



Are automated vehicles really a killer use case for 5G?

Automated vehicles are often touted as the killer use case for accelerating the deployment of private 5G networks. However, most automated vehicles available to buy and deploy do not require 5G connectivity. STL Partners spoke to leading automated vehicle manufacturers to find out more about their connectivity needs.

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Automated vehicles are often touted as a “killer” 5G use case

Telecoms operators are actively exploring the potential for private 5G networks as a means of providing dedicated secure connectivity to enterprises catered to enabling enhanced industrial automation and mission-critical applications. By offering tailored solutions, telcos are looking to tap into new revenue streams but to do this successfully, it involves building a viable business case for each technology and proving the value to the end customer. The automated vehicle use case is often discussed as a “key” or “killer” use case for private 5G adoption, especially in campus environments such as a factories, warehouses or ports.

Automated vehicles include Automated Guided Vehicles (AGVs) and Autonomous Mobile Robots (AMRs). When discussed as a key use case for private 5G networks, people are often referring to AMRs. Before outlining why autonomous vehicles may or may not be a killer use case for 5G adoption, it is useful to consider what exactly we mean by an “autonomous vehicle” whether an AGV or AMR.

Automated Guided Vehicles

Automated guided vehicles are vehicles used for the handling and transportation of materials across sites, this could include medical equipment or supplies in a hospital environment or raw materials in a manufacturing plant. Typically, AGVs navigate via fixed magnetic tape or wires embedded in the floor. They are designed to execute more repetitive, predefined routes. As such, AGV systems do not rely on real-time data exchange or require high bandwidth communication that 5G offers for navigation. Given they operate independently using these pre-programmed routes and simple commands, the systems can perform relatively efficiently even with connectivity issues (e.g. with Wi-Fi).

When referring to autonomous vehicles as a key use case for 5G connectivity, people are not typically referring to AGVs that follow a fixed tape as described here, although the term “AGV” is sometimes used as a shorthand for all autonomous vehicles. Instead, people typically mean AMRs when they refer to the type of autonomous vehicle use case that will help to drive adoption for private 5G networks.

Autonomous Mobile Robots

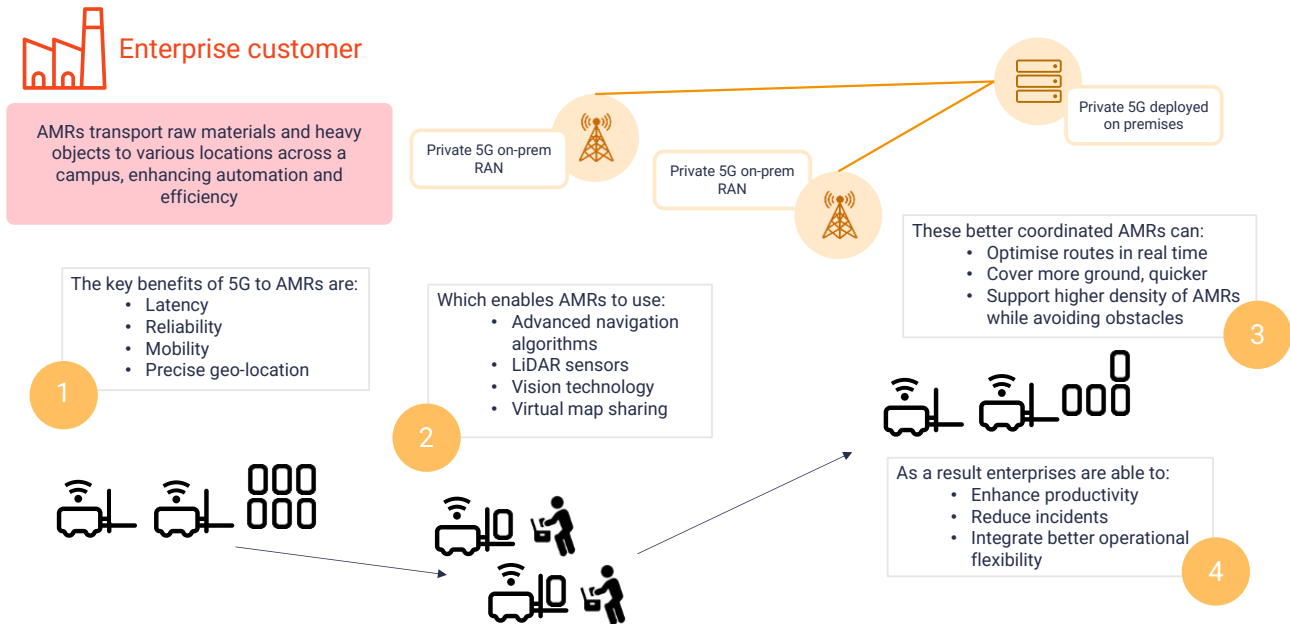
Autonomous mobile robots operate in a similar fashion to AGVs in that they transport materials around operational sites. However, they use more sophisticated software and compute to map the sites they navigate in, they communicate with other AMRs and they move freely without use of a track. The benefit of AMRs is that they provide much greater flexibility, adaptability, and scalability for the end-customer, making them well-suited for dynamic environments where tasks and layouts may change frequently. This is increasingly the case for many manufacturers for example given the increasing customer demand for customisation.

