A new era for the automotive industry

How cloud computing will enable automotive companies to change the game
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Converging forces are disrupting industry operating models

Across the world, automotive manufacturers are facing the convergence of several global industry trends that are putting existing operating models under strain:

• Market uncertainty and pricing pressure in major markets worldwide mean automotive original equipment manufacturers (OEMs) need to adjust their growth strategies and functional operations, to capitalize faster and more cost-effectively on market opportunities.

• Changes in customer demands—especially among younger demographics—are gathering pace as the social importance and prestige of car ownership decline, and as customers seek new and different in-car experiences. This is putting OEMs under pressure to develop vehicle features that provide greater digital connectivity and mesh into the day-to-day lives of younger consumers.

• Intensifying competition, as automotive OEMs from emerging markets catch up in terms of quality and begin to enter developed markets. Incumbent OEMs are under pressure to defend their market leadership through product innovation.

• New sources of differentiation are emerging, as competition and changing customer demands shift the focus of customers’ buying decisions from traditional vehicle design aesthetics to in-vehicle infotainment and communications technology innovation.

• Regulatory and consumer pressure for greater environmental responsibility—and the energy transition from oil to renewables—requires OEMs’ product and service portfolios to be more environmentally friendly, both during use and at the end of the lifecycle.

• New business models are emerging in response to a decline in the importance of ownership over usage; rising demand for services that support car-sharing; and the increasing value attributed to connected technologies in consumers’ choice of vehicle. Traditionally, most OEMs sold their cars on a business-to-business (B2B) basis via dealerships, rather than direct to consumers through business-to-consumer (B2C) relationships. Now this model is changing, with major automakers moving to a blend of B2B and B2C, and increasingly seeking to deal directly with consumers in areas such as connected vehicle services.
Cloud computing is a model for providing and sourcing information technology services on a "pay per use" basis. Cloud services are elastic, allowing them to be highly configurable, adaptable and scalable, and generally require less upfront investment and ongoing operating expenditure than traditional IT models.

Clouds generally take one—or a combination—of four forms: private, public, hybrid and community. Private clouds are dedicated to a single company for private use and can either be built within a company’s premises or located off-site, owned and provided by an external third party. Private clouds deliver virtualized application, infrastructure and communications services for internal business users.

Public clouds are accessible to the public over a network and are fully owned and provided by external third parties. Hybrid clouds blend the benefits of public and private clouds, by enabling a company to retain confidential information in a private cloud, while providing access to the wider choice of cloud computing services in public clouds. Community clouds are collaborative resources shared between a limited number of organizations with common requirements and interests—often in the same industry or geographical region. Community clouds can be hosted internally or by external third parties as a managed service.

All four forms of cloud computing can provide computing “on demand” at one or more of four levels:

- At the infrastructure level, companies use infrastructure-as-a-service (IaaS) offerings to source raw computing resources, processing power, network bandwidth and storage on demand. IaaS is the most basic cloud service model.

- At the application level, with software-as-a-service (SaaS), the end user receives a complete software application encompassing apps and associated data centrally hosted on the cloud and accessed via web browsers, supporting device independence and anywhere access.

- At the platform level, platform-as-a-service (PaaS) is a software platform including infrastructure elements such as database, middleware, messaging, security and development tools, as well as a presentation layer, that are used to develop custom applications. Where there is a need for continuous change, PaaS provides companies with an environment that supports software development.

- At the business process level, cloud computing–based solutions known as business-process-as-a-service (BPaaS) offer a web-enabled, externally provisioned service for managing business processes. These solutions differ from application clouds in that they provide robust process support, covering not just software but also people processes such as contact centers.

Accenture believes that, over time, today’s individual forms or “flavors” of cloud will evolve into a model known as “Everything-as-a-Service,” or XaaS, in which all infrastructure, services and processes are provided on demand from the cloud. Many enterprises are moving towards this model.
Cloud computing uptake is underway throughout the industry value chain. . .

As automotive OEMs face these converging forces, cloud computing’s blend of scalability, agility and pay-per-use costs—combined with mobile, social and analytics technologies—can play a role in helping companies adapt to the new environment. More and more automotive companies are using the cloud to achieve benefits throughout the value chain, such as faster time to market, more flexible collaboration and data sharing.
The opportunities for cloud computing in design include:

- Cloud-enabled global product development
- An integrated product data collection hosted in the cloud
- Cloud-based project management applications.

