Berg Insight™

VOLT ACTIVE DATA

How real-time data processing powers the future of connected vehicles

Introduction

The automotive industry is in a transformative phase. The shift to electric vehicles (EVs) is accelerating as governments tighten emissions regulations and consumers push for cleaner alternatives to internal combustion engines. Automotive OEMs are investing heavily in the development of new technologies such as connected car services and advanced driver assistance systems (ADAS) to stay ahead of the competition and meet evolving consumer needs. While carmakers continue to stand at the center of the industry, they are now stepping into the role of orchestrators within a new emerging ecosystem that includes connectivity service providers, software developers and technology suppliers.

In parallel, OEMs are digitising their manufacturing processes using Industry 4.0 solutions like industrial IoT, AI and digital twins, enabling predictive maintenance, real-time data visibility and process optimisation. This white paper examines how real-time data processing powers the future of the connected car industry, reimagining everything from the driving experience to production lines.

The state of the connected car market

The connected car has firmly entered the mainstream, with leading automakers worldwide offering mass-market connected car services in major regions. Berg Insight estimates that 79 percent of all new cars sold worldwide in 2024 were equipped with an OEM-embedded telematics system, up from 75 percent in 2023. Looking ahead, Berg Insight estimates that the number of connected cars will grow at a compound annual growth rate of 13.0 percent from 282.6 million connected cars in 2024 to 521.0 million connected cars in 2029.

The adoption of telematics systems is driven by both commercial and regulatory factors. On the commercial side, carmakers leverage connectivity to stand out in a crowded market, offering services like music and video streaming, as well as advanced navigation and voice assistant services. Autonomous driving and ADAS features also serve as key differentiators, especially in delivering safer driver experiences. Additional safety-related technologies include V2X communications between cars. V2X communications can prevent accidents by enabling real-time data exchange between vehicles, infrastructure and pedestrians, and anticipate and respond to potential hazards, such as collisions or unsafe road conditions.

Regulatory drivers, such as the European eCall mandate, have significantly accelerated the rollout of connected cars. Since April 2018, all new car models in Europe must support for automatic emergency call services via an embedded telematics device. In the event of a serious accident anywhere in Europe, cars equipped with eCall automatically call the nearest emergency center. Similar mandates have been implemented in Russia, Saudi Arabia and the UAE, and will soon take effect in China. A corresponding mandate does not exist in North America. However, telematics-based emergency services already have a high attach rate in North America and are now available in most new cars.

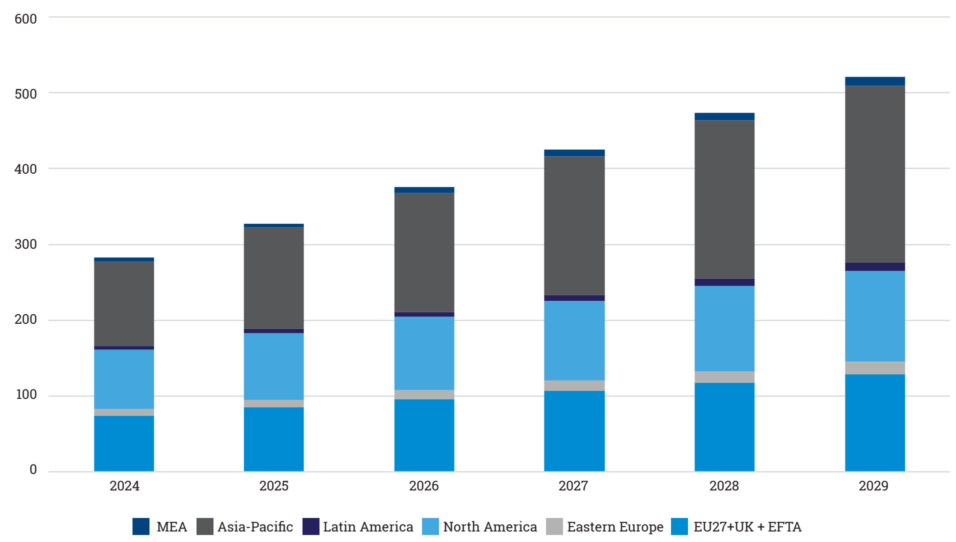

Figure 1: Installed base of connected cars by region (World 2024–2029)

