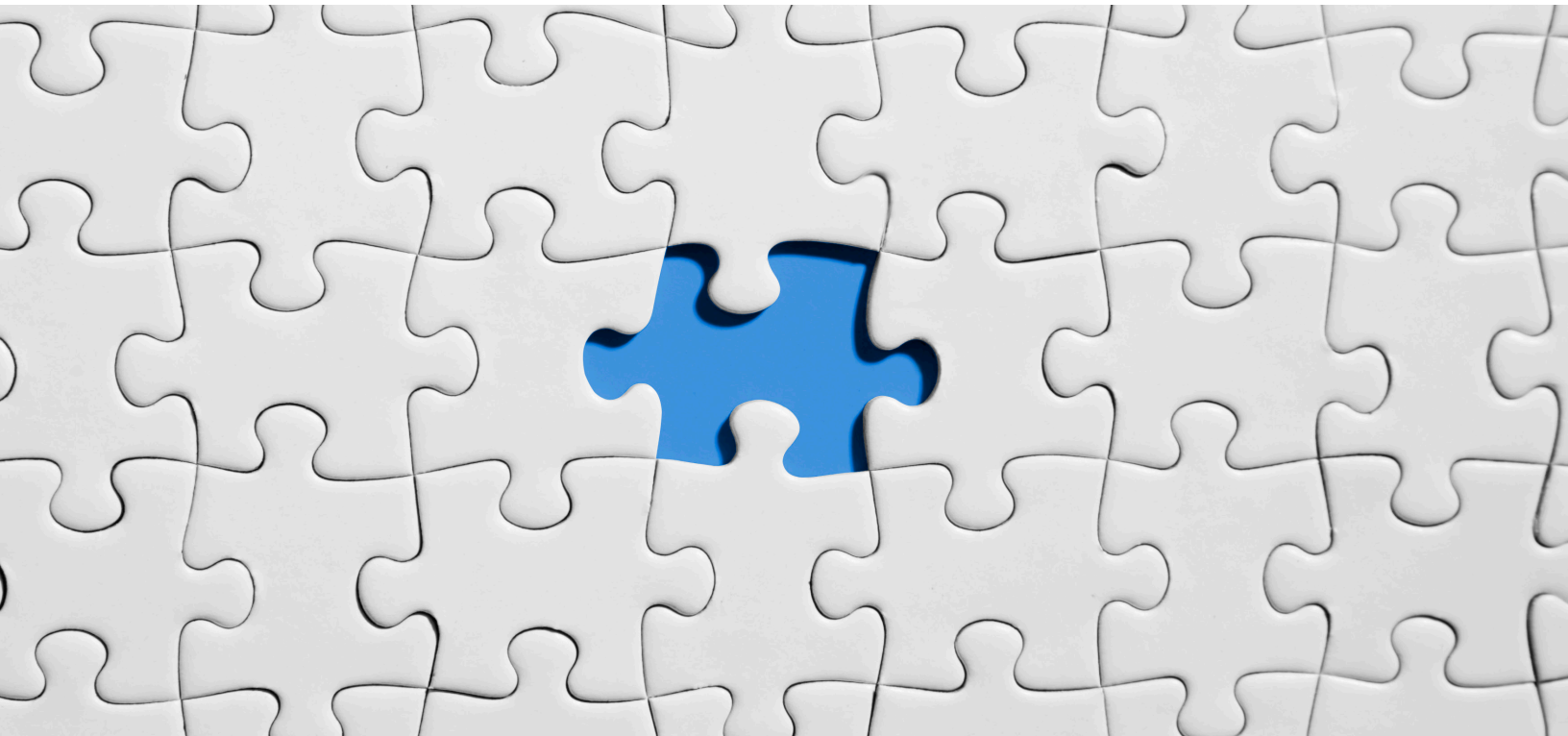


CONNECTED VEHICLE CLOUD PLATFORM



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Introduction

“Data is quickly becoming the new ‘fuel’ for the automotive industry”- Economic Times

