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Title: M2M SIM and Digital Identity for enablement of Vehicle Registration and Transfer

Abstract

Telecommunication Engineering Center (TEC), Department of Telecommunications (DoT), Ministry of Communication& IT, Govt. of India, formed 11 multi stake holders working groups (WGs) in the last two years to work in M2M/ IoT domain. Nine WGs are in the verticals Power, Health, Safety and Surveillance, Intelligent transport Systems, Smart Cities, Smart Homes, Smart village & Agriculture, Environment & pollution control and Smart Governance. Two WGs are on M2M Gateway & Architecture and security of M2M domain. Nine technical reports were released and available on TEC website (www.tec.gov.in/technical-reports/). Out of nine, two technical reports, related to intelligent Transport Systems are as given below:

1. M2M Enablement in Intelligent Transport Systems
2. V2V/ V2I Radio communication and Embedded SIM

Connected Cars (Vehicles) are growing rapidly as the industry moves towards deploying new technologies that benefit the connected car ecosystem – vehicle manufacturer, vehicle user, vehicle owner, fleet manager, insurer, service agency and the government – to name a few.

Although millions of vehicles are connected, the process for the car registration and transfer is mostly manual, whereas the vehicle registration, identification, tracking and management can benefit tremendously from the deployment of new technologies such as the M2M SIM and Digital Identity (e-KYC).

This paper discusses an approach to enabling the vehicle registration, identification and traceability using technologies such as the M2M SIM (eUICC) and e-KYC. The use case defined in the annexure, if implemented, can substantially reduce time and cost of the vehicle registration / transfer process and in turn may be helpful in reducing theft and crime.

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Annexure: Use Case for M2M SIM and Digital Identity enablement of the Vehicle Registration and Transfer Process

Table of Contents

1 Title

M2M SIM and Digital Identity for enablement of Vehicle Registration and Transfer

2 Objective

This use case deals with significantly improving the convenience and security of the vehicle identification, registration and transfer process using the new age capabilities of M2M SIM (eUICC) and Digital Identity (e-KYC).

The objective of the contribution is to create a detailed understanding of how the eUICC and e-KYC enablement of Vehicle Registration and Transfer can benefit the transportation ecosystem, the governance and the security.

3 Background

3.1 TEC Technical Reports

Over the last two years, the Telecommunication Engineering Centre (TEC), Department of Telecommunications (DoT), Ministry of Communication & IT, Government of India, has released nine Technical reports in M2M/ IoT domain. These reports are available on TEC website (www.tec.gov.in/technical-reports/). These reports relate to M2M enablement in Power sector, Remote Health management, Safety and Surveillance systems, Intelligent Transport Systems and ICT deployment and strategies for India's Smart Cities: A Curtain Raiser. Two reports are on M2M Gateway & Architecture and Numbering plan.Two technical reports released in the area of Intelligent Transport Systems are as given below:

1. M2M Enablement in Intelligent Transport Systems
2. V2V/ V2I Radio communication and Embedded SIM

This use case is a detailed description of one of the recommendations of the previous two reports in the area of M2M SIM and Digital Identity. A brief quote from the previous Study report is reproduced below:

> Embedded SIM: The normal SIM card is not suitable for harsh conditions of vehicles like vibrations, temperature, and humidity. GSMA has created specifications for embedded M2M SIM, for remote Over-the-Air (OTA) provisioning, hermetically sealed or installed in hazardous or remote locations. It can withstand temperature variation for automotive grade temperature range of -40 degree to- +125 degree Celsius. Embedded SIM technology offers big opportunities for auto manufacturers as the lifecycle of an eSIM is, on averages, 10-15 years. International standards for eSIM have evolved.

One of the challenges identified in the ITS Technical Report related to the Know-Your-customer process for issuance of the M2M SIM.

> Know-Your-Customer (KYC) norms for the M2M SIM used in ITS Devices (GPS/ GPRS etc.) may be different than the KYC norms for SIM being used for mobile phone. Currently, there is no mechanism to ensure vehicle ownership transfer is in sync with the device SIM connection, which needs to be addressed.

