



## **Autonomous Vehicles to Evolve to a New Urban Experience**

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### **DELIVERABLE 3.2**

#### **Second Cooperation with relevant initiatives and projects report**



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# Acronyms

ADS	Automated Driving Systems	LIDAR	Light Detection And Ranging
AI	Artificial Intelligence	MEM	Monitoring and Evaluation Manager
AM	Automated Mobility	MT	MobileThinking
API	Application Protocol Interface	OCT	General Transport Directorate of the Canton of Geneva
AV	Automated Vehicle	ODD	Operational Domain Design
BM	Bestmile	OEDR	Object And Event Detection And Response
BMM	Business Modelling Manager	OFCOM	(Swiss) Federal Office of Communications
CAV	Connected and Automated Vehicles	PC	Project Coordinator
CB	Consortium Body	PEB	Project Executive Board
CERN	European Organization for Nuclear Research	PGA	Project General Assembly
D7.1	Deliverable 7.1	PRM	Persons with Reduced Mobility
DC	Demonstration Coordinator	PSA	Group PSA (PSA Peugeot Citroën)
DI	The department of infrastructure (Swiss Canton of Geneva)	PTO	Public Transportation Operator
DMP	Data Management Plan	PTS	Public Transportation Services
DSES	Economy - Traffic Police (Swiss Canton of Geneva)	QRM	Quality and Risk Manager
DTU	test Technical University of Denmark	QRMB	Quality and Risk Management Board
track	test track	RN	Risk Number
EAB	External Advisory Board	SA	Scientific Advisor
EC	European Commission	SAE Level	Society of Automotive Engineers Level (Vehicle Autonomy Level)
ECSEL	Electronic Components and Systems for European Leadership	SAN	(Swiss) Cantonal Vehicle Service
EM	Exploitation Manager	SDK	Software Development Kit
EU	European Union	SLA	Sales Lentz Autocars
EUCAD	European Conference on Connected and Automated Driving	SMB	Site Management Board
F2F	Face to face meeting	SoA	State of the Art
FEDRO	(Swiss) Federal Roads Office	SOTIF	Safety Of The Intended Functionality
FOT	(Swiss) Federal Office of Transport	SWOT	Strengths, Weaknesses, Opportunities, and Threats.
GDPR	General Data Protection Regulation	T7.1	Task 7.1
GIMS	Geneva International Motor Show	TM	Technical Manager
GNSS	Global Navigation Satellite System	TPG	Transport Publics Genevois
HARA	Hazard Analysis and Risk Assessment	UITP	Union Internationale des Transports Publics (International Transport Union)
IPR	Intellectual Property Rights	V2I	Vehicle to Infrastructure communication
IT	Information Technology	WP	Work Package
ITU	International Telecommunications Union	WPL	Work Package Leader
LA	Leading Author		

# Executive Summary

In this Deliverable D3.2 we describe the activities related to the contacts and communication with other projects and initiatives and the contributions of the advisory board experts.

For each collaboration, we give a short but precise description of the collaboration established and the information and knowledge exchanged.

# 1 Introduction

AVENUE aims to design and carry out full-scale demonstrations of urban transport automation by deploying, for the first time worldwide, fleets of Automated minibuses in low to medium demand areas of 4 European demonstrator cities (Geneva, Lyon, Copenhagen and Luxembourg) and 2 to 3 replicator cities. The AVENUE vision for future public transport in urban and suburban areas, is that Automated vehicles will ensure safe, rapid, economic, sustainable and personalised transport of passengers. AVENUE introduces disruptive public transportation paradigms on the basis of on-demand, door-to-door services, aiming to set up a new model of public transportation, by revisiting the offered public transportation services, and aiming to suppress prescheduled fixed bus itineraries.

Vehicle services that substantially enhance the passenger experience as well as the overall quality and value of the service will be introduced, also targeting elderly people, people with disabilities and vulnerable users. Road behaviour, security of the Automated vehicles and passengers' safety are central points of the AVENUE project.

At the end of the AVENUE project four-year period the mission is to have demonstrated that Automated vehicles will become the future solution for public transport. The AVENUE project will demonstrate the economic, environmental and social potential of Automated vehicles for both companies and public commuters while assessing the vehicle road behaviour safety.

## 1.1 On-demand Mobility

Public transportation is a key element of a region's economic development and the quality of life of its citizens.

