Fraunhofer FOKUS

Fraunhofer Institute for Open Communication Systems FOKUS


## Business Unit Smart Mobility

# Cooperative and safe on the road

# Connected and automated mobility

## We support the mobility industry and cities with highly accurate localization, AI tools, and simulations.

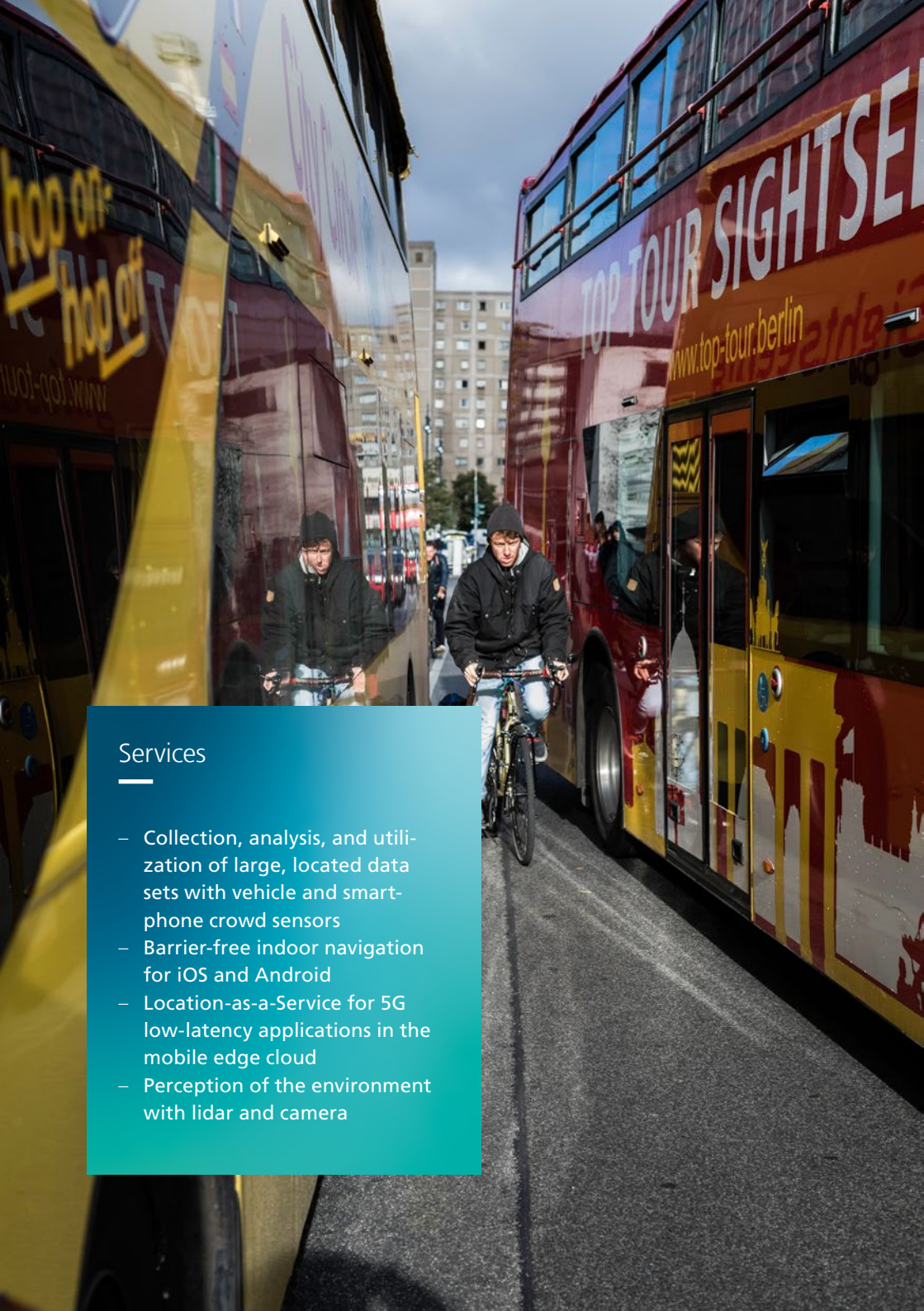
*Dr. Ilja Radusch, Director Business Unit Smart Mobility*

Sustainability, mobility mix, traffic safety: Urban mobility of the future must face significant challenges. In this context, holistically connected traffic planning is essential, which also includes people on foot and by bike as well as public transport. This is the only way to ensure environmentally friendly and user-centered mobility.

