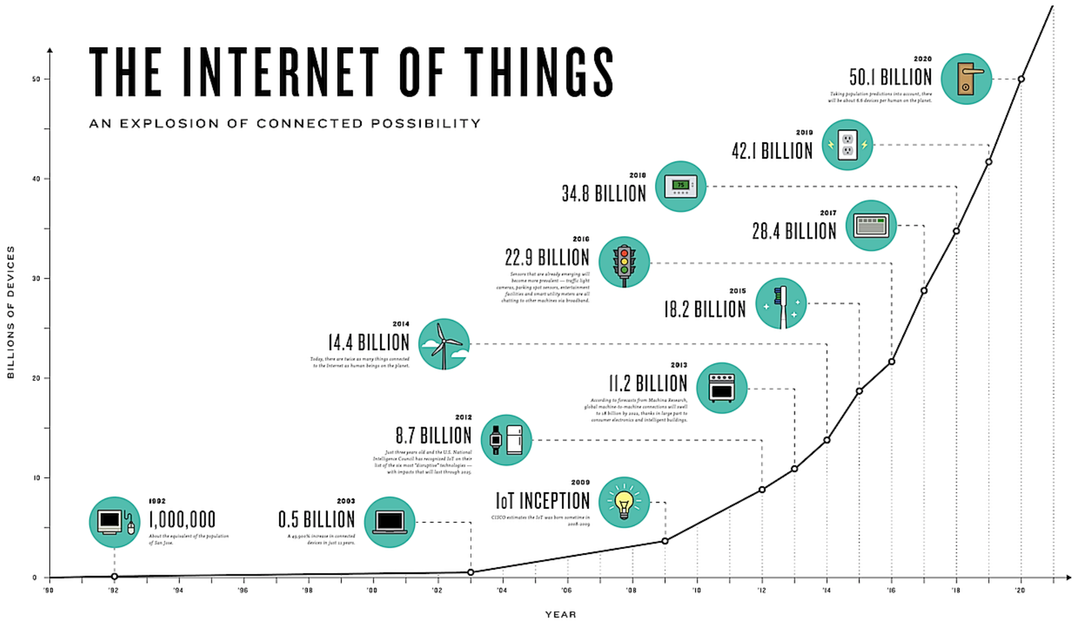
IoT for Automotive & Transport

Sharad Arora, MD, Sensorise

20 Sep 2017

Yes…we heard it ….from the Telecom hockey stick, to the hockey stick of everything…why don't I see it?



Source: Earthdecks, based on data from Cisco

- Three years into focused operations, of the 100,000 Cr+ committed for Smart Cities, only about 6000 Cr ordered this far
- Minimal impact of Quality of Life, the most significant objective of any IoT / M2M / Smart City solution
- Waste Management and Tracking Solutions struggling to offer reliability and Customer Impact
- Radio Taxis, on the other hand, have disrupted the personal transport domain

WHY?

How will the ecosystem collaborate to develop inter-operable, reliable and affordable solutions?

What are the M2M Challenges?

What are the requirements of IoT Ecosystem?

The Scale in Intelligent Transport & Connected Vehicles exists….

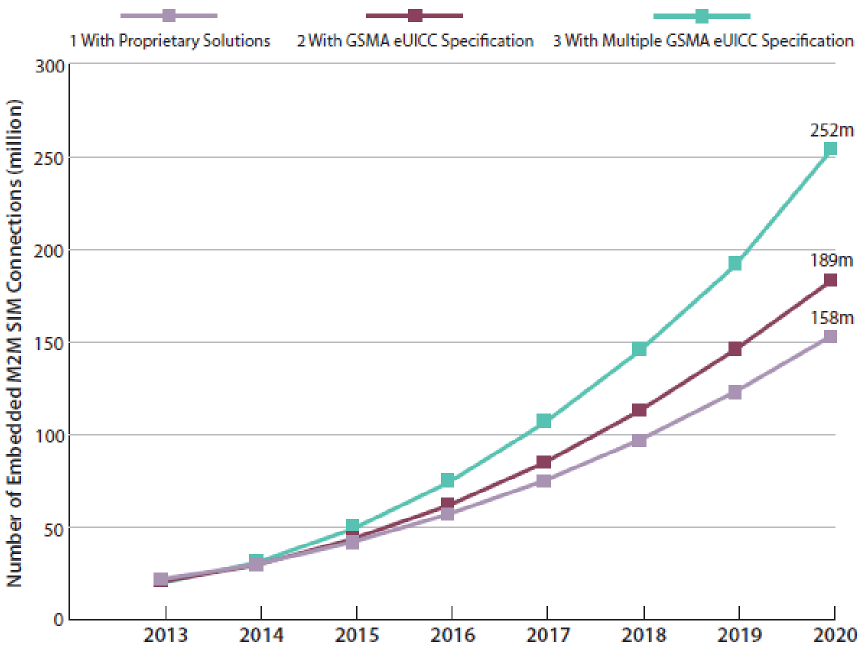


Figure 1.2: Projected Connected Car Connections worldwide with alternative scenarios

