

## Aeris Mobility Platform: Simplifying Complex IoT Services Delivery

*Automotive Multimedia and Communications (AMCS)*



**A revolution in connected vehicle services requires a revolutionary approach. The Aeris Mobility Platform is designed for the future while fulfilling all current industry and market requirements for scalability, security, and customization.**



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## Executive Summary

The Aeris Mobility Platform (AMP) is a cloud-based software solution for connecting to and managing the connected features of IoT devices. Built using a micro-services architecture, AMP is comprised of an extensive set of software services, packaged as Granular Entity Modules (GEMs), which are functional building blocks that can be combined in a multitude of configurations to create application-specific variations. The AMP power comes from its customizable ability to address this multi-variant complexity.

This Aeris global platform allows for regional market variations (brand, location, and more), thereby redefining, and expanding the ability to gather, analyze, and react to volumes of data. This whitepaper will focus on one area within the AMP, and we will use the connected car as our example, but the concept covered could apply to multiple business sectors (trucks, motorcycles, squadrons of drones, you get the idea).

### **Simplifying the Complex**

A revolution in vehicle connectivity requires a revolutionary approach. Aeris is bringing new thinking to this technical challenge with its Aeris Mobility Platform, thereby providing an integrated solution for end-to-end service delivery, device management, and connectivity.

Already live and supporting connected vehicles around the world, the Aeris Mobility Platform is designed for speed, agility, flexibility, scalability, and security. Many of these elements have been absent from existing vehicle management deployments but now are made available via the Aeris solution.

Much has changed since the early days of OnStar<sup>®</sup>, when the primary objective of the connectivity system was to summon assistance in the case of a vehicle-related emergency. Embedded connectivity systems have evolved into service delivery and data collection platforms, transforming the nature of driving, as well as the vehicle ownership experience.

Strategy Analytics estimates that 75% of all new cars shipped globally in 2024 will be equipped with wireless connections. Twenty years after General Motors shipped its first connected Cadillacs, car companies have learned that it is not enough to build a telecom module into the vehicle. The entire system supporting that connection has to be properly conceived and maintained for the connected car proposition to be viable.

Modern connected car systems are expected to be always-on and, increasingly, will be asked to support autonomous driving and safety applications, such as collision avoidance. A reactive system, like OnStar's original offering, is no longer sufficient. Today, 80% of connected cars are using technology that is more than a decade old and hardly suited to automakers' rapidly changing needs going forward.

Wireless connectivity, today and in the future, will be expected to maintain live connections with increasing demands on the communication of vehicle data and software updates. These rigorous requirements call for a rethink of connected car platforms and gave birth to the Aeris solution.



## Addressing Multi-Variant Complexities

The Aeris solution arrives in the market at a time when car makers are considering the introduction of higher bandwidth applications and even multiple-carrier connections to support mobility services and autonomous vehicles. Modern connected car monetization opportunities now encompass everything from subscription revenue for various services (connectivity, Wi-Fi, vehicle sharing) to support of vehicle-related payments, such as parking, fuel, or tolls.

Car makers have been honing in on the monetization of vehicle data. This need to monetize includes data for internal applications (diagnostics, customer relationship management, marketing) and external applications (usage-based insurance, traffic information) and is demanding more complex systems for extracting, storing, normalizing, and preserving or deleting data — along with distinguishing between anonymized and non-anonymized information.

