TATA COMMUNICATIONS

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IOT IN THE AUTOMOTIVE INDUSTRY

IOT CHALLENGES AND OPPORTUNITES FOR AUTOMOTIVE MANUFACTURERS

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INTRODUCTION

New technology is proving transformational to the automotive sector and these changes are both rapid and disruptive. A key component of this transformation is centred around connected vehicles and the associated opportunities and risks. The ability of a vehicle to connect with the outside world will undoubtedly enhance the driver and passenger experience, as well as creating new service opportunities. Automotive manufacturers, insurance companies and telematics providers all have a vested interest in the types of benefits of a vehicle that can optimize aspects of its own operation and maintenance, provide next generation infotainment services, with additional safety and security as well as adding additional value to the vehicle owner.

The ability to convert technology advances and capabilities into new value, is largely driven by the analytics and customization that is a key part of the Internet of Things (IoT) value chain. At Tata Communications, we believe that driving these business outcomes from the collection, dissemination and use of this data should be a core focus for automotive manufacturers, who can utilize the skills of multiple expert specialists to deliver a complete connected vehicle solution.

The IoT ecosystem is fragmented and the expertise referred to above, exist across the various parts of the value chain, including hardware OEMs, communications connectivity providers, analytics, data storage and applications. Challenges exist for the automotive manufacturer in managing this value chain and creating the appropriate type of solution to ensure that business outcomes and financial returns are met.

This paper focuses on the IoT opportunities for automotive manufacturers, as well as the challenges within the ecosystem, with a particular focus on the complexities related to IoT connectivity.

OPPORTUNITIES FOR AUTOMOTIVE MANUFACTURERS

The key opportunities for automotive manufacturers includes:

1. **Operational** – including telematics, predictive maintenance, software updates etc
2. **Infotainment** – in-car streaming and other consumer services
3. **Value Added Services** – for example, additional in-built intelligence to assist the owner
4. **Self-driving** / autonomous vehicles

Across the wide swathe of industrial IoT deployments the majority of successful use cases have been in the operational area where early deployments have tended to exist. These initial business cases rely less on user uptake or new business models and simply perform an existing function in a more efficient and streamlined manner, reducing costs and improving product quality. To date, this is where the majority of automotive manufacturers have also gained the most from investment in telematics related areas and associated data collation and action.

Infotainment or in-car connectivity is evolving rapidly. Several manufacturers have developed their own systems and the “sweet spot” for manufacturers is still being defined. A key enabler for success of in-car infotainment is the information connectivity element, particularly when a vehicle is on the move, the localization of the service to push contextual information to the driver or passenger, particularly as borders are traversed. The overall quality of connectivity performance can be critical in the delivery of a pleasing service experience.

Value Added Services allow the expansion and evolution of existing components within a vehicle. Voice activated search and other features included with the in-car navigation system allow the automotive manufacturer to deliver added value to the consumer at a relatively low cost.

Self-driving and fully autonomous vehicles are the current hot topic in the automotive sector. This will continue to be a focus of interest in coming years as the technology develops and promises to be an exciting area of innovation as well as disruption.

Opportunities exist today for automotive manufacturers, however the rapidly evolving technical and competitive landscape means these opportunities also bring challenges and complexities. The following sections will explore the role of communications connectivity in IoT solutions in more detail.

CONNECTIVITY IN AUTOMOTIVE APPLICATIONS

THE CHALLENGES OF GLOBAL IOT DEPLOYMENTS

The ability to convert technology advances and capabilities is largely driven by the data analytics and customization opportunities that are key elements of the IoT value chain. That having been said, at the heart of every new solution lies the requirement to offer ubiquitous and seamless connectivity.

In this regard, cellular connectivity represents clear advantage, with its wide-ranging coverage and well defined ability to maintain cross border continuity via roaming services. While cellular connectivity solves the requirement for ubiquitous and seamless connectivity it also brings it owns challenges. Automotive manufacturers are having to make decisions about technology that has a much shorter lifecycle than that of a conventional vehicle. In offering a connected car proposition to the end consumer manufacturers have to develop a set of capabilities and competencies that are not traditionally core to their business. Decisions on user interface, billing, or service management have to be considered, and once again at the core is making a decision about which partner should provide this connectivity and associated communications services. With the potentially long lifespan of a car, clearly decisions that are made at the point of manufacture or sale will have long term implications. There are multiple challenges that IoT deployments present:

NETWORK "LOCK-IN"

The lifespan of a vehicle far exceeds the normal commercial term of a communications connectivity contract. Once deployed within the car traditional SIM cards are difficult to replace. Embedded SIM technology (eSIM), that allows changing mobile communications service providers "over the air", is one way to overcome this.