Governments around the world are defining strategies for the development of efficient public transport based on different criteria of importance to their regions, such as topography, citizens' needs, social and economic barriers, environmental concerns and historical development. However, new technologies, modes of transport and services are appearing, which seem very promising to the support of regional strategies for the development of public transport.

On-demand transport is a public transport service that only works when a reservation has been recorded and will be a relevant solution where the demand for transport is diffuse and regular transport is inefficient.

On-demand transport differs from other public transport services in that vehicles do not follow a fixed route and do not use a predefined timetable. Unlike taxis, on-demand public transport is usually also not individual. An operator or an automated system takes care of the booking, planning and organization.

It is recognized that the use and integration of on-demand Automated vehicles has the potential to significantly improve services and provide solutions to many of the problems encountered today in the development of sustainable and efficient public transport.

## 1.2 Fully Automated Vehicles

A self-driving car, referred in the AVENUE project as a **Fully Automated Vehicle (AV)**, also referred as Autonomous Vehicle, is a vehicle that is capable of sensing its environment and moving safely with no human input.

The terms *automated vehicles* and *autonomous vehicles* are often used together. The Regulation 2019/2144 of the European Parliament and of the Council of 27 November 2019 on type-approval requirements for motor vehicles defines "automated vehicle" and "fully automated vehicle" based on their autonomous capacity:

- An "automated vehicle" means a motor vehicle designed and constructed to move autonomously for certain periods of time without continuous driver supervision but in respect of which driver intervention is still expected or required
- "fully automated vehicle" means a motor vehicle that has been designed and constructed to move autonomously without any driver supervision

In AVENUE we operate **Fully Automated minibuses for public transport**, (previously referred as Autonomous shuttles, or Autonomous buses), and we refer to them as simply *Automated minibuses* or *the AVENUE minibuses*.

In relation to the SAE levels, the AVENUE project will operate SAE Level 4 vehicles.



### SAE J3016™ LEVELS OF DRIVING AUTOMATION

		SAE LEVEL 0	SAE LEVEL 1	SAE LEVEL 2	SAE LEVEL 3	SAE LEVEL 4	SAE LEVEL 5
What does the human in the driver's seat have to do?		You <b>are</b> driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			You <b>are not</b> driving when these automated driving features are engaged – even if you are seated in “the driver’s seat”		
		You must constantly supervise these support features; you must steer, brake or accelerate as needed to maintain safety			When the feature requests, you must drive	These automated driving features will not require you to take over driving	
<div><div>These are driver support features</div><div>These are automated driving features</div></div>							
What do these features do?		These features are limited to providing warnings and momentary assistance	These features provide steering OR brake/acceleration support to the driver	These features provide steering AND brake/acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met		This feature can drive the vehicle under all conditions
Example Features		<ul style="list-style-type: none"><li>• automatic emergency braking</li><li>• blind spot warning</li><li>• lane departure warning</li></ul>	<ul style="list-style-type: none"><li>• lane centering OR</li><li>• adaptive cruise control</li></ul>	<ul style="list-style-type: none"><li>• lane centering AND</li><li>• adaptive cruise control at the same time</li></ul>	<ul style="list-style-type: none"><li>• traffic jam chauffeur</li></ul>	<ul style="list-style-type: none"><li>• local driverless taxi</li><li>• pedals/steering wheel may or may not be installed</li></ul>	<ul style="list-style-type: none"><li>• same as level 4, but feature can drive everywhere in all conditions</li></ul>

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## 1.2.1 Automated vehicle operation overview

We distinguish in AVENUE two levels of control of the AV: micro-navigation and macro-navigation. Micro navigation is fully integrated in the vehicle and implements the road behaviour of the vehicle, while macro-navigation is controlled by the operator running the vehicle and defines the destination and path of the vehicle, as defined the higher view of the overall fleet management.

For micro-navigation Automated Vehicles combine a variety of sensors to perceive their surroundings, such as 3D video, LIDAR , sonar, GNSS, odometry and other types sensors. Control software and systems, integrated in the vehicle, fusion and interpret the sensor information to identify the current position of the vehicle, detecting obstacles in the surround environment, and choosing the most appropriate reaction of the vehicle, ranging from stopping to bypassing the obstacle, reducing its speed, making a turn etc.

