Media Backgrounder
Fujitsu Automotive Solutions

Munich, January 2019

There can't be many more exciting industries to work in right now than automotive. For the last century it has been a fundamental building block of the modern economy, but the industry is now going through two epic-scale changes. One of these is propelled by a shift in energy technology from carbon-based fuels to electric and hydrogen power-trains. And in the second, which could not have been predicted even 10 years ago, the industry has within its sights the ability to introduce autonomous vehicles that will totally reengineer the relationship between people and cars.

One of these changes would have been challenging. Managing both simultaneously is a roller coaster ride in which one false move could be terminal. And it's already clear that these changes are spawning further disruption. Autonomous cars are only viable if they are totally connected to external data sources at a level of reliability and scale that is unprecedented. There will also be behavioral change that will transform the way most people consume car travel, with a shift from ownership of one or more cars, to sharing access to vehicles on an as-needed basis – it even has a new acronym: MaaS, or Mobility-as-a-Service.

It's a fascinating equation, fueled by societal change – the need to reduce carbon emissions in the face of climate change – and a 21st century business/technological environment, where the convergence of multiple technologies within a new tech milieu that simply ignores old rules is creating new solutions to issues that were previously considered beyond our capabilities.

Government action is a factor too. Behind the scenes and on a global scale, governments are prompting change in the form of carbon-reduction programs, such as subsidies for electric vehicles, and legislation to ensure that their economies benefit from the emerging market for autonomous, connected vehicles. In the United States, the Connected Vehicle Pilot Deployment Program from the US Department of Transportation is a national effort to deploy, test, and operationalize cutting-edge mobile and roadside technologies and enable multiple CV applications. In Germany, the Strategy for Automated and Connected Driving from the Federal Ministry of Transport and Digital Infrastructure has the declared aim to strengthen "Germany's position as the world's number one car manufacturer" and in Japan the Ministry of Internal Affairs and Communications has issued guidelines.

With these powerful tailwinds, it is estimated that 69 percent of new cars sold by 2023 will have data-exchanging capabilities[1] and, even on conservative estimates, there will be 10 Million self-driving cars by 2020[2]. According to the International Energy Agency, the world's fleet of electric vehicles grew 54 percent to about 3.1 million in 2017 and the number of electric vehicles on the road around the world will hit 125 million by 2030.

How to manage disruption on all sides

Trying to manage global scale manufacturing organizations through this level of disruption is a massive challenge. A framework for the task has emerged, known as CASE, described by Dr. Dieter Zetsche, Chairman of the Board of Management of Daimler AG, as: "Connected, Autonomous, Shared, Electric: Each of these has the power to turn our entire industry upside down. But the true revolution is in combining them in a comprehensive, seamless package."

Fujitsu is working with car manufacturers to do just that. It already has more than half a century of experience in the industry, starting with a relationship with Toyota in 1961 and, in the ensuing 57 years, developing into a compelling portfolio and deep relationships with all Japanese

OEM´s, including Toyota, Nissan, Honda, Mazda, Subaru, Mitsubishi, Suzuki and Isuzu, as well as other global OEMs such as Volkswagen and Ford.

Fujitsu's approach is collaborative and partner-oriented, and its sector-specific solutions combine the best of automotive industry insight with global expertise in IT, mobility, engineering and R&D to deliver automotive solutions for OEM's around this CASE industry framework. For each element Fujitsu is able to provide value by combining innovative technologies, with proven IT services and infrastructure as well as the necessary integration skills to combine all these elements into end-to-end solutions.

Connected
From work with a number of global vehicle manufacturers on autonomous vehicles, in Japan and Europe, Fujitsu knows that the volume of data being generated in a test car is running at about 500MB per minute. Because there is no infrastructure in the auto industry currently capable of sharing this amount of data, these cars must drive to the engineering HQ to offload something like 25TB every day, via manual transfer. In our work with, for example, Toyota, we are building the platform to manage the highly-secure interchange of data between the car and the OEM. This is a three-way partnership between Toyota, Fujitsu and VMware announced at VMworld Europe in November 2018, where VMware CEO Pat Gelsinger spoke about the new vehicle architecture Fujitsu is co-creating with Toyota to become a fully-updating platform.

