Digital cars need digital automakers

An integrated hybrid cloud strategy is the first step

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Key takeaways

This is what true cloud-native businesses do instinctively—they consider hybrid cloud as an enterprise-level strategy.

■ **By 2030, a majority of automakers predict that carmakers won't be the ones making cars anymore.**

62% of auto executives say they will have significantly outsourced vehicle production operations to focus on digital competencies by 2030.

■ **The shift to digital is all-encompassing—vehicles, corporate offices, manufacturing, and the customer model.**

But a majority of digital transformations fail. Across industries, 71% of IT professionals agree that without a hybrid cloud strategy, it's difficult to realize the full potential of a digital transformation.

■ **Automakers have been trying to build a cloud foundation, but they're struggling in three industry applications.**

They're not alone. Almost a third of cloud adopters report being stalled in the middle of their journeys and 37% say they are done with their cloud adoption after only minimal migration.

Foreword

The shift to digital vehicles that operate with increasing autonomy is no longer a futuristic endeavor. It's happening today, with our clients. This transition presents both exciting opportunities and significant operational and technological challenges, from data management and security to creating workflows that span operational siloes.

A hybrid cloud strategy offers the necessary technical blend of security, scalability, and agility automakers and suppliers need as they make this shift. It's not that automakers aren't in the cloud. It's that most of them adopted cloud as so many other companies have—use case by use case. A holistic, integrated hybrid cloud strategy could move them light years ahead in several areas—from the vehicles themselves to connected manufacturing to how they interact with customers.

At IBM and Amazon Web Services (AWS), we're excited about the future of the automotive industry. We hope this report helps automotive decision-makers build a solid, cloud-based foundation underneath their other digital efforts. With AI already a force and quantum computing around the corner, there's never been a better time to help ensure automotive IT has the scale, agility, and security it needs for a successful future.

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71%

of IT professionals agree that without hybrid cloud strategy it's difficult to realize the full potential of a digital transformation.

The changing role of the automaker

Automakers, once defined by Detroit muscle and German engineering, are undergoing a seismic shift as they try to become digital-first companies making digital cars. Forget horsepower—cloud servers and lines of code are defining the automotive future.

Automotive companies and their suppliers are navigating a shift that isn't just about in-dash features, but instead is a complete transformation of how cars are designed, built, sold, and serviced. The era of the connected, software-defined vehicle (SDV) has begun.

A software-based future

In an industry that has prided itself on managing complex supply chains, integrating mechanical components, and building safe, reliable vehicles, the push to a software-based future is strong—so strong that 62% of automotive executives predict that by 2030 they will have significantly outsourced vehicle production operations to focus on digital competencies .[1]

Underlying not only SDVs but also automakers' own enterprise digital transformations is one key base technology layer—hybrid cloud. Across industries, 71% of IT professionals agree that without a hybrid cloud strategy, it's difficult to realize the full potential of a digital transformation.[2] Hybrid cloud provides the capacity and business agility for original equipment manufacturers (OEMs) to not only compete but also to remain viable. While automakers are using cloud, they have been struggling to implement it for some major use cases. And most have yet to create a true hybrid cloud strategy as part of a comprehensive, integrated enterprise strategy. In this report, we'll cover the three main areas where automakers are struggling and show how a hybrid cloud strategy can help them build a solid foundation for their digital future.

What is
hybrid cloud?[3]

Hybrid cloud describes a mix of cloud environments, including public, private, and multicloud, as well as on-premises infrastructure. Our data shows that during the pandemic, many organizations became hybrid cloud users as a simple consequence of tactical decisions by user departments, IT, and procurement.

Beyond this mix of environments, however, we use the term hybrid cloud platform to describe some level of integration that spans public, private, multicloud, and on-premises infrastructure, and increasingly edge computing and distributed cloud. Done right, a hybrid cloud platform provides a fabric for orchestration, management, and application portability across these environments. The result can be a single, unified, open, and flexible distributed computing environment where an organization can run and scale its traditional and cloud-native workloads on the most appropriate computing model.

Hybrid cloud optimization describes a highly evolved way of operating hybrid cloud platforms that can fundamentally improve—and transform—business performance.

Hybrid cloud: Designing for success

Many companies across industries have adopted hybrid cloud, but it's done in siloes, rather than according to an overarching plan. For instance, a connected vehicle's functional and health data transmits to and from enterprise clouds. At the same time, automakers and suppliers are also migrating their business applications and workloads to cloud.