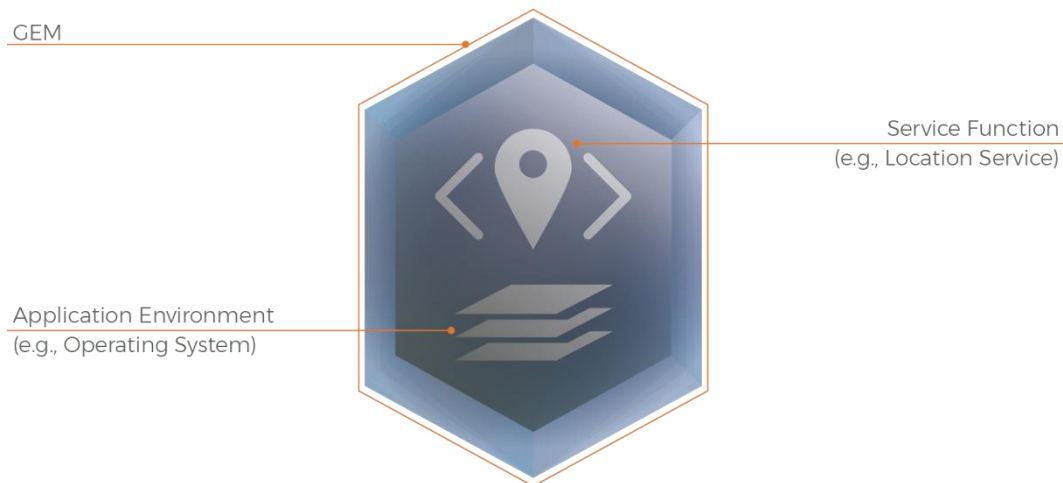
The broader context of these changes is that car companies themselves are becoming fleet operators. From Ford Motor Company and GM to BMW and Mercedes Benz, car companies are putting shared connected cars on the road, creating networked transportation solutions. These networks, too, require more sophisticated connections to determine location, availability, fuel level, and mileage — along with routine diagnostic data — for growing networks of vehicles.

At the same time, car companies are trying to deliver increasingly customized and personalized experiences in their cars, whether they are owned or shared. A flexible cloud-based service delivery platform, such as the Aeris offering, is the ideal solution for managing different sources of data (hardware, services, wireless technologies, regulatory compliance, and more) needed for a unique transportation experience.



## GEMs, Capsule Farms, and the Automotive Experience

Using a variation on container technology, the Aeris solution affords the opportunity of running multi-variant applications in varied environments, with divergent functionality and goals. For example, the Aeris Granular Entity Modules (GEMs) are self-contained applications that have everything they need to run, sustain, and maintain a service function. Those functions vary from the common — such as data transport, caching, or authentication — to the highly specialized — such as GPS location or custom device controls.



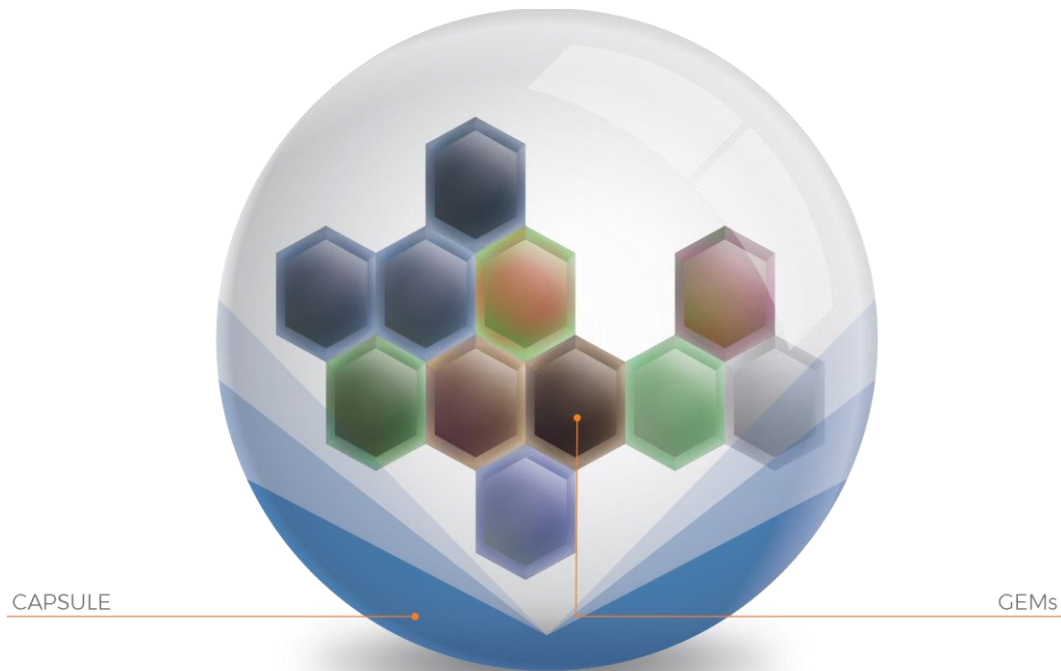
As automakers' vehicle deployments grow and push computational limits, GEM instances can be created to seamlessly expand capacity. Like parts from a bin, GEMs are assembled to enable the rapid development, deployment, modification, maintenance, security, and scalability of unique capsules.