For the Macro-navigation, that is the destination to reach, the Automated Vehicle receives the information from either the in-vehicle operator (in the current configuration with a fixed path route), or from the remote control service via a dedicated 4/5G communication channel, for a fleet-managed operation. The fleet management system takes into account all available vehicles in the services area, the passenger request, the operator policies, the street conditions (closed streets) and send route and stop information to the vehicle (route to follow and destination to reach).

## 1.2.2 Automated vehicle capabilities in AVENUE

The Automated vehicles employed in AVENUE fully and automatically manage the above defined, micro-navigation and road behaviour, in an open street environment. The vehicles are Automatically capable to recognise obstacles (and identify some of them), identify moving and stationary objects, and Automatically decide to bypass them or wait behind them, based on the defined policies. For example with small changes in its route the AVENUE mini-bus is able to bypass a parked car, while it will slow down and follow behind a slowly moving car. The AVENUE mini-buses are able to handle different complex road situations, like entering and exiting round-about in the presence of other fast running cars, stop in zebra crossings, communicate with infrastructure via V2I interfaces (ex. red light control).

The mini-buses used in the AVENUE project technically can achieve speeds of more than 60Km/h. However this speed cannot be used in the project demonstrators for several reasons, ranging from regulatory to safety. Under current regulations the maximum authorised speed is 25 or 30 Km/h (depending on the site). In the current demonstrators the speed does not exceed 23 Km/h, with an operational speed of 14 to 18 Km/h. Another, more important reason for limiting the vehicle speed is safety for passengers and pedestrians. Due to the fact that the current LIDAR has a range of 100m and the obstacle identification is done for objects no further than 40 meters, and considering that the vehicle must safely stop in case of an obstacle on the road (which will be “seen” at less than 40 meters distance) we cannot guarantee a safe braking if the speed is more than 25 Km/h. Note that technically the vehicle can make harsh break and stop with 40 meters in high speeds (40 -50 Km/h) but then the break would too harsh putting in risk the vehicle passengers. The project is working in finding an optimal point between passenger and pedestrian safety.

Due to legal requirements a **Safety Operator** must always be present in the vehicle, able to take control any moment. Additionally, at the control room, a **Supervisor** is present controlling the fleet operations. An **Intervention Team** is present in the deployment area ready to intervene in case of incident to any of the mini-busses.



## 1.3 Preamble

WP3 objective is to create a web of collaborations to reach a broad spectrum of directly and non-directly relevant parties to maximise the output value of AVENUE.

The target of task T3.1 “Cooperation of related Initiatives and projects” is to identify relevant initiatives and projects and maintain communication channels, a network of promoting collaborations, knowledge exchange and technology transfer. The task will also valorize the Advisory Board experts, allowing them to have an overview of the project and provide a broader legal, environmental, technical and societal acceptance requirements perspective.

In this Deliverable D3.2 we describe the activities related to the contacts and communication with other projects and initiatives and the contributions of the advisory board experts.

## 2 Collaboration with relevant initiatives and projects

All project partners have actively created formal and informal contacts with other projects, initiatives, and related companies, based on their expertise and needs. In the following we present the most important contacts where an active collaboration is/can/will be established. Simple presentations and information given to companies by our partners is not included in this report, considered rather as a dissemination activity.

During the 2<sup>nd</sup> year of the project and following the successful marketing campaign of the project results, the project became known for its innovation and its success stories, opening the door for the establishment of new collaborations with projects and initiatives. Furthermore, with the advancement of the technical work, we were able to share technologies with other projects, import results and offer our platform for tests.

### 2.1 European Projects

Our first source and target of collaboration was with other INEA and EU projects. These collaboration was established and by Navya and the University of Geneva (project technical manager and project coordinator respectively). The AVENUE project took contact with the ARCADE support action project, which acts as concentration point for information exchange on mobility related projects. We were present in several events and meetings organised (EUCAD) and had the opportunity to discuss, present and initiate contacts and collaborations with other related projects and experts.

#### **SHOW :**

The SHOW project is the most relevant project with the target of AVENUE. There are six (7) common partners in the projects (CERTH, bestmile, NAVYA, UniGe, AVL, VIM, Keolis) working in complementary tasks and domains.

A key point of contact between AVENUE and SHOW is the fact that Geneva is a follower site in SHOW , while being a key site for AVENUE. Via the UniGe, all knowledge developed, not only in the Geneva site, but the other AVENUE sites, was communicated to SHOW, ranging from use-cases, obstacle and barriers, deployment issues, etc. At the same time many common workshops and webinars were organised with SHOW and AVENUE, with the participation of different common partners.