This working group has looked into the technology and its enablement for theIntelligent Transport sector, including the requirements and standards for M2M SIM, and the processes required to proliferate the M2M / IoT Use Cases.

This use case addresses the use of Digital Identity and M2M SIM for Vehicle Identification, Registration, Transfer and Tracking using National Identity Database for the purpose of online authentication of an individual/Company/Vehicle.

3.2 SIM Evolution

The traditional SIM card is a form factor that a consumer can insert and remove from the device. It stores an operator defined profile which is programmed during manufacturing, and enables the identification, authentication and use of the network resources and services by the customer.

The SIM is built on Smart Card (UICC) technology, which is just like the bank cards. The UICC is a physically secure computing device that can be used across multiple vertical sectors including mobile telecommunications.

The Embedded SIM is a form factor that is physically integrated into the device, mostly by soldering to the device PCB. The Embedded SIM cannot be easily removed in the field. As a result, the Embedded SIM requires remote provisioning, which is the ability to remotely select the SIM profile deployed on a SIM without physically changing the SIM card. This technology is standardized and can be implemented on a SIM card with any form factor.

The term eUICC is used to represent a SIM card that can be remotely provisioned.

3.3 Digital Identity (E-KYC)

Technopedia defines a digital identity as an online or networked identity adopted or claimed in cyberspace by an individual, organization or electronic device. These users may also project more than one digital identity through multiple communities.

In India, the parliament has promulgated an Act (The AadhaarACT, 2016), An Act to “provide for, as a good governance, efficient, transparent, and targeted delivery of subsidies, benefits and services, the expenditure for which is incurred from the Consolidated Fund of India, to individuals residing in India through assigning of unique identity numbers to such individuals and for matters connected therewith or incidental thereto”. The Reserve Bank of India (Central Bank) has recently notified that the paperless electronic authentication, or electronic know-your-customer (eKYC), process provided by the Unique Identification Authority of India (UIDAI) is “officially valid”.

3.4 M2M Service Provider

The GSMA Embedded SIM Business Process document “GSMA Embedded SIM Business Process CLP-05-v1-0“defines the role of the M2M Service Provider as “Actor who provides services to its service Subscribers on a contractual basis and who is responsible for the services offered”

A Mckinsey report “E-SIM for consumers— a game changer in mobile telecommunications? “ identifies the role of an Independent Third Party for setting up the server for real time discovery of the Subscription Profile.