In cloud conversations with clients across the industry, these two focus areas dominate, but rarely within the same conversation. Connected vehicle initiatives are owned by the product development organization, and the IT department manages enterprise cloud and applications. The siloed approach may help move the needle in these specific areas, but it is less than ideal when striving for broader digital transformation, which requires integration and a holistic cloud strategy.

Dabbling and stalled journeys

There are issues with this approach. Too often, cloud adoption programs lose momentum before investments start to pay off. "Dabbling-level" adoption stops short of a tipping point where the ROI from improvements in business performance balances—and then outpaces—cloud implementation costs. Consequently, cloud programs can be seen as necessary but unwelcome drains on resources, rather than opportunities for reinvention.

Almost a third of cloud adopters report being stalled mid-journey.[4] A further 37% report being "done" after only minimal workload migration.[5] Why? One reason is they're seeing unexpected increases in operating costs as they add more cloud vendors or cloudify more business functions.[6]
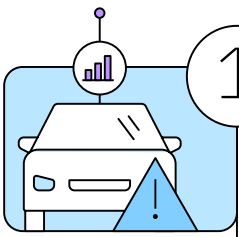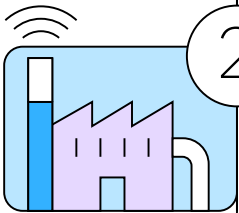
Hybrid cloud as an enterprise-level strategy

There's more. Running a series of cloud programs for isolated use cases leads to inefficiencies and missed opportunities to take data out of silos and integrate it, using it to build new insights, new products, and new business models. This is what true cloud-native businesses do instinctively—they consider hybrid cloud as an enterprise-level strategy, identifying every business area that it might transform over the next decade.

Automotive CIOs who deliberately and carefully reexamine automotive hybrid cloud strategy across three key areas of the business—beyond the obvious and the easy—put their companies in a better competitive position. Across industries, when leaders combine a cloud strategy with other business transformation levers, they can generate up to 13 times greater financial returns than with cloud alone.[7]

Moving to an enterprise-level maximalist strategy allows them to reap the true benefits of hybrid cloud, rather than incremental gains in siloed areas. Here's how.

# Hybrid cloud can help automakers with three main challenges

Optimizing hybrid cloud should mean the difference between aiming for transformational business outcomes and short-term gains. These three areas are key to getting it right in automotive companies.

|	The challenge	Current use of cloud	Optimal use of cloud
1 Connected car and SDV	How to handle millions of lines of code and up to 25 gigabytes data per vehicle, per day, while maintaining vehicle quality and consistency	Handling basic vehicle health data, in a silo, for a limited pool of vehicles	Hybrid data processing capabilities between in-vehicle, edge and cloud in a distributed computing environment, allowing seamless access to rich vehicle health, configuration and utilization datapoints
2 Connected manufacturing	How to successfully integrate information technology and operations technology and form a consolidated view of capabilities to successfully act upon the hundreds of gigabytes of data produced by factories daily	Lifting and shifting mainframe factory applications to cloud hosting	Combining the power of a centralized cloud and localized edge computing to unlock analytics, AI and monitoring use cases, on the factory floor and across the supply chain
3 Direct to consumer	How to create an omnichannel customer experience in a rapidly shifting sales environment	Creating a cloud sales platform for dealers and agents	Creating a true digital-first customer platform, through which a next-generation customer experience can be created, encouraging customers to remain loyal for longer
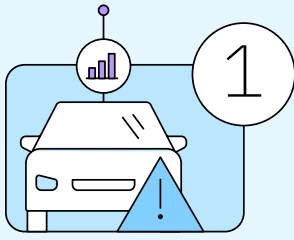
Connected cars and software defined vehicles

Vehicles today can have hundreds of millions of lines of software code, which may be distributed among multiple electronic control units (ECUs) supported by sensors, cameras, radar, and light detection and ranging (LIDAR) devices, as well as in-vehicle infotainment systems. As the industry continues to make cars that are increasingly digital, two domains have emerged—the connected vehicle and the SDV.
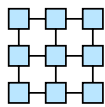
Connected vehicle

A connected vehicle communicates bi-directionally, allowing it to share internet access, and hence data, with other devices both inside and outside the vehicle. It uses cloud for workload and data management.
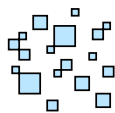
Software-defined vehicle (SDV)

An SDV's features and functions are primarily enabled through software, instead of hardware. Autonomous driving is a typical SDV use case because it requires low latency, which means it runs best on a computer network that is optimized to process a very high volume of data messages with minimal delay. Imagine a situation that requires an immediate response for safety reasons—the car needs to process data related to obstacles in the road, or other potential hazards. SDVs use in-vehicle, edge computing to take in information and act on it quickly rather than sending it to a central location, awaiting a response, and then proceeding.