Communication devices such as car navigation systems and on-board ECUs (Engine Control Units) have been installed in vehicles in the past, but several new technological factors have converged to ignite a new connectivity spark. The availability of high-speed, high-capacity wireless communication enables real-time transmission of massive quantities of data while, at the same time, the cost of in-vehicle information communication terminals has dropped alongside a simultaneous rise in the availability of smartphones with tracking and processing capabilities. In the background, the spread of cloud computing, has made it possible to generate, distribute, accumulate, analyze and utilize 'big data' quickly enough to apply it to the real-time processing needs of car navigation.

The business opportunities that arise from this degree of connectivity are tantalizing. Fujitsu is innovating in this area with its Over-the-Air (OTA) Reprograming Solution, which gives car makers the capability to install or update on board software, potentially upgrading the car in the process. This functionality extends product lifecycle, refreshes and updates the user experience and creates new, monetizable functions with the real-time ability to enable features on demand after the vehicle is on the road. For example, you purchase MaaS for the weekend to drive to the mountains for some skiing and realize you need off-road capability that you didn't book. No problem – choose that option from your platform provider's app and it's switched on automatically. Or maybe a little extra power for the autobahn.

However, there are risks as well. The data problem is complex and Fujitsu is concentrating on how to get information into and out of the vehicle and manage it in an intelligent way that meets stringent data security requirements as well as data privacy legislation such as GDPR. Its capabilities in these areas, plus its global scale and capacities, make Fujitsu a strong partner choice for car makers.

Cars are increasingly 'computers on wheels', with all of the advantages and threats this implies. Preventing cyber-attacks is a crucial aspect here and as part of its Mobility IOT platform (see below), Fujitsu offers a Key Management System (KMS) that makes it possible to identify the components of the vehicle, validate the owner's identity and authorize services. With this capability you can guarantee that the component is still in its original state and has not been tampered with.

Fujitsu is also alert to the operational implications and managing the complexity of updating several hundred or more ECUs installed in a single vehicle. This normally implies that OEMs and Tier 1 manufacturers do not update ECUs unless absolutely necessary. Fujitsu's solution is OTA reprogramming and to identify the firmware of the ECU landscape and update vehicles with new software, its OTA platform supports Firmware-OTA (FOTA), Profile (POTA) and Service (SOTA).

Autonomous
Autonomous vehicles are dependent on the transfer of huge amounts of data in the form of images – in fact 70 percent of the total data required for autonomous driving - and Fujitsu is focused on the challenges associated with image and map distribution.

The first step is video data optimization to bring the data load down to the most manageable proportions. Fujitsu has a long history in dealing with large quantities of video and also offering high definition encoders/decoders in the streaming space for broadcasting. Using this experience and porting it to the automotive field, it is helping OEMs to build solutions that reduce the amount of video being sent upstream to values of compression of almost 100 percent of the original raw data. This is achieved using a combination of Fujitsu's improvements of traditional compression algorithms for streaming (like H264) but also by using event driven changes to those compression algorithms to optimize the compression even further.

Secondly Fujitsu helps contain the huge cost of maintaining HD Maps through dynamic automatic map validation and updating. It also ensures the latest high-precision map of a complex environment is available to the car at the right time, helping with map distribution to vehicles into

infotainment systems using its OTA platform as well. Dynamic Map Management is the process which allows the use of vehicle data to report real-time updates to OEMs and map providers (such as HERE Technologies) and distribute them via Fujitsu's SPATIOWL platform – a service for the integrated management of many types of transport-related data using big data analytics and cloud computing technology.