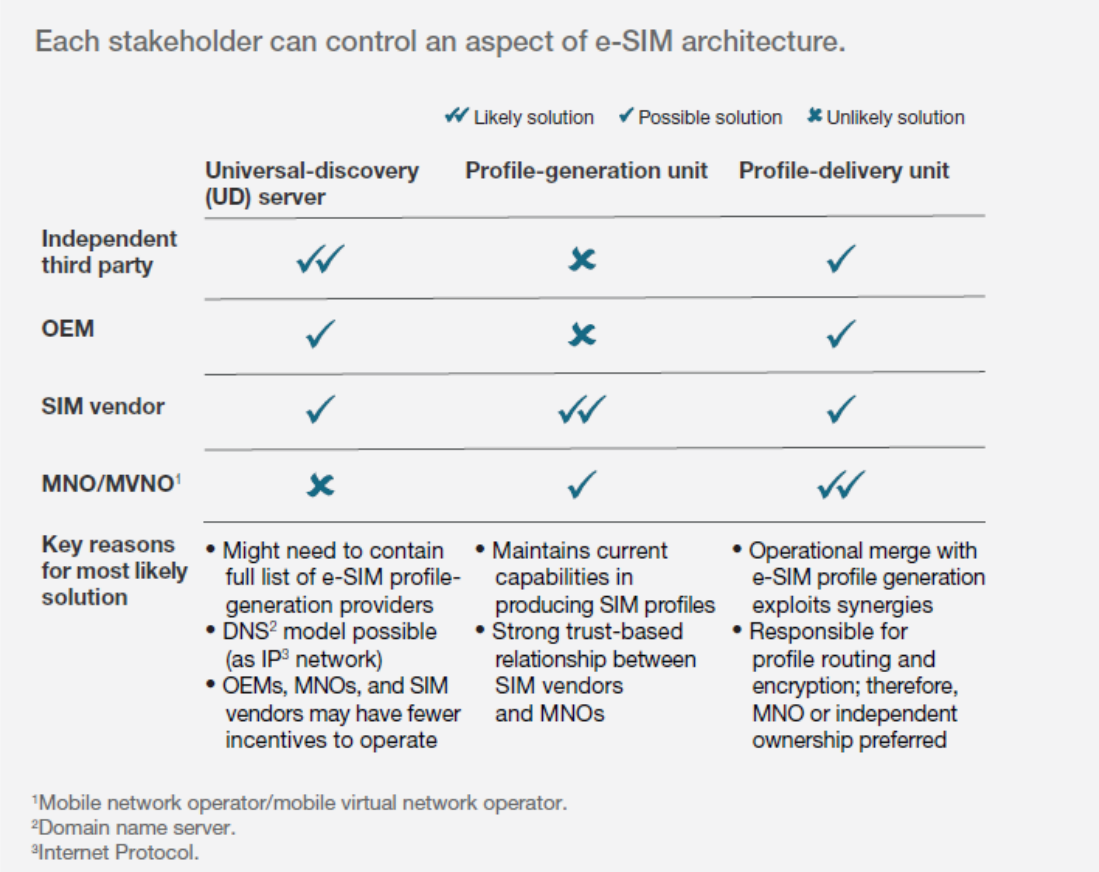


Figure 1: Role of Independent Third Party

4 Description

4.1 Ecosystem description

Currently there is a massive shift in the fleet management market; both regulatory requirements, such as that for speed controllers, safety and surveillance for public transport, along with cost management by fleet owners are creating a need for different telematics devices in the vehicles.

This leads to a situation where M2M connectivity becomes a critical enabler for the mission critical and often life-saving use cases. In emerging markets, the coverage/capacity gaps can go up to 30%, worsened by the use of consumer grade SIM cards, which suffer a 2-5% failure rate when used in the harsh environment such as that of vehicles on the road.

Governments have enacted parliamentary acts to setup National Identity Registers that can be used for online authentication of citizen identity. Examples are Sweden, France, India (UIDAI), to name a few.

Governments everywhere are pursuing a strategy of digitization and automation, both to convenience the citizenry, as also to ease the governance in itself.

The recommendations in this use case enables both the stated objectives

1) Digitization and Automation of the Vehicle Transfer Process

2) Use of Digital Identity (e-KYC) for authentication

The **GSMA's eUICC Specification** provides a single, de-facto standard mechanism for the remote provisioning and management of machine to machine (M2M) connections, allowing

the “over the air” provisioning of an initial operator subscription, and the subsequent change of subscription from one operator to another. GSMA eUICC is a vital enabler for Machine to Machine (M2M) connections including the simple and seamless mobile connection of all types of connected machines.

ETSI has standardized the eUICC through its Technical Specification Smart Cards; Embedded UICC; Requirements Specification.

4.2 About the eUICC

The eUICC has the following improvements over the generally available consumer SIM

a. Secure and Tamper resistant

b. Factory ready due to the optional solder able form factor, which enables the devices to be IP67 compliant

c. Ready to handle the industrial and automotive environment

d. 10 year life with significantly enhanced Read / Write cycles and Storage

e. Stores up to 5 subscription profiles, thereby enabling a selection of bootstrap and commercial life-stages from a variety of Mobile Network Operators