The scalability and massive processing power of the cloud is ideally suited to supporting analytics that help improve product quality—including facilitating the design of the programmable, autonomous car of the future.

Automotive designers at General Motors (GM) are now leveraging a US$130-million enterprise data center that GM launched in 2013 to transform its global IT infrastructure.1 The data center’s private cloud architecture serves as the computing backbone for GM’s global operations, helping the company work smarter and faster, from the design studio to the factory to the showroom. For example, GM can now conduct supercomputer-powered crash-test simulations, each time saving the US$350,000 it takes to conduct a physical crash test.

Cloud computing can open up opportunities for faster and more seamless collaboration across worldwide automotive supplier networks. This helps ensure efficient and responsive product development. It also allows for more integrated, secure, and visible order management and shipping of OEM parts.

Cloud solutions currently deployed in the automotive supply chain include Renault’s Easy Tracker,2 a cloud supply chain platform that Renault is rolling out in export markets worldwide to support its international expansion. As part of the company’s "2016—Drive the Change" corporate initiative, Renault’s after-sales organization is focusing on the high-value spare parts and accessories business.

The Easy Tracker project is based on technology from GT Nexus—a vendor of supply-chain-related cloud solutions—and Renault hopes it will help the company better serve its fast-growing international markets and customers, while also reducing inventory and transportation costs.

Cloud computing could enable enhanced analytical and reporting capabilities for plant operations and plant product performance, as well as integrated monitoring of product quality and related data. Cloud computing could also be used to improve synchronization between manufacturing and business systems, by making them more interoperable. Other uses for the cloud might include load balancing between assembly plants (assuming a flexible production network), real-time analytics of manufacturing quality–related data, and feedback to a plant network (assuming standardized processes and production systems).

Ford is piloting a cloud solution based on Google Earth, to enable virtual navigation of its assembly plants, down to the level of individual workstations.3 IntoSitem, developed by Siemens using the Google Earth infrastructure, is a cloud-based web application that allows users to share information within private virtual spaces created across Ford’s plants and around the world. Ford expects to reap benefits such as improved communication, efficiency, globalization, and standardization.

At the retail level, cloud computing may facilitate detailed consumer insights through cloud-based social media analytics and real-time monitoring of consumer behavior. The cloud can also support advanced dealer management systems (DMS), automated vehicle servicing, faster and more effective management of parts ordering, and enhanced dealer training.

Renault Belgium’s recently built myrenault.be website and sales management tool,4 both based on Salesforce.com’s customer relationship management (CRM) platform. The sales management tool is used to manage relationships between Renault, its local dealers and its customers, and is integrated with a data warehouse that contains the existing commercial data in Renault’s transaction systems. The myrenault.be site was designed for regular use by Renault drivers. It enables drivers to register vehicle information such as actual mileage and create a personalized driver profile, and also provides them with a reference for scheduled maintenance dates and predicted parts replacement.

Aftermarket and "connected vehicle" services is the segment of the automotive value chain where cloud computing may have the most profound and disruptive impact on the industry. Here, the potential applications for cloud technologies include advanced connected vehicle solutions and next-generation infotainment products and services. Cloud-based aftermarket services will also cover areas like proactive remote fault discovery and maintenance; faster and more effective recall and parts inventory management; vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication services; and mobility-related services such as car-sharing, parking services and electric vehicle charging.

To date, examples of cloud applications in these areas include GM’s announcement5 in January 2014 that it will roll out OnStar 4G LTE running on AT&T’s network in most Chevrolet vehicles in North America by 2015. This will enable passengers to connect personal devices such as smartphones, laptops and tablets to high-speed wireless internet on the move. The built-in 4G LTE connection will also allow vehicles to be updated with the latest software and mobile apps.
... but with limited adoption of cloud in core operations

While cloud computing is being used increasingly throughout the automotive value chain, most cloud solutions in the industry are still largely limited to discrete, tactical and targeted solutions outside core operations. In contrast, there is relatively little use of cloud in a strategic or integrated way across enterprises, or to foster external collaboration in the manufacturing supply chain.