The world has gone digital, and the same is true for the mobility and transportation industry. From smarter vehicles to autonomous ones, it's going to take new partnerships and processes driven by technology to power it all. Technology has helped define the human experience for decades and we are now at a moment in history where the pace of change takes a dramatic leap forward. The automobile industry is seeing growth at a rapid pace over the past decade and with the advent of technology in vehicles, the complexity of knowing one's vehicle or diagnosing the issues faced during the ownership period becomes easier to decode and, in turn, saves time.

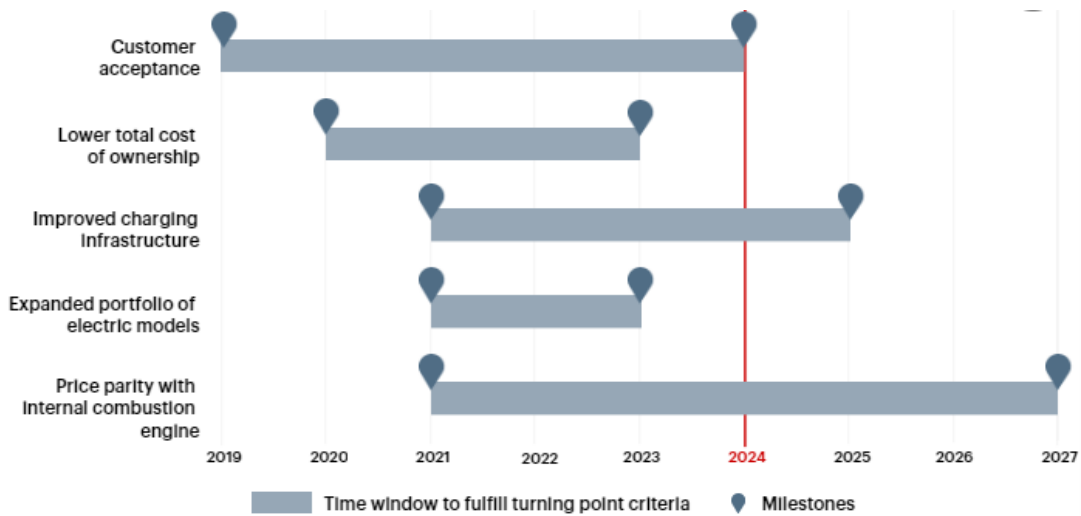
The connected Vehicle concept helps in tracking usage patterns of the vehicle or to monitor fleet activities, quickly diagnose the health of the automobile (which helps in preventive maintenance), evaluate insurance claims and so on. The vehicle will learn the pattern of the user and adapt itself accordingly, enhancing the ownership experience.

As governments are emphasizing stricter emission norms and safer roads, vehicle OEM's also must align with the government's policies and make their vehicles smarter and future-proof.

The connected vehicle cloud will transform the automobile industry's landscape as several transformational changes will take place such as autonomous driving, enhanced in-vehicle experience, robust safety and security measures to protect its owners and so on. The data feedback loop leveraged to provide safety improvements and better design and production of vehicle parts is continually shortening. Combined with a more efficient vehicle design pipeline, consumers will increasingly see their driving experience improve at much faster paces. This change will affect the entire supply chain of the automobile industry as OEM's were traditionally reliant on spares and services to boost their revenue. As the data of the automobile as well as the user can be tracked, it becomes easier for law enforcement agencies to ascertain any legal issues and for faster and transparent insurance claims. Also, this benefits the OEM's as they can enable a revenue stream for the connectivity and software features provided in the vehicle.