Because of the need for low latency, SDVs distribute their workload between in-vehicle edge computing, and cloud computing.

SDVs interact with their environment, can act autonomously, learn, are always connected, and enable service-based business models.

Main challenges for automakers

A wide range of unintegrated solutions.
Connected vehicle and SDV solutions exist today as a wide variety of applications and services hosted in various environments: on-board, private and public cloud, on-premises, or a combination of all. In addition, on-board computing typically have limited capabilities compared to cloud. This makes managing and integrating the solutions very challenging.

Data in all forms, at volume, coming fast.
The range and forecasted volume of data, as well as the variety and frequency of data, have changed dramatically—leading to a major scalability issue.

Security and privacy concerns.
Attack surfaces are significantly expanding due to the electrification of vehicles. Automakers must secure complex edge connectivity with multiple technology layers, from in-car to the cloud. Also, regulatory compliance adds significant workload.[8]
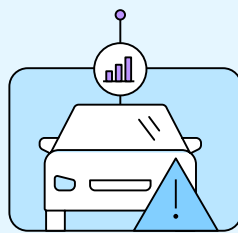
How a hybrid cloud strategy can help

Cloud can play a major role in the shift to connected and software-defined vehicles. Here are just a few of the ways cloud provides the foundation to power digital vehicles.

Robust infrastructure. While in-vehicle computing capability is essential for SDVs, the software needs to be enabled, built, and updated through a robust cloud infrastructure. This helps ensure the quality and consistency of the vehicle software, as well as the ability to rapidly update across fleets.

Hybrid data processing can enable deeper insights. Storing vehicle data and history in the automaker's cloud allows for deeper insights. Distributed computing and hybrid data processing between in-car, edge and cloud will help solve unintegrated data challenges.

Build once and deploy multiple. Cloud technology can orchestrate in-car and out-car applications seamlessly. This should be the target "North Star" solution. Standardized deployment processes between the vehicle and the enterprise can expedite simulation, virtual testing, and allow faster rollout of new features. It is also easier to leverage the open source community benefits, technical ecosystems, and alliances.

Action guide

01

Revisit technology architecture from future use case perspectives.

Take an inventory of IT infrastructure, data, middleware, and applications. Consider vehicle on-board computing and network constraints but strive to integrate advanced cloud-based technologies also.
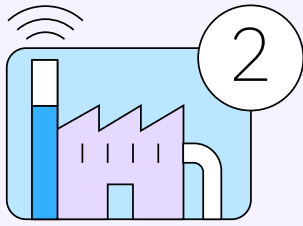
02

Shift product development practices from a hardware-driven mindset to prioritize software.

The change may not happen overnight, but nurture a culture shift by adopting an OpenShift approach as well as cloud work tools and open processes.

Almost a third of cloud adopters report being stalled in the middle of their journeys.

2 Connected manufacturing

Connected manufacturing uses a combination of edge and cloud computing to harness operational and business data to gain more value from improved processes and insights. However, only a quarter of manufacturing-related operations have migrated their data and workloads to the cloud.[9] Also, executives report their cloud architecture is inadequate for some of their most important technology initiatives, such as supply orchestration and manufacturing quality root cause analysis.[10]

Main challenges for automakers

Lack of a standard IT landscape. There is often significant deviation among IT landscapes from plant to plant, with proprietary and homegrown IT systems managed locally on-premises. This presents significant challenges for organizations trying to spread best practices globally. Due to legacy equipment and the lack of commonality, plus concerns at certain plants about latency and bandwidth of data processing, the shift to truly connected manufacturing on a wide scale is a pipe dream for many manufacturing organizations.

Loads of data, but few insights. Conversely, there is often a significant lack of data processing capability at the point of manufacturing. This means that factories generate many hundreds of gigabytes of data, but with very little capability to act on them. Thus, even where data gathering with instrumentation is available, the ability to manage the data collected and contextualize it in the same way is missing.