4.3 Actors and Business Roles

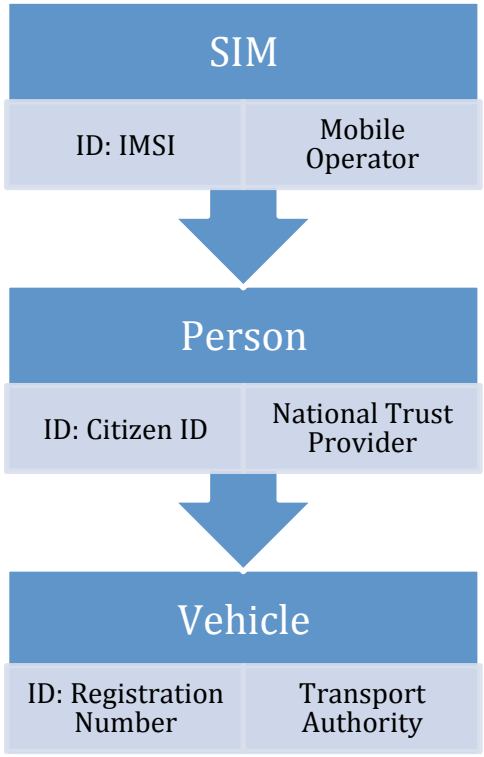
The following actors contribute to the use case

1: Actors and Business Roles

S No	Actor	Business Role
1	Transport Authority	Registration of Vehicles
2	Vehicle OEM	Manufactures the Car
3	Device OEM	Manufactures Telematics devices with appropriate M2M SIM
4	SIM card supplier	Supplies factory ready SIM Cards in MFF2 form factor
5	M2M Service Provider	Provider of the enabling Provisioning (bootstrap) connectivity and over the air management of Subscriptions SIM lifecycle management and e-KYC. This role could be played by an MNO, VNO or a registered M2M Service Provider
6	Trust Provider	Certification and Authentication Authority (like National Identity Registers) that provide online authentication for citizen identification
7	Mobile Operator	The provider of mobile services from a GSM network
8	Buyer	The Buyer of the Vehicle
9	Seller	The Seller of the Vehicle

The important Identities and their issuers are shown below

Figure 2: Key Identities and Issuers



1. The identities of eUICC and e-KYC when linked in the Transport Authority Database provide a powerful and secure traceability tool for the vehicle and its owner
2. The eUICC-IMEI pairing (which can be locked to each other) provides a unique identity pair with which a vehicle can be remotely reached for purposes of tracking, safety, remote monitoring and surveillance
3. The owner authentication using a Citizen ID may be restricted tothe owner as an individual. In such cases, a Digital Certificate issued to the Company may be usedfor authentication of the Company

Actors are visualized in the figure below:

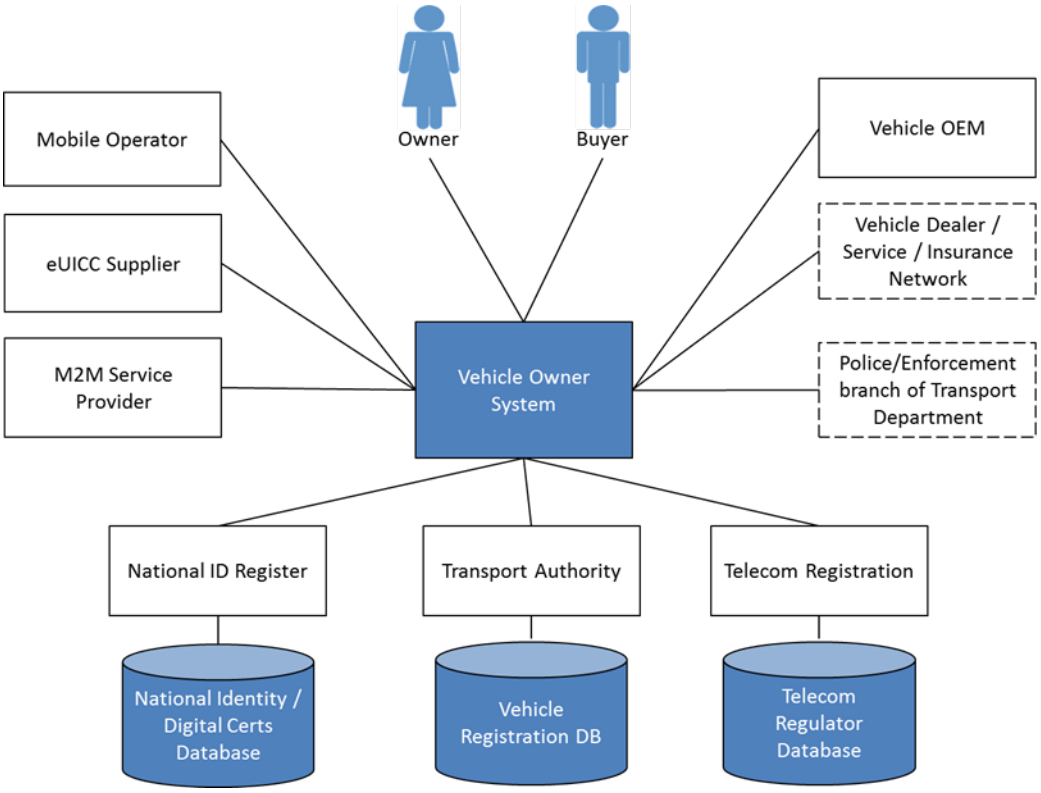


Figure 3: Actors

4.4 Contextual Illustration

The process of vehicle registration and transfer as it is today, passes through several manual steps that require filling of forms and offline authentication and verification of the data.

The Indian case in point, with the Delhi state as a specific example, is as follows

> The transfer of ownership of a vehicle is to be applied in the concerned zonal office where vehicle is already registered and following are the documents to be submitted:-
>
> 1. Registration certificate in original
> 2. Form no.29 duly filled in duplicate
> 3. Form no.30 duly filled in duplicate
> 4. Attested copy of valid insurance, in favour of buyer
> 5. Attested copy of address proof of buyer
> 6. Attested copy of valid pollution under control certificate
> 7. Attested copy of G.I.R./Pan no. or Form no. 60/Form no. 61 (in case of cars only)
> 8. Prescribed fee
> 9. For commercial vehicles in addition to above
> 10. Permit surrender slip for S.T.A.
> 11. Challan clearance from Traffic Police & Enforcement branch of the transport deptt. are required.
> 12. Tax clearance report from Accounts

4.5 Proposed Process Flow

This process flow described the car registration and transfer service addition of an automation step as described below:

1) The Vehicle OEM / Dealer enters the Vehicle details online at the PoS or Government Registration Authorityieat the Regional Transport Office (RTO)
2) Vehicle Buyer details are entered next
3) Vehicle Buyer is identified using an Aadhaar Number (or a Digital Certificate if the buyer is a Company)
4) An e-KYC OTP is sent to the Mobile phone of the buyer(or a Digital Certificate Online Authentication for Companies)
5) The buyer is asked to enter the OTP
6) The registration records are updated

The Process flow diagram below exemplifies the process using the Indian context. The generic roles described earlier are clarified below

2: Process Actors and Indian Role takers

S No	Generic Actor	Indian Business Role
1	Transport Authority	RTO
2	Vehicle OEM	Vehicle OEM
3	Device OEM	Device OEM
4	SIM card supplier	SIM Card Supplier
5	M2M Service Provider	M2M Service Provider
6	Trust Provider	Unique Identification Authority of India - UIDAI OR Digital Certification Authority e-Aadhaar for Individuals OR Digital Certificate based Authentication for Companies KYC User Agency (KUA)