“THIS DOES NOT JUST MEAN THAT BETTER CARS ARE PRODUCED FASTER, BUT IT ALSO MEANS THAT IN THE NEAR FUTURE, IT MAY BE POSSIBLE TO SYSTEMATICALLY REPAIR AND UPGRADE ENTIRE VEHICLE FLEETS USING CONNECTIVITY SYSTEMS” -U. S Chamber of Commerce Foundation

Autonomous and Electric Vehicles will reach a turning point by 2024



Sources: Bain & Company; IHS Markit; European Federation for Transport and Environment

Automobile Industry Transformation by 2030

\$ The mobility services and auto industry value are estimated over \$ 3 trillion

📡 60% of vehicle value is formed by sensors, software

History

With the development of mobile communication technologies, since 2007, carmakers have begun to integrate telematics systems into their cars, using exclusively data transmission channels of cellular operators.

In 2008, Wi-Fi first appeared in cars. The solution was originally developed for trucks to support communication with the head office. In the summer of 2014, Audi became the first automaker to integrate the 4G LTE module into the car to provide automation, while providing passengers with high-speed Internet access via Wi-Fi.

Currently, OEM's use mobile applications to provide vehicle owners a much closer connect to their vehicles by sharing critical and timely updates over the air (OTA).

Current Trends

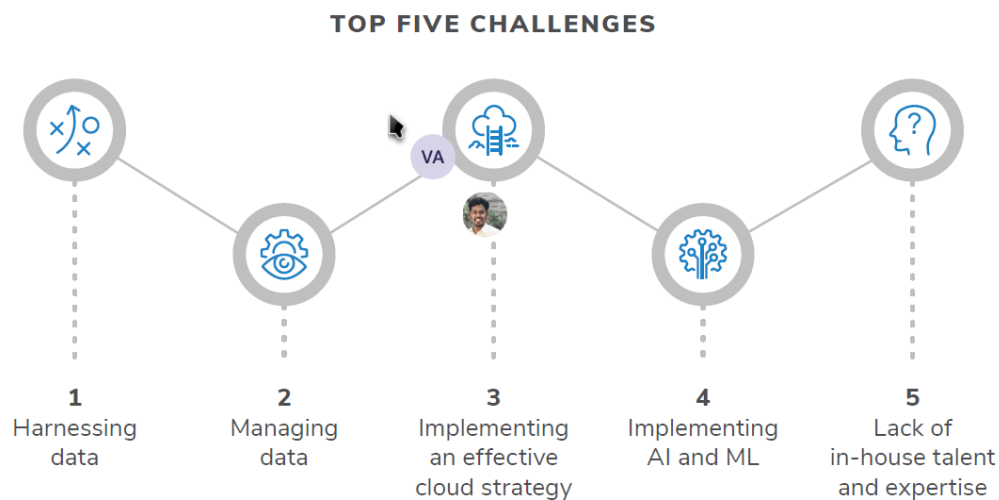


Real-time Streaming



Data Management
OEM & Technology

Key Challenges



Source: Dell Technologies, ICV & Mobility by Frost & Sullivan

Harnessing data to future-proof vehicle design, development, and deployment

Data from vehicle usage and driving patterns should enable vehicle makers to rectify any future faults by providing on-time OTA updates, as well as feed into design and development of next-generation vehicles. A data-centric approach to process improvement will require identifying and aggregating relevant data from multiple sources, exposing it to analytics software and applications, and storing it securely and cost-effectively.

Managing the volumes of data associated with connected and autonomous functionality

Next-generation vehicles require the ability to support, capture, catalog, move, store, secure, and index massive volumes of data from mobile sources, to cloud-based resources.

Implementing an effective cloud strategy

The challenge for automotive technology executives is to design, deploy, and manage an effective, agile infrastructure that integrates multiple clouds, on-premises data centers, and vehicle and edge infrastructure.

Implementing AI and ML across the organization

An integrated data approach provides the highest visibility to artificial intelligence (AI)/machine learning (ML) compute power. This, in turn, enables firms to shorten hardware and software test cycles, which is essential to fast-tracking the development of multiple projects in parallel.