Furthermore, complementary work profiting both projects is contacted by the common partners, and is introduced to both projects. NAVYA develops and validates the on-demand functionalities mainly in the AVENUE project, while road-behaviour (speed, manoeuvrability, traffic complexity, weather conditions, geographical condition (e.g. slope), etc) is mainly developed in SHOW. The results of both projects are eventually made available and profit both projects.

CERTH and UniGe share also complimentary tasks of the projects in the domain of cyber-security. While in AVENUE we target security for data privacy and identify cyber-threats and protection, in SHOW the target is to define procedures that make cybersecurity of automated functions *efficient* with regard to the vehicle configuration, characteristics of the driving functions and the provided infrastructure, based on the experience gained in AVENUE.

BESTMILE is developing in AVENUE the on-demand system (fleet orchestration and management) and the connectivity to the NAVYA APIs, and integrating them in the overall AVENUE architecture, in SHOW, based on the experience of AVENUE BESTMILE concentrates on the development of a common conceptual system architecture framework that can apply to all types of AVs and use cases.

#### **NloVe :**

Thanks to the common partners in the H2020 project NloVe (CERTH, NAVYA, UniGE, TPG) which targets the cybersecurity for IoT vehicles, we are able to exchange important information in IoT cybersecurity, use of IoT devices and technical issues and identify the implications for public transportation services in AVENUE.

The NloVe project is using data from the Autonomous vehicles from the AVENUE Meyrin and Belle-idee sites regarding the routes followed, speed, breaking, GPS and 4G signal quality, in order to evaluate site conditions and their impact to the safety and security of the Vehicle IT systems. Furthermore, the AVENUE project, for the validation of the in-vehicle services, will install on-board computer in the some of the Belle-Idee vehicles. We plan to connect to this on-board computer a small set of devices for the NloVe project needs, like the V2X communications with the SafeStrip (collecting information on road humidity, etc), V2X communication with traffic lights (to be noted that there are no traffic lights in the Belle-Idee site, so we NloVe will install temporary traffic lights visible only to the mini-buses, since no authorization can be given for real traffic lights).

#### **LIV.IN**

LIV.IN is a project that aims to co-create more responsible approaches to innovation in the areas of smart home and smart health that tackle societal challenges and respond to pressing societal trends. The LIV.IN project test site at Seestadt Aspern, is of high interest for the AVENUE project regarding the smart home (and in extension smart city) infrastructure which is addressing the issues of special needs citizens.

Uniquely, and for the first time, the initiative involves industry leaders that engage with lead users in co-creation processes to create solutions that meet user needs and leverage collective creativity to uncover new business opportunities. Smart mobility for all citizens has been identified, in LIV.IN, as one of the major topics.

Siemens (partner in LIV.IN and AVENUE) has set up a co-creation Lab for identifying user mobility needs and for co-creating solutions for persons with reduced mobility, especially older persons and people with a wide range of disabilities. In this framework, Siemens conducted a series of physical and virtual workshops with interested persons identifying:

- functional requirements for an accessible mobility application and
- relevant (accessibility) information and assistive mobility services

for supporting their mobility.

For co-creating successfully with PRMs, special co-creation methods and tools have been adapted to the special needs of the participants. Results of this workshops were fed into AVENUE WP2 and WP4 as well as into a master thesis at the University of Paderborn. The result of the master thesis was presented in AVENUE as a possible solution to support PRMs in a driverless situation. The outcome of the LIV\_IN workshops has been transferred to a standardisation committee for the preparation of a respective norm at the DIN NA063-06-04 "Assistive Technologies" standardisation committee.

Because the LIV\_IN Project leader is the Business University in Vienna, closely located to Vienna Seestadt, we had the kind opportunity of a joined intensive evaluation of the auto.Bus - Seestadt project while getting regular updates from students afterwards.

### **Stimulate**

Is a national project (Germany) for City-compatible mobility using automated minibuses. The aim of the Stimulate project is to test fields of use and the acceptance of autonomous driving in a realistic environment, to discover potential for improvement and to make a contribution to climate and environmental protection. From November 2017, the first autonomous small bus was deployed in the Virchow Clinic. The Charité Hospital locations with their 268,207 m<sup>2</sup> and 137,964 m<sup>2</sup> each have a moderately large test area and offer an ideal test area with their various user streams such as passers-by, passenger cars, delivery vehicles and bicycles. During the pilot project, a total of four autonomous, intelligent electric vehicles was used. Siemens collaborated with the Stimulate project, in the definition of the projects objectives, and the identification of common goals and overlaps.

