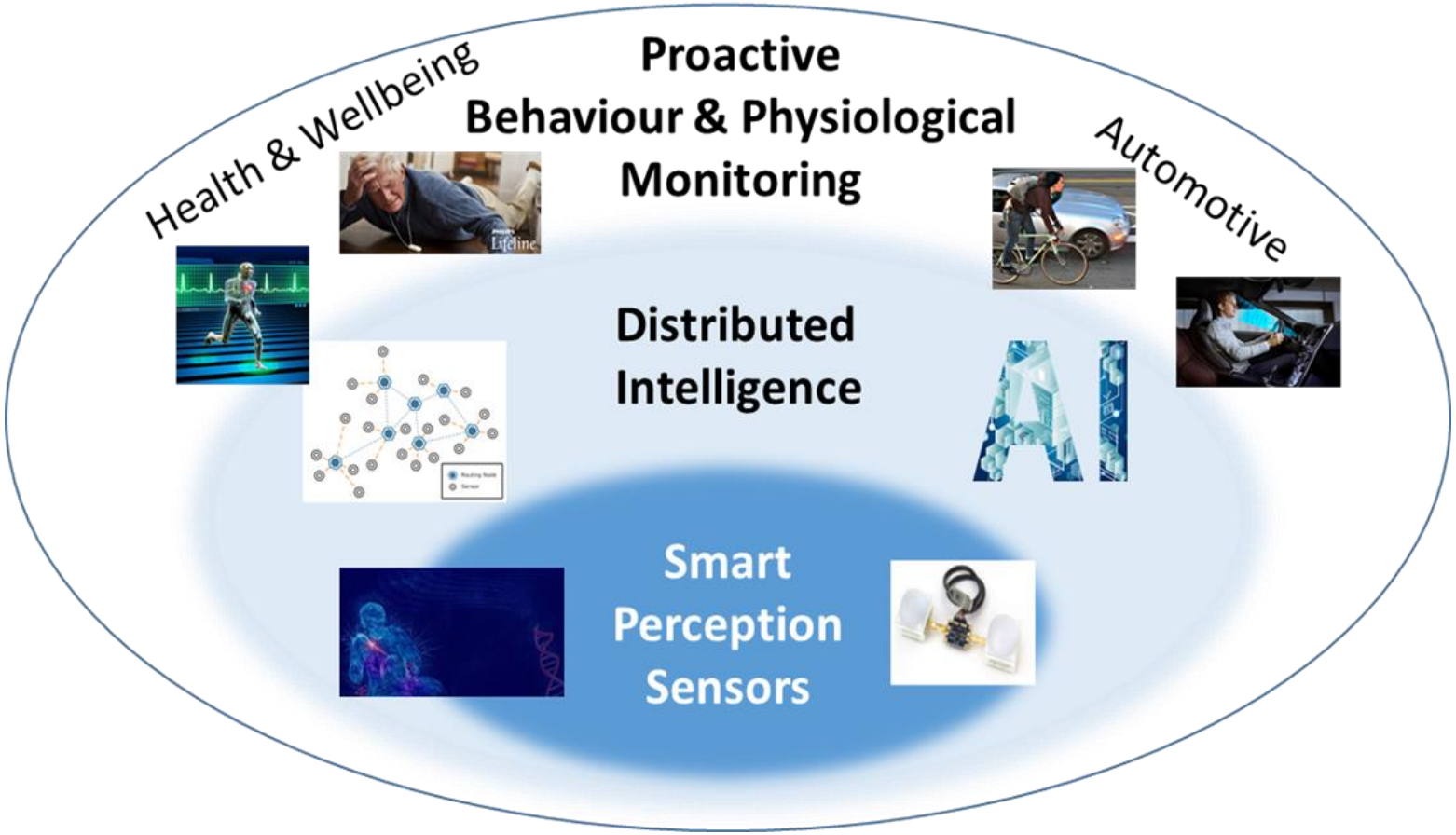
Monitoring elderly health

Driver drowsiness detection

Protecting vulnerable road users

# Project goal and concept

**Next generation smart perception sensors and distributed intelligence for proactive human monitoring in health, wellbeing and automotive systems**