The information technology (IT) versus operational technology (OT) divide. IT systems handle data-centric computing. OT systems monitor devices, events, and processes, making adjustments within industrial operations when necessary. There is a fundamental difference between IT systems, designed to solve business challenges and refreshed regularly, and OT systems, which are designed for reliability and longevity. OT devices can frustrate managers who are accustomed to digital omniscience.

Unintegrated data. Even automotive organizations which are capable of some IT/OT integration do not tend to hold a truly integrated overview of manufacturing and operational metrics. This means that, in many cases, data may be available, but it remains untrusted by the business—or it is so outdated as to only be useful for historical reporting, rather than decision-making. This means that decisions regarding manufacturing continue to be taken on gut feeling versus trends identified by analytics.

The impact of these four challenges is that the adoption of connected manufacturing throughout the automotive industry has not been as rapid as it should be.
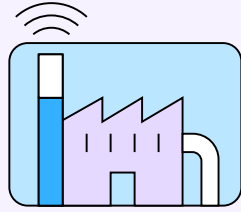
How a hybrid cloud strategy can help

Automotive companies invest billions on enterprise systems, industrial automation, and advanced product technologies, but they are slow adopters compared to data and technology companies—which is essentially what they are trying to become. A hybrid cloud approach that enables collection, storage, and analysis of data across the organization and the value chain can help mitigate the challenges auto companies are facing.

A greater level of transparency. Modernizing legacy applications in automotive plants—putting them in the cloud—can provide transparency across the organization. That transparency is essential for connected manufacturing. The effort should involve virtualization and containerization as part of a larger application modernization.

Integrating cloud-orchestrated automated workflows for better insights. Many organizations still have siloes. Because of that, many have data that hasn't been integrated across their business, particularly in the divide between IT and OT. That's not an ideal situation in an environment where data is the new gold. Cloud-orchestrated automated workflows can help break these siloes, allowing enterprises to unlock the insights that may reside in that data.

Optimized workloads via edge computing. Edge computing is all about decentralized data and application processing across hundreds to millions of edge endpoints that reside outside of a traditional data center. It involves a large number of capable devices or servers processing data in close proximity to the point of action, centrally managed with containerized software. Major hyperscalers already have edge management platforms that help optimize workloads.

Decisions regarding manufacturing continue to be taken on gut feeling versus trends identified by analytics.

Cloud helps automakers power up sustainability efforts

Sustainability is becoming an existential challenge for every automaker—and the conversation has moved far beyond just tailpipe emissions. A variety of factors, from regulatory change and societal pressure, to material scarcity and expense, to a shift in consumer preferences, are rapidly making sustainability a business differentiator.

Automotive CEOs consider sustainability to be a key focus area. A majority of automotive CEOs (72%) experience the most direct pressure for sustainability from board members and investors.[11] In addition, over 80% of automotive CEOs expect sustainability investments to produce improved business results in the next five years.[12]

Checking the box versus true transformation

Despite the pressure, sustainability has become an accounting and reporting exercise rather than a transformation effort for many organizations. For example, 43% more is spent on sustainability reporting than sustainable innovation efforts.[13]

Cloud computing can help on both counts, making a significant contribution to an organization's carbon footprint as well as its balance sheet. However, 44% of CEOs surveyed stated that they had either made no investment, or had only invested to comply with mandates and regulations.[14] Only 13% of globally assessed CEOs had made investments related to sustainability, such as cloud transformation, which would reshape major aspects of the enterprise.[15]

In addition, 55% of auto executives say they use hybrid cloud capabilities extensively for sustainability.[16] But, just 66% say sustainability objectives are incorporated into cloud strategy—leaving a significant number of automotive companies disconnected in this area.[17]

Automotive companies recognize that hybrid cloud can be a key enabler for profitable, sustainable transformation, but it appears they have no clear roadmap for getting there. Currently 42% of automotive OEMs and 35% of automotive suppliers are operating across multiple cloud environments; the majority of executives believe there is significant room for growth.[18]

Action guide

01

Triage data inventory based on criticality to manufacturing operations.

Track data lineage across OT manufacturing data layers, as well as IT planning and reporting layers. Assess the impact of having transparency and timely KPI data. Evaluate suitable cloud platform and migration options.

## 02

Analyze what's holding back the adoption of AI, automation, and other advanced technologies in manufacturing operations.

Simulate the technical and financial impact of hosting such applications and moving workflows to hybrid cloud.

03

Decide whether your organization wants to prioritize capabilities in data and technology, or production engineering.