Furthermore Siemens participate in the organization of and conducting user tests with the ABSV Berlin (together with BVG and Easymile). The site was a potential replicator site for AVENUE.

### **FABULOS:**

Having established contact with the FABULOS project we organised a webinar where we presented the Open Call for replicator and invited the FABULOS partner sites to participate, after explained the targets of AVENUE and the requirements for the replicator sites. However, first due to the procurement process which taking very long, none of the sites were able to confirm if and when they will be able to identify the number of vehicles and the exact site they plan to operate (Finally only Trikala submitted an application for a replicator site, but it was not retained due to lack of precise operation site).

The established contact with ERTICO allowed us to network and present the AVENUE targets to the different events organised (ex. ITS 2019) where we participated.

### **MOMENTUM**

The goal of MOMENTUM is to develop a set of new data analysis methods, transport models and planning support tools to capture the impact of these new transport options on the urban mobility ecosystem, in order to support cities in the task of designing the right policy mix to exploit the full potential of these emerging mobility solutions.

CERTH as a common partner presented the AVENUE test sites as use-cases where MOMENTUM is able to draw information on the needs and operation of Autonomous vehicles. On the other hand, via CERTH, the first results of MOMENTUM for data models and transport models were presented to the partners and taken into account for the AVENUE services.

#### **TRUSTVEHICLE**

VIF brought in the contact and information exchange with the H2020 TRUSTVEHICLE (which they coordinate), where issues of safety and security, of interest to AVENUE, are exchanged. VIF also brought in the contact and cooperation with the ECSEL projects AUTODRIVE, PRYSTINE and NEWCONTROL, all concentrating on different security and safety of components and operations for automated vehicles.

Finally VIF, with its participation in the Austrian test ground Alp.Lab ALP.Lab, a sophisticated testing environment for testing and verifying the components and systems of automated driving in diverse and complex scenario, brings in AVENUE important information for safety evaluation of the autonomous shuttles.

#### **ECOSMILE:**

Contact was also established with the Interreg project ECOSMILE, which investigate trans-border AVs shuttle services, at the Archamps site (at the French site of the Geneva borders) where an Easymile shuttle operates since 2020. Bestmile is the partner at ECOSMILE providing the fleet management with their driverApp. We have participated in and presented the AVENUE project in different meeting and events organised by ECOSMILE at the Archamps site, and we have exchanged information on service requirements, legal issues, barriers etc. The trans border barriers faced by ECOSMILE were communicated to the AVENUE project.

#### **TERMINAL**

Sales-Lentz also collaborated with the TERMINAL Interreg project, that targets the deployment of Automated electric minibuses in international commuter traffic, between 3 countries : Germany, France and Luxembourg. Data from the Pfaffenthal site are exchanged with the TERMINAL project, as well as information on issues, barriers and regulatory framework,

#### **BVG site in Berlin,**

Furthermore Siemens, via their Siemens Berlin office, established collaboration with the BVG site in Berlin, where they operate until the end of 2019 autonomous shuttle services. (And which we invited to join as replicator site, but the requirements set by AVENUE were beyond the anticipated services of BVG).

#### **Ride4All**

Siemens established contact and collaboration with the the Ride4All project, where an EasyMile mini-bus will be integrated into the regular operation of the existing public transport system of Regionalverkehr Ruhr-Lippe GmbH (RLG) and its transport partners. The target of the project is to develop inclusive use (use by everyone) of autonomously driving buses. With the aspects of barrier-free operation and use, the "Design for All" in particular is being developed, conceptualized and evaluated. In detail, the aim is to clarify several key questions, among others, How can I access and operate an autonomously driving bus? Where do I get on? , How do I know if the bus is going to my destination stop? What assistance do I have during the journey in the event of an emergency? The questions

become even more important for persons with special needs. In this domain we collaboration is established exchanging ideas and solutions with the AVENUE operators.