While automotive OEMs are making growing use of private cloud and virtualization technologies in their in-house data centers, they remain wary of using external hosting or public cloud services.

**Why the hesitation?**

There are several reasons for automotive OEMs' reluctance to bring cloud computing into the heart of their operations.

Among the most important of these is the industry's entrenched and relatively conservative engineering-focused industry mindset. OEMs have thrived for many years by focusing on their core engineering competencies—building and running in-house systems and processes related to these—and they tend to be wary of any form of outsourcing to third parties.

Within the automotive industry, many hold the view that the industry and supply chain—and indeed individual OEMs—are fundamentally different and distinct from other companies and industries. This creates skepticism that common, standardized and off-the-shelf solutions can meet automotive OEMs' apparently "unique" needs, and strengthens the resistance to cloud solutions.

Similar skepticism over standardization also exists regarding the use of cloud computing in the supply chain. For example, automotive dealers operate on a wide range of different models—owned, independent, single marque, multiple marque—and use a vast array of different technologies. OEMs feel this diversity and fragmentation would make cloud-based standardization problematic.

At the same time, many OEM executive teams harbor deep concerns over a perceived loss of control of data security and privacy in the cloud. As stewards of a wealth of highly commercially sensitive data—ranging from core engineering intellectual property and design information to personal customer and market data—they fear that a breach of cloud security could severely undermine their business and reputation.

Finally, Accenture's experience suggests that many automotive executives are still unconvinced of the business case for investing in cloud capabilities. The biggest OEMs are concerned about the risk that moving to cloud might bring in terms of writing off massive prior investments in bespoke in-house systems.

These barriers to cloud computing in the automotive sector are substantial and deeply embedded. But we believe the barriers will be overcome in the coming years, heralding a migration toward increasingly widespread use of cloud across the industry. Before examining how this will happen, let's first investigate why.
The triggers for cloud in automotive: Connected vehicle, analytics, mobility and social

In the long term—perhaps 15 or 20 years from now—cloud computing architectures may well have established a central role in the automotive industry ecosystem, effectively acting as the "glue" integrating all the disparate participants, processes and interconnections in the automotive value chain. The value chain is not as distinctive or unique as many OEMs believe.

Cloud computing is already starting to play this role in other industries, from retail to healthcare. But progress towards this model in the automotive sector will take years. In the meantime, adoption of cloud computing in core operations and supply chain will remain gradual.

However, we believe that one specific segment of the automotive value chain will see cloud solutions come to the fore much faster and more dramatically than any other. This is in the hugely disruptive move to the "connected vehicle"—a trend that opens up massive potential for cloud services, and which may be integral to the vehicle or provided on separate devices.

The rapid adoption of cloud computing in the connected vehicle space will be supported and accelerated by the converging and complementary technologies of social networking, mobile and analytics, used in combination with cloud. Together, this "SMAC" ecosystem—a commonly used acronym for social, mobile, analytics and cloud—will enable a radical transformation of everything from the connected car value chain to the driving experience.

The advent of the connected vehicle. . .

Drivers and passengers around the globe increasingly expect to access connected services in their vehicles, just as they do elsewhere. Meeting this demand isn’t just about better in-car information and entertainment, or "infotainment". The diagnostic and transactional data that connected vehicle systems generate can simultaneously provide OEMs with the insights they need to enhance services in areas such as CRM, marketing, quality, customer services, aftermarket services, and research and development (R&D).

A recent Accenture survey (http://www.accenture.com/us-en/Pages/service-connected-vehicle.aspx) underscores the scale of global demand for connected vehicle capabilities. Data from more than 14,000 consumers across 12 countries—conducted to investigate what consumers want and how OEMs can fulfill those demands—found that drivers are twice as likely to choose a vehicle based on its technology options rather than on its performance. See page 11 for more findings.
Accenture’s connected vehicle study shows technology options trump vehicle performance

Our survey of 14,195 drivers in Brazil, China, France, Germany, Indonesia, Italy, Malaysia, South Africa, South Korea, Spain, the United Kingdom and the United States examined current use of connected vehicle technologies and expectations for future use.

We found that drivers are twice as likely to choose a car based on in-vehicle technology options rather than on its performance, demonstrating the rising importance of vehicle connectivity to the automotive industry’s customers. The survey also revealed that high interest in next-generation in-car technologies among drivers in emerging economies could help shape future demand for sales and provide the automotive industry with a sustained revenue stream.

