WHITE PAPER 2

VAMOS AUTONOMOUS MOBILITY IN SMART SPACES

Automated Last Mile Mobility Solutions: How driving automation can solve the last mile challenge

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REMOTED

INTRODUCTION

Traditional public transportation is well suited for efficiently moving large numbers of people, with a single driver operating a vehicle capable of carrying dozens or even hundreds of passengers. However, these high-capacity vehicles cannot provide the door-to-door service like private transportation, often making them a less attractive alternative for individual travelers.

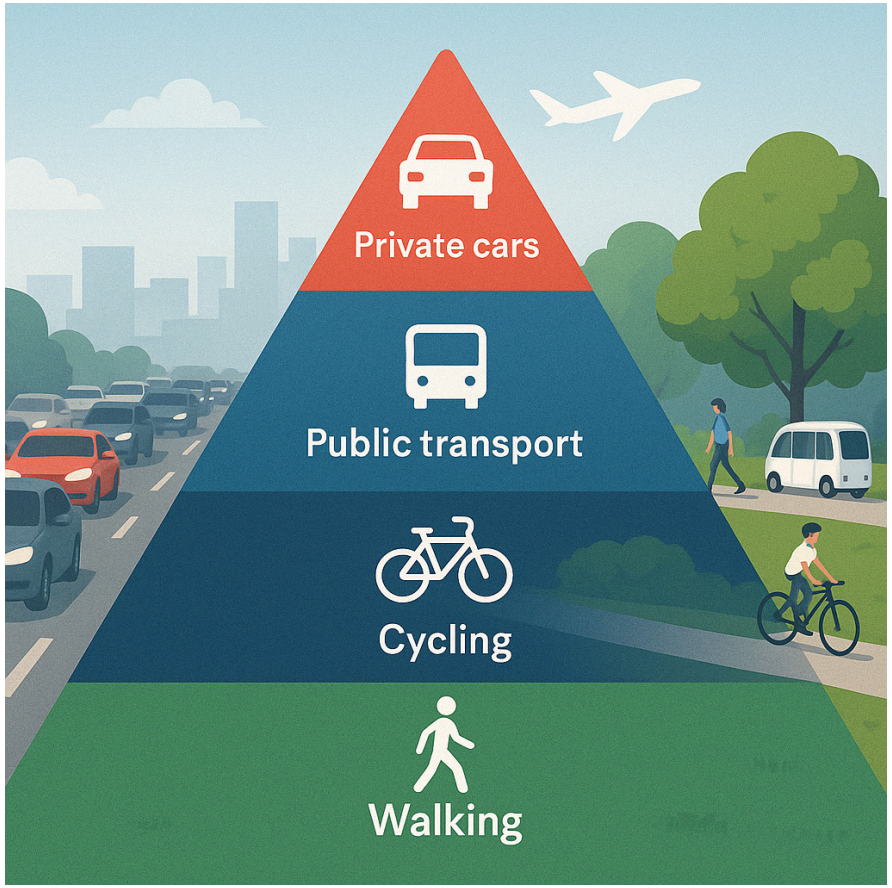
One proposal for solving this so-called last-mile need is to deploy smaller traditional vehicles, such as minibuses, as feeder traffic to the high-capacity trunk lines. However, having one driver to transport the limited capacity needed for the last mile service is often not economically feasible.

This paper discusses a proposed solution that involves deploying small automated vehicles on last-mile routes to enhance the accessibility of public transportation while keeping service costs under control. The key advantage of automated vehicles is that they eliminate the largest single cost component, ie. the driver, and replace it with software that automates the driving task.

Challenge: How to get people to replace their privately owned vehicles and shift to public transportation?

Our planet cannot sustain the level of pollution generated by the current transportation system. Transitioning from fossil fuels to renewable energy sources in vehicles is a positive step, but it is not sufficient. The production of new vehicles, especially those requiring batteries for electric propulsion, consumes vast resources and contributes to pollution. Additionally, cities have become increasingly congested as private vehicles occupy more and more public space.

To address mobility challenges, especially in cities, the reliance on private vehicles must be reduced and replaced with more sustainable modes of transportation. According to the widely recognized Mobility Pyramid, walking should be the primary mode of transport, followed by cycling and micromobility, as these options are both environmentally friendly and beneficial to public health.



Challenge: How to get people to replace their privately owned vehicles and shift to public transportation?

For longer distances or when these modes are not feasible, public transportation is the preferred alternative, followed by shared car services such as taxis and ride-sharing. Privately owned cars and air travel should be used the least, as they contribute the most to pollution.