**HUBCHAIN :**

Siemens established contacts with the HUBCHAIN project in Osnabrück, started operating in 2020 autonomous vehicle services using one Easymile shuttle for an on-demand service at a 1.1 Km circuit. Similarly contacts were established with the city of Mainz, where a test site started in 2020 (after a 20 days test in a 800m line in August 2019 with one Navya shuttle) and the with the region of Soest where a trial was made in February 2020. With all these sites Siemens exchanged information and experience from AVENUE, and we investigated if they would be interested (and if they have a strategic plan) to join AVENUE as replicator sites (but none was up to the requirements asked for the AVENUE replicator sites).

**HEAT**

HEAT, the Hamburg Electric Autonomous Transportation, is a research and development project in which HOCHBAHN, together with other partners (including Siemens), is running a trial of the first driverless minibus service in Hamburg public transport.

Siemens has established collaboration with the HEAT project Exchange of the different targets of the project Heat has a more technical focus including intelligent environment (CAR2X) and does not have a real user focus including user services as the AVENUE. A meeting and a test of the AV had to be cancelled due to COVID.

## 2.2 Collaboration with Industry

**Toyota Europe**

A first company that contacted us (the project coordinator) was Toyota Europe, in summer 2018, in order to investigate possible cooperation for the forthcoming Tokyo Olympic Games and the idea to use autonomous shuttles for the athletes and visitors.

**Easymile**

A second company we contacted was Easymile, the second major constructor of Autonomous Shuttles in Europe, in view, first exchange ideas and issues, and then investigate the possibilities to integrate one of their sites as a replicator site in AVENUE. However, in spite many discussions there was finally no common ground for stronger collaboration. Regarding the replicator sites, none of the sites operated by Easymile was advanced enough to be integrated as replicator site (no site had more than 2 vehicles and none had any plans to deploy on-demand, door-to-door services).

**OSR Enterprises AG**

Following the GIMS 2019 in Geneva, we established contact with OSR Enterprises AG, a Swiss company specialising in platforms for next generation mobility, interested to evaluate if their AI platform can be used in the AVENUE project, where we have identified the need for a 3<sup>rd</sup> computer for the services.

**AKKA technologies**

We established also a good collaboration with AKKA technologies, to the AKKA Academy in Geneva, where we collaborated in setting the Sustainable Mobility Hackthon in June 2019. Furthermore, the AVENUE advances were presented in the AKKA Academy.

**PSA Autonomous vehicle group**

CentralSupelec established collaboration with the PSA Autonomous vehicle group, where common presentations and exchange of issues are taking place in a regular basis.

## 2.3 Other initiatives

Apart the above described collaborations, the project partners we have also established close collaboration with different initiatives and stakeholders related to mobility and autonomous vehicles.

**NAVYA** representing the AVENUE project in different events (ex. the 4<sup>th</sup> High Level Meeting in Vienna) established connections across different key stake holders (European governments working on AV, European commission related teams), where they presented the AVENUE project and targets and investigated possible future collaborations.

**Sales-Lentz**, via their participation in the 4<sup>th</sup> VDV Future Congress Autonomous Driving within Public Transport the established several connections (manufacturers, policy makers, stakeholders,...) allowing then to, from one side promote the project, and from the other side receive feedback and input regarding needs, and legal and regulatory issues.

The project coordinator (**UNIGE**) is active member of the Nomads Foundation Mobility Hub, lead by ABB in Geneva, where several mobility actors in Switzerland and France participate, with target the creation of events and initiate contacts and projects in new models of transportation.

The project coordinator is also active participant of the Shift AUTOMOTIVE Forum (a partnership with IFA, Messe Berlin and Palexpo and is supported by the International Telecommunication Union (ITU)), organizing events in on future mobility in different international exhibitions.

In addition the project coordinator is vice-chair of the ITU Focus Group on Vehicular Multimedia, established to identify the need for new vehicular multimedia standards based on space and terrestrial networks integration. The group will make a proposal for a new standard for Vehicle Multimedia.

**Siemens** has also established a strong collaboration with associations of PRM e.g. expert group on environment, traffic and mobility of the associations for the blind and visually impaired. This collaboration allows us to recruit PRM who can validate the proposed project solutions, and also provide us needs and requirements for special needs passengers.

Furthermore, strong with the experience gained in the AVENUE project, SIEMES was invited by the City Council of Mainz to act as consultant on the acquisition of autonomous buses for the last mile including PRMs (EMMA).