The automotive sector is on the brink of innovation and manufacturers are looking to provide their customers with vehicles that can enhance the driving experience. The passenger car segment has seen tremendous evolution over the years, but other than digitalization of the instrument cluster and implementation of GPS systems, the overall dashboard design and driver's involvement has remained relatively unchanged over the last century. Development and deployment of the connected car will soon change this. The transformation will be driven by how users interact with vehicles and the way they communicate with the world around them. From the moment the car door is unlocked to the time it arrives at the destination, the vehicle's connected features will enable a fundamentally different experience for the driver and passenger, leaving many of today's current pain points a thing of the past.

Drivers, data and onboard assistants

Development of onboard digital assistants will do away with many of the buttons and dials that clog up dashboards, allowing both drivers and passengers to control everything by voice, from adjusting the cabin environment to finding the best route for the journey. For the regular trips, connected cars will be able to learn preferred routes. If there are problems reported on the way it'll warn the driver as soon as they enter the vehicle, offering various alternative routes that still allow for the usual coffee stop. Connected transport could potentially do away with the frustrations of battling traffic jams and unexpected delays.

Digital Challenges for CIOs, CTOs and mobility leaders

CIOs, CTOs, R&D and Engineers working in connected and autonomous industries are facing — and must find solutions to — key technology challenges:

- **Supporting rapid innovation:** Creation of new business application/workload and next generation infrastructure and the platforms and skills required to run them.
- **Moving, processing and managing massive scale data sets:** Because of the scale of data, new solutions are needed for object, image management, metadata management, reduction, compression and deep learning including moving, processing and managing massive scale data sets and adopting new management models.
- **Meeting data privacy, security, risk, regulatory and compliance requirements:** Connected vehicles will represent a valuable target for cybercriminals — perimeter security won't work.
- **Gaining insights** from Exabytes and eventually Zettabytes of data.

The three biggest changes forcing the automotive industry to change its value proposition are:

1. **Safety** – Driven by accidents, with a focus on reducing fatalities.
2. **Congestion and Emission** – Major cities are aiming to reduce congestion and CO2, in effect, becoming regulators.
3. **Saturation of sales** – caused by Usership models and challenges of urban driving and parking

On top of this, digital customers have varied preferences for different services that match their lifestyle, causing the automotive industry to rethink the services that they offer.

Efficiency in transport systems can be achieved through optimal utilisation of transportation data- thereby saving time, increasing road capacity and lowering costs. Adopting comprehensive and well-coordinated management of mobility supply which is highly connected, automated, shared and electric- will shape the future of mobility

Automobile workloads

- Data Ingestion
- Annotation / Data Enrichment
- AI Training & Evaluation
- Synthetic Scenario Generation
- Hardware-in-the-Loop
- Real-time Streaming

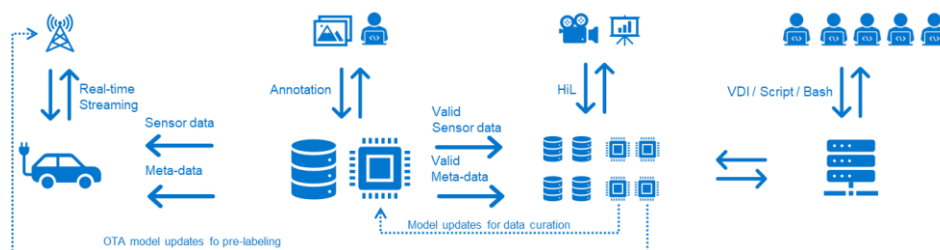
As digital mobility organizations become increasingly reliant on data, security must be top of mind across the automotive value chain. Organizations must consider:

- Modern vehicles and transport networks are exposed to security risks just as are other connected devices.
- Personal data represents a valuable target for cybercriminals as well as companies and governments.
- Data security, hacking risks and privacy concerns increase as cars, trucks, rail and aircraft become more connected.