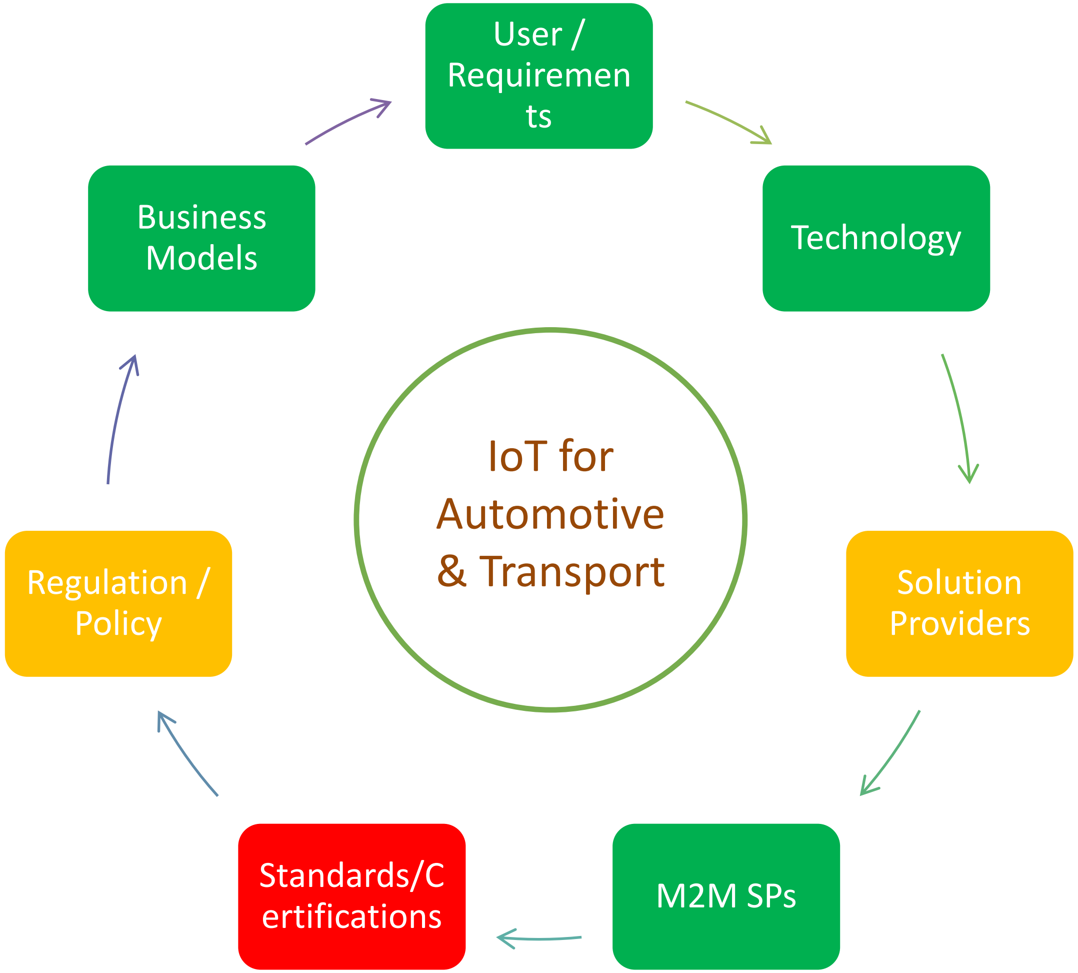
	2013	2014	2015	2016	2017	2018	2019	2020
1 With Proprietary Solutions	27,669	35,708	47,183	62,163	80,716	102,912	128,822	158,519
2 With GSMA eUICC Specification	27,669	36,780	50,420	68,680	91,651	119,424	152,093	189,755
3 With Multiple GSMA eUICC Specification	27,669	38,924	56,894	81,715	113,520	152,447	198,635	252,225

Source: GSMA

- India has approx 20 Mn Public Vehicles
- The Nirbhaya Fund created by the Cabinet mandates all public vehicles have traceability and surveillance
- The Ministry of Road Transport & Highways has published the AIS-140 Standard draft specifying the devices, connectivity and functionality [Aug-16]
- TRAI has released its guidelines on M2M after a 9 month industry consultation [Sep-17]
- How will the industry collaborate to develop inter-operable, reliable and affordable solutions?

The Ecosystem is vast

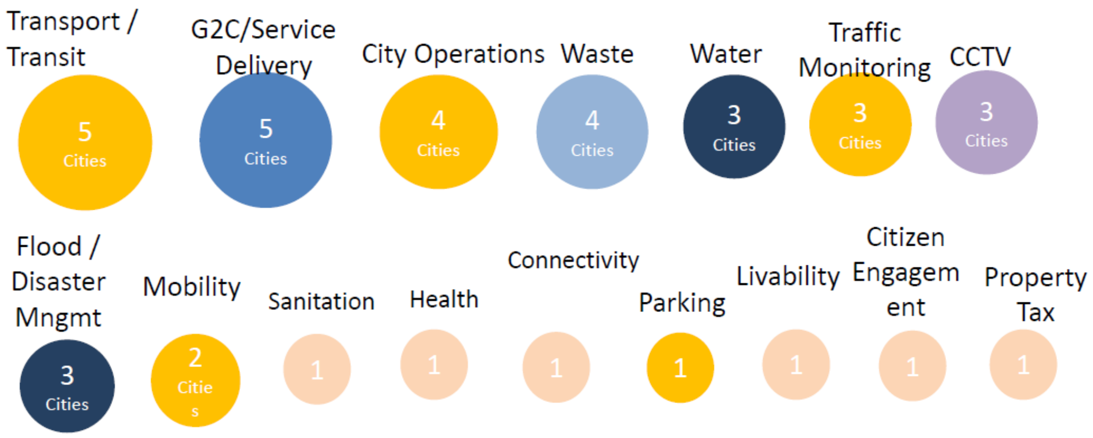
- User Requirements are well developed
- Technology is mature
- Solution Providers are in early stage of preparation
- M2M Service Providers ready for the industry
- Many Standards, still maturing, low adoption
- TRAI M2M Guidelines issued, Policy awaited
- Business Models ready



User Requirements – Intelligent Transport Systems

User / Requirements

- Around 15 cities out of first 20 have major ITS intervention at PAN City level.
- 80% of cities have Intelligent Transport(Mobility components)

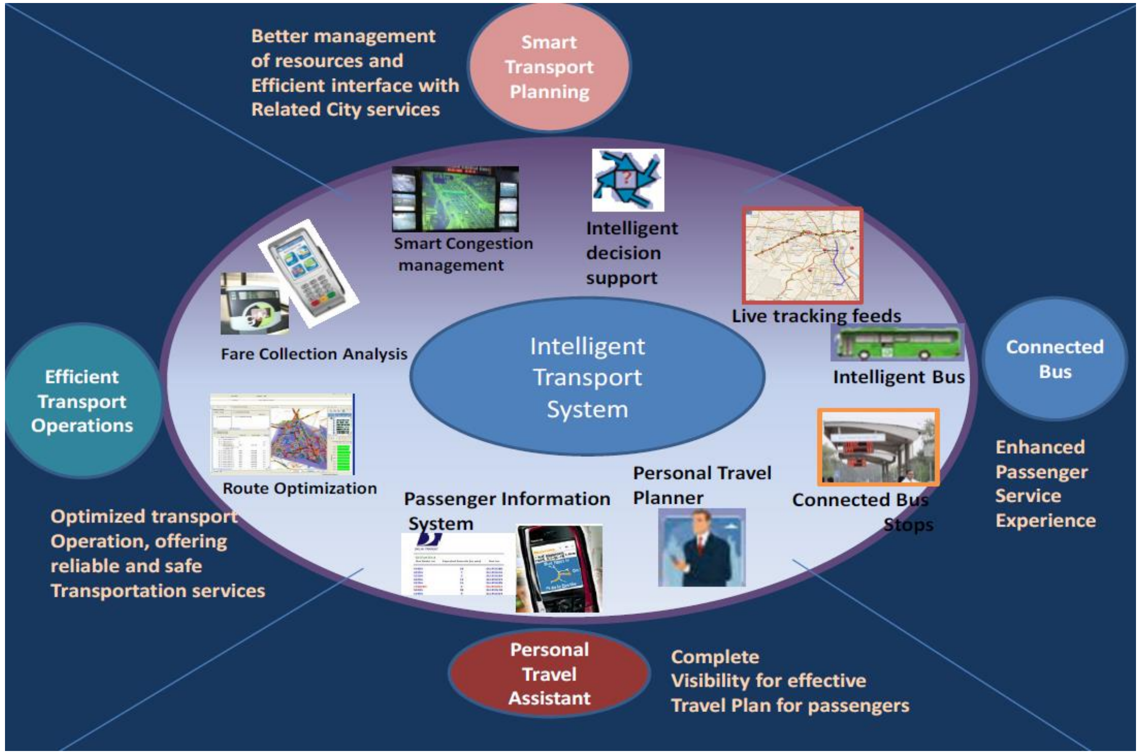


Pan City Solutions identified by the 20 Smart Cities

- A large number of Smart City Proposals have chosen Intelligent Transport Systems
- The Functional Requirements are well defined
- Quality of Service, Reliability and Data Security Requirements could be improved