The mobile communications service provider commercial model is built around short to medium term fixed contracts. At the conclusion of the contract the end consumer is once again free to make a choice about who they wish to use. This model lends itself well to a conventional retail proposition, and is aligned with the end user device lifecycle. This model is not appropriate for end devices with a much longer lifecycle such as motor vehicles. An example of a mature deployment facing this type of situation is the smart meter industry, where once deployed, changing connectivity provider at a later data becomes a significant logistical and operational challenge so in effect these devices are tethered to their original communications service provider.

Automotive manufacturers need to be "de-coupled" from the underlying mobile communications network and allow themselves the independence to adapt to new technology and new suppliers as the market evolves. This also allows the manufacturer to be in a much stronger bargaining position with the mobile network operator.

This can be achieved through the deployment of eSIM technology and working with an independent service provider, who can deliver multiple connectivity options, thus ensuring a greater level of flexibility through a single interface and contract.

COVERAGE / COST TRADE-OFF

There are a multitude of communications connectivity providers in the market. Generally their core strengths lie within the footprint of their domestic home network. Commercial terms and product development is largely driven by their core business, which in most cases is servicing the needs of their retail customers. With rapidly evolving technology far outpacing the lifecycle of a motor vehicle, this means that commercial choices made today may not offer the best advantage in the longer term.

Tata Communications overcomes this constraint through its negotiated agreements with communications service providers in different regions around the world and its ability to aggregate this connectivity using a single SIM to access multiple connectivity access agreements. This model lets an automotive manufacturer take advantage of the cost advantages that local mobile network operators have in their own territories and regions where their subscribers travel. These cost and coverage benefits accrue on a global basis. By standardizing the connectivity and commercial pricing of mobile network operators in different region, on a single SIM and interface (API or Portal), the automotive manufacturer can minimize cost without giving up the convenience of working with a single provider.

ADMINISTRATIVE OVERHEAD

To address the coverage/cost trade off it is common to have to strike agreements with multiple mobile network operators. This brings significant administrative overhead and logistical complexity, particularly when operating with traditional SIM form factors where specific SIMs need to be inserted into vehicles in an after-market environment, depending on which country the vehicle is operating in.

IT departments are then required to integrate with multiple provides user portals or APIs to mediate the service for internal users. This can lead to an inconsistent level of service between different mobile network operators and also brings additional complexity inherent in the delivery approach.

Independent Service Providers such as Tata Communications enable use of a single contract, single SIM and single interface to address the cost/coverage trade-off.

NETWORK PERFORMANCE AND LOCALIZATION

The use of mobile roaming to deliver a global service is often a simpler way to address cross border requirements. However, the data roaming model prevalent in the mobile communications industry means that all the roaming data is returned to the "home" network before being sent to the manufacturer's private or public cloud. If a vehicle has been sold on another continent this means the data will often traverse half the globe before potentially being sent back to the originating country for storage. This situation creates both cost and quality of experience issues.

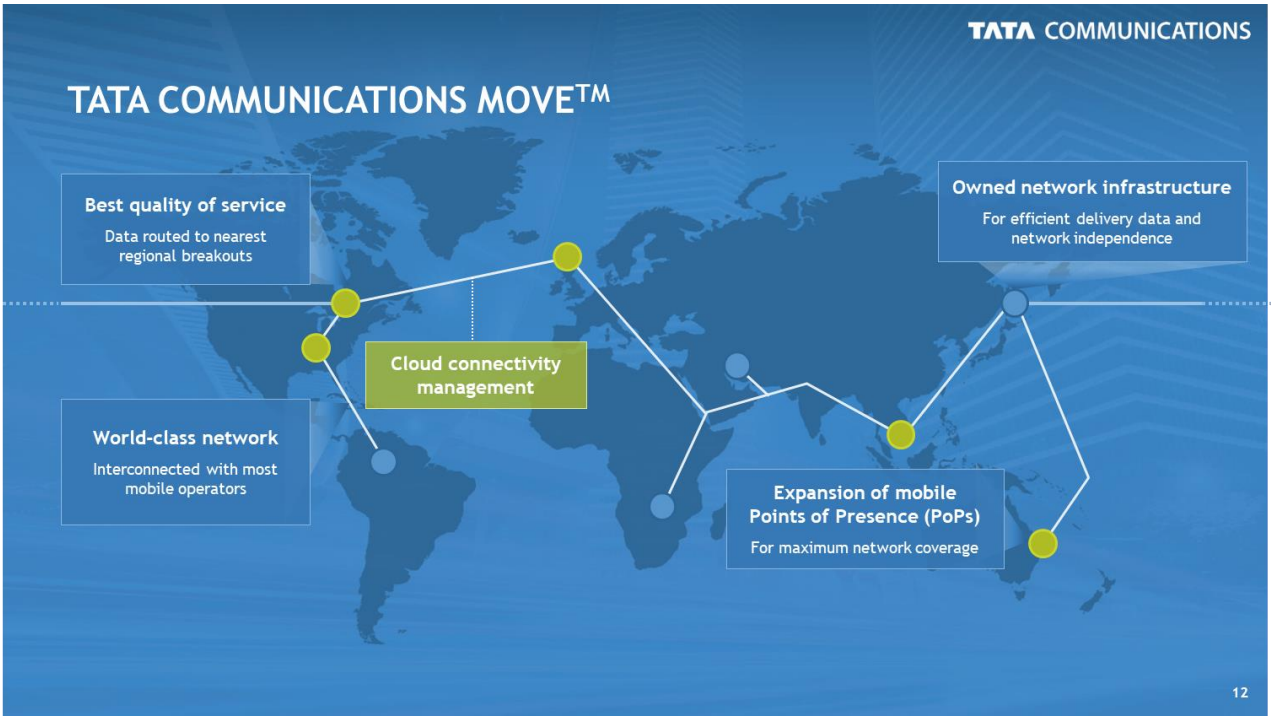
In addition, services in remote countries often have to be "localized" – meaning that the end consumer needs to feel like they are in their home country. Roaming often means that consumer appears to be a user of the visited mobile network operator so things like IP addresses which impact search engines and streaming providers will reflect the set up of the originating home mobile network provider.