Shared

The change in lifestyle – already underway among younger urban drivers - from owning to sharing a car, requires on-demand transport service and fleet management capabilities. Fujitsu has several years of experience in dealing with customers like the Tokyo taxi central, which it has been supporting using the SPATIOWL platform to deal with taxi workloads. Fujitsu has built the capability in the system to change the allocation of passengers and to give taxi drivers the flexibility to change from a normal taxi mode to a ride sharing mode. This functionality can be offered to OEMs that manage car sharing platforms or to ride sharing providers as well.

Fujitsu is also thinking ahead to important practical issues of shared ownership, including the personal comfort and safety of shared users, through the validation of authorized users by personal identification and information protection for car sharing. Fujitsu's FIDO Verification Services, for example, enable safe and easy use of cloud services through IoT devices using the biometric authentication functionality of smartphones and near-field communication (NFC). Using this combination of technologies and the FIDO protocol users maintain ownership of their biometric data with only the authorization token used for the transaction. This way there is no biometric data stored in a datacenter, outside the control of the user.

SPATIOWL's origins in the transportation world bring other specific benefits to OEMs, such as the facility to offer integrated car sharing in a seamless customer journey, allowing people who have a ticket or token from a city transportation authority to ride on a car sharing platform, with SPATIOWL taking care of the integration in the background.

Electric

One of the inhibitors to electric car uptake is so-called "range anxiety", which is a result of unclear battery usage and the length of the remaining journey. Fujitsu's SPATIOWL cloud battery management solution provides a data management platform to manage the charging point information for electric vehicles (EVs), providing drivers and autonomous cars with information regarding the locations, hours of operation and capacity at stations via the car-navigation systems, the driver's smartphones or other devices.

The range anxiety issue can also be addressed from another direction, which is to improve the efficiency – and therefore reduce the necessary energy input - of driving. Using data stored in Fujitsu's SPATIOWL platform, such as electric driving data, battery-status information, road conditions, and weather conditions, the system creates a power-consumption map showing power-consumption rates for each road, so that drivers can pick the most power-efficient route. And because vehicle-status information is captured, such as battery condition and the number of motor rotations, this information can be used to analyze ways to minimize deterioration over time and to predict and give advance notice on battery failure.