User Requirements – Intelligent Transport Systems

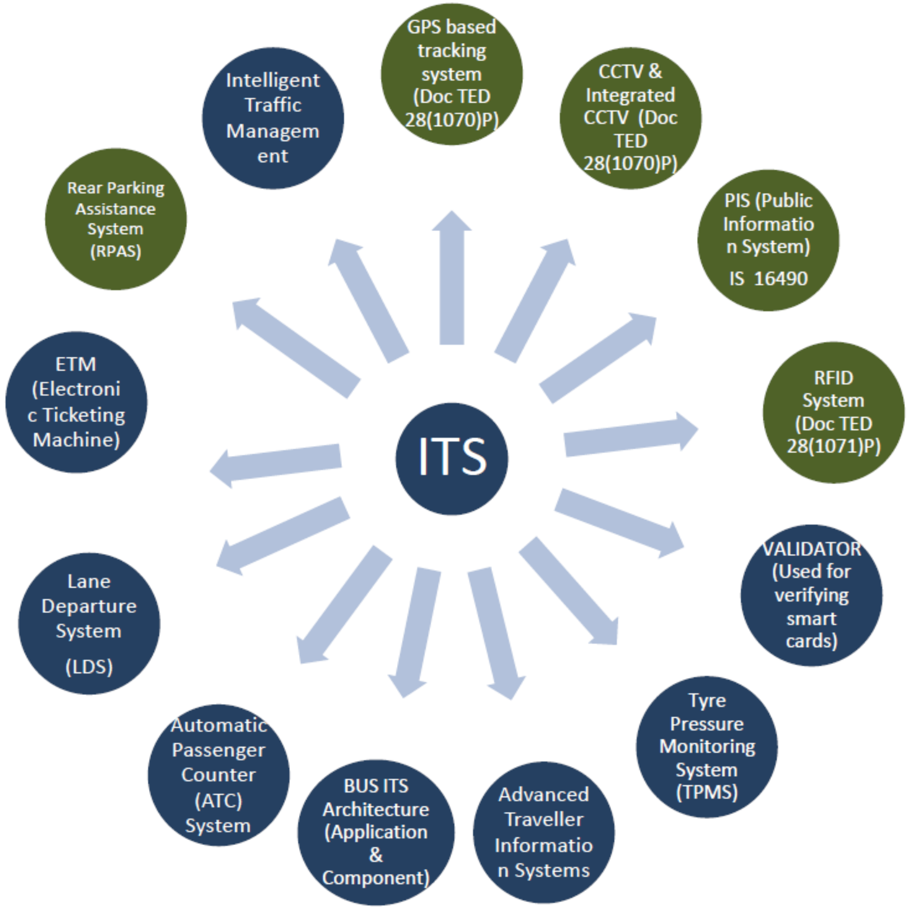
User / Requirements


Better management of resources and Efficient interface with Related City services
Smart Transport Planning
Smart Congestion management
Intelligent decision support
Live tracking feeds
Fare Collection Analysis
Intelligent Transport System
Intelligent Bus
Connected Bus
Efficient Transport Operations
Route Optimization
Personal Travel Planner
Passenger Information System
Connected Bus Stops
Enhanced Passenger Service Experience
Optimized transport Operation, offering reliable and safe Transportation services
Personal Travel Assistant
Complete Visibility for effective Travel Plan for passengers

- **Improved service quality**
  - On time departures, even headways, better reliability
- **Improved productivity and resource allocation**
  - Achieve more with the available bus and crew resource
  - Less slack time in schedules, less overtime needed, less lost-kms
  - Reassign dispatchers etc. to where they are more effective
- **Improved operational discipline**
  - Better driving, less accidents, better customer perception
- **Accurate and extensive information for passengers**
  - Waiting times reduced, passenger will wait for a good service
- **Extensive information for planning and management**
  - Improved corporate management, ability to track
- **Complete, timely and error-free data to support administrative systems, reduced processing costs**
  - Reliable means to implement contract monitoring and payments

User Requirements – Intelligent Transport Systems

User / Requirements

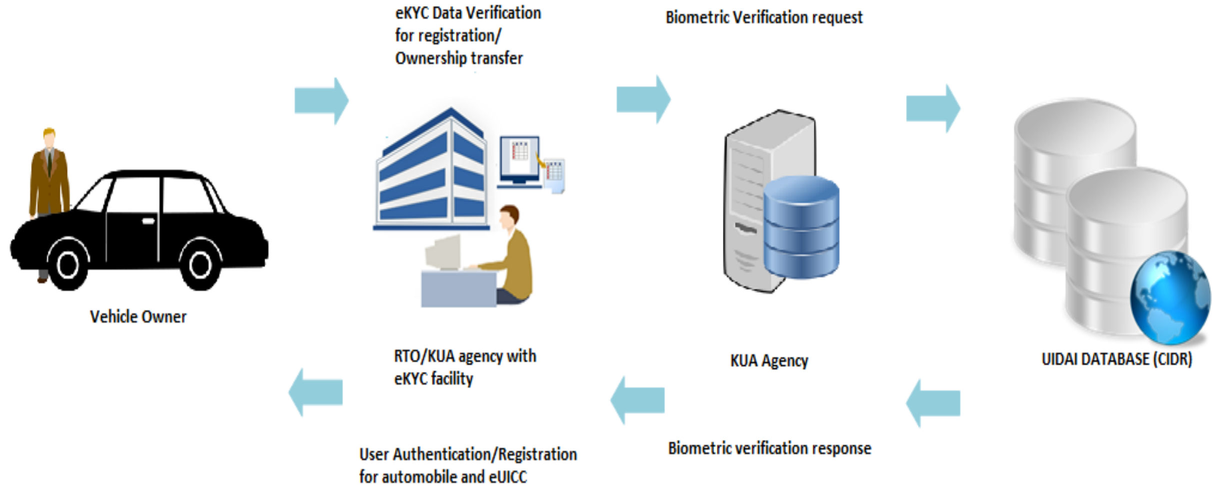

ITS
GPS based tracking system (Doc TED 28(1070)P)
CCTV & Integrated CCTV (Doc TED 28(1070)P)
PIS (Public Information System) IS 16490
RFID System (Doc TED 28(1071)P)
VALIDATOR (Used for verifying smart cards)
Tyre Pressure Monitoring System (TPMS)
Advanced Traveller Information Systems
BUS ITS Architecture (Application & Component)
Automatic Passenger Counter (ATC) System
Lane Departure System (LDS)
ETM (Electronic Ticketing Machine)
Rear Parking Assistance System (RPAS)
Intelligent Traffic Management