Detailed findings include:

- **65%** would like to use an in-car feature that enabled them to read and dictate emails while driving.
- **86%** are already using in-car search and point-of-interest (PoI) services, or are interested in doing so.
- **50%** of drivers are already using connected traffic information—and only 6 percent are not interested in it.
- **95%** are using or would like to use a recovery tracker for stolen vehicles.
- **70%** are interested in in-car e-learning or educational services.
- **86%** are already using in-car search and point-of-interest (PoI) services, or are interested in doing so.

The research also revealed strong interest in vehicle health reports and vehicle lifecycle management services. OEMs that are able to tap into this demand could open up new revenue streams in providing maintenance-related digital services and services to address ongoing wear and tear on engines and parts. While only 13 percent of drivers surveyed said they currently use a vehicle health report and 12 percent use vehicle lifecycle management services, 39 percent and 37 percent, respectively, expect to start using these services soon.
as consumer expectations and behaviors continue to evolve

More generally, Accenture’s Connected Vehicle study provides a valuable snapshot of consumers’ evolving mindset. Advancing digital and communications technology, mobile devices and digital media are driving up consumers’ expectations for new functionalities and features in their vehicles, including always-on internet-based services and applications. This escalation is seeing drivers’ expectations evolve beyond basic technologies—Bluetooth, mp3 players and so on—to becoming comfortable with the idea of their vehicles being internet-connected environments. The buying experience and processes are also facing profound disruption, through innovations such as Tesla’s model of selling direct to consumers via the internet, and locating stores in shopping malls where prospective buyers can book a test-drive.

Over the coming years, social and behavioral changes will continue to redefine the basis on which people decide to buy a car, with vehicle technology becoming relatively less important, and in-car digital services—and the convenience of the selection process—playing a growing role in consumers’ choice of vehicle. As possession of a car becomes less of a lifestyle goal, these shifts are driving a trend away from “ownership” and towards “usage”, especially among younger people—opening up the world of mobility services which, almost by definition, require open, cloud-based capabilities. See Figure 2.

One outcome of these trends is a further increase in the potential for connected vehicle technologies. Despite relatively mild growth in global new vehicle sales—projected to rise at just three percent, compounded annually, from 2013 to 2020—the connected car market is expected to surge (see Figure 2), as the number of new vehicles sold with connected technology grows at a compound annual growth rate (CAGR) of 21 percent through 2020.

As a result, the penetration rate for connected systems is projected to surge from 14 percent in 2013 to over 50 percent by 2020, driven by growth in smartphone integrated systems and advances in vehicle-embedded systems. As connected vehicle capabilities continue to evolve and roll out, Accenture believes they will tend to focus on four key functional areas, as described in the accompanying information panel.

Figure 2: New cars sold with connected technologies; number of cars sold globally and penetration rate on total cars sold

Despite a relatively mild growth rate in global new vehicle sales (three percent CAGR from 2013 – 2020), the connected car market is expected to surge.

- The number of new vehicles sold with connected technology is forecasted to grow by a 21% CAGR through 2020.
- The penetration rate for connected systems is predicted to increase from 14% in 2013 to over 50% by 2020.
- The rapid increase in connected vehicle sales will be driven by growth in smartphone integrated systems segment and advancements in vehicle embedded systems.

Note: Connected Technology Systems includes embedded, tethered or smartphone connected capabilities
Source: SBD, Accenture Research Analysis
Connected vehicle solutions focus on four key functions

Telematics. Vehicle telematics encompass a wide range of computing and communications services located within a car. They focus mainly on safety, security and convenience, and include features as varied as stolen vehicle recovery, emergency calls, concierge services, remote door unlocking and remote diagnostics. Most in-car telematics solutions are managed by service providers through call centers.

Advanced driver assistance systems (ADASs). These services focus primarily on accident avoidance and driving efficiency, and do not always require internet connectivity. However, more recent ADAS innovations are increasingly leveraging cloud connectivity to augment the information gathered from embedded onboard systems. Falling prices are boosting adoption, and future services will focus on autonomous driving capabilities.