Data consumption of connected cars will grow significantly

As the global fleet of connected cars expands, the volume of data consumed is set to increase significantly in the coming years. Many modern premium cars feature data-heavy services such as video and music streaming, gaming and video calls. Though these cars only account for a fraction of the global connected car fleet today, a growing number of models will come with more advanced capabilities and service packages. The data-heavy segment is estimated to consume data at a level of more than 30 GB per year.

In the mid-segment, there are today a much larger number of connected cars that utilise standard, but still advanced telematics services, consuming in the range of 2–3 GB of data per year. At the low end, there are a substantial number of connected cars that consume between 0.1–0.5 GB of data per year. Such cars might only utilise data-light connected services such as location tracking and emergency call services.

Berg Insight estimates that a connected car on average consumed 2.5 GB of data in 2024. This number is expected to grow at a CAGR of 18.4 percent to reach 5.7 GB in 2029. The growth will be driven by an increasing number of cars featuring more advanced connected car services.

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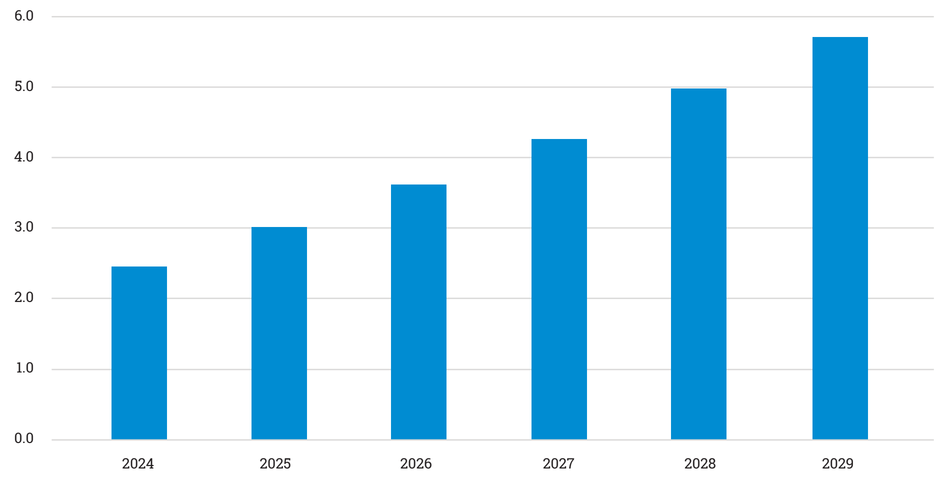

Figure 2: Average annual data consumption per connected car (World 2024–2029)

Introducing Volt Active Data

Volt Active Data specialises real-time data platforms for high-performance applications. Its solutions cater to applications that need to process and analyse large volumes of data at ultra-low latency, serving industries such as telecommunications, financial services and IoT.

Volt Active Data's platform is ideal for mission-critical use cases where reliability and sub-millisecond response times are paramount. As connected car data consumption grows and services increasingly depend on real-time data, automotive OEMs, connectivity service providers and connected car service vendors must adopt efficient and reliable data management solutions. Future connected car services will also need to aggregate, ingest and harmonise data from many different sources to power next-generation applications.

By enabling the aggregation of data from diverse inputs such as vehicle sensors, cameras and public safety systems, Volt Active Data supports real-time decision-making in a matter of milliseconds. This real-time processing capability enables a new wave of applications that require instant insights – from advanced driver assistance and emergency services to seamless connected-car experiences.

Meeting the emerging real-time processing demands of connected car services

Along with the increasing requirements to handle larger amounts of data, many connected car services today also depend on reliable, real-time data processing. For instance, data transmitted during emergency situations must be both accurate and instantaneous. Real-time data processing is equally crucial for enabling personalised in-car services, enabling vehicles to adapt dynamically to each driver's mood and needs for a fully tailored experience. Emerging technologies such as V2X communications and autonomous driving further increase the need for dependable and instant data processing. Autonomous vehicles especially must rapidly analyse input from a variety of sensors, including lidars, cameras and radars, to make safe and precise driving decisions in real time.