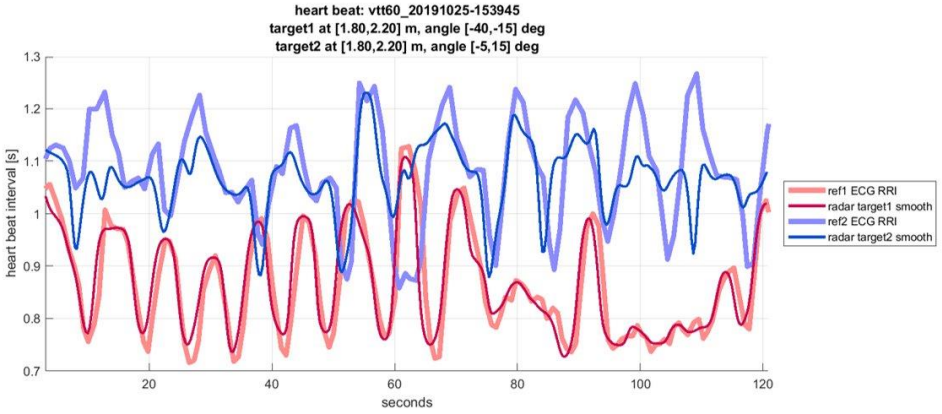

NextPerception Concept

# Perception sensors

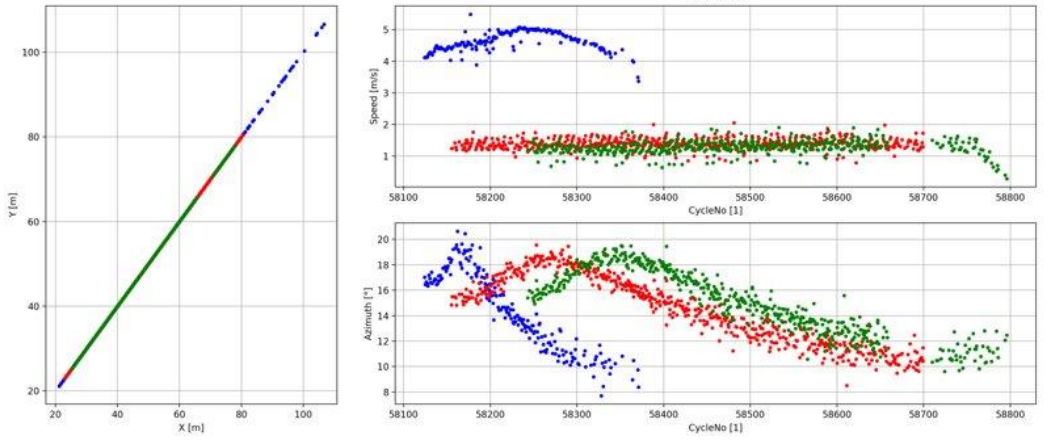
- Perception sensors are sensors observing the world much like our own eyes do; remotely without touching, constructing an understanding from the objects in view. The project focuses specifically on
  - **ranging technology (UWB, FMCW, Lidar) and camera-based sensing techniques (ToF, thermal),** as well as
  - **complementary sensor techniques (wearables, IMU, positioning).**
- The sensors are applied for **human behaviour and physiological parameter sensing**, and will go beyond the current state of the art.

FMCW radar

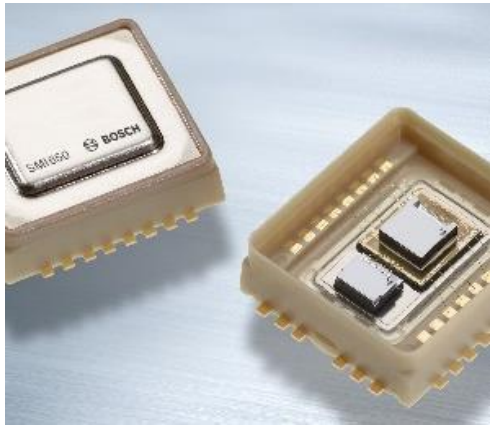
Heart rate detection




Multiple person tracking

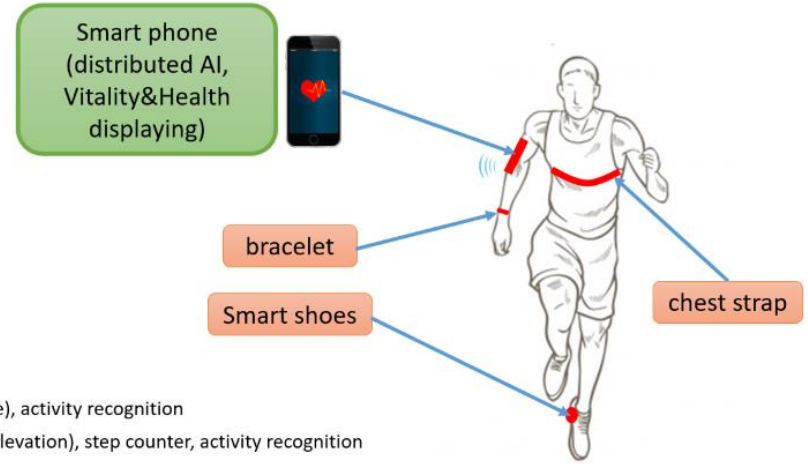


# Complementary sensors




IMU (accelerometer)