Mobility services. These solutions collect vehicle-specific data through various technologies—positioning technology, wireless communication modules, vehicle sensors and mobile device integration—and then leverage it by linking to an internet-based application via mobile connectivity. Mobile services include vehicle access as a service, and usage and mileage-based services. The most current mobility services are operated by non-automotive vendors, but this may change as OEMs extend their offerings.

Infotainment. This category includes information services—like navigation, traffic services, weather and mobile apps, and email—and also entertainment. Infotainment features can be offered either via technology embedded in the vehicle or via device-to-vehicle integration, using consumers’ separate mobile devices as a hub for accessing internet-based content. These offerings focus strongly on ease of use and safety-related services. To offer infotainment services, OEMs generally collaborate with non-automotive vendors.
New connected vehicle services will unleash a flood of data... 

The rise of connected vehicle services across various functions will unleash an expanding flood of data that needs to be captured, stored, analyzed, and turned into intelligence to underpin services and revenues.

Connected vehicle capabilities could potentially be created and rolled out on a proprietary basis—and on non-cloud platforms—by individual OEMs, for implementation in their own product range. This means the availability of cloud computing solutions is not a major trigger for the move to the connected vehicle. Rather, the cloud is just one possible enabling platform for connected vehicle applications and capabilities.

...demanding cloud analytics...

We believe the sheer amounts of data that connected vehicle services collect and produce will help to tip the balance in favor of cloud computing by ushering in the widespread adoption of cloud-based analytics, leveraging the cloud’s connectivity, scalability and flexible processing power. Within the next 18 to 24 months, we believe that these rising data volumes will press home the business case for cloud solutions. Research firm IHS Automotive estimates that globally, 23 million cars are now connected to the internet in some capacity. By 2020 that figure is expected to rise to 152 million; just a fraction of the estimated 18 billion Internet of Things (IoT) devices on the planet.

With data being shared across a wider range of value chain participants, questions will inevitably arise around who owns and may access data. Increasing connectivity, information exchange and automation also introduce new concerns about the security of the systems in a vehicle. So maintaining security and privacy across different hand-offs and interface points will be key—and not only because drivers will want to protect the security and privacy of their own personal mobility information.

...and robust security

The crucial importance of security in the connected vehicle is reinforced by the fact that the lives of drivers, passengers and other road users could be at risk if the security and integrity of in-car and vehicle-related data are not maintained. For example, vehicle software systems will increasingly be upgraded via onboard diagnostics or wirelessly “over the air” to correct faults, improve functionality and introduce new features. Cars will also communicate safety information such as speed and position as part of advancing V2V technology—a capability that the U.S. federal government is planning to make a mandatory requirement for connected vehicles.

If these types of systems or data are compromised or tampered with maliciously, the outcome could be catastrophic failure, such as failure of engines or anti-lock brakes, with potentially fatal results. Such incidents could also cause severe financial and brand damage to the car manufacturer. Some in-car systems now incorporate automatic communication with emergency and medical services when needed. Even now, any failure or compromise of these systems could be fatal.

Given these implications, the security considerations that need to be addressed in connected vehicle systems—and indeed more generally in the IoT—include operations security, privacy, software patching, communication protocols, digital identities and access management.
To prepare fully for security in this new world, automotive OEMs and third-party service developers need to engineer trust into their products and services; adopt a different mindset around operations focused on the emergence of Big Data as well as machine learning; adopt privacy-by-design (PbD) principles; and, most importantly, educate users.
Cloud computing changes auto design, manufacturing and sales in five major ways

As automotive OEMs' use of cloud computing—in combination with mobile, analytics and increasingly social technologies—gathers pace over the coming years, it will help OEMs to adjust to five game-changing shifts that are already beginning.

Over time, we believe these shifts will trigger a profound reshaping of the automotive value chain, in turn driving further adoption of cloud in a widening range of activities. And by helping OEMs adapt to and participate in these shifts, cloud computing will also help them retain their relevance to customers and their central positioning in the automotive market. The five shifts are:

From differentiation on vehicle features to differentiation on in-car digital services and connectivity

When they are driving, young adults no longer crave the traditional experience of keeping their eyes on the road and hands on the wheel. Instead they want to continue their digital social life over connected devices, so they're switching the focus of their car-buying decisions to in-car digital services.