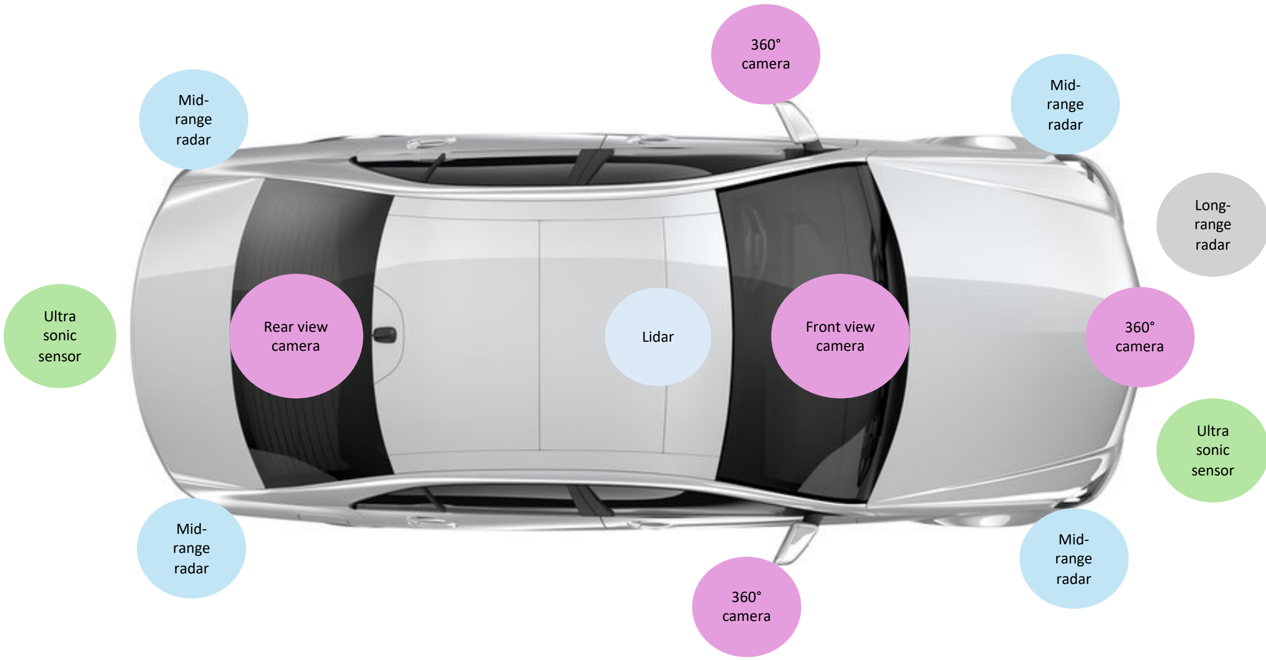

Figure 3: Different types of vehicle sensors for autonomous vehicle systems

Emergency services

Most connected cars sold are today equipped with an emergency service that activates automatically in the event of a crash. This often includes an eCall solution, which establishes a voice connection with a call center or the nearest Public Safety Answering Point (PSAP), while transmitting the vehicle's precise location. If required, the emergency operator coordinates with responders to dispatch the appropriate assistance.

Currently, most emergency services only share basic data on location, time, and direction of travel. There is however significant potential to enhance accident response by transmitting additional information from the vehicle. Examples include the number of occupants at the time of the crash, speed leading up to the collision, impact from the accident and which parts of the car that took the hit. Such information could help accident responders to better prepare before arriving at the location where the accident took place.

AI-powered in-car personal assistants

Carmakers are increasingly focusing on enhancing the driver experience, with infotainment systems and personalised in-car services being key focus areas. Personalised services rely heavily on customisation, which requires efficient processing of data at the edge. This ensures immediate responses, a critical factor for delivering high-quality, seamless services to the driver.