The mobility industry must continuously evolve managing security and risk to a point where it becomes an enabler and accelerator to innovation rather than a barrier.

As a result, the business can move further and faster by providing intrinsically secure infrastructure platforms and devices that enable vast amounts of data to be generated and processed while providing peace of mind that assets across the mobility ecosystem and value chain are secure, protected and available.

Development Process of Autonomous Cars



Source: Dell Technologies

A high-level Diagram of Autonomous car data architecture

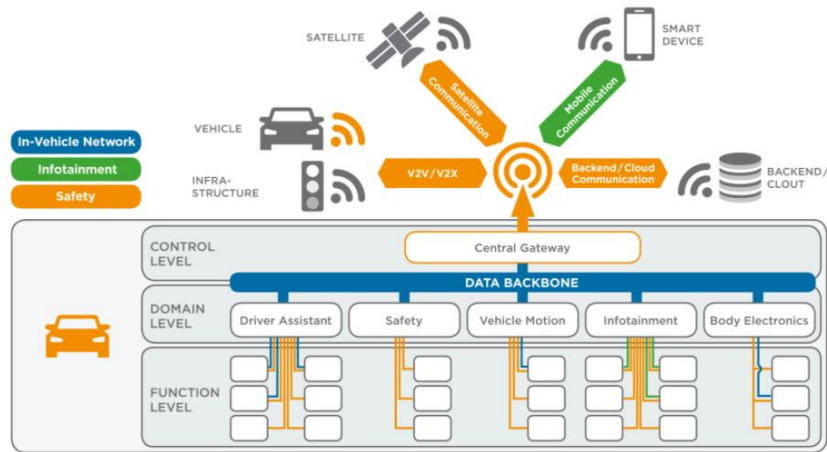


Diagram by IEEE Spectrum

Why Dell Technologies for the mobility industry?

Dell Technologies invests resources and expertise in R&D and technology roadmaps built on extensive business and mobility insights and use cases.

Working with OEMs worldwide, as well as suppliers across the transport value chain and industry, Dell Technologies is focused on several key projects, including:

- scalable infrastructures
- standardized architectures
- platforms and solutions to support their mobility customers' needs

Differentiators

- Dell Technologies is a trusted name in solutions for Advanced Driver Assistance Systems {ADAS}/AD with a large majority of tier 1 suppliers and 80% of OEMs using Dell Technologies for their development.
- Best-in-Class ADAS/AD Test & Dev. and Production-level Solutions (Compute, AI/ML, Deep Learning, Automation and Storage).
- Engineering R&D and investment into the next generation Zetta-scale infrastructure.
- The future is hybrid-multi-cloud and we uniquely fill that need enabling the best of both worlds without compromise and cost-effectively.

Source: Dell Technologies Chief Technology Office

Conclusion

Mobility leaders are highly aware that their industry fundamentals are shifting. Against a backdrop of changing customer preferences and expectations, the convergence of autonomous, connected, electric and shared mobility technologies is radically altering how people and goods move. By efficiently collecting, processing, analyzing, and storing valuable data assets, the automobile industry can:

- Streamline product design and development processes, speeding time to market and cutting costs
- Launch autonomous vehicles that safely interact with their environment, whether by a city street, highway, port, farm, or mine
- Increase revenue, based on the ability to monetize the right data for trusted ecosystem partners, both public and private
- Fund and support new business models and operations
- Define a position in the new mobility value chain
- Establish points of contact to the end user
- Secure access to Level 4 ADAS technology

The future of mobility is getting closer, faster than many expected considering the pandemic. While the time frame is narrow, OEMs can still catch up to their competitors by creating a bold strategy and quickly executing it.

“WHEN WE SHARE CONNECTED CAR DATA, WE CAN ALSO HELP MORE THAN JUST OURSELVES” - U. S Chamber of Commerce Foundation

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