Even older demographics are increasingly focused on connectivity and less on traditional driving and design excellence, though these are still powerful forces for many Baby Boomers, who still have the deepest pockets.

The ongoing shift is raising concerns over driver distraction, and is helping to push the industry towards autonomous vehicles (see opposite page). More generally, it will require OEMs to expand their competency from manufacturing cars to include providing infotainment and digital services—insurance, tolling, remote maintenance, automated cruise control and more—through in-house development or collaboration with partners.

We believe cloud computing will play two key roles in helping OEMs achieve this change: First, by providing a generally cost-effective, fast and scalable platform for generating data insights and developing new services by integrating cloud, mobile, analytics and social technologies; and second, by enabling OEMs to participate more effectively in...
Fears of driver distraction fuel moves towards autonomous vehicles

While drivers—especially younger drivers—value the ability to stay digitally connected while driving, this trend has prompted some commentators to raise concerns over road safety. While in-car connectivity is attractive, it also creates the risk that drivers could get distracted at a vital moment; even a split-second inattention could prove fatal to the driver and others.

Such fears are helping to fuel the development of driver assistance and accident avoidance features such as adaptive cruise control, which may ultimately lead to the development of fully autonomous vehicles of the type already in use at many industrial and resources facilities worldwide.

Volvo Car Group’s cloud solution offers “total connectivity”

In February 2014, Volvo Car Group launched Sensus Connect, an updated onboard infotainment and navigation solution designed to offer a fully connected in-car experience. The cloud-based service allows drivers to find and pay for parking from their car, discover new restaurants at their destination, stream their favorite music seamlessly, and much more.

The solution enables tens of thousands of radio stations to be enjoyed in-car, and its navigation system allows the driver to set destinations through their mobile device and get information about their surroundings through Wikipedia. Volvo developed Sensus Connect with partners including Ericsson, Pandora, HERE, Yelp, Glympse and parking service providers.

Collaboration and agile development along the entire digital services value chain.

Cloud-based computing combined with car telematics will also enable new mobility models. Cloud will be especially crucial in enabling the automotive industry to make the breakthrough to fully self-driving cars. To operate and navigate these autonomous vehicles safely and effectively, intelligent transportation systems will coordinate the traffic, and digital maps in the car will be constantly updated over the cloud.

By 2020, with self-driving cars becoming increasingly widespread, a vehicle will potentially have more than 100 million lines of code running in it. The result will be a further sharp rise in the complexity of electronics and software in the car—and the migration of some functions to the cloud will help manage and simplify this complexity.

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Accenture’s “Connected Vehicle” research found that 90 percent of consumers are interested in autonomous driving options, primarily those related to safety. The most popular features included lane-changing and collision warning systems, automatic braking systems that avoid collisions, and fully automated parking.
Amazon launches Cloud Player for BMW and MINI vehicles

Amazon.com recently announced the availability of Amazon Cloud Player for iOS in BMW Apps– and MINI Connected–equipped vehicles released from 2011 onwards. The release enables Amazon Cloud Player customers using Apple iPhone and iPod Touch devices to access their music conveniently using the vehicle’s controller and screen.

The integration of Amazon Cloud Player for BMW Apps– and MINI Connected–equipped vehicles means customers can access their music playlists stored in Amazon Cloud Player using dashboard controls; enjoy high-quality music up to 256kbps; free up local storage space on their phones by storing and accessing music in the cloud; and get rid of bulky CDs for easier music listening in the car.

From a unified automotive and digital services design cycle to separate decoupled design cycles

In the traditional automotive vehicle design cycle, it takes six or seven years to progress from initial concept to car on the road. And road-testing requirements mean the mechanical engineering design for a new vehicle needs to be finished three years before it goes on sale.

But the transformation cycle in digital services is closer to one or two years, creating a major mismatch between the two design cycles.

Historically, OEMs have managed the design of in-car electronics as one element of the overall vehicle design. But such an approach risks the electronic components and services being out of date well before the car reaches production. So OEMs need to decouple the automotive design cycle from the digital services design cycle, whether it’s carried out internally, in collaboration with partners or by third parties.