Create the modernization roadmap accordingly.
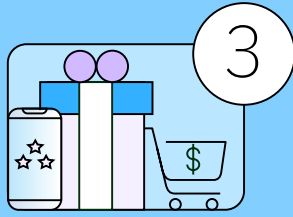
Direct to consumer: Transforming the customer relationship

Automotive executives expect electric vehicle subscriptions will grow from 3% today to 37% by 2030.

As OEMs reinvent cars with technology, the automotive sales process undergoes its own changes. Automotive companies are diversifying from the legacy franchised sales model by adding direct-to-consumer, agency, and subscription sales models. They are also looking to diversify their digital revenue streams, moving away from relying on one-time vehicle purchases and post-sale services.

In a world where customers are frequently consuming multiple digital and physical products directly from an automotive brand, a hybrid cloud ecosystem is critical.

Main challenges for automakers

Disjointed customer experience. In the legacy dealership model, customer data resides in multiple places: in dealership management systems (DMS) of retail franchise groups, some within the corporate CRM system of the automotive company, and some within the databases of the captive finance company. This means that customers are frequently chased by multiple parties regarding the same sale, frequently in contradiction with one another, leading to a disjointed experience.

Slow, uneven access to customer data. In a legacy automotive scenario, customer information tends to be guarded closely by the CRM team and processed in monthly batches for consumption by management. This level of opacity and slow pace do not spell success in a fast-moving, B2C environment. If automakers are to become responsive digital organizations, they will need to restructure the storage, processing, and role-based access to management-critical insights, so that dashboards and key performance indicators (KPIs) can be dynamically refreshed and highly relevant.

Shifting revenue model with the shift to vehicle subscriptions. Automotive executives expect electric vehicle subscriptions to grow from 3% today to 37% by 2030, and to become a popular ownership option for consumers.[19] The overarching objective is shifting to increasing the customer's lifetime revenue streams. It's no longer simply about building and selling more vehicles.
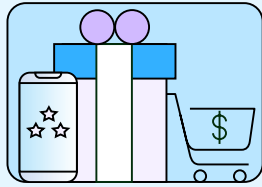
How a hybrid cloud strategy can help

Better insights and a better customer experience. Hybrid cloud lets organizations have a single view of all customer data stored across public and private cloud. They can share data based on roles with OEMs, dealers, and finance companies. In addition, a slight majority of auto organizations (58%) expect to use generative AI to reduce digital commerce technology and infrastructure costs by the end of 2024[20]—and to be successful with generative AI, companies need an agile hybrid cloud foundation.

More choice for customers. Sensitive, identifiable vehicle data can remain in private clouds to be used for diagnostics, monitoring, or engineering. More transient connected vehicle data can be shifted to public cloud to enable personalized customer journeys—for example, the awarding of "green driving points" to offset a customer's next vehicle purchase or recommending a switch to a different consumption model based on their driving style. All data can be unified by a single set of customer permissions, allowing them the choice of how much to share and to enrich their profile.

Faster, simpler access to customer data for both business and operations teams. Cloud enables a data lakehouse approach, allowing structured, unstructured, and semi-structured data to be unified under a single data architecture. This enables instant access to real-time data that can be used for machine learning and predictive analytics. It also allows operations and business leadership to create self-serve reports, accessing integrated data. And it allows generative AI workloads to run at scale on proprietary data.

In a world where customers are frequently consuming multiple digital and physical products directly from an automotive brand, a hybrid cloud ecosystem is critical.

Action guide

01

Create a blueprint of your retail ecosystem platform with internal and external stakeholders.

Focus on maximizing customer benefits and value first, then a fair distribution of benefits to the stakeholders. Pay attention to privacy, security, and regulatory requirements.

02

Evaluate an open platform where future enhancements and expansions are possible, as well as on and off-boarding of business partners and/or internal departments.

03

Enhance the customer experience, utilizing advanced AI and a data platform, enabled by hybrid cloud.

All things digital begin with cloud

Cloud is the foundation for today's digital technologies such as generative AI, and what automakers will need when tomorrow's technologies (hello, quantum computing) hit their stride.

As automotive digital technology prowess becomes increasingly important to consumers, automakers need a solid but agile foundation to build upon—hybrid cloud provides just that. Given that automakers entered the cloud arena long before the competitive and consumer landscape look as they do today, now is the time to revisit their hybrid cloud strategy and upgrade for the future.

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Related reports

Automotive 2030

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Cloud-enabled manufacturing

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