Wearables




chest strap : ECG, salinity, breathing

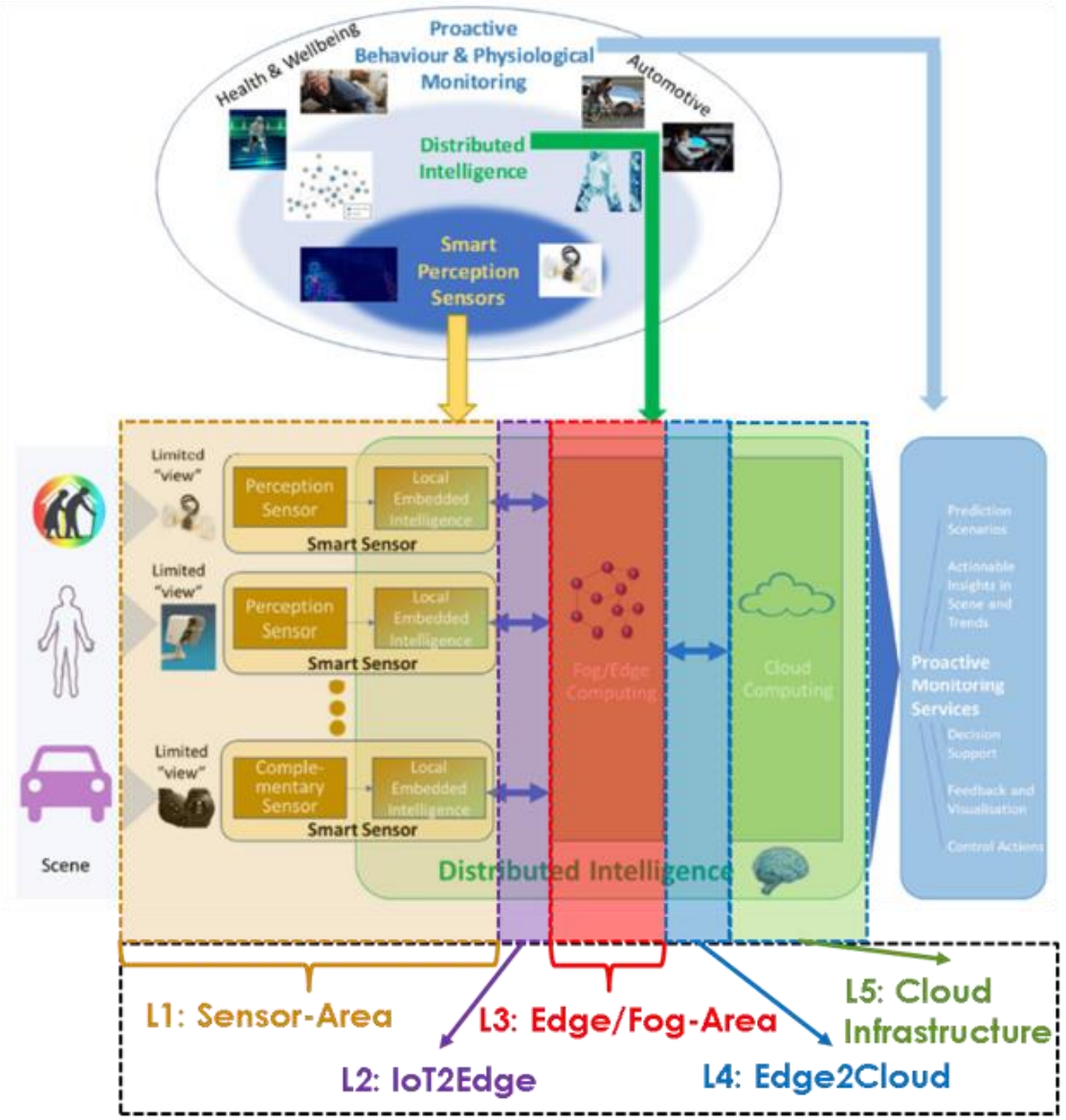
Smart shoes : path tracking (distance), activity recognition

bracelet : PR, $SpO_2$, GPS (distance+elevation), step counter, activity recognition