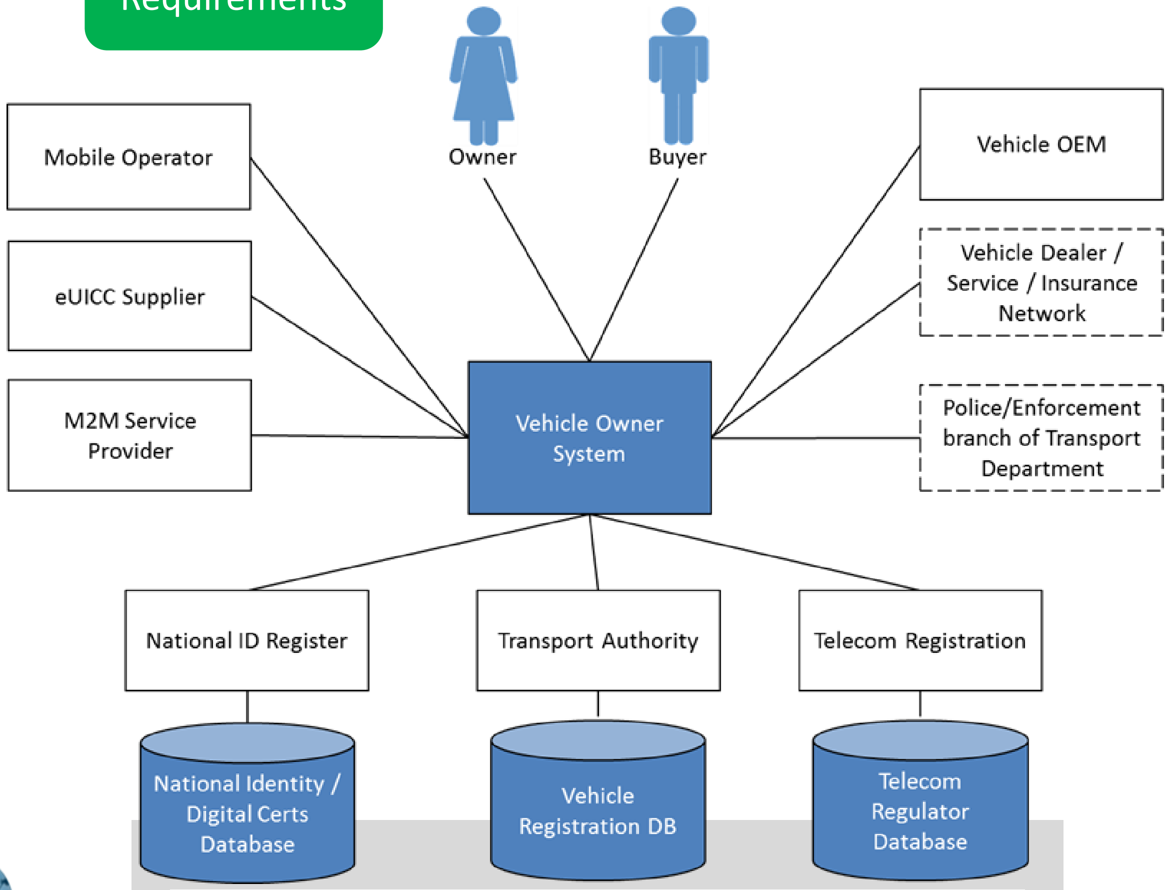
- Comprehensive Requirement map developed under TED.28 under Bureau of Indian Standards
- Significant focus on functional requirements such as Automation, Digitisation, Information, User Safety, Ticketing, Payments etc.
- Non Functional requirements [Sustainability & Inter-operability, Data Security, Privacy & Sharing, Device Identity and Machine KYC]

User / Requirements

Use Case | Digital Identity for Connected Cars

- Digital Identity for connected cars
- Real time diagnostics
- Real time online registration and transfers
- Real time compliance information





INTERNATIONAL TELECOMMUNICATION UNION

TELECOMMUNICATION STANDARDIZATION SECTOR

STUDY PERIOD 2013-2016

COM 20 – C Q2 - E

July, 2016

English only

Original: English

Solutions – Intelligent Transport Systems

Solutions

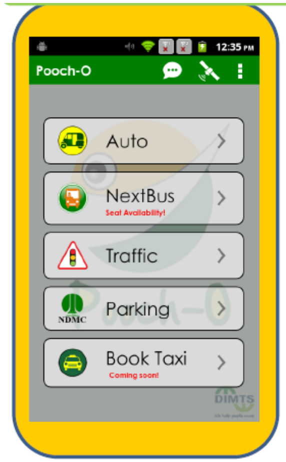
uberPOOL trips
in Bangalore and Delhi
25%
of all trips in the city are on uberPOOL since its launch
50,000
riders opt to share their trip via uberPOOL each week

OLASHARE
SHARE YOUR RIDE & SAVE YOUR FARES
Ola Share now in Kolkata & Chennai

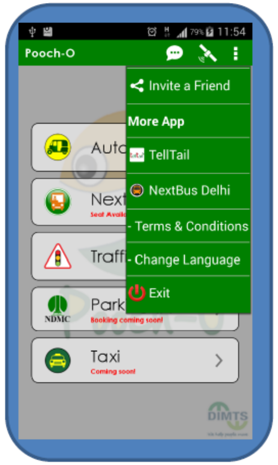
- Mature Radio Taxi Services have disrupted the personal transport segment
- Sharing Rides, Car Pooling, Car Hire services on the rise
- Battery Operated vehicles disrupting the legacy vehicles

Solutions – Intelligent Transport Systems

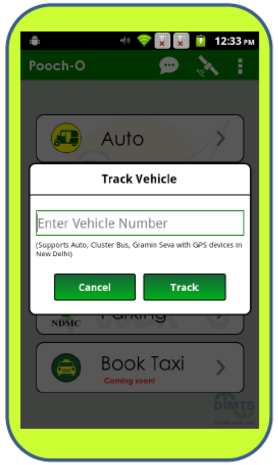
Solutions



- Poocho Home screen

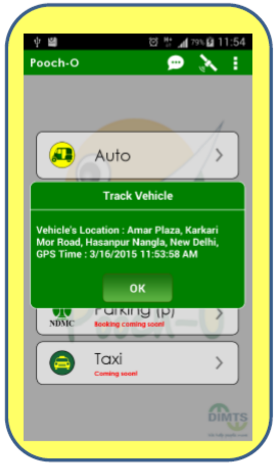


- Poocho app menu list
- Change language- Hindi/English
- Exit from app
- Share app link