In comparison to AGVs, AMRs leverage much more advanced sensors and mapping technology to navigate autonomously. They can even interact with one another through virtual map sharing between vehicles and coordinate high speed movements with one another. As a result, 5G can help in several ways:

- 5G’s faster data transfer speeds and lower latency enables greater real-time data exchange between AMRs and central control systems allowing them and the central control system to react faster and respond much more quickly to changing situations.
- The high bandwidth also enables some of the more advanced features of AMRs like simultaneous localisation and mapping (SLAM) or advanced object recognition (some AMRs are even equipped with computer vision with real-time AI/ML for this). This leads to better navigation, obstacle avoidance and enhanced (and safer) interactions with other system and humans.

The relationship between advanced AMRs and 5G can viewed in Figure 1 below. It is these AMRs that are typically cited as a key use case for private 5G networks.

Figure 1: Autonomous mobile robots and 5G connectivity



Source: STL Partners

Most autonomous vehicles do not need 5G for optimal functionality

While AMRs as described in Figure 1 would need 5G connectivity for optimal performance, the reality is that in general AMR technology is not advanced enough to warrant the need of 5G and the adoption of AMRs is not yet widespread given the existing AGV systems in place. Typically, AMRs do not operate at the level of speed that requires them to send and receive data at the ultra low latencies offered by 5G. Nonetheless an autonomous vehicle running on a 5G network will still benefit from the ultra low latency, reliability, bandwidth, and mobility of 5G. However, these benefits are not needed for the vehicles to operate at maximal efficiency. Although the situation continues to improve, there are still some challenges regarding the availability and price of 5G modules, which can impact the scalability and implementation of AMRs coupled with private 5G networks.

STL Partners spoke to 10 companies who manufacture autonomous vehicles at the manufacturing trade fair Hannover Messe 2023 to understand more about the need and use of 5G for their autonomous vehicle products. Each of the companies we spoke to produce vehicles that navigate autonomously without the use of track to guide them, falling broadly into the category of an AMR rather than an AGV (with two exceptions – [Hito robotic system](#) and [Staubli](#) – both of which are AGVs following fixed lines).

Just one of the companies we spoke to produces vehicles designed to be used with 5G connectivity, that company was [SEW Eurodrive](#). The companies we spoke to can be seen in Figure 2.

Figure 2: Automated vehicle connectivity needs by manufacturer

Vehicle manufacturer	Primary form of connectivity	Description
	5G	A range of automated vehicles that move autonomously around an industrial environment for moving boxes, pallets, crates etc.
	Wi-Fi	- A range of automated vehicles that move autonomously around an industrial environment for moving boxes, pallets, crates etc. - Also produce autonomous vehicles for transporting people
	Wi-Fi	A range of automated vehicles that operate indoor or outdoor to facilitate use cases such as remote inspection, surveillance, person transport and transporting goods and objects
	Wi-Fi	A range of automated vehicles that includes jacking robots, smart forklifts and picking robots, to be deployed for transportation and task-based workloads
	Wi-Fi	A range of automated vehicles for stacking, towing and handling, e.g., smart forklifts
	Wi-Fi	Range of automated guided vehicles that follow a fixed line
	Wi-Fi or 4G	Produce an automated vehicle "shuttle" that can be used to haul loads across an industrial site
	4G	Produce an automated vehicle with a robotic arm for site inspection, packaging, transporting pallets, picking and placing and other industrial tasks
	Wi-Fi	Produce an automated vehicle for transporting materials, sorting items, picking and placing, inspection, and patrol.
	Industrial Ethernet	Produce an automated vehicle that transports payloads around a site following fixed lines and docks to fixed points where it connects to a fleet control software to send and receive data

Source: STL Partners

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