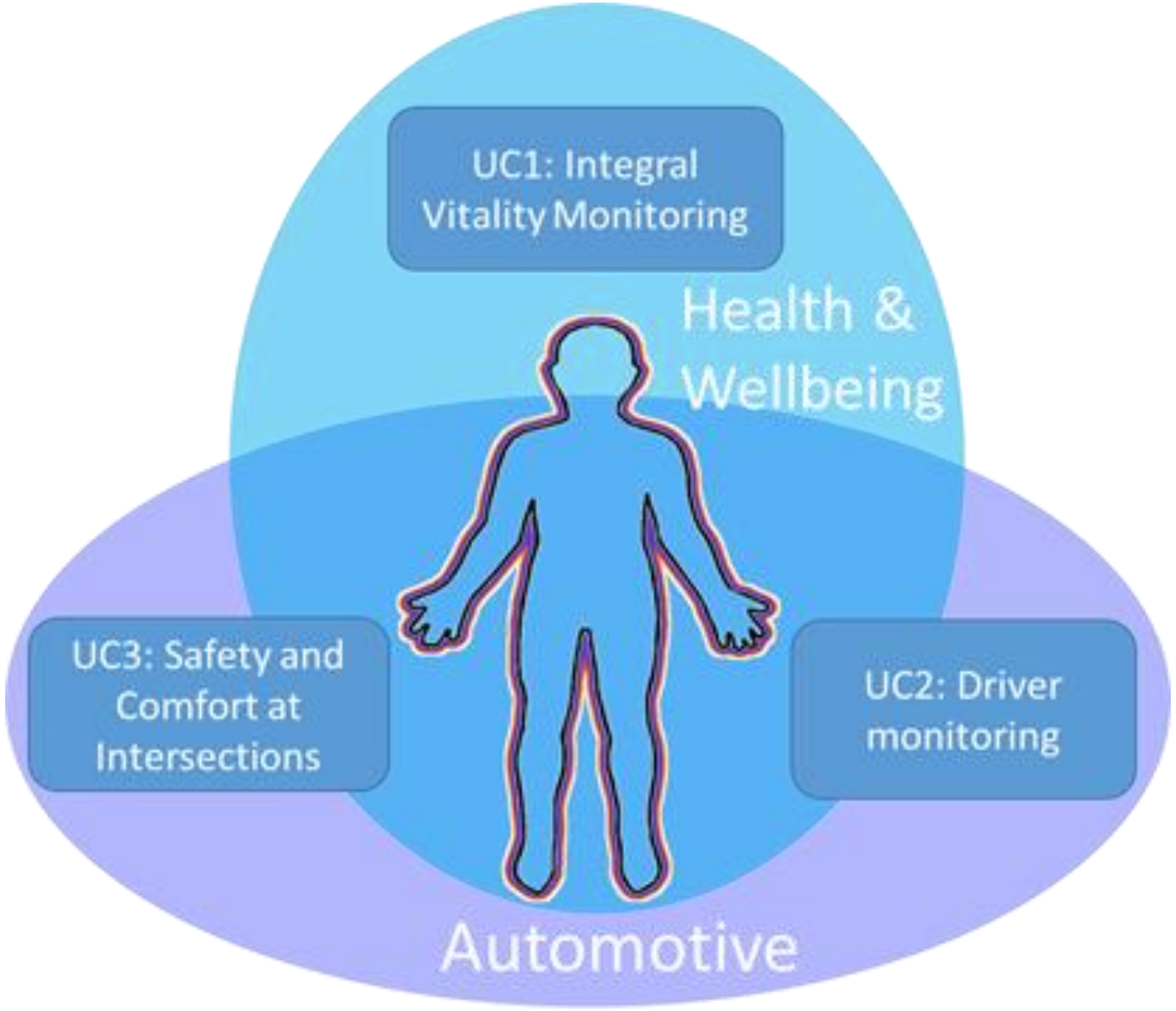

Positioning

# Distributed intelligence

- The distributed intelligence paradigm relies on developments in the system to provide and leverage computational power in the sensors, edge, and cloud. Furthermore, it needs advances in the design of intelligent systems to cater for splitting processing, fusion, prediction and decision-making processes into parts that can be distributed over the available computational resources.
- The project aims to develop solutions suitable for the use cases in the project and abstract methodologies for the design of distributed intelligence in systems.