(Supports Auto, Cluster Bus, Gramin Seva with GPS devices in New Delhi)

Track by Vehicle number



Vehicle's Location : Amar Plaza, Karkari Mor Road, Hasanpur Nangla, New Delhi, GPS Time : 3/16/2015 11:53:58 AM

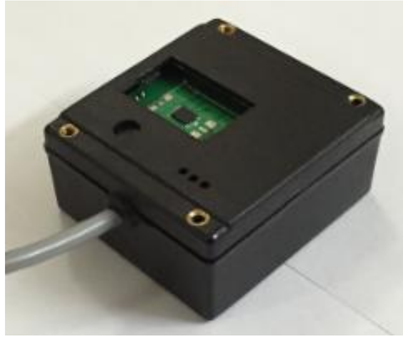
- Vehicle's current location

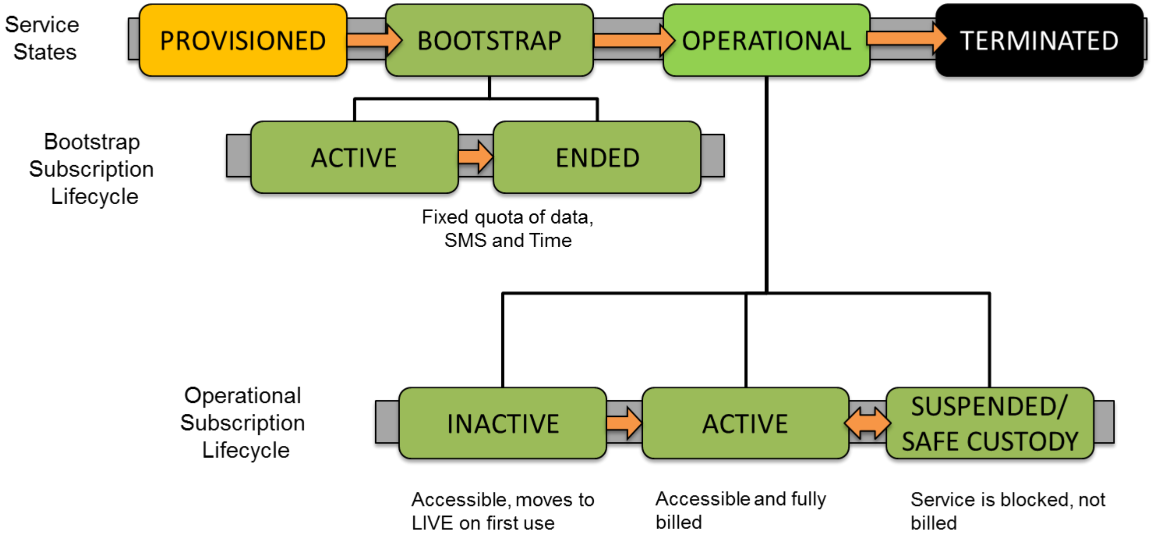
- Many Data, Logistics, Diagnostics Management Solutions
- Several Solutions with appropriate functionality
- High QoS Connectivity and connection management solutions in the market
- Security, Reliability, Data Management, Data Sharing immature

GSMA eSIM… with remote Lifecycle Management

Solutions

- Solderable IC form factor SIM for machines – extends the proven identity and security to machines
- Industrial grade and tamper resistant
- Factory fitment possible
- Multi-Profile SIM - Automatic Network Switching
- Remote Provisionable





Service States

PROVISIONED → BOOTSTRAP → OPERATIONAL → TERMINATED

Bootstrap Subscription Lifecycle

ACTIVE → ENDED

Fixed quota of data, SMS and Time

Operational Subscription Lifecycle

INACTIVE → ACTIVE ↔ SUSPENDED/ SAFE CUSTODY

Accessible, moves to LIVE on first use

Accessible and fully billed

Service is blocked, not billed

Standards: Several Standards, Agencies

Standards

- Many Agencies writing Specifications and Standards
- AIS specifies the Functional Requirements for the Devices, Location Data, Server Data, use of IRNSS and the Embedded SIM for reliable communications
- Needs support for non-functional Use Cases
  - Security
  - Privacy
  - Access Control

- **BIS TED28 Panel**
- **AISC(Automotive India Standards Committee) Panel on ITS**
- **TEC , DoT M2M committee Work Group on Automotive**
- **Current finalised Standards**
  - AIS 140 – Vehicle Tracking devices and Emergency Button
  - BIS Automotive Tracking Devices
    - Part I – ATD with Emergency Button
    - Part II – ATD with Emergency Button and fare metering
    - Part IV – ATD with Emergency Button and CCTV systems

Forward looking TRAI M2M Guidelines Released 5 Sep 2017

Regulation / Policy

- DoT released the Draft M2M Service Provider Registration Process in mid 2016
- TRAI has concluded the M2M Consultation and issued M2M Guidelines
- Policy mandates are expected to clear the Industry uncertainty and drive the required reliability and quality of service

- TRAI endorses DoT's recommendation on M2M Service Provider (M2M SP), the Entry Fee, Performance Bank Guarantee (PBG) or Financial Bank Guarantee (FBG) should be same as envisaged by DoT in "M2M Service Providers Registration –Draft Guidelines May 2016", mandates M2MSP registration, OSP insufficient
- New license with authorization under UL (M2M) for connectivity provider using LPWAN technologies in unlicensed spectrum
- Mandate for OEM to implement "Security by design" principle in M2M devices so that end-to-end encryption can be achieved
- Proof-of-concept (PoC)/ Pilot for emergency response service on the lines of eCall and provisions for emergency support in vehicles
- 'Over the air' (OTA) provisioning of local subscriptions mandatory for imported devices with pre-fitted eUICC GSMA approved guidelines for provisioning of new profile remotely with 'Over-the-air' (OTA) mechanism
- Machine KYC mandated with requirements to update the concerned authority databases

Challenges for M2M / IoT

M2M Device Identity, Machine KYC and Ownership

1

- Management of M2M Service Providers and M2M Applications
- Customer and Data Ownership Principles

ADMINISTRATION

- Trusted Source
- Standard and Secure Protocols
- Levels of Assurance

AUTHENTICATION

- Standards and Protocols for M2M authorizations
- Can a user access the resource and what can they do when they access it?