To resolve this isue, a set of mobile data nodes can be distributed around the world to reduce the distance data has to travel before being handed of to a private or public cloud.

In the case of infotainment this means being able to provide a 'home' like user experience, while keeping data in region to reduce latency and round trip delay and ensuring a user experience comparable to the normal 'domestic' service. The status quo would be to perform regional deployments with local communications services providers and go through integrations a number of times, each time making allowances for nuances that are particular to the chosen service communications service provider. This approach does not scale and quickly develops into a patchwork of different implementations each with its own operational overhead.

Localization also refers to the ability to reswpsond to local regulatory requirements. For example in India, intelligent transportation systems associated with public vehicle operation are governed by AIS-140 regulations, so any connectivity system must be able to support the requirements in this specification. The same holds true for such regulations across multiple countries.

Tata Communications has currently deployed five of these regional nodes across four continents (see below), with expansion into other geographies to deliver localized and high performance services.



SECURITY

A critical component of all IoT solutions and particularly for the automotive industry is security. While the SIM card and mobile network have some inherent security built-in to the network deployment standards, this is negated once the data reaches the edge of the network. The requirement for additional layers of security to protect data-in-motion beyond the network edge and the reliability of the source of the data itself becomes crucial.

These security concerns can be addressed in multiple way including Virtual Private Network (VPN) connectivity, encryption and security tokens. These capabilities can be enhanced with additional security tokens issued from the SIM card itself, allowing a match between the SIM and the vehicle to ensure there has not been any tampering with the SIM. Security measures are a critical piece of the IoT puzzle and ongoing advancements in the technology and approaches are being made.

ESIM – MANAGING NON-CORE TECHNOLOGY

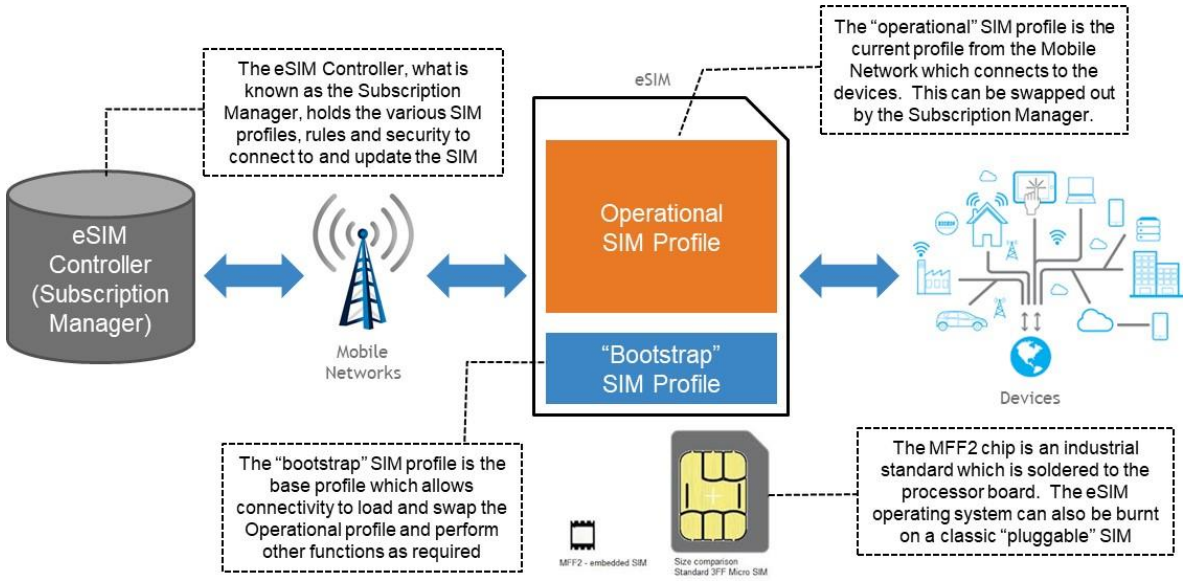
"eSIM is a significant development for the automotive industry, to deliver the independence from the mobile network operator required over a vehicles' long lifespan"