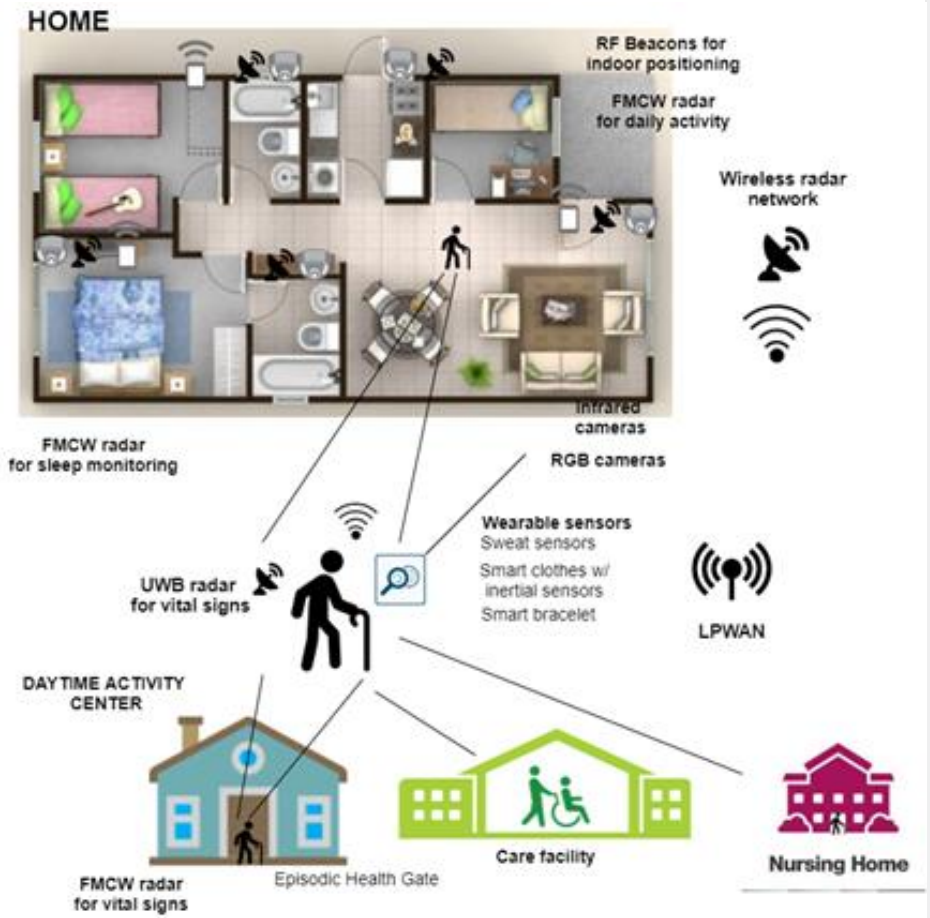


# Use Cases


UC1: Integral Vitality Monitoring
Health & Wellbeing
UC3: Safety and Comfort at Intersections
UC2: Driver monitoring
Automotive

# UC1: Integral Vitality Monitoring

Measuring and **monitoring health parameters**, behavior and **daily activities** of persons which might require increased attention or care from a **para-medical perspective** (e.g. decreased functional capabilities due to **age**, **frailty** or increased risk for developing **mild cognitive impairment**, people involved in **sport** activities, **sleep tracking**).

# Sleep monitoring (VTT, eLive, Kempenhaeghe)

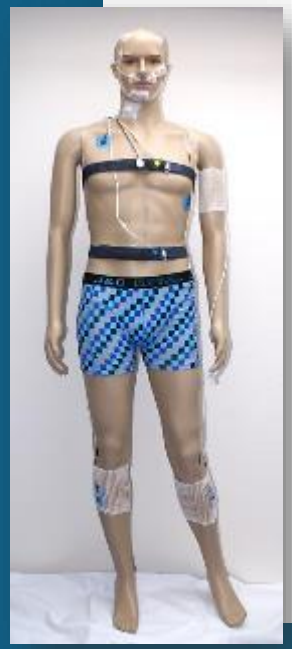
**Continuous long-term assessment of sleep quality and sleep disorders** using **unobtrusive sensors**. **Radar technology is especially suitable** as it allows true non-contact measurement of vital signs during the resting position. Radar technology also allows a variety of sleep related parameters to be assessed, starting with **in/out of bed times**, and gross **body movements during sleep**. Moreover, it allows assessment of vital signs that have an intimate relation with sleep disorders, including **respiration and cardiac activity**. Also used to assess sleep quality itself, for example using heart rate variability analysis.