AUTHORIZATION

- Track who does what, when, where and how
- Focused Alerting
- In-Depth Collated Reporting
- Governance

AUDITING

Challenges for M2M / IoT

Scale, Inter-operability, QoS

2

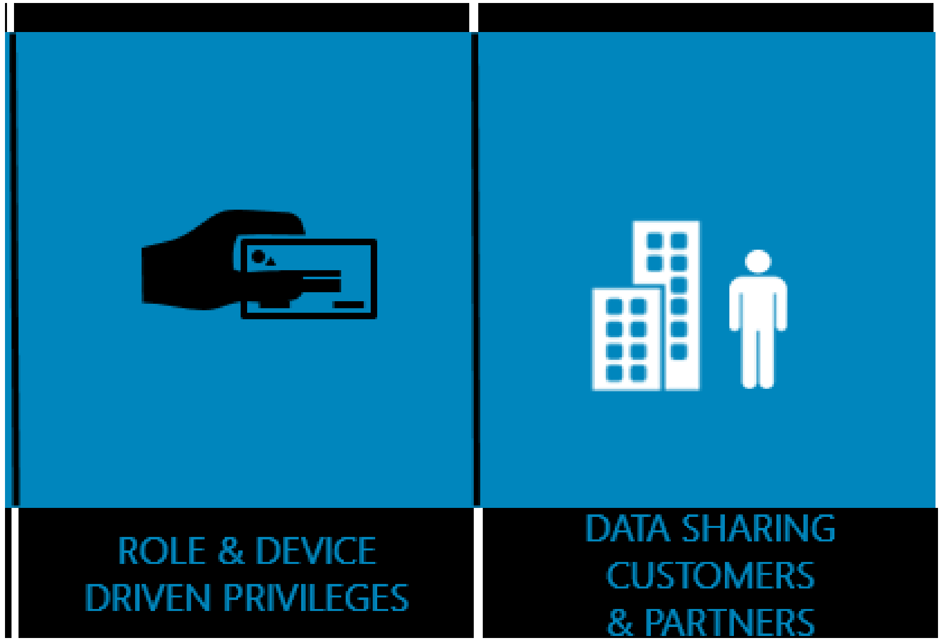
ADDRESS LARGE VARIETY OF DEVICES

Assured delivery, Low Latency, High Availability

Challenges for M2M / IoT

Security, Privacy, Sharing and Actionable Use of Public Data

3

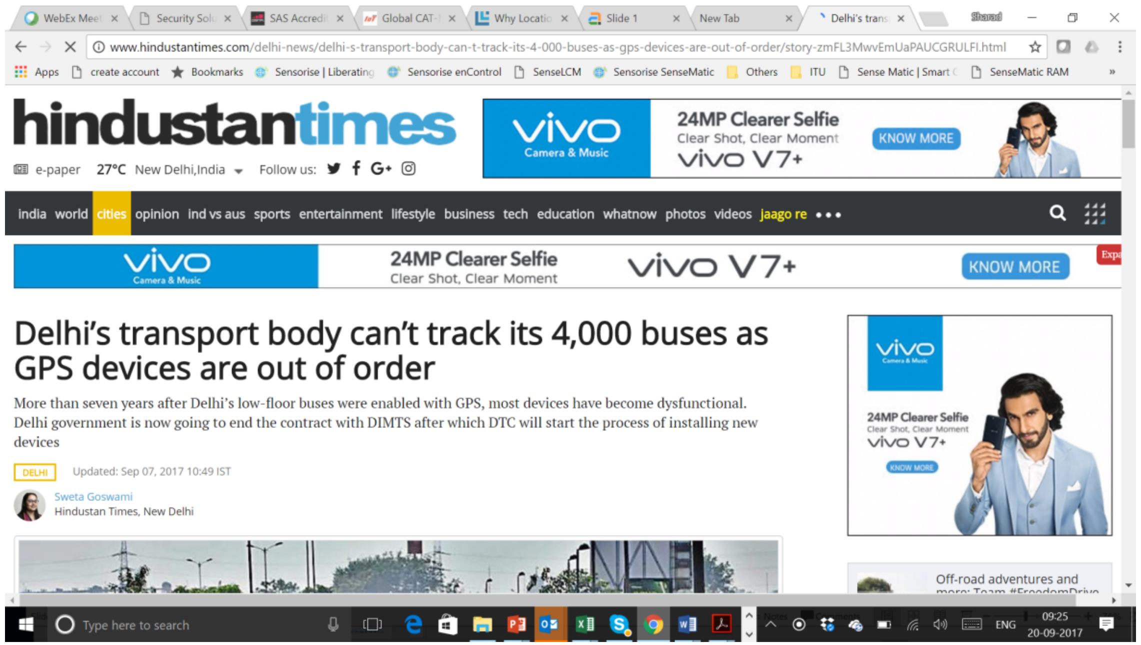


ROLE & DEVICE DRIVEN PRIVILEGES

DATA SHARING CUSTOMERS & PARTNERS

Why is Standardisation so important & inter-operability so critical

Because this can happen….


www.hindustantimes.com/delhi-news/delhi-s-transport-body-can-t-track-its-4-000-buses-as-gps-devices-are-out-of-order/story-zmFL3MwvEmUaPAUCGRULFI.html
hindustantimes
e-paper 27°C New Delhi,India Follow us:
india world cities opinion ind vs aus sports entertainment lifestyle business tech education whatnow photos videos jaago re
vivo Camera & Music 24MP Clearer Selfie Clear Shot, Clear Moment vivo V7+ KNOW MORE
Off-road adventures and
09:25
20-09-2017

Delhi's transport body can't track its 4,000 buses as GPS devices are out of order

More than seven years after Delhi's low-floor buses were enabled with GPS, most devices have become dysfunctional. Delhi government is now going to end the contract with DIMTS after which DTC will start the process of installing new devices

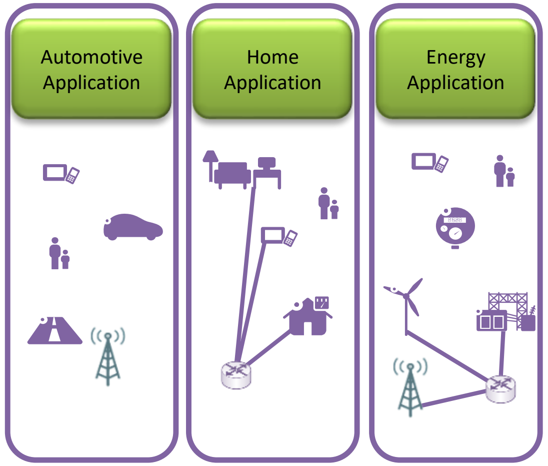
DELHI Updated: Sep 07, 2017 10:49 IST

Sweta Goswami
Hindustan Times, New Delhi

An internal report of the government termed the Automatic Vehicle Location System (AVLS) "non workable", "inefficient" and "unreliable"

- Quality of Service issues on which the an M2M Service Provider has no control
  - E.g. 1:2 IP pools; versus a requirement of continuous 10s data submission
  - Inadequate QoS guarantee from TSPs
- Device Installation Issues
- The Software and Server capacity
- Service Technician training
- Device was designed to stop when the bus engine stopped