AI-powered in-car personal assistants have become an increasingly common offering from OEMs in recent years. These assistants often rely on on-board edge computing, but can also be complemented by cloud services to enable access to external content and services such as live traffic data. Another way to enhance in-car personal assistants is by utilising user preferences and behaviours collected across various contexts to offer tailored suggestions for media, routes, and services.

Future versions of these AI-powered assistants will likely need to be cloud-connected to meet driver demands, allowing them to experience the same level of functionality and quality in their cars as they enjoy in other aspects of their lives.

Smart infrastructure integration (V2X)

Vehicle-to-Everything (V2X) communications enable seamless interaction between vehicles, traffic signals and road infrastructure, facilitating real-time data exchange essential for enhancing safety, optimising traffic flow and improving driver experiences. To achieve instantaneous and reliable responses, edge-based processing is vital, ensuring low latency and high reliability in data transmission.

A major challenge for V2 lies in managing data from diverse sources, which can include vehicles, traffic infrastructure, mappings systems and other cloud-based environments. An efficient V2X solution must be able to ingest, aggregate, process and communicate the information to the driver in near real-time so that the driver can act on the data.

Autonomous vehicles

Autonomous vehicles collect data from a wide range of sources. For the car to make the right driving decision in an appropriate time frame, real-time processing of all collected data needs to be conducted reliably. This task is especially complex because an autonomous vehicle typically integrates information from multiple sensors – lidars, radars, cameras and others – alongside external inputs from cloud services that provide road and traffic updates. Processing the data reliably and instantaneously demands both significant computing power as well as an infrastructure capable of handling data ingestion, aggregation and the rapid communication of decisions to the vehicle.
In the near term, the introduction of increasingly advanced Autonomous Driving Assistance Services (ADAS) will also have a significant impact. Many carmakers already offer "highway pilots", where the vehicle can drive itself under certain conditions without driver intervention until prompted to regain control. As these solutions gain traction and become standard over time, the need for systems that can manage large volumes of data and deliver complex decision-making will rise. In particular, the introduction of ADAS into more affordable car models will drive demand for scalable, resource-efficient technologies that can meet these growing requirements.

How the need for connectivity and high-performance computing extends across the value chain

Beyond connected cars, the need for connectivity and high-performance computing extends across the value chain down to transport, logistics and manufacturing. The manufacturing industry is currently experiencing the fourth industrial revolution, commonly referred to as Industry 4.0. The revolution is enabled by key technologies such as industrial IoT (IIoT), networking, artificial intelligence (AI), machine learning (ML), cloud and edge computing, data analytics and digital twins. Factories leverage these Industry 4.0 principles by integrating digital technologies into manufacturing to enable real-time communications and data exchange across the entire ecosystem.

Manufacturers are investing heavily in IIoT solutions to support use cases surrounding predictive maintenance, asset optimisation and quality control. IIoT solutions enable industrial automation systems to be remotely accessed and gather more extensive data from numerous connected devices. These solutions are increasingly used to secure assets, increase operational efficiency, optimise processes, predict equipment failures and remotely monitor and control industrial plants and machinery.

