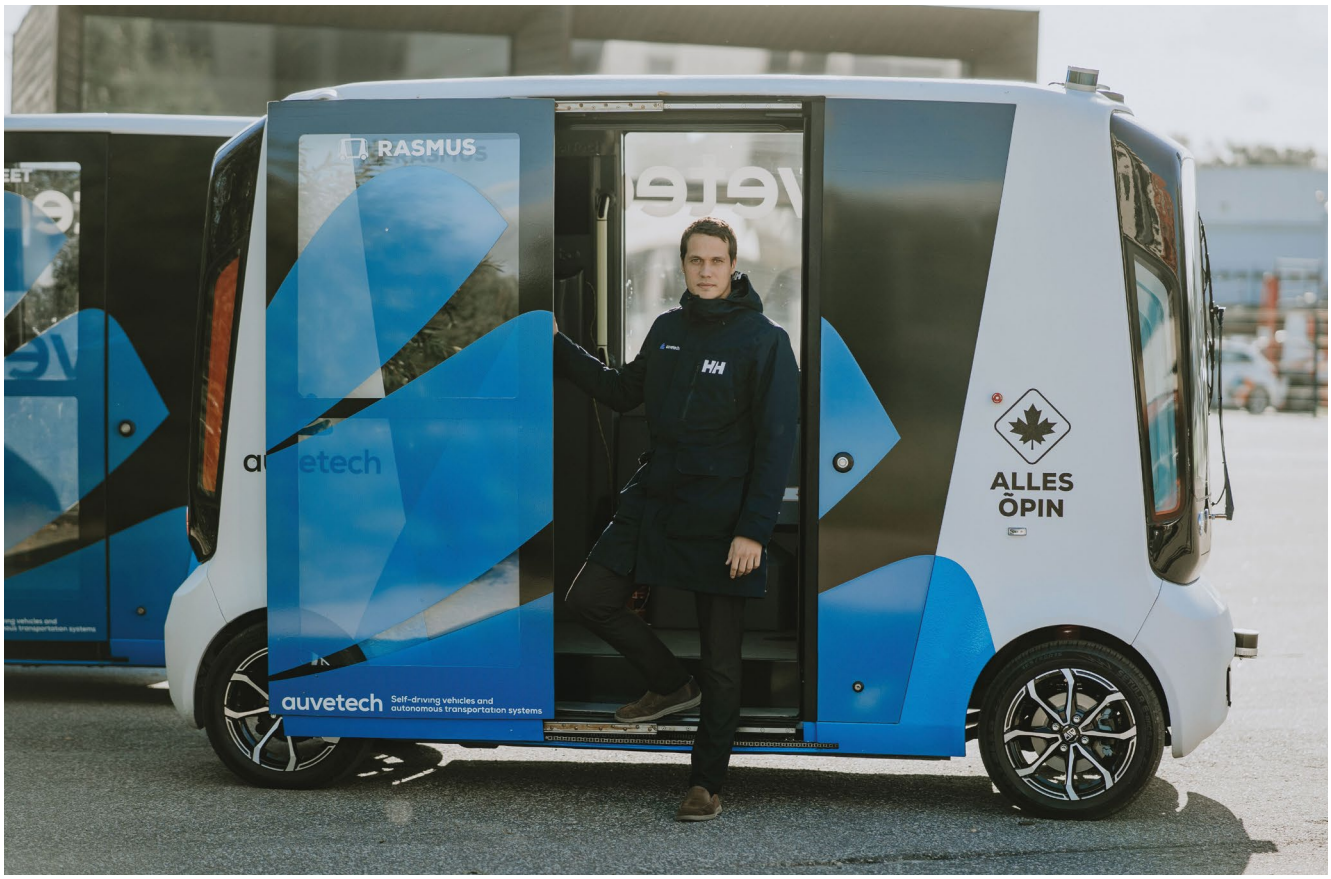

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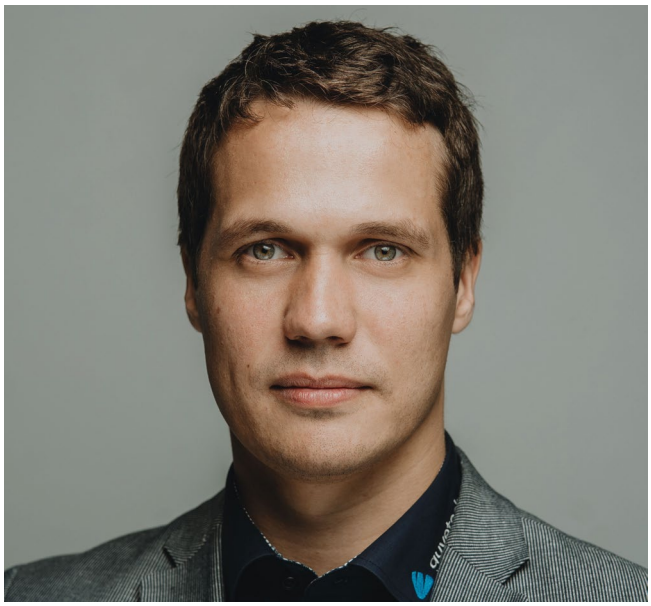
"We take responsibility for the first and the last mile"

Auve Tech, a company founded in 2019 in the Estonian capital Tallinn, develops and manufactures self-driving shuttle vehicles. In this interview with ATZ, Johannes Mossov, a member of the firm's management board, explains how the company came into being and describes the obstacles that it had to overcome before starting production.

ATZ _ Johannes Mossov, your company was only established in 2019 and yet it has already developed the MiCa autonomous vehicle. How did this come about?
MOSSOV _ The founder of Auve Tech, Väino Kaldoja, had the idea of developing a self-driving vehicle to celebrate the 100th anniversary of Tallinn University of Technology. It began as a small-scale project with a team of specialists who produced the first prototype of an autonomous vehicle. This shuttle had such great potential that it led to Auve Tech being founded shortly afterwards. Since then we have been continuously working not only on improving our vehicles but also on becoming a leading player in the field of autonomous mobility. We are constantly growing and developing and we launched the new generation of the MiCa self-driving shuttle in 2022.

Which challenges in particular did you have to overcome during its development?
During the development of the MiCa, the transition from the first generation to the

Johannes Mossov, M. Sc., (born in 1993) has been a member of the management board of Auve Tech, an Estonian company that develops, manufactures and operates autonomous shuttles, since January 2019. Before this, he worked for almost three years as a project manager at AS Silberauto Eesti. Mossov has extensive engineering knowledge and has been involved in the development of specialist vehicles, such as police cars and ambulances, and of autonomous vehicles. Mossov holds a bachelor's degree in product development and manufacturing and a master's in mechanical engineering from Tallinn University of Technology.