If the digital design is carried out in-house, the agile development capabilities and pay-per-use scalability brought by cloud computing may facilitate quicker responses to customer needs and help accelerate and focus development. If carried out with external partners, cloud platforms may provide a faster, more seamless and more cost-effective way of collaborating with third parties, while maintaining visibility and control over the process.
There are three basic types of in-vehicle connected solutions, the most popular currently being the fully “embedded” system:

- **Embedded solutions.** These are the solutions built within the vehicle to provide telematics connectivity, intelligence, security and reliability. They are already widely adopted by major OEMs.

- **Smartphone-integrated solutions.** These solutions integrate smartphone applications in a vehicle to provide features to the driver. Smartphone integration enables mobile apps that run on mobile devices to be displayed and controlled via the vehicle’s human machine interface (HMI).

- **Tethered solutions.** These solutions use a phone as a modem to provide connectivity with the help of Bluetooth or Wi-Fi services, and are beneficial for navigational purposes. However, they may well turn out to be the least popular solution due to technical issues when connecting a smartphone to the vehicle computer.

From developing and controlling proprietary in-car services to offering an open platform for third-party apps

To date, OEMs have mostly developed in-car digital services on a siloed and proprietary basis, making them specific to their own vehicles. However, the blending of the automotive and digital design cycles has meant that OEMs’ in-car services often seem out of date by the time they are launched. The result is that drivers often decide not to use the in-car services provided onboard, and look elsewhere instead. The satellite navigation market is one area where many OEMs have already lost out to third parties with shorter and more responsive design cycles. And the competitive pressure on OEMs' proprietary digital services will increase, as drivers seek in-vehicle apps that provide an ever-wider range of communication options, from linking up with friends on social media to letting drive-through coffee shops know their order automatically. It will be very difficult for OEMs to keep up with these rapidly evolving expectations.

In the era of ubiquitous mobile devices, there are three options for in-vehicle connectivity solutions (see information panel): “Embedded” solutions built into the vehicle; “smartphone-integrated” solutions that link the third-party device and the vehicle's human interface; and “tethered” solutions that use the phone as a modem for the car’s electronics.

Given these options, we believe OEMs should move to open up their in-car digital service platforms to third-party app developers, ideally supported by standardized operating systems across vehicles and even across OEMs. This would trigger the creation of collaborative ecosystems where drivers would benefit from wider ongoing innovation, supported and enabled by the standardization, scalability, processing power and connectivity of the SMAC ecosystem.

If OEMs do not open up their own vehicles' systems to third-party developers, we believe the ultimate risk is that online technology or device companies could produce a low-cost, commoditized, “plain vanilla”-branded vehicle, offering an open platform for apps. The main value of such a car to consumers would lie in its connectivity and continually upgraded digital services, which may be enough to convince many to buy or rent one.
Inteva adopts storage-infrastructure-as-a-service solution, integrating a public cloud

Inteva Products—a global tier-one global supplier of engineered components and systems to automotive OEMs—has adopted a storage-infrastructure-as-a-service solution that integrates public cloud storage. Inteva has used the unified storage solution from vendor Nasuni to transform and standardize its data control, storage and access infrastructure worldwide, adopting it as the primary storage solution in its manufacturing plants, engineering, finance, sales and marketing offices, across 18 countries on four continents.

From car ownership, usually by the individual, to car usage, increasingly shared among drivers

As consumers’ preferences move away from car ownership and towards merely using vehicles, transport is increasingly regarded as a service rather than a physical product. At the same time, advancing sensor technologies, in-car telematics and connectivity are enabling the development of automated vehicle guidance systems, ranging from adaptive cruise control to fully autonomous driving capabilities.

With the average age at which people get their first car rising steadily, a related development is that many younger consumers are developing an attachment to a manufacturer’s brand before they can afford a car. OEMs’ goal in online social marketing used to be to turn existing customers into new fans, but now it’s increasingly about turning existing fans into new customers.

However, these new customers may increasingly want to simply use or share an OEM’s vehicle rather than actually own one. One factor is the declining social prestige of car ownership. Another is that environmental, economic and regulatory pressures—including congestion charges, road tolling and dedicated lanes for multi-occupancy cars on freeways—are pushing people towards sharing transport rather than driving individually.