7	Mobile Operator	Mobile Operator
8	Buyer	The Buyer of the Vehicle
9	Seller	The Seller of the Vehicle

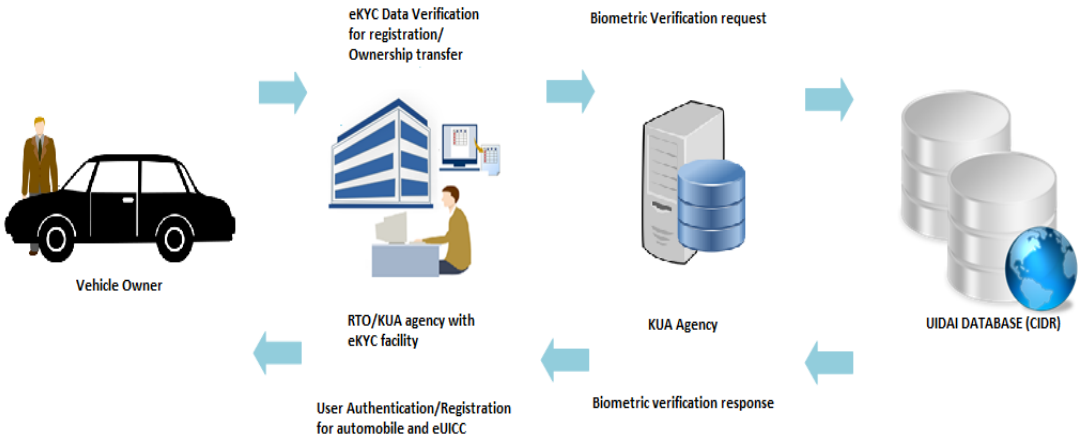


Figure 4: Vehicle Registration with e-KYC

The above process will improve the authenticity of customer; it will empower the authority with more knowledge about registrant and will improve traceability of registrant if need arises addressing country level security concerns.

4.6 Pre-requisites

The Pre-requisites to implement such a process are defined below

- Existence of an Online National Citizen Database
- Vehicles embedded with an eUICC based SIM
- M2M Service Provider for enabling / provisioning (bootstrap) connectivity and over the air management of SIM and Subscription Profiles
- Transport Authority with online registration capability linked to the online National Identity authentication
- Web interfaces for Vehicle registration by the OEM / Dealer

4.7 Pre-conditions

The following pre-conditions enable the proposed use case

- Vehicles are embedded with M2M SIM Card
- The Vehicle OEM has registered the vehicle with the Transport Authority
- The M2M SIM card has a bootstrap connection (Provisioning Profile) so that the buyer's preferred connection can be selected on the M2M SIM card
- The Seller and Buyer are registered at the National Identity database

4.8 Triggers

The process flows are triggered from the following events

- Vehicle OEM producing a batch of Connected Cars

- Vehicle OEM dealer registering the Cars with the Transport Authority
- A buyer wanting to Purchase a Connected car
- Scrapping of a Connected Car

4.9 Scenarios

The process can be applied to

1) New Vehicle Registration
2) Vehicle Purchase & Transfer Process
3) Vehicle Health, Fitness and Pollution Control Tracking
4) Vehicle Identification
5) Vehicle Location Process
6) Vehicle Fines and Tickets recording Process

4.10 Post-conditions

Once the transfers are completed as per the process, the following actions are required

- Updation of the records of the Buyer at the following databases
    - Vehicle OEM for receiving vehicle diagnostics information
    - Vehicle OEM Service Centres
    - Mobile Operator
    - Telecom Authority

4.11 Information Exchange

Although the eventual implementation may require additional information flows, the following are the critical ones for a startup use case

a. M2M Device information triplet - Device Serial No, Device Communication Module identity (IMEI) and SIM Serial Nos (IccID) Pairing for bootstrap subscriptions
b. Connected Vehicle Engine / Chassis and M2M Device Pairing information
c. New Connected Vehicle / Car Production information to Transport Authority
d. Updated Vehicle Registration, M2M Device Information triplet, Operational Subscription information to Transport Authority, Telecommunications Agencies, Vehicle OEM, Buyer

5 Architectural Considerations

The following architectural aspects are important for the implementation of the proposed use case

- Architecture of the National Online Authentication systems capable of online verification and authentication of individuals and companies
- Architecture of the Transport Authority systems permitting online Vehicle Registration and buyer Authentication
- Architecture of the Telematics Device for factory ready connectivity with an embedded SIM
- Architecture of the M2M SIM for hosting Provisioning Profiles (bootstrap subscription from the M2M Service Provider) and Operational Profiles (buyer's mobile subscription)
- Architecture of the Over the Air Subscription Lifecycle management platforms

The Architecture must consider the following

- Open API architecture
- IPV6 support

6 Potential Market

Connected Vehicles are set to drive the adoption of M2M globally.

Safety systems in cars will be the key growth drivers for the automotive electronics market in the next few years as it attains Compounded Annual Growth Rate (CAGR) of 21.8% as per research estimates.