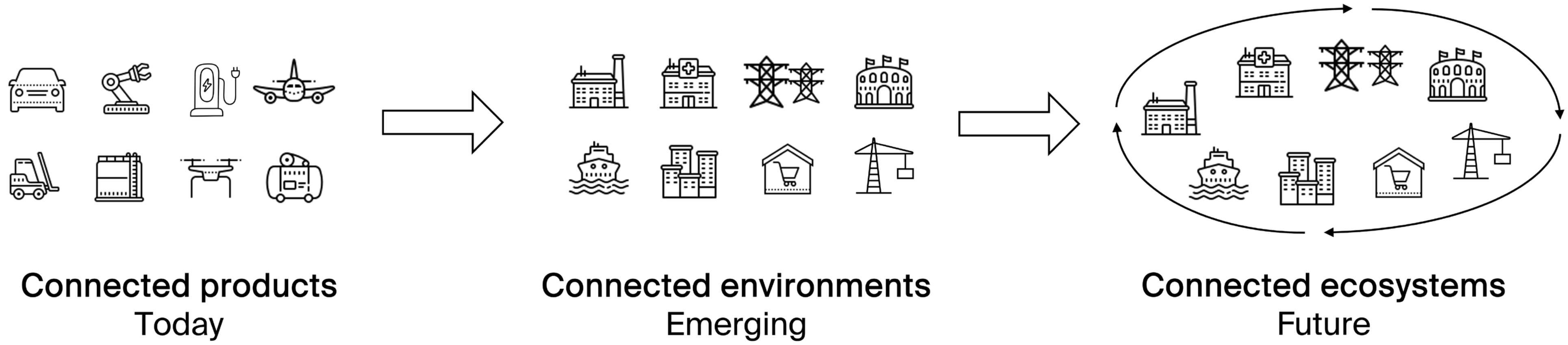

Figure 4: The evolution of connected systems

IIoT solutions within factory automation

Automotive manufacturing is the dominant industry within factory automation, resulting from the assembly of individual parts and components. Factory automation is characterized by fast production processes with machine parts being frequently in motion within a limited space. These fast processes require short operation cycles and fail-safe transfer of sensor and actuator signals. With sub-millisecond cycle times as the standard when requesting data from control systems, fast and extremely reliable IIoT solutions are required within a relatively small area. The flexibility and expandability of IIoT solutions can moreover increase the quality of data in an automation system which further enables improved optimisation and responsiveness when controlling the manufacturing process.

One of the main benefits of IIoT is remote product management, making it possible for equipment manufacturers to for instance perform machine inspections as part of service agreements. As manufacturing companies often depend on uninterrupted maintenance, continuous monitoring can enable errors to be detected and addressed as soon as possible in order to avoid further damage. IoT connectivity allows the service partner to provide remote and predictive maintenance as well as minimise downtime in case of machine failure, all without having to interfere with customers' networks.

High-performance data analysis enables predictive maintenance of assets

Data from IIoT devices in operational processes is collected to monitor, control and optimise an asset's performance. As operations become more automated, the need to transport greater volumes of data rises. The increased data volume in factory automation in combination with analytics can facilitate advanced solutions for predictive and even prescriptive asset maintenance. The growing volumes of data can moreover identify new ways to operate more reliably and better manage risks.

The usage of AI for data analytics has allowed machine operators to improve efficiency and prevent safety incidents through predictive maintenance. Predictive maintenance enables condition-based maintenance of equipment instead of using scheduled maintenance. When combined with ML algorithms, AI-driven analytics can be used to predict failure of equipment while forecasting repairs and deviations. This can also be achieved with digital twins by creating digital representations of physical assets to predict future performance levels, test operational changes and improve decision making around asset maintenance and operation. Ultimately, the application of predictive maintenance solutions can result in both lower service costs and increased operational efficiency through minimised downtime.

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About

Volt's mission is to help companies solve the hardest real-time data processing challenges of our time: delivering scale, speed, consistency, and resiliency simultaneously on massive, ever-growing data volumes. We believe there's a better way to handle data—one where businesses with mission-critical applications never have to sacrifice any data processing requirements. As a trusted backbone of global applications, Volt processes over 2 billion data transactions daily, providing the real-time foundation that drives innovation, efficiency, and growth for leading enterprises worldwide.

Visit **www.voltactivedata.com** to learn more.

Berg Insight is an independent industry analyst and consulting firm, providing research, analysis and consulting services to clients in the areas of IoT and digital technologies. Our analysts possess deep expertise in major IoT verticals such as fleet management, automotive telematics, smart metering, smart homes, mHealth and connected industry. Founded in 2004, we operate on a global basis from our head office in Sweden.

Our clients include many of the world's largest mobile operators, vehicle OEMs, fleet management solution providers, wireless device vendors, content providers, investment firms and venture capitalists, IT companies, technology start-ups and specialist consultants. We have provided analytical services to 1,500 clients in 72 countries to date.

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