happiest minds
The Mindful IT Company
Born Digital . Born Agile

Automotive Safety - In-Vehicle Emergency Call System Leveraging IoT

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Objective

This use case deals with providing an infrastructure and a corresponding process/infrastructure to auto call an emergency number in case of any untoward scenario or accident.

Current Practice

One of the existing implementation, FORD has implemented in its Ecosports version of SUV. The system, according to Ford, is a vehicle-based, no-cost, non-subscription call-for-help system that delivers a voice message directly to emergency operators, indicating that a vehicle has been involved in an accident in which the airbags have been deployed or fuel pump shut-off triggered and opens the line for hands-free communication.

The Emergency Assistance system works via Ford's Sync system, which is a voice-activated, hands-free communications and entertainment package for mobile phones and digital media players that allows the driver to make and receive calls and play music.

The Sync system uses the driver's own mobile phone via Bluetooth and activates the moment the driver enters the car. In case an accident occurs, the Sync system uses its hands-free phone capabilities to connect the driver directly with India's emergency service number – 108.

Before initiating the emergency call, the Sync system will provide a 10 second window to allow the driver or passenger to decide whether to cancel the call. If not manually cancelled within the 10 second window, Sync will place the emergency call.

The call flow for the same is as follows:

1. In event of accident the vehicle location is determined by GPS

2. SYNC audibly announces to the cabin that it is placing an emergency call

3. Dials "112"-emergency number for all emergency services across Europe/Any country

4. Automatically plays a message which informs the operator that a crash has occurred in a Ford vehicle and the location of that vehicle using the most

5. SYNC audibly confirms that the emergency assistance call has been

6. The user can cancel the call anytime by pressing the hangup button

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What is eCall System

eCall system is an In-Vehicle Call system which opens the line for communication over GSM/CDMA in case of an accident. eCall System to be positioned in the Vehicular Network. An accident can be identified based on airbags deployment or triggering of fuel pump shut-off. All necessary information required for road side assistance in time is sent over SMS through the established communication to the Emergency Service Provider. This includes

Geo Coordinates

Vehicle Model

Vehicle Diagnostics info (crash impact)

Before the communication is established, Vehicle Identification Number and Vehicle Diagnostics information is read from vehicular network using OBD protocol. Geo Coordinates are read using the embedded GPS module.

A voice call is also placed for the driver to provide any additional data to Service provider. However voice call is hanged up after certain timeout, if the driver condition is critical and couldn't responds.

eCall System to also publish the accident information over V2V network to nearby vehicles and to nearby infrastructure unit over V2I network using short range communication protocols.

Emergency Service provider is to receive the data from the vehicle over GSM network. Emergency Service provider will have an intelligent system to analyze the received data and then determine the type of service to be deployed at the accident site. System then will automatically place a call to the service provider (Medical, Fire, Car Service center) and to share the vehicle data.

Service Vehicle to deploy an intelligent system with in itself, which communicates the accident information to nearby infrastructure units which in-turn forwards the data to infrastructure unit in the near vicinity until closer to accident spot. Infrastructure units could be Signal Lights which upon reception of such a data could make way for the service vehicle to reach the accident spot in time and thereby resulting in timely deployment of service vehicle at the accident spot.

Need for eCall System

Every year the number of vehicle accidents and death injuries are increasing exponentially. Had it been that a quality service is deployed at the accident site in time, number of such tragedies could have been avoided.

Some of the factors affecting such quality service are

1. Delayed alerts at the emergency center
2. Delayed arrival of emergency services at the accident scene
3. Insufficient information during rescue
4. Inefficient traffic management

This requires an automated system in the vehicle that can detect and react in case of an accident or any untoward accident.

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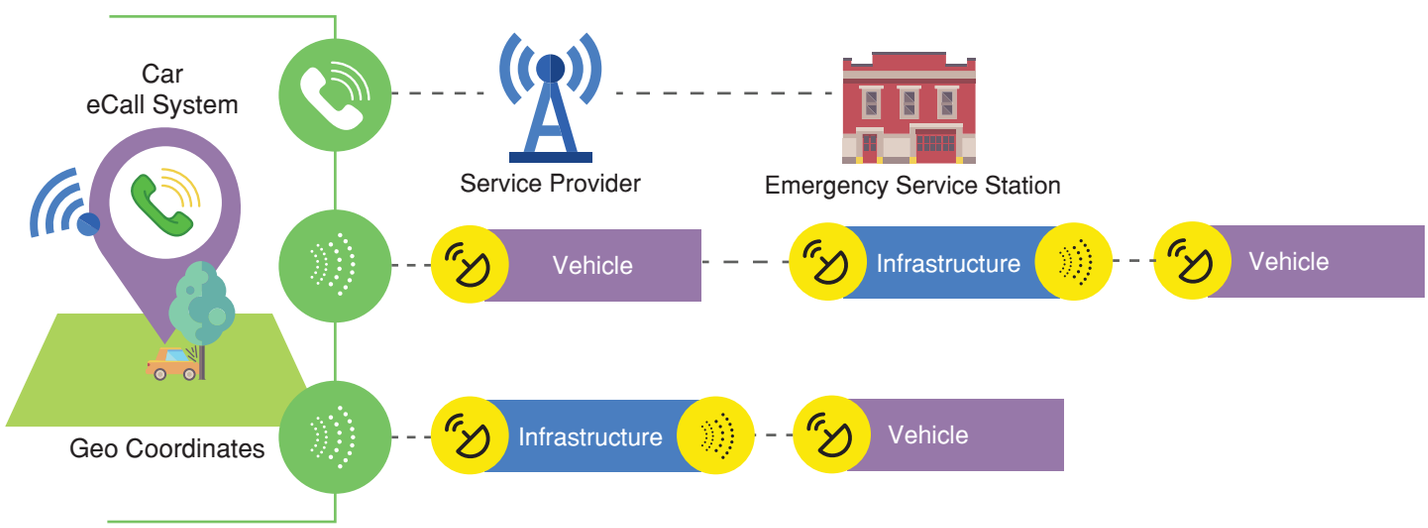
Actors

Actor Name	Actor Type (person, organization, device, system)	Role Description
eCall System	Device	Device responsible for identifying and initiating the rescue operation
Service Provider	System	System responsible for 1. Deploying the necessary services at the site of accident 2. Arrive at best route for the service vehicle 3. To Communicate the accident details to all the traffic signals to make way for service vehicles
V2V Communication Unit	Device	Device responsible for vehicle to vehicle communication
V2I Communication Unit	Device	Device responsible for vehicle to Infrastructure communication
Service Vehicle	System	Vehicle carrying the necessary equipment

Contextual Illustration – (as applicable)



Pre-requisites (Assumptions)

1. An infrastructure (person/service) is expected to route and receive the Emergency Calls.
2. A system is expected to be in place to act upon the Emergency Calls

Triggers (if any)

Any Vehicle Accident or an untoward accident may activate the vehicle Emergency Call System

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