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second represented a major challenge. One of the most significant obstacles was to improve the autonomous driving capabilities of the new model to give better performance, safety and reliability in comparison with its predecessor. We achieved this on the basis of the feedback we received about our slightly smaller Iseauto model, which has a less powerful motor.

What are the technical specifications of the MiCa?
The MiCa is the new generation of autonomous vehicles in our fleet. It is the result of all the knowledge and experience that we have acquired during the course of real-life projects. We have increased safety levels by improving the sensors, but also by installing redundant critical systems, increasing the vehicle's cybersecurity and incorporating the flexibility needed to enable us to produce both left-hand-drive and right-hand-drive models. The MiCa can carry eight passengers and is powered by electricity which makes it an environmentally friendly transport solution. It is 4.2 m long, 1.85 m wide and 2.5 m high and offers an ideal balance between compact maneuverability and a comfortable, spacious interior. Its advanced camera system consists of ten exterior and two interior cameras which give a full 360° view of its surroundings. The MiCa is also equipped with seven lidars that allow for accurate detection of objects and precise navigation in a variety of environments and offer passengers a smooth, safe ride.

Which obstacles did you have to overcome during the implementation process, for example in relation to legal considerations and approval regulations?
In the case of autonomous vehicles, every market is different. For example, the approval processes for vehicles vary considerably. Fortunately, we had extensive experience that we had acquired from the previous generation of vehicles, which was a major help with the development and approval processes for the new model. In the new markets where we launched the new generation of shuttles we also had supportive partners who helped us with the process.