### Capsule Farms

Capsules are a unique way to organize the deployment of specific sets of GEMs. For example, a capsule could be generated to manage connected medical devices, and another could be made to manage connected vehicles. They could be designed to perform many different functions, from merely collecting information, to extremely sophisticated command and control operations.

Large device deployments may require very complex segmentation. Once again, using connected vehicles as an example, we see that beyond managing vehicles of different model-years, an OEM also may be dealing with many different models, and the different feature packages of each model. On top of that, those models might be deployed to different geographical regions, each with its own vehicle and information regulatory environments — creating even greater complexity.

Capsule farm architecture ultimately is designed to enable the rapid deployment, modification, or removal of applications while maintaining security and overall functionality. This creates a more orchestrated vehicle connectivity experience designed to support the secure interchange between data sources and applications.



Capsules can scale as needed by modifying their constituent components—instantiating GEMs to increase computational capacity and redundancy. They can be created to meet the needs of virtually any IoT deployment or segment, duplicated to create a new capsule with identical capabilities or copied and modified to create similar variations.

For example, think of a car—same type, model, and year—going to differing locations (for example, from U.S. to Canada or Mexico). The services needed might be the same but the language, the regulatory requirements, or even local currencies might all differ. The capsule farm enables different information resources and applications to be securely linked and shared to create new value propositions for vehicle users. Capsules provide the flexibility to match infrastructure with vehicle mobility. This is a powerful proposition for car makers seeking to deliver value propositions as brand-defining opportunities.