In this spirit, the Smart Mobility team advises its customers on developing mobility strategies, evaluates solutions and services, and offers its own artificial intelligence (AI) and simulation tools. For real and virtual testing, our Automotive Testbed is available at the institute. There, 5G Small Cells, LTE-V2X, and classic Vehicle-2-X communication are ready for use to test automated and teleoperated driving in a protected environment in the institute's parking garage before they have to pass the practical test in different Berlin test sites.

### Provide data for mobility and map services

The Smart Mobility team has developed a smartphone app that can incidentally record the road situation without special sensors. The data enables an independent digital road map for the municipal administration, which can be used, for example, by development teams as a basis for mobility services. It runs on conventional smartphones attached to the windshield of vehicles that regularly drive through the city, such as public transport buses or the garbage collection service. The screen is deactivated so as not to distract the driver. The app uses video and GPS




## Services

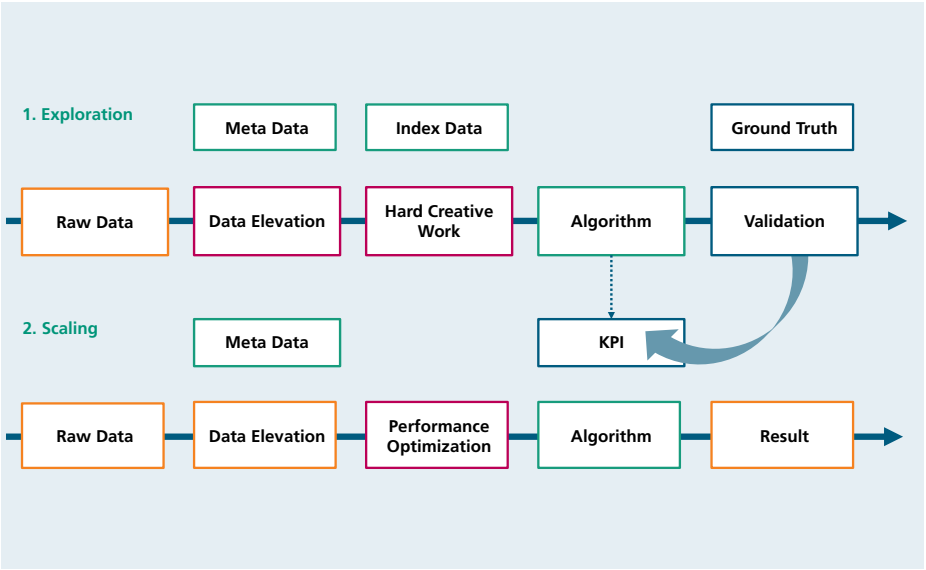
- Collection, analysis, and utilization of large, located data sets with vehicle and smartphone crowd sensors
- Barrier-free indoor navigation for iOS and Android
- Location-as-a-Service for 5G low-latency applications in the mobile edge cloud
- Perception of the environment with lidar and camera