eSIM is a significant development for the automotive industry, to deliver the independence from the mobile network operator required over a vehicles' long lifespan. eSIM and Remote SIM provisioning gives an automotive manufacturer the ability to change to a different mobile access supplier and thus address the problem of potential network lock-in. This ability to change a SIM profile over the air and to remotely configure the connectivity, depending on where the device is eventually, sold provides additional flexibility to the manufacturer.

Whilst this does open new commercial options, it is also dependent on the connectivity access provider supporting eSIM and also having an eSIM platform that is interconnected with other networks, thereby allowing a profile to be switched between networks.

Managing this engagement with mobile network operators and different inter-operability standards also provide challenges to the implementation of this exciting technology by the automotive manufacturer themselves. Such technology is usually not core to an automotive manufacturer and as such represents additional cost and complexity. This in turn takes resources away from the core function of utilizing the IoT solution to provide value to the vehicle.

In speaking with our customers across a range of industries, Tata Communications has developed an eSIM solution which includes connectivity across multiple network operators (with an expanding footprint), and a single interface to ensure that regardless of the inter-operability challenges, these will be abstracted from the manufacturer and simply presented with a single interface to offer greater control and visibility. The hosting of this solution also means that a manufacturer can also strike their own agreements with operators and Tata Communications would ensure the integration is performed and managed through the single interface whilst the commercial relationship resides with the manufacturer.



SUMMARY

The rapidly changing face of the automotive industry presents both challenge and opportunity for automotive manufacturers. The opportunities, in the face of this disruptive period, is to utilize the leaps in technology of computing power, storage, artificial intelligence, machine learning and communications connectivity technology to create additional value to the customer and make what was until recently science fiction into reality.

New connected vehicle solutions, particularly those in their infancy, are complex and created from a fragmented combination of expertise from disparate providers. The challenge for the automotive manufacturer is in developing use cases which best suits the needs of their customers and successfully implementing them with the highest efficiency and lowest degree of complexity. Also, knowing that some developments in this early phase may fail, then the flexibility to change and adapt become paramount.

Tata Communications MOVE™ IoT Connect solves many of the issues highlighted in this paper. Through a single integration, access is provided to 600 mobile networks, across 200 countries around the world. Data traffic traverses Tata Communications wholly owned network, via data nodes deployed in every major region of the world, all of which support eSIM capability. This ensures the communications connectivity that is vital for 'connected' devices is firmly under control, while the ability to swap out providers no longer has the logistical and operational impact it has today.

To address the communications connectivity requirements of the end consumer we enable an automotive manufacturer to become a global mobile virtual network with all the associated capabilities including end user billing, retail plans, roaming plans, policy controls etc.

At Tata Communications, we believe every vehicle should be "born connected" and should be simplified with a single interface so manufacturers can focus on building value for their customers.

Tata Communications MOVE™ Key features

- Independent service provider with global and local access
- eSIM enabled, for independence and flexibility
- Distributed network nodes for high performance
- World class sub-sea network for secure and efficient data delivery
- Intelligent SIM technology brings additional security levels
- Ongoing expansion of coverage for cost optimization
- Flexible, itemized billing as a service to allow new business models

*"At Tata Communications, we believe every vehicle should be **born connected**. Connectivity should be simplified with a single interface, so automotive manufacturers can focus on building value for their customers."*

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About Tata Communications

Tata Communications Limited (CIN no: L64200MH1986PLC039266) along with its subsidiaries (Tata Communications) is a leading global provider of A New World of Communications™. With a leadership position in emerging markets, Tata Communications leverages its advanced solutions capabilities and domain expertise across its global and pan-India network to deliver managed solutions to multi-national enterprises, service providers and Indian consumers.

The Tata Communications global network includes one of the most advanced and largest submarine cable networks and a Tier-1 IP network, as well as nearly 1.5 million square feet of data centre and collocation space worldwide.

Tata Communications' depth and breadth of reach in emerging markets includes leadership in Indian enterprise data services and leadership in global international voice.

Tata Communications Limited is listed on the Bombay Stock Exchange and the National Stock Exchange of India.

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