System-level Interoperability for Mobile Robots: Why and How?


FARobot

The Dilemma for Mobile Robot Players and End-Users

The mobile robot industry is challenged with providing innovative products without increasing costs. As a result, the playing field is now much more diverse in both regional players and the variety of robots than it was just 3 years ago.

Early mobile robot players who invested in this space in 2010 were not expecting such a rapid change. They are now faced with two choices:
1. expand their fleet variety at the expense of cost
2. open their ecosystem to 3rd party robot players
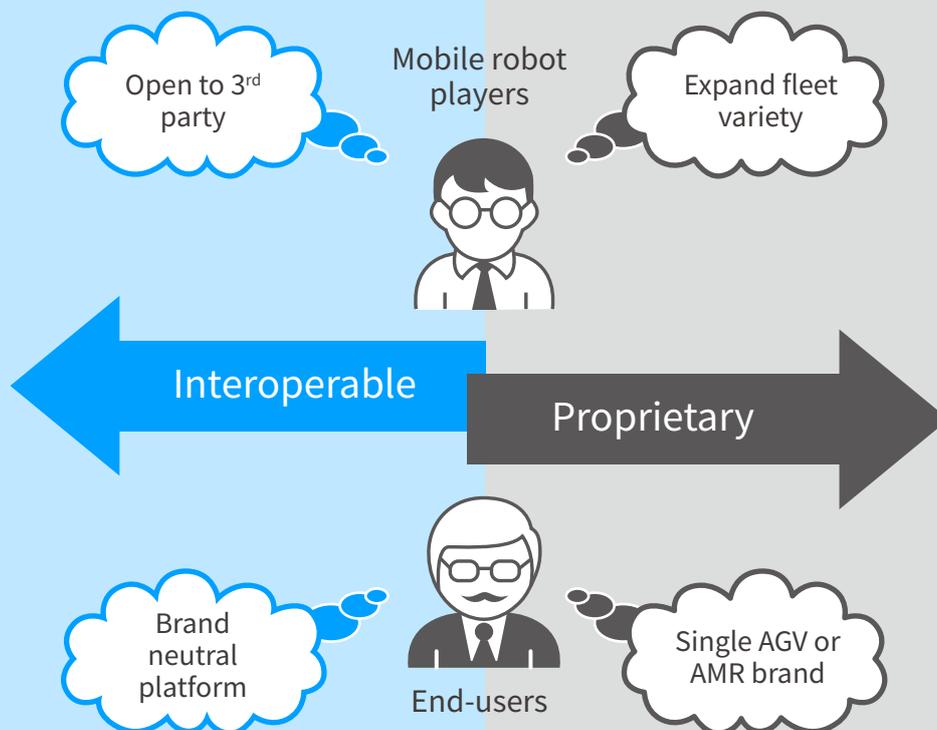
End-users also did not anticipate their automation needs to expand so rapidly and the market offerings to be so diverse.
They are now faced with two choices:
1. rely on a single AGV or AMR brand to fulfil their entire needs from a plant or country level
2. use a brand neutral platform with a high degree of flexibility

When we look at the current industry trend, both end-users and OEMs are likely to veer away from closed ecosystem models and embrace more interoperable systems.
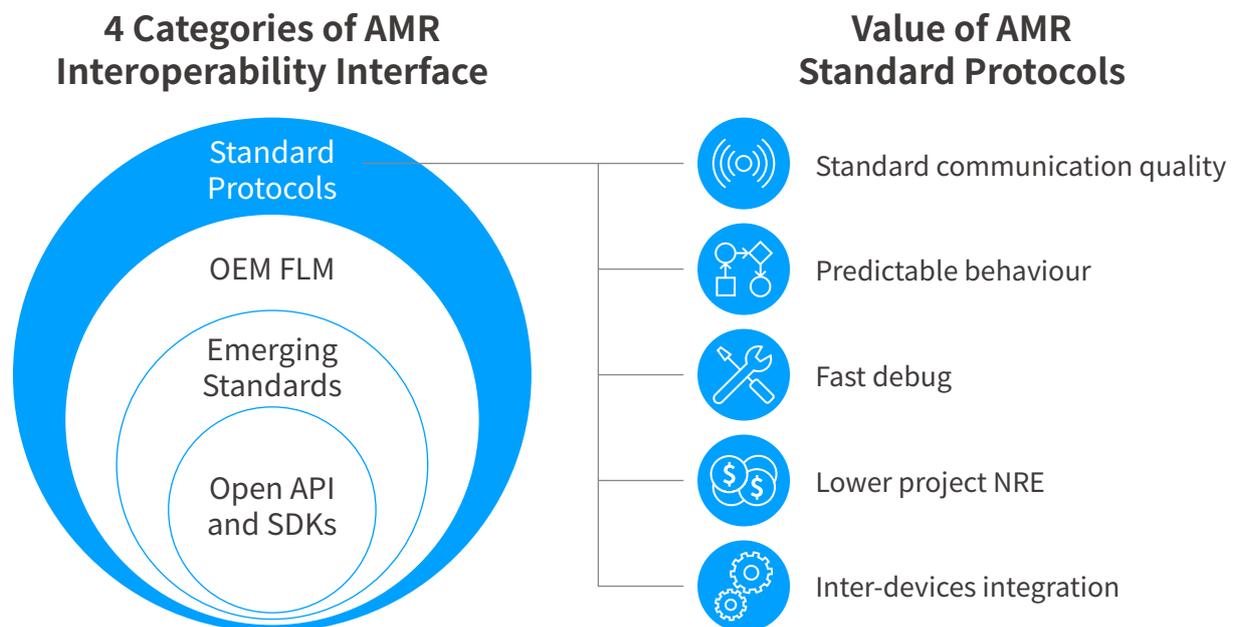
Enabling Interoperability with System-level Connectivity