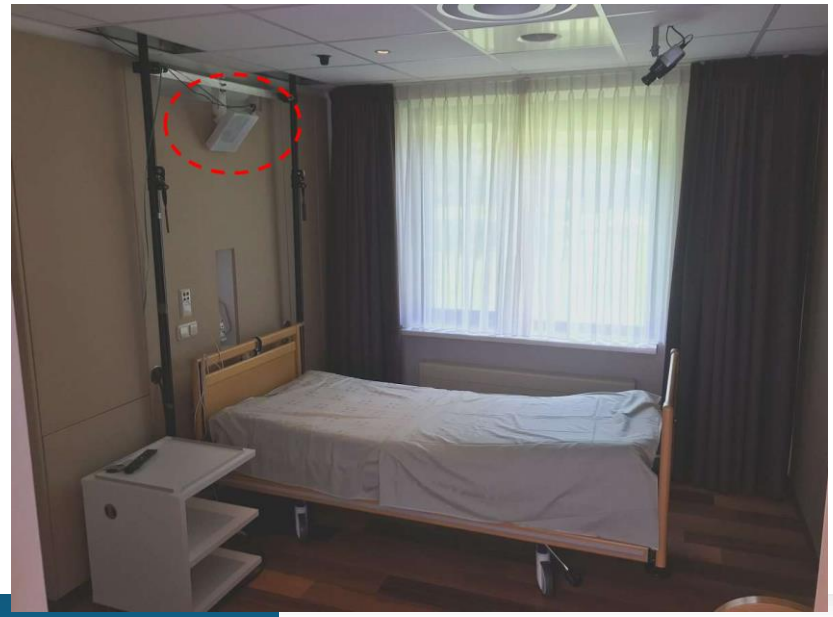
**Objective:** Comparing traditional polysomnography methods with contactless solution,

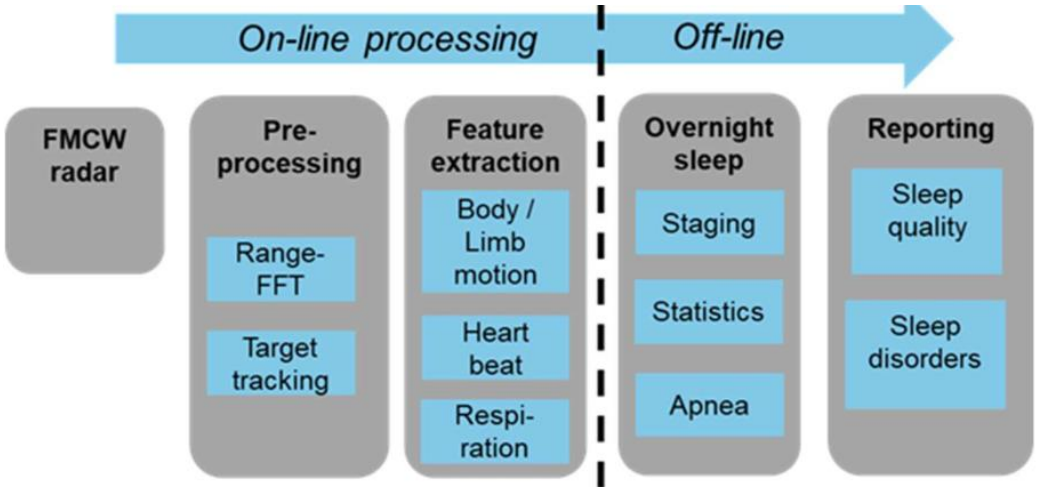
**Pilot:** Kempenhaeghe sleep clinic (Heeze, NL): >40 subjects already scheduled for polysomnography (NP is extra)

**Integrated technologies:**

FMCW radar, vital signs/ sleep analysis algorithms.