OEMs and third-party car rental companies are responding to the rising demand for car-sharing through technology-enabled sharing services such as Daimler’s Cars2Go; Avis Budget Group’s Zipcar; and BMW’s DriveNow, a joint venture with Sixt. Industry analysts say these services are already eating into sales of new and used cars. Some OEMs are also forming closer partnerships with major car rental companies to meet the rising demand for alternatives to ownership.

Cloud computing will help OEMs navigate the shift from individual ownership to shared use, by helping them manage and keep track of the data and processes needed to support an expanding array of vehicle use and payment models. The cloud may also help OEMs access cost-effective, standardized platforms that underpin in-car telematics-based applications—including electronic tolling, interactive short-term insurance and autonomous driving features.
AT&T launches connected car innovation initiatives with support from Accenture

AT&T has announced two major initiatives to lead innovation in the connected car market: A first-of-its-kind connected car center called the AT&T Drive Studio, and a modular, global automotive platform called AT&T Drive.

The AT&T Drive Studio is a dedicated facility for connected car innovation and research, featuring working garage bays, a speech lab, a full showroom to exhibit innovations, conference facilities and more. The Drive Studio integrates AT&T solutions across multiple companies, and serves as a hub where AT&T can respond to the needs of automotive manufacturers and the auto ecosystem at large. Accenture is committed to the Drive Studio and will work alongside AT&T as an ecosystem player.

AT&T Drive is the company’s connected car platform—a modular, global solution that allows carmakers to pick and choose what services and capabilities are important to them so they can differentiate their solutions in the marketplace. AT&T Drive aims to allow carmakers and developers develop their own innovative and customized connected car solutions, from connectivity and billing solutions to data analytics and infotainment.

From selling new cars that are physically maintained to providing remote digital maintenance and upgrades on existing cars

Once a car has been sold, it has traditionally been maintained and repaired over many years by a network of dealers and other providers. With the move to the connected vehicle, this will change. Just as today’s IT systems are commonly serviced, repaired and upgraded remotely via internet links, the same is already happening with cars—and we believe this trend will accelerate in the future.

As cars become increasingly digitally connected, the need to go to the dealer for servicing and repairs is being replaced by digitally downloading software and new apps to the car’s onboard systems. Over time cars will effectively become self-correcting, with problems being diagnosed and repaired through remote links, without the driver necessarily even being aware it is happening.

Downloaded apps and upgrades will also deliver continual enhancements to driving performance and also to electronic applications such as micro-payments and cruise control. In line with these advances, service and maintenance channels will also shift from a model based on selling and servicing via dealers to one founded on selling and servicing over digital links and, increasingly, via social media.

Declining residual values contribute to the trend away from new cars and toward digital upgrades and reconditioning. Car leasing terms are shortening from the traditional five years to as little as six months, with people looking for cars to be digitally refurbishable so they are “as good as new” and keep their resale value.

Cloud solutions can play a pivotal role in helping OEMs manage and control the data and connectivity needed to run a system of remote digital downloads and upgrades across all the cars they sell. We believe the vast amount of information involved means that cloud analytics will be the only viable and cost-effective means of doing this.
Cloud computing adoption set for takeoff—and soon

The automotive industry’s use of cloud technology is currently largely limited to discrete, targeted applications, usually based on a private cloud, with limited integration between cloud applications and little use of the cloud in core operations.

However, in the next few years the rise of the connected vehicle will transform the automotive landscape and create the context for rapidly increasing use of cloud solutions, within and beyond OEMs’ organizational boundaries.

This take-up of cloud will be spearheaded by analytics, mobile and social technologies, as OEMs seek to retain their central role in the industry; expand their core competency into digital services; and collaborate more widely with drivers, third-party application developers and communications providers.

These advances will help to usher in a new world of automotive capabilities: a world where cars will incorporate embedded machine-to-machine solutions that talk to other connected vehicles and to appliances in consumers’ homes; where cars will optimize the route for commuters driving to work and plan people’s trips, even telling them when to wake up in order to arrive in time; where pulling into the garage at home will trigger automatic adjustments to heating and lighting in the house; and where a car being driven into a shopping center car park will indicate which available parking bay is closest to the driver’s favorite store.

Migrating to the cloud will enable forward-thinking OEMs to navigate their way through seismic shifts both in drivers’ lifestyles and the automotive industry. We believe those that hold back from seizing this opportunity risk being left behind, facing a struggle to get back into the race.
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References


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