Multiple AGV/AMR providers have already embraced the "interoperability" value proposition. As a result, there are three interface categories being delivered:
1. Open API and SDKs for robot OEM integration
2. The emerging standards dominated by VDA5050 and MassRobotics
3. The OEM management software including: FLM, RCS, WMS, etc.

The mobile robot industry will benefit greatly from interoperability, making buying and integrating robots a straightforward process. Unfortunately, this is again only one part of the problem. The actual challenges go beyond the entire system or entire plant including manufacturing and intralogistics equipment.

By creating a 4th category of interface, FARobot will allow system integrators to add greater value to their whole project, guaranteeing standard quality. This 4th category allows interoperability not only at the Agent level, which refers mostly to robots but also at the Artifact level, which refers to factory and warehouse equipment.

4 Categories of AMR Interoperability Interface

- Standard Protocols
- OEM FLM
- Emerging Standards
- Open API and SDKs

Value of AMR Standard Protocols

- Standard communication quality
- Predictable behaviour
- Fast debug
- Lower project NRE
- Inter-devices integration

Before trying to address the challenges from a system prospective, it is important to first understand the value of standard protocols. Standard protocols provide:
1. Standard communication quality: adaptable to use cases peculiarity while guaranteeing resilience
2. Predictable behaviour: the system latency is known
3. Fast debug: identifying issues is much faster and easier
4. Lower project Non-recurring engineering: time spent integrating different devices diminishes greatly
5. Inter-device integration: enable cross-brand, cross-devices communication

Standard protocols prove to be valuable tools for industrial grade robotic solutions.
At FARobot we develop our own protocol called Swarm Protocol.

Harmonizing System Interoperability with Swarm Protocol

Standard protocols prove to be valuable tools for industrial grade robotic solutions. At FARobot, we developed a proprietary protocol called Swarm Protocol. In addition to providing standard functions, it also delivers a powerful tool to take a "system prospective" approach. What does it mean and why is it important?

Standard protocols promoted by the German automotive industry (VDA5050) and the MIT (Mass robotics) both focus on one thing: the Agents

They both forget that every Agent interacts with a large array of peripheral Artifacts, including:
- Conveyors
- Top-modules
- Sensors
- Elevators
- Call button
- Pallet platform

These peripherals being part of every project, a standard protocol should extend its scope to provide the same services to manufacturing and logistical equipment as well.

Artifact-server-agent Interoperability

Agents
Autonomous Mobile Robots

Swarm Protocol — Swarm Ready SDK

Artifacts
peripheral equipment
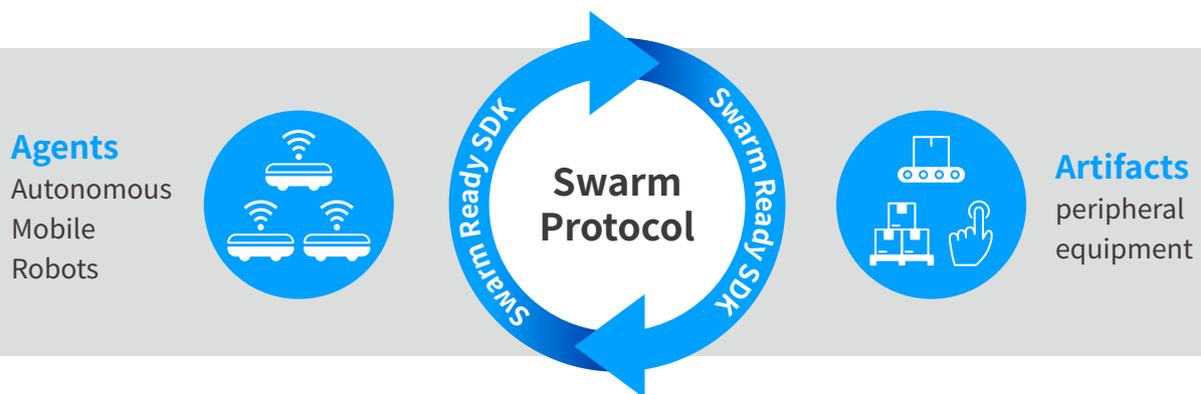
These challenges can be solved through three features that enable artifact-server-agent interoperability:
1. Peer-to-peer communication to reduce server traffic.
2. Individual QoS and remote updates.
3. An SDK to wrap these agents and artifacts.

Why is this important?
Project duration and costs are slowing the adoption of mobile robots.
With the increased connectivity of manufacturing equipment, end-users need:
- Active equipment's available anytime with the right QoS setting
- Decentralized communication to reduce network traffic, avoiding a single point of failure
- System-level fail safe mechanisms to ensure continuous operation

To address these requirements FARobot is set to launch Swarm Protocol and its Swarm-ready SDK.
Stay tuned for the product launch.