### **MASTER REGISTRAR: Oversight and Management**

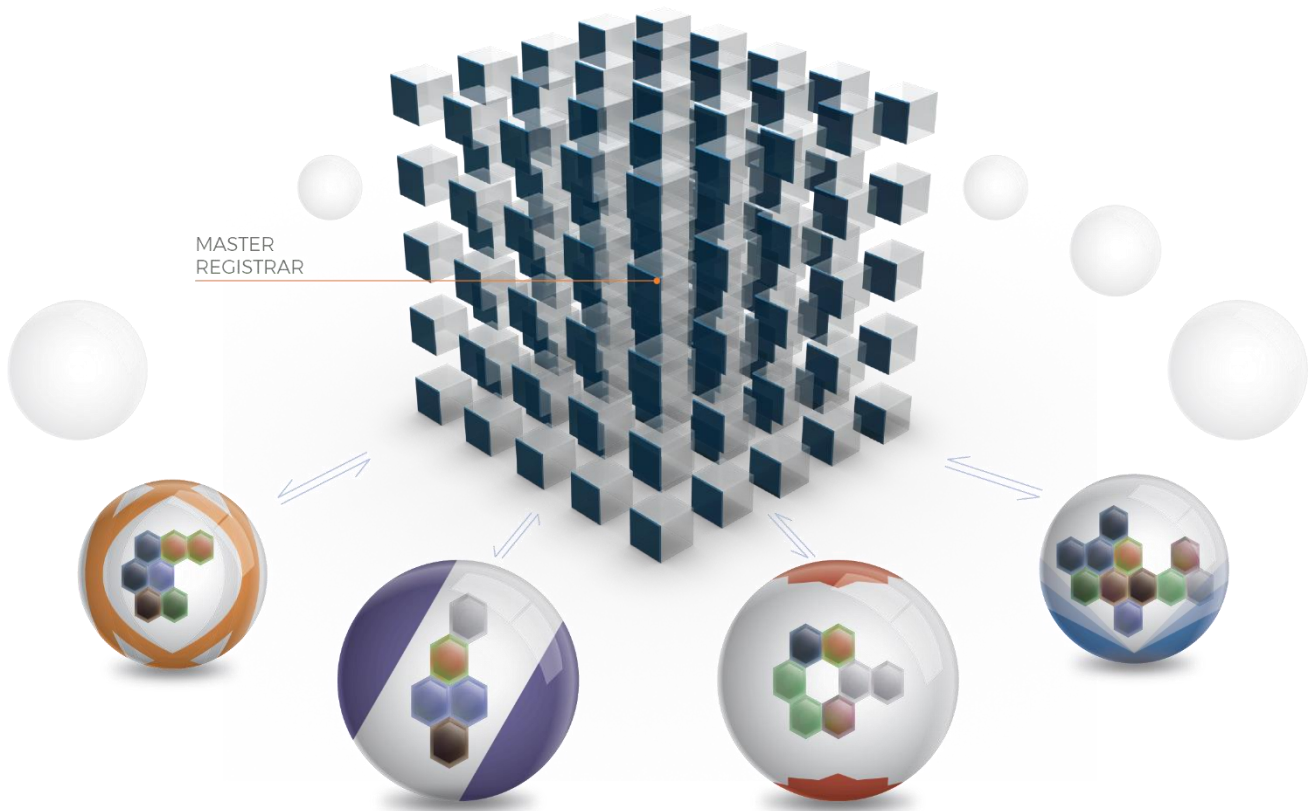
Overseeing device assignments is the MASTER REGISTRAR. It is the single record of truth for IoT device data acquisition, and it knows which devices belong to each capsule and why.

The MASTER REGISTRAR can respond dynamically to real-world conditions. For example, if a device moves from an area of logical CAPSULE control to another — say, from one geographic region to another — it can be reassigned via over-the-air-updates to meet regional or national compliance, a change in carriers, or a host of other issues that might occur.



Via the MASTER REGISTRAR, code updates can be rolled out to a single GEM or capsule, to a select few devices, or to the entire deployment. Server hardware can be added as processing needs evolve.

From GEM to capsule to MASTER REGISTRAR, Aeris Mobility Platform is designed from the bottom up to manage multi-variant complexities.



Aeris is well suited for these connected sharing applications as its platform is designed to support and integrate multiple functions, thereby enabling the appropriate access privileges and data exchanges.

In a real-world example, Aeris is the telematics service provider for Mitsubishi Connect globally. Aeris handles all aspects of the program, including mobile application development, call center support, and OTA updates. Innovations include the company's capsule farm technology for scalability, power management to protect the vehicle's battery, and edge processing to deliver highly responsive services.



## An Integrated End-To-End Solution

The Aeris Mobility Platform integrates with any cloud provider for data collection, indexing, and storage in support of performance monitoring applications. The system also integrates with open source data processing applications to monitor the performance of the vehicle and the wireless connection.

Those applications include:

- Nagios and CloudWatch for infrastructure monitoring, including proactive and reactive probes and notifications
- Elastic, Logstash, and Kibana, as well as Grafana, for tracking and troubleshooting, including alerts, notifications, service reports, and dashboards
- INMP, a home-grown solution, for application health monitoring, including probes, and more.

The platform itself is firewalled from the public internet with secure authenticated channels to the vehicle. VPN access is required with application-level and multi-stage encryption. Further security is provided via software containers with credential management, remote monitoring, and multiple infrastructure and technology validation points to prevent spoofing.