An adhoc non-formal cooperation was setup in Paderborn between the public Transport company "Padersprinter" the University of Paderborn, Siemens, two local technology partners and the local association of blind and low vision people. The background of this project is that all about 100 city busses are equipped with Bluetooth providing real-time info on the vehicle like Bus number, direction etc and allowing to request services like kneeling bus, acoustic door finding signal etc. Moreover some acoustic traffic light in Paderborn are equipped with Bluetooth to request pilot signal and acoustic signal for the green light.

Two apps were tested by blind passengers. Interestingly these tests simulated driverless vehicles to some extent in the early corona time, because the bus driver was not addressable for any help (closed first door). Blind persons were completely dependent on the information provided by the mobility apps. We got very helpful feedback for designing mobility apps for persons with reduced mobility.

The test field results were used in AVENUE WP 2 and WP 4 and considered in DIN 13278.

Because Siemens is an active member of the DIN standardisation committee NA063-06-04 "Assistive Technologies" we took the opportunity to transfer the LIV\_IN workshop results on smart mobility to this group. We spent a lot of effort on transposing the input to a norm which is going to be published as German Norm DIN 13278 "Smart Mobility for persons with reduced mobility - functional approaches" in summer 2021. An english translation is planned.

As a leader of operating autonomous shuttles worldwide, the **Keolis** group (Keolis Lyon being subsidiary) has deployed more than 40 different projects in 10 different countries including Navya and EasyMile autonomous vehicles. The Keolis Lyon experience within AVENUE is then shared with all the stakeholders involved in the other projects as well.

As a leader of the autonomous vehicle manufacturers Navya has build and deployed more than 12à autonomous shuttles worldwide. This vast experience is shared in the project, bringing valuable information on issues and solutions, from the other Keolis sites.

## 3 Advisory Board Contributions

The advisory board was stabilised with 4 very active members:

Prof. Huei Peng	University of Michigan - MCity project director; Autonomous vehicle deployment under DOT, USA funding
Mr. Arthur van der Wees	Arthur's Legal B.V. - Policy and legal issue related to IT; leading the horizontal topics on trust, data, processing, protection, security, accountability and other strategic, ethical and legal topics for the 5 H2020 Large Scale Pilots
Mr. Benno Nager :	Swiss Federal Roads Office Coordinator in charge Automated driving trials in Switzerland Legal expert in traffic technology / ITS innovations project manager
Mr. Sascha Ott :	Managing Director IPEK @KIT, Karlsruher Institute of Technology Business development.

Each of the members of the Advisory board made important contributions to the project and from the day they accepted the appointment, they were present to all General meetings (taking place online since May 2020).

Mr. Arthur van der Wees, being a cyber-legal expert, provides us clarifications and insides on issues related to data ownership, usage and protection, GDPR restrictions, European legal and regulatory issues, commenting on issues that should be faced in the implementation of services, and commented on the pertinence of proposed transport and passenger services. Mr van der Wees has also direct contacts with project members, especially for the WP9 recommendations work on legal issues.

Prof. Peng, as director of the MCity project, provide valuable input on the issues and solutions they gave in facing similar problems as in AVENUE (like collection of video for the evaluation of passenger



behavior) provided technical, legal and regulatory information regarding the United States. He made many comments in the General meeting regarding services, transport issues and why some vehicle data cannot be extracted from the vehicle. Prof Peng has also provide us access to the data collected in the MCity project and facilitated the establishment of a Twinning with MCity.

Mr Benno Nager joined the Advisory board in fall 2019. He is a key person for the smooth deployment of the Swiss site at Belle-Idee, providing advice and helping cutting “red-tape” at the Swiss Federal Roads Authorities for the realization of the on-demand deployment services. He has regular discussions with the TPG and has strongly promoting the AVENUE project in the Swiss federal authorities as well as in international forum he participates, as an example of the future mobility solutions.

Mr. Sascha Ott, joined the Advisory board in December 2019 and has provided valuable input and advice in the General meetings on questions of drive issues and road behavior and methodologies’ suggestions for economic and business analysis. Mr. Ott has regular contact and collaborated with HSPF in WP8 related questions.

## 4 Future work

In the next and last period of the project, we plan to promote the results and systems developed, and collaborate with projects and companies in view of a possible up-take for a commercial level deployment.

One of the key results of the project being the recommendations of WP9, we will collaborate with other projects and organizations, with target, from one side, to validate the soundness of the proposed recommendations, and from the side adapt the recommendations from experience developed from other projects and initiatives.

We also target, when possible to help other sites to deploy on-demand services, using parts or the complete AVENUE platform.