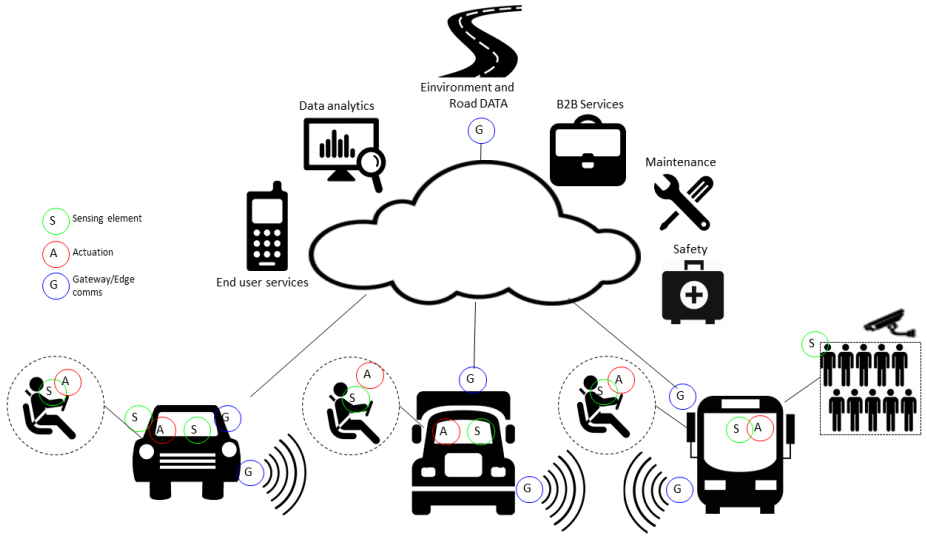


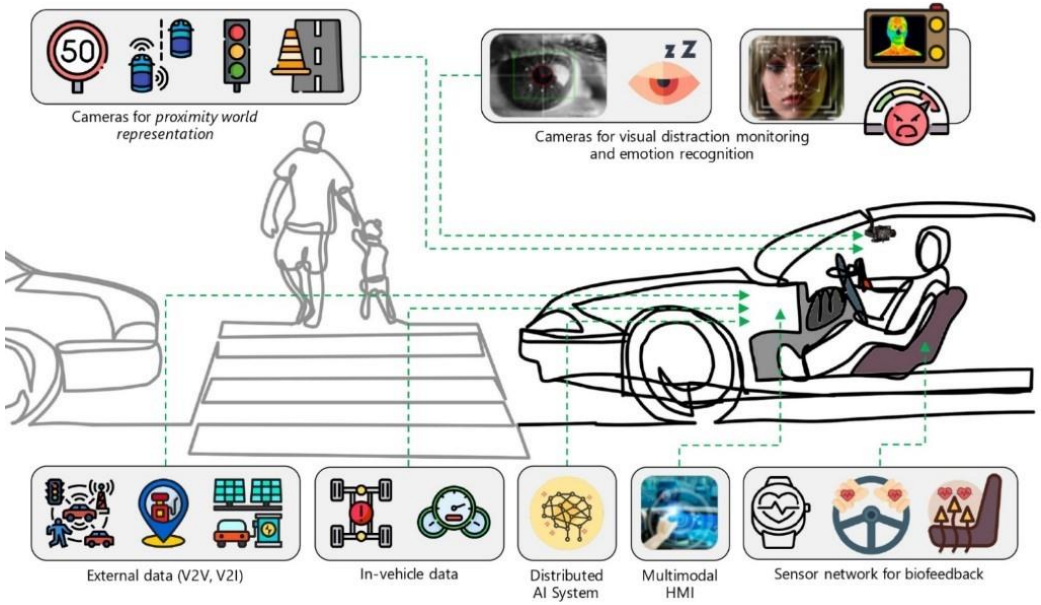


# UC2: Driver monitoring

Driver Monitoring System (DMS), which can classify both the driver's **cognitive** (distraction, fatigue, workload, drowsiness) and **emotional** (anxiety, panic, anger) states and **intention**.

This information will be used for **partially automated driving** functions, including take-over-request and driver support.



# UseCase2

This Use Case includes Italian and Finnish partners, and is deployed into three demonstrators:

- Demonstrator UC2D1 is implemented on a **driving simulator**, led by RELAB
- Demonstrator UC2D2 is implemented on a **passenger vehicle**, led by VTT
- Demonstrator UC2D3 is implemented on a **heavy-duty vehicle**, led by TTS


# UseCase2 Pilot2 – Driver’s state monitoring



- Pilot has been tested in different environments in Tampere region:
  - Motorways
  - Urban roads
  - Gravel roads