Did you make contact in the early stages with other manufacturers of autonomous shuttles, so that you could benefit from their experience?
Although we were not in direct contact with other companies that produce autonomous vehicles, we actively monitor the news and the trends in the industry so that we can keep up to date with the latest advances and innovations in the field of autonomous transport. We focus on making use of our own expertise and on continuously improving our technologies. This enables us to meet the changing requirements of our customers and of the market.

Which routes does the MiCa operate on? Which maps does it use? Which algorithms are needed? And which sensors (cameras, lidars, radars) provide the best data for trajectory decision-making in practical tests?
Our MiCa shuttles are being used in a variety of projects all over Japan. They are helping to develop autonomous transport solutions in urban environments. The projects involve a range of different routes from inner-city streets to districts in the suburbs. They have also been strategically designed to overcome specific mobility challenges and to improve the entire transport infrastructure. We use a combination of sensor technologies to guarantee that the vehicle has a reliable picture of its surroundings. These include lidars, but also other sensors, such as cameras and

"In the case of autonomous vehicles, every market is different"

radars. Lidars are the sensors of choice for low-speed vehicles that usually operate in close proximity to pedestrians, cyclists and street furniture in city centers. These systems provide accurate distance measurements and detailed 3-D point clouds that allow objects to be detected and tracked with precision even if they are only a short distance away. In addition, a vector map is created that shows the vehicle where it can move to and where other traffic could go. And, of course, the other sensors provide supplementary information about the vehicle's surroundings. If a sensor fails or reaches its limits under specific conditions, the other sensors can compensate for this and ensure that the vehicle's perception of its environment is reliable. This is why our vehicles are always equipped with a variety of different types of sensors.

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"We believe that remote operation will be essential for autonomous vehicles," says Mossov

How are the vehicles currently operating in practice? Are there still support staff on board?

Because of current legislation and regulations, we still have safety staff on board our vehicles. As rapid progress is being made with the technology for autonomous transport in particular, we are in a situation where the technical possibilities are outstripping the road traffic laws and regulations. Although our goal is ultimately to move to fully autonomous operation with no safety staff on board, we first have to find our way around in the regulatory environment and work closely with supervisory authorities. This allows us to ensure that our autonomous vehicles comply with the necessary safety standards and conformity requirements.

Are you planning to introduce teleoperation?

We believe that remote operation will be essential for autonomous vehicles. This applies in particular in borderline cases where it is necessary to give a command or to take control of the vehicle when the system requires this to happen. Auve Tech has equipped its vehicles with teleoperation systems since 2021.

What does the cost-benefit ratio look like at the moment?

Our autonomous shuttles currently involve a higher initial investment than conventional vehicles. But we can demonstrate that the total costs of our service with a fleet of five vehicles managed by one remote operator are lower than those of ordinary shuttles. As things currently stand, our key added value lies in the shortage of bus drivers. Another factor in our favor is the rapidly growing public acceptance of autonomous vehicles. People are increasingly willing to travel in them.

"We can fill the gap in public transport provision"

Which other areas could the shuttle be used in? And what is your view of its future development in general terms?

Our objective is to complement the existing public transport system. We take responsibility for the first and the last mile from a bus or tram stop or a rail station to the front doors of businesses and private homes with the aim of reducing the number of journeys by private car. Our shuttles have already demonstrated in many different districts and countries that they are able to overcome real challenges. We can fill the gap in public transport provision by providing a more attractive and sustainable means of transport for the daily commute. We can help people to become less dependent on their cars and, at the same time, cut the cost of transport over the last mile by reducing the number of working hours needed. Autonomous technologies exclude the possibility of human errors and guarantee a safer transport culture. Our solution allows for the fact that nowadays people are too busy to concentrate on the traffic on the road for hours at a time. The option of using public transport and autonomous vehicles could enable them to avoid wasting this time and to use it to do something much more productive. This would also help to reduce the alarming number of road accidents, which are largely caused by human error and a lack of concentration on the part of drivers.

Johannes Mossov, thank you very much for this interesting conversation.

INTERVIEW: Frank Jung

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