The capsule farm architecture segregates various layers, including service logic, services catalog and payments, customer experience, and vehicle and customer data. This architecture enables scaling of subscribers and services, including addition, modification, or removal. The architecture also mitigates risks by enabling rules-based, seamless expansion across regions and car models.

Aeris joins the growing roster of vehicle connectivity innovators using MQTT for pub/sub applications, such as remote vehicle functions, to reduce the cost and latency associated with SMS-based approaches. SMS is not only expensive but can take 8-10 times longer to send simple vehicle requests, such as door unlocks or engine starts.

The Aeris Mobility Platform is purpose built to distinguish vehicle connectivity from generic cloud connections for consumer mobile devices or non-mobile IoT applications. Most telling is the fact that Aeris has been managing multi-carrier connection solutions for years, while the auto industry just now is beginning to explore carrier-agnostic or multi-carrier platforms.

The significance of multi-carrier support is not only in preserving connectivity in varying circumstances but also selecting and shifting to the ideal connection at any given moment based on signal strength and/or cost. Presently, indications are that multi-carrier systems are on the drawing board for a number of car companies.



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## Solving a Problem

First and foremost, Aeris is solving a major problem. The cost of adding connectivity to cars has ramped rapidly. Costs range from tens to hundreds of millions of dollars for secure network operating centers and the steady expansion of server capacity. Car makers have recognized the need to scale up service offerings, creating more elaborate back-end systems capable of orchestrating vehicle connections with vehicle and customer information, as well as subscription management, along with regional nodes and localized protocols for privacy and security.

In effect, the drive to monetize the in-vehicle connection has demanded even more sophisticated connectivity platforms capable of extracting and transmitting data while also supporting service expansion and customization. The latest twist has been the monetization of vehicle data, with multiple car companies introducing API access to vehicle data, for a price, to multiple partners — from rental car companies to fleet operators.





## Stepping into the Future

It now is clear that cars must share information via the network at more frequent and regular intervals. This means the network connection must not only be reliable but also secure.

The challenges for car makers include the high cost of hardware, software, and service delivery for vehicle connectivity. Complexity of privacy and cybersecurity concerns have grown even as the demand for more connectivity, expanded service offerings, for over-the-air software updates, and other essential applications have grown.

In the past, the main challenge simply was ensuring connections were made. The early hurdles revolved around issues such as periodically activating in-vehicle telecom modules without draining the vehicle battery or accessing remote vehicle functions via high latency and expensive SMS messages.

Beyond these functional challenges, car makers quickly learned about the demands of adding tens of thousands of cars to their platforms, even as networks were changing and services were evolving. The industry has learned that supporting connected car solutions requires flexible, customizable, scalable, and secure connected car platforms capable of handling bi-directional, always-on communications, as well as taking into consideration the rapid growth in user numbers and functionality.

The Aeris Mobility Platform is designed for the future while fulfilling all current industry and market requirements for scalability, application isolation, security, and customization. Aeris' capsule farm architecture is secure, nimble, and scalable — all of which are essential elements of the modern connected car.





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## In Conclusion

The Aeris Mobility Platform is designed to empower and prepare automakers either entering the connected car business or expanding an existing offering. It allows them to rapidly scale and enhance their service portfolio with confidence. Aeris leverages its capsule architecture to support many millions of vehicles with a flexible, secure, and customizable system capable of monitoring itself while supporting the car maker's management and monetization priorities.

And remember, while our example has focused on the connected car, the platform also supports software versioning and protocol management to address regional connectivity requirements, including access privileges, privacy regulations, personalization, and security, for any number of businesses and device types.

The platform combines Aeris' capsule architecture with its existing expertise in optimizing wireless connections to ensure performance reliability while managing and mitigating cost. This Aeris end-to-end solution represents state-of-the-art technology for connected cars.

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