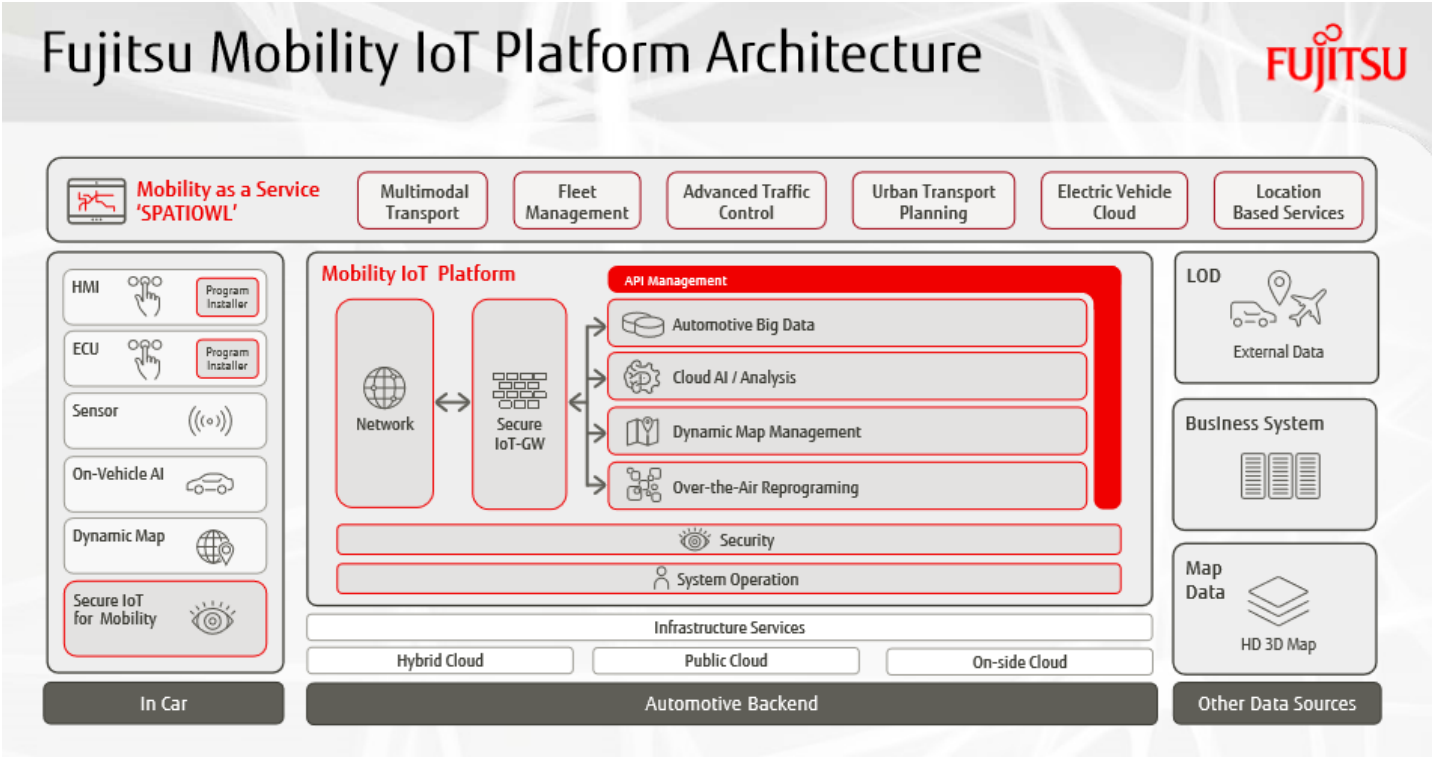
Further efficiencies can be gained from real-time routing using Artificial Intelligence alongside Fujitsu's revolutionary Digital Annealer technology, which focuses on combinatorial optimization to find the most optimal solution from a finite set of options. Here the issue has previously been that, as the finite set of options increases, so the computation power and the time needed to find the solution increases exponentially. For example, in the case of the so called 'traveling salesman' problem, if the number of cities visited by the salesman is 30, then it would take the most powerful classical computer in the market today approximately 800 million years to find the shortest possible route. However, the Fujitsu Digital Annealer can solve this within a second.

The Fujitsu Mobility IoT Platform Architecture

The Fujitsu Mobility IoT platform is a set of applications developed to be integrated into shared platforms and using pooled data sources. Each application or module can be picked to fit the solution or use case at hand.

The architecture (see diagram, below) embraces data collection services (telematics services) from the car to the cloud and the ability to start creating value with that data using the Automotive Big Data platform, which can be combined with AI capabilities and an Analytics platform. It also combines the information created by vehicles (see left hand side of diagram) with an array of services (see top layer of diagram) to help OEMs manage fleets of autonomous car or to just help find the next charging station.

Security is an integral component of the platform to ensure compliance with regulations and to protect users and the companies that manage and hold their data.



Notes to editors

[1] Source: IHS: https://ihsmarkit.com/topic/autonomous-connected-car.html

[2] David Galland, Partner, Garret/Galland Research Managing Editor, Compelling Investments Quantified, The Passing Parade

Online resources

- SELECT Partner Program: http://www.fujitsu.com/fts/microsites/spp/index.html
- Read the Fujitsu blog: http://blog.ts.fujitsu.com
- Follow Fujitsu on Twitter: http://www.twitter.com/Fujitsu_Global
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- Find Fujitsu on Facebook: http://www.facebook.com/FujitsuICT
- Fujitsu pictures and media server: http://mediaportal.ts.fujitsu.com/pages/portal.php
- For regular news updates, bookmark the Fujitsu newsroom: http://ts.fujitsu.com/ps2/nr/index.aspx

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