Accelerating growth in embedded, in-car Telematics over the next 15 years will lead to cars representing over 5% of all connected devices by 2025, compared with just 0.1% today. The automotive embedded Telematics market is expected to grow at a CAGR of 24.6% over the next 15 years to reach €20 billion by 2025.

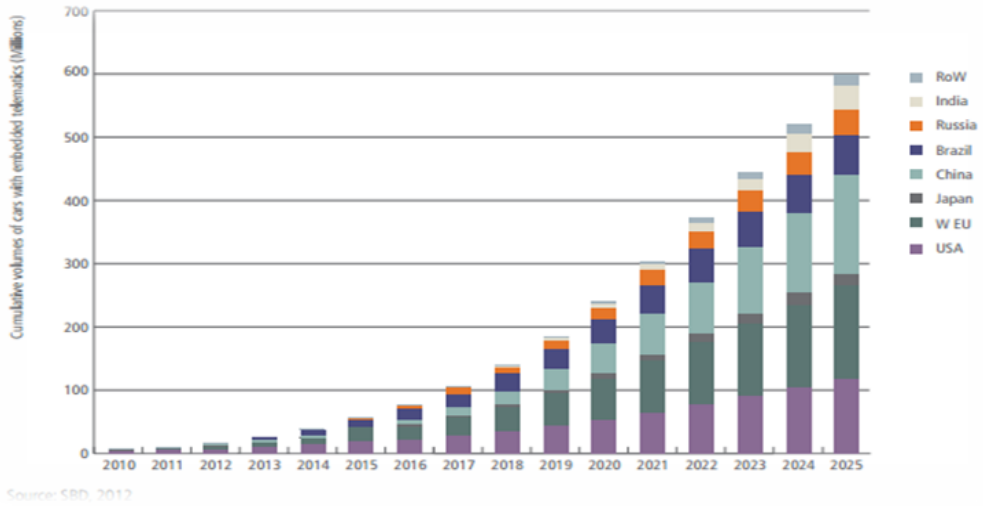


Figure 5: Connected Vehicles Forecast

A recent McKinsey report says the following regarding the M2M enablement with the e-SIM