The main challenge in encouraging people to shift from private cars to public transportation, especially in suburban areas, is often the added inconvenience and extended commuting times. Public transport services may be too far away or operate at frequencies that do not meet passengers' needs. These limitations result from the high cost of running smaller-capacity vehicles, which could otherwise improve service proximity and frequency.

Solution: Solving the last-mile mobility challenge with automated vehicles

If the primary obstacle to financially sustainable and efficient last-mile services is the cost of the bus driver, the logical solution is to eliminate the need for one; this is where automated driving comes into play.

For typical last-mile routes with short distances and high-frequency demands, automated vehicles provide an effective solution. Automation not only saves costs by replacing the driver but also enhances service safety by eliminating human error. To ensure both safety and a seamless passenger experience, the vehicles are monitored and supported by a Remote Control Center. Passengers can easily reach a remote supervisor via integrated communication systems if they need assistance or have any concerns.

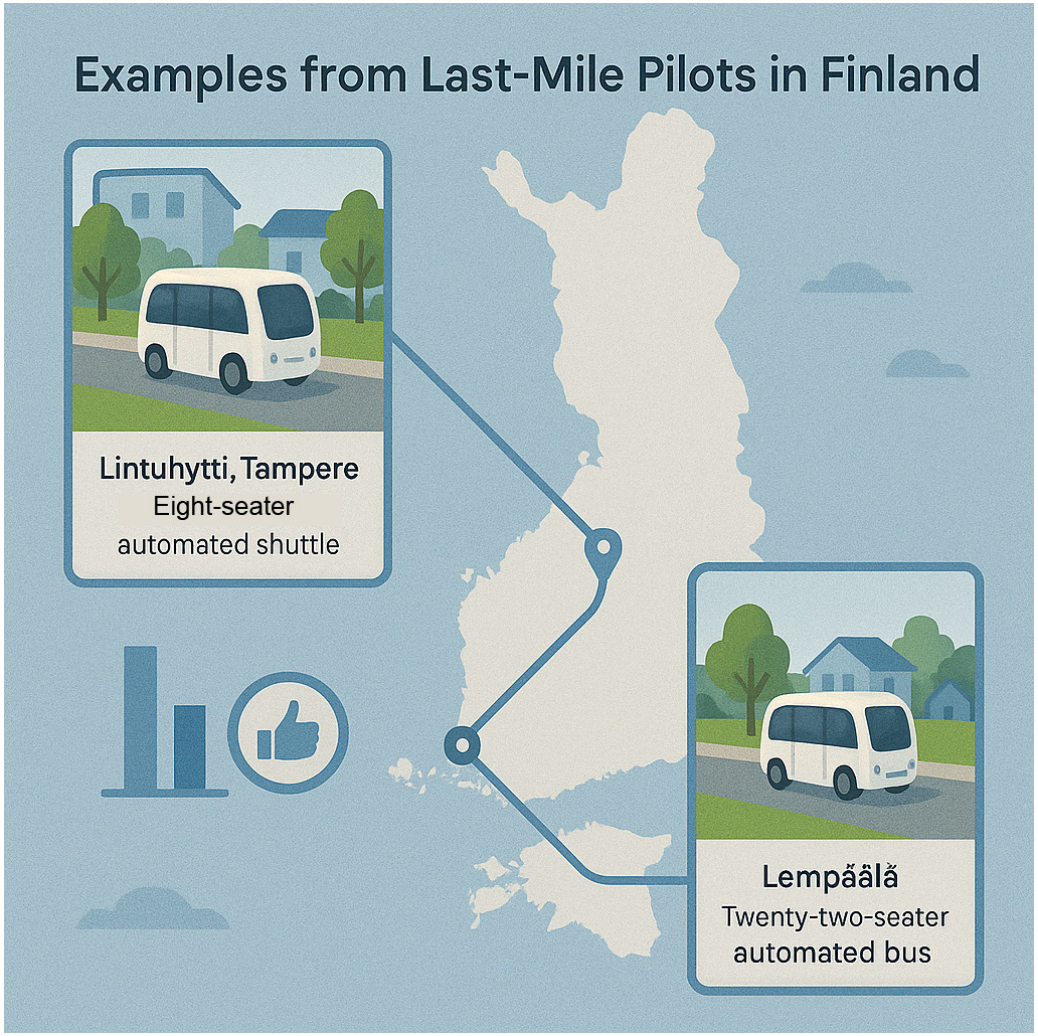
Solution: Solving the last-mile mobility challenge with automated vehicles

Although automated vehicles are somewhat more expensive than their traditional counterparts due to added technology, cost savings can be achieved with a fleet of just four or more units. Depending on operational conditions, a four-vehicle fleet can reduce the number of active personnel per shift from four to two. As one remote supervisor can oversee up to 10 vehicles simultaneously, scaling the fleet further decreases personnel requirements, enhancing efficiency and cost-effectiveness.