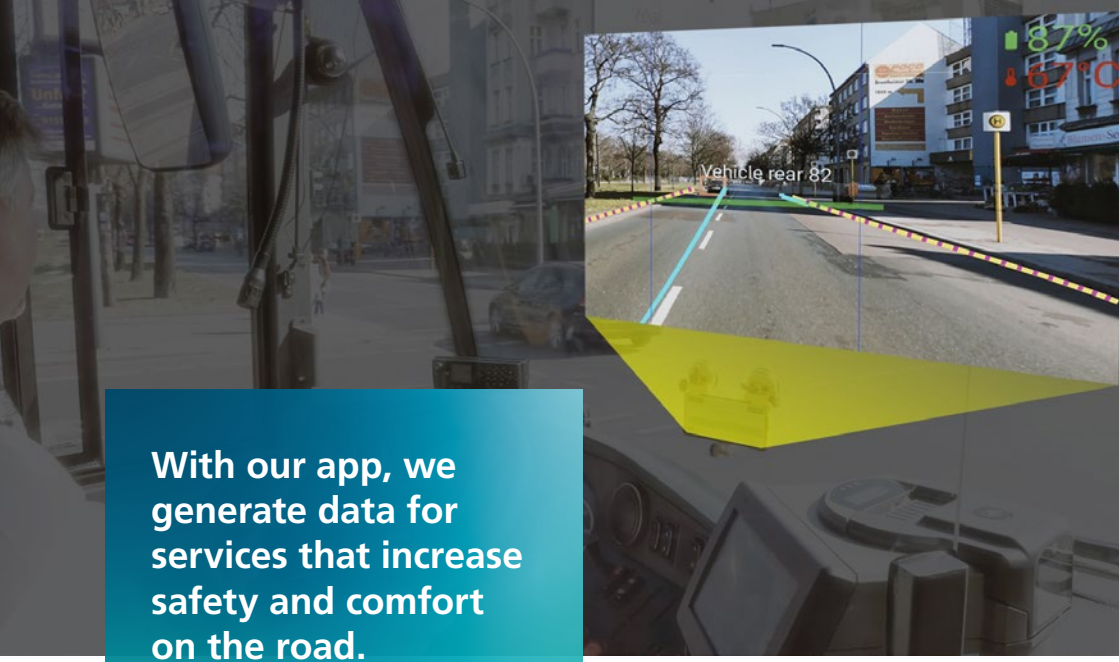
## Ensuring the quality of data

Mobility services depend on high-quality, current data. Fraunhofer FOKUS pursues a systematic process to achieve this. First, the data quality is determined, for example, for completeness and outliers deleted. Then the FOKUS team uses mathematical methods to close gaps. An algorithm now created is robust enough to scale the data.

data generated by the smartphone and processes it directly on the mobile device. For this purpose, the app runs pre-trained neural networks that recognize objects. To ensure data protection and a fast transfer to the backend at Fraunhofer FOKUS, only object information such as street signs, traffic lights, and curbs necessary to detect changes are forwarded.

*Working with mobility data: The secret is the process!*






**With our app, we generate data for services that increase safety and comfort on the road.**

## Locate vulnerable road user with high precision

Due to their various sensors, cars can be reliably localized and warned accordingly. Precise localization of people on foot, by bike or scooter, does not yet exist. The research team is closing this gap with the help of sensors in smartphones, which make conventional localization with GPS more precise. LaaS, "Location as a Service," is available as a service and can be intuitively integrated by developers into various apps, e. g., for collision warning or prioritization at traffic lights.

The real-time capable cloud middleware guarantees the anonymization of user data for data protection.

## Barrier-free navigation in buildings

Many people find it difficult to orient themselves in large or unfamiliar buildings, especially blind people. The research team has developed everGuide, a precise indoor navigation system that uses the sensors in the smartphone for positioning instead of GPS. The building equipment is inexpensive and virtually maintenance-free. The Design4All app promotes self-determined


> **The digitalization of mobility is successful when it implements sustainability goals while meeting urban as well as individual needs."**
>
> **Dr. Ilja Radusch,**
> Director Business Unit Smart Mobility

social participation. everGuide is already in use throughout Germany, for example, in the House of Health and Family in Berlin-Mariendorf.

## Automated driving

The automated car perceives its environment through sensors, such as a camera and lidar. In order to recognize the environment correctly, the car must learn what a tree, human, car, etc. is. For this, it has to be trained with a lot of image data. Fraunhofer FOKUS supports this AI training with its semi-automated labeling tool FLLT.AI for lidar data. Labeling experts thus need on average only 10 percent of the time to generate high-quality learning data. The FOKUS research team is not only focusing on cars, but is also teaching trains to recognize their surroundings reliably.

## Virtual testing of mobility services

The open source simulation environment Eclipse MOSAIC from Fraunhofer FOKUS is based on VSimRTI (Vehicle-2-X Simulation Runtime Infrastructure), which has been further developed over the past 12 years in close cooperation with the DCAITI at TU Berlin and has already been used by more than 600 partners to test mobility services and traffic scenarios. The goal of the virtual environment is to make the preparation and execution of simulations as simple as possible. Therefore, a framework for integrating individual simulators was designed to facilitate the simulation of traffic scenarios.

Eclipse MOSAIC also enables the simulation of diverse aspects of a mobility service before it is tested under actual field conditions by coupling different simulators. MOSAIC Extended also offers additional features and simulators, such as the vehicle simulator Phabmacs.

*With its precise localization, Fraunhofer FOKUS supports reliable collision warnings for stress-free cooperation on the road*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