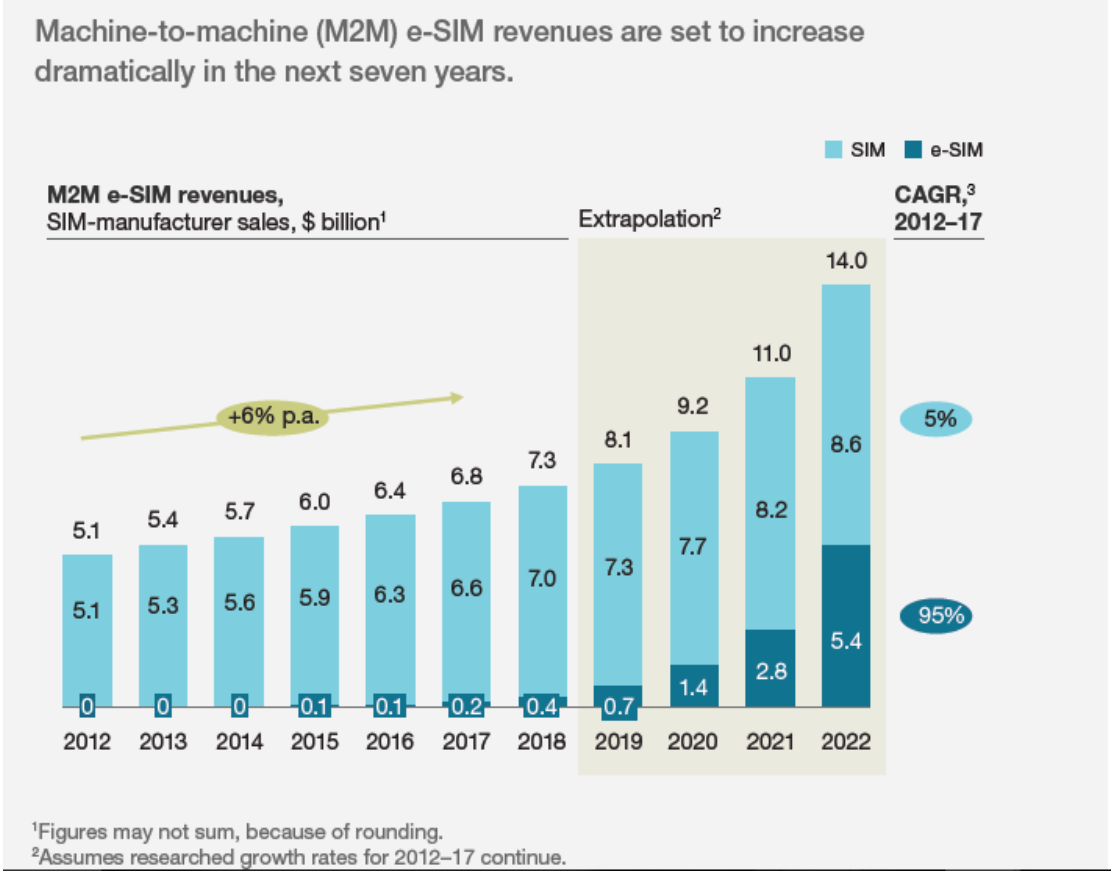


Figure 6: McKinsey Research, Jan 2016

7 Implementation Constraints

The following implementation constraints are visualized

- Mandating the standards for Telematics Devices
- Policy mandates for the M2M Service Provider
- Open API for Transport Authority Databases for online registration and authentication
- A National Identity database which offers online authentication

8 Standards, Statutory compliances and related Regulations

The following related documents are noted here

- GSM Association Non-confidential Official Document SGP.02 - Remote Provisioning Architecture for Embedded UICC Technical Specification
- AAdhaar Act 2016 and RBI Notification regarding e-KYC using UIDAI Aadhaar (India specific)

9 Available Global Standards

- ETSI TS 102 225 V12.1.0: “Secured packet structure for UICC based applications (Release 12)”.
- ETSI TS 102 671 V9.2.0 (2015-06) Smart Cards; Machine to Machine UICC; Physical and logical characteristics

- ETSI TS 102 267 V7.1.0 (2010-04) Smart Cards; Connection Oriented Service API for the Java Card™ platform (Release 7). For All other relevant standards for the Smart Cards please refer here and for SIM please refer here
- OneM2M TS 0002 on Machine-to-Machine communications (M2M); M2M service requirements. All other related oneM2M specification are available here
- ETSI TS 122 101 Universal Mobile Telecommunications System (UMTS);Service aspects; Service principles (Release 8 or later)
- ETSI TS 124 008 (Release 8 or later)
- ETSI TS 124 123 (Release 8 or later)
- ETSI TS 126 267 (Release 8 or later)
- ETSI TS 126 268 (Release 8 or later)
- ETSI TS 126 269 (Release 8 or later)
- ETSI TS 127 007 (Release 8 or later)
- ETSI TS 151 010 (Release 8 or later)

10 References

The UIDAI Aadhaar based e-KYC Process
https://developer.uidai.gov.in/book/export/html/41

The Indian National Telecom Roadmap
http://www.dot.gov.in/sites/default/files/Draft%20National%20Telecom%20M2M%20Roadmap.pdf

Mckinsey Report
"E_SIM_for_consumers_a_game_changer_in_mobile_telecommunications"

11 General remarks

The trilogy of the M2M SIM, Digital Identity (electronic Know-Your-Customer) and the role of the M2M Service Provider have the potential to dramatically change the M2M enablement scenario for the industry.

Government, Regulation, Policy, Standards and Industry bodies have a lot of work to do in the domain, ensuring that the environment is conducive to the safe yet speedy introduction of the digitization capabilities.

12 Proposal

The use case submission to ITU is intended to benefit the member countries that may be considering the use of Digital Identity and M2M SIM for vehicles and related registration processes and records.

It is proposed that this use cases may be taken in to account (as appropriate) in the standardization work plan of the M2M / IoT.