Categorisation of IoT / M2M Solutions, Policy mandate for Standards compliance for public infra / mission critical solutions is a must for sustainable development



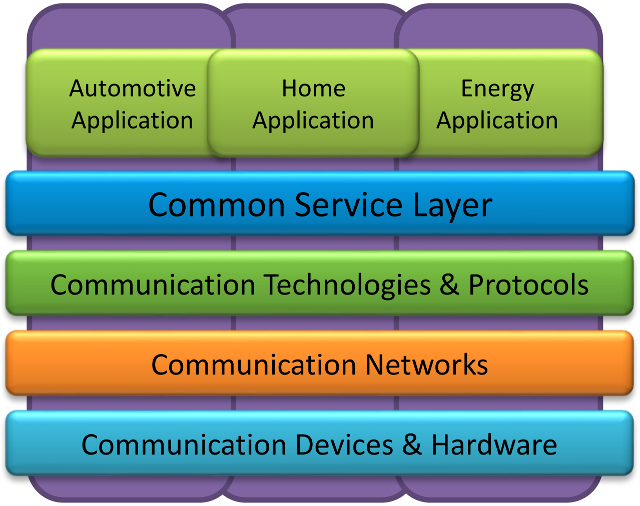
Automotive Application

Home Application

Energy Application

Legacy Solutions are Technology Verticals (Zigbee, DLMS for smart meters, etc.)

Connected Machines



Automotive Application

Home Application

Energy Application

Common Service Layer

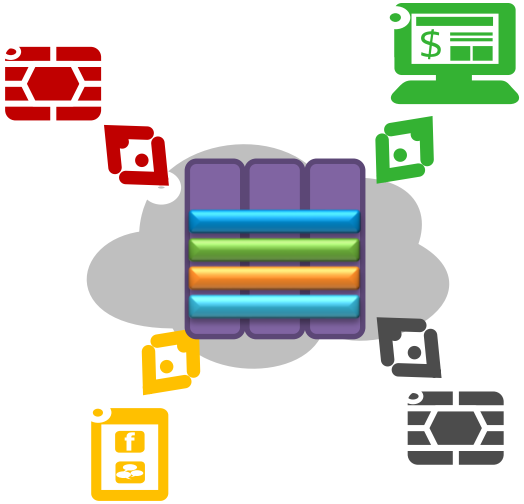
Communication Technologies & Protocols

Communication Networks

Communication Devices & Hardware

Horizontal framework, APIs, Objects as Resource Access Control Policy

OneM2M Framework



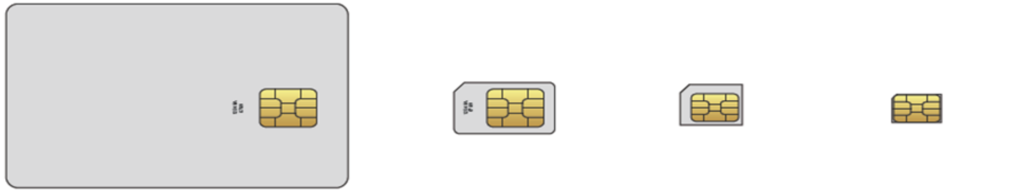
IoT Ontologies (formal description of concepts and relationships, e.g. W3C Semantic Sensor Network) as well as big data frameworks

IoT Ready

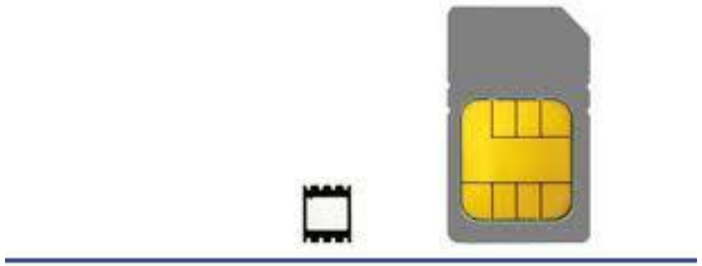
GSMA eUICC …enabler for proliferation of M2M / IoT

Solutions

- **eUICC : Embedded Universal Integrated Circuit Card**
  - Specifications from GSMA
  - Offers
    - Unique, Tamper Resistant Identity for any device
    - Change service provider over-the-air (OTA), without physically changing the SIM card
    - Hybrid multiple profiles in the same SIM, only one active at a time
- **Form Factors**



Variant	1FF	2FF (“Mini SIM”)	3FF (“Micro SIM”)	4FF (“Nano SIM”)
Year of launch	1991	1996	2003	2012
Dimensions (mm)	85.6 x 53.98	25.0 x 15.0	15.0 x 12.0	12.3 x 8.8



SIM on Chip
Surface Mount Technology
5mm x 6 mm only

Standard SIM Card
15mm x 25 mm

Identity, Integrity, Privacy and Non-Repudiation

"The right to privacy is an intrinsic part of Article 21 that protects life and liberty" – Supreme Court

- Aadhaar can not be mandatory
- Citizens privacy must be guaranteed

- M2M communication should be encrypted
  - Any private data must be protected
    - Vehicle Registration Numbers
    - Credit card numbers
    - Surveillance videos/images
    - Phone numbers, Email addresses, etc that can be used to track a persons life
- IoT devices must be Identifiable
  - Requires unique identify for every connected device
    - IMEI [GSM specific, can be changed]
    - SNO [not unique, each OEM follows a different numbering]
    - IccID [GSM specific, but secure and permanent when MFF2 form factor is used]
    - MAC [IP devices only, Unique and Secure]