The vehicles are fully electric and programmed for energy-efficient driving, including regenerative braking to recover energy while slowing down, making them even more environmentally friendly than human-driven equivalents. Additionally, as many automated vehicles lack a driver's seat and related controls, their passenger compartments can be designed with a more open and accessible layout, enhancing accessibility for individuals with special needs.

Examples from Last-Mile Pilots in Finland

In Finland, REMOTED has run several successful automated vehicle pilots in various cities. Examples of last mile solutions include Lintuhytti, Tampere and the Municipality of Lempäälä. In the Lintuhytti residential area, home to 1,000 residents and popular among families with children, feeder transport was needed to connect to the Hervantajärvi tram stop, just over a kilometer away. The chosen solution was REMOTED's eight-seater automated shuttle. The route's operation began in 2023 and ended in September 2024 as part of the EU's SHOW project. The route was operated for six months each year in collaboration with REMOTED and Tampere Region Public Transport, Nysse. Over 900 passengers per month used the service.



Examples from Last-Mile Pilots in Finland

Another example is from Lempäälä, where feeder traffic complemented the main line network. Finland's first large 22-seater automated bus began operating in Lempäälä in May 2024 as part of public transport. The service was jointly implemented by the Municipality of Lempäälä, Nysse, and REMOTED, aiming to gather experience with the automated bus as a tool for reducing headways and improving service levels. The automated bus operated between Lempäälä's town center and Haurala residential area.

Based on the passenger survey results, most of the respondents expressed their satisfaction with the automated transportation pilot. The most common suggestions for improvement were related to the bus schedule and route. Feedback included proposals for longer operating hours in the evenings and on weekends, route expansions to different areas, and more frequent service intervals.

Examples from Last-Mile Pilots in Finland

The survey responses revealed that the age range of passengers who traveled on the automated bus was very broad. The majority of respondents were adults of various ages. The bus was most commonly used for errands, trips as part of a travel chain, and leisure activities. Before the pilot started, some concerns or rather prejudices were raised among residents but during the pilot, they quickly faded away. As a summary, citizens from different age groups are ready to use the automated bus service.

Recommendations to Decicion-makers, PTAs and PTOs

One approach to deploying automated buses is to establish a strategy and engage in discussions with various industry stakeholders. Collaboration and dialogue between the public and private sectors are essential to ensure that all key aspects, such as legislation, permits, necessary infrastructure changes, consumer behavior analysis, procurement process, and cost-benefit modeling, are properly considered. However, the most effective approach often involves rapid experimentation in the spirit of agile development. The technology is already mature enough to support reliable operation, and pilot projects provide an excellent opportunity to fine-tune the service for specific use cases. This iterative approach enables rapid learning, allowing practical insights to be implemented quickly and facilitating service scaling, ultimately unlocking the full benefits of automated mobility.

SUMMARY

Deploying automated buses for last-mile solutions can significantly reduce public transport costs, particularly personnel expenses. Beyond cost savings, automation can improve safety, accessibility, and service frequency. However, due to higher initial investments and the benefits of scalability, a single automated vehicle is not a financially viable alternative to traditional options.
Automated vehicles have already been successfully demonstrated in various locations across Finland and globally. The next step is to scale up the service and integrate it seamlessly into the broader transportation network.

The future of transportation is Shared, Electric and Automated!

SOURCES

https://www.aamulehti.fi/tampere/art-2000010431191.html
https://cities-today.com/transit-leaders-survey-reveals-strugg-les-with-workforce-ai/
https://www.kauppalehti.fi/uutiset/robottibussi-liikennoi-pian-ilman-turva-kuskia-tampereella-tallaista-vauhtia-se-voi-kulkea/e219236e-133d-4c53-8cf7-51c934f8bc13
https://www.lempaala.fi/tiedotteet/lempaalan-robottibussipilotti-sai-kayt-tajiltaan-kiitosta/
https://pedestrianspace.org/share-north-mobility-pyramid/
https://www.thedrive.com/guides-and-gear/how-many-cars-are-the-re-in-the-world#:~:text=That%20has%20resulted%20in%20a,be%20around%201.47%20billion%20vehicles
https://transport.ec.europa.eu/news-events/news/20400-lives-lost-eu-road-crashes-last-year-2024-10-10_en
https://buslinemag.com/PDFs/DriverShortageReport2023Passenger.pdf
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