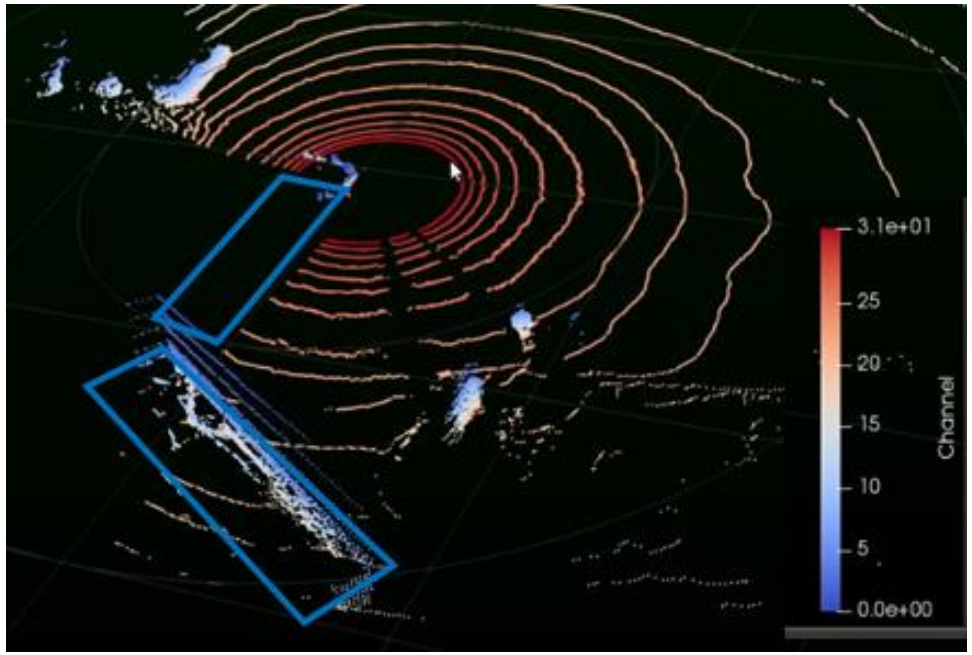
# UC3: Safety and comfort at intersections

Provide safety and comfort for all road users - including Vulnerable Road Users (VRUs) like pedestrians and bikers - at a road intersection. The use case will demonstrate the capability to detect the presence of traffic participants, determine their positions and track their motion and intent with high reliability. Specifically, for VRUs this concerns body gestures analysis to derive their intent.

# Truck's Situational Awareness When Turning [TTS, VTT, Modulight]

- This pilot involves only one demonstrator heavy truck targeted LiDAR and complained to other sensor detections . The objective of the pilot is the detection of other road users, which are truck needed turning area on the street, in normal and harsh weather conditions (in 1st cycle pilot clear weather).

Lidar detection of truck and trailer moving path, made by Oyster OS1G lidars at test track



# Consortium


43 Partners
7 Countries
~30M€
1.5.2020-
30.4.2023

# Setting up an ECSEL/KDT project

- Consortium building
  - Present idea or join an idea at a brokerage event
    - KDT brokerage was held e.g. 3-4 May 2022 in Brussels
    - EFECS is also an important event to establish contacts for your network
      - Next EFECS event is 24-25 November in Amsterdam
    - Be prepared to present the additional value your company can bring in
  - Alternatively contact active players in ECSEL/KDT for participation (e.g. VTT)
  - Consortium will be built in the participating countries by the country coordinators (assigned in the project)
- Project proposal writing
  - Coordinated by the coordinating partner
  - Contributions by all participants
    - WP leaders, task leaders etc will contribute more
    - Typically partner contributions are required for various application sections

# ECSEL/KDT project application

- Application is first submitted to the EU portal
  - Specific call in the EU portal
  - EU budget and partner information needs to be provided in the portal
- Applications are also submitted to the Business Finland portal
- After approval of EU, Business Finland considers funding
  - Earmarked funding for ECSEL/KDT (approximately 7 M€)
  - No guarantee (e.g. applications may exceed funding capacity), but good chance
- EU negotiations start
- National funding decisions in the various countries
  - A country or partner may drop out because of this.
- Note, that the EU budget is different from the BF budget
  - Different eligibility rules e.g. related to indirect costs
- ECSEL/KDT participation fee
  - Some 2-3% of received funding

# Running an ECSEL/KDT project

- Management
  - Coordinator together with the WP leaders and country coordinators (and Use Case owners) coordinate the project
  - GA (General assembly) twice a year with all partners
    - Used to be F2F, in Covid times on-line
  - Finnish consortium has a separate steering group
- Reporting
  - Twice a year to ECSEL/KDT (EU representative)
  - Reporting to BF according to similar schedule
  - Once a year review by ECSEL/KDT
- Collaboration
  - Working together with partners often via use cases or in work packages
  - Can be very concrete, but needs own activity

# Why to participate in an ECSEL/KDT project?

- Possibility to work on research or innovations of own products
- Opportunity to collaborate with partners in the value chain to evaluate feasibility and validate approach/solutions
  - Use Cases and piloting
- Allows to work together with international small and large businesses
  - Benchmark own technologies
  - Understand other business environments and markets
  - Build international networks
- Collaboration with research institutes and universities in participating countries
- Rather good funding percentage for businesses


# NextPerception Consortium meeting

## 19-20 May 2022, Espoo, Finland

ECSEL Joint Undertaking
Electronic Components and Systems for European Leadership

# NEXT PERCEPTION


## COORDINATOR:

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START: 1. MAY 2020

END: 30. APRIL 2023

https://nextperception.eu


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