M2M Security Work Group in India | Objectives

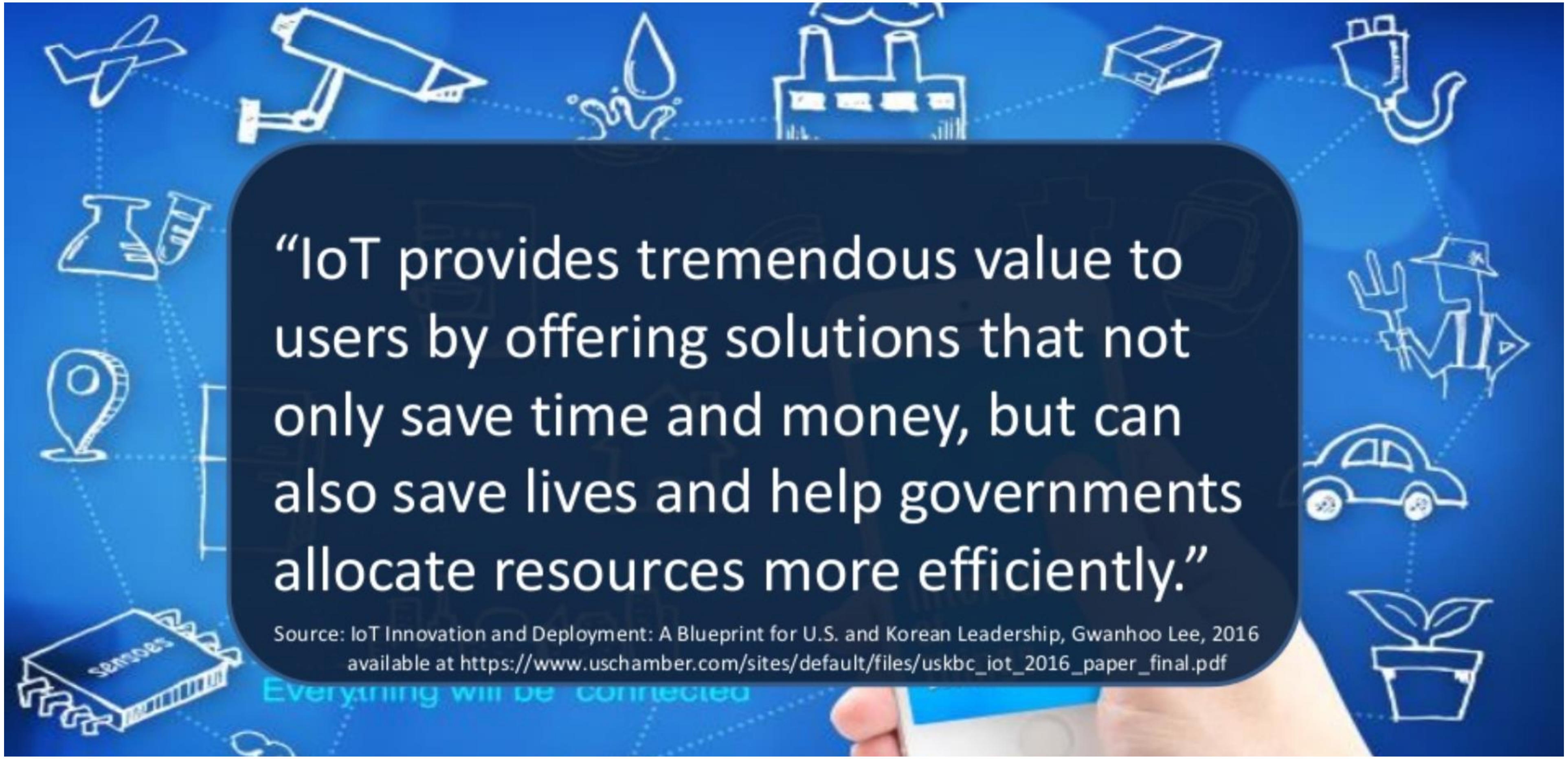
- Incorporation of minimal security standards for M2M products and services with interoperability in view
- Define guidelines for security
  - data ownership and retention period
  - security of sensitive data
  - location of application services
  - location of remote terminal unit/m2M devices
  - Location of core n/w elements
- Define policy/standards from security angle to connect legacy and non-IP devices on existing n/w technologies.
- Define precautions/security conditions for voice/SMS/MMS/video on M2M
- Aspects to be taken care of with respect to security framework for various verticals and solutions
- Define separate KYC norms for M2M from security angle
- Requirement of M2M product certification from security point of view

M2M Security Work Group | Charter

- Assimilate Existing Regulatory / Policy / Certification
  - Hosting of Application Servers in India
  - Role of M2M Service Provider
  - Registration Process for the M2M Service Providers
  - E-KYC Norms and Aadhaar
- Reference to Industry Standards
  - TEC reports
  - AIS Standards [Automotive] / BIS Standards
  - Health Standards
  - Smart Cities Requirements
- Recommendations of Application Layer Security Requirements
  - Classification of Security Levels
  - Identity, Authentication and Authorisation
  - Payment Interfaces
  - Identification of Sensitive Data and Personally Identifiable Information
  - Requirements for QoS and Reliability
  - Secure storage of Sensitive Application Data
  - Protection against known Application Layer Threats

- Clarify the role of eUICC as a Machine Identity Security Token
  - Simplify the Machine KYC
  - Providing Trust for Application Level Security for all M2M Gateways and M2M Nodes
  - Inter-operability of eUICC Operator Profiles and Subscription Management
- Enrolment of M2M Applications
  - Enrolment for Devices, Gateways & Applications
  - Inter application Communication, procedures enabling M2M application provider to control which applications are allowed to use the M2M services
  - security credential (M2M Application key) which can be used to grant specific authorization to access an approved list of M2M services

Summary



"IoT provides tremendous value to users by offering solutions that not only save time and money, but can also save lives and help governments allocate resources more efficiently."

Source: IoT Innovation and Deployment: A Blueprint for U.S. and Korean Leadership, Gwanhoo Lee, 2016 available at https://www.uschamber.com/sites/default/files/uskbc_iot_2016_paper_final.pdf

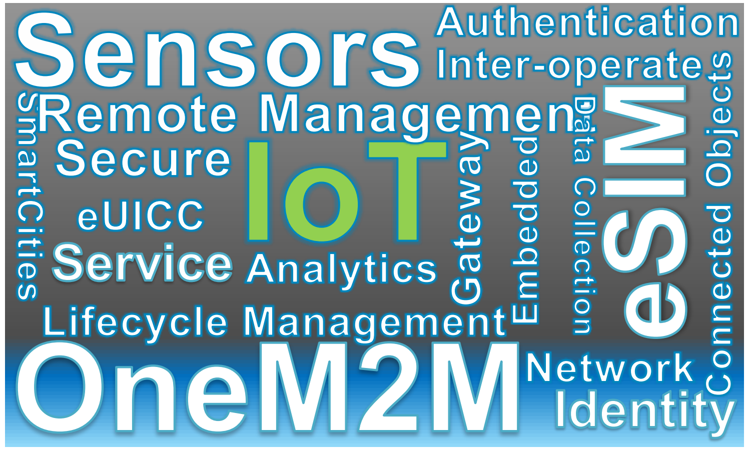
"IoT faces several technical, social, legal, and policy challenges, ranging from interoperability and spectrum availability to cybersecurity and privacy."

Source: IoT Innovation and Deployment: A Blueprint for U.S. and Korean Leadership, Gwanhoo Lee, 2016
available at https://www.uschamber.com/sites/default/files/uskbc_iot_2016_paper_final.pdf

Government Policy mandates for support of Standards will play a critical role in IoT Innovation, Inter-operability, Reliability, Scale & Proliferation

Thank You!

Sharad Arora, Founder and MD,
Sensorise Digital Services
sharad.arora@sensorise.net
20 Sep 2017



SENSORISE
Connect & Serve

Sensorise Digital Services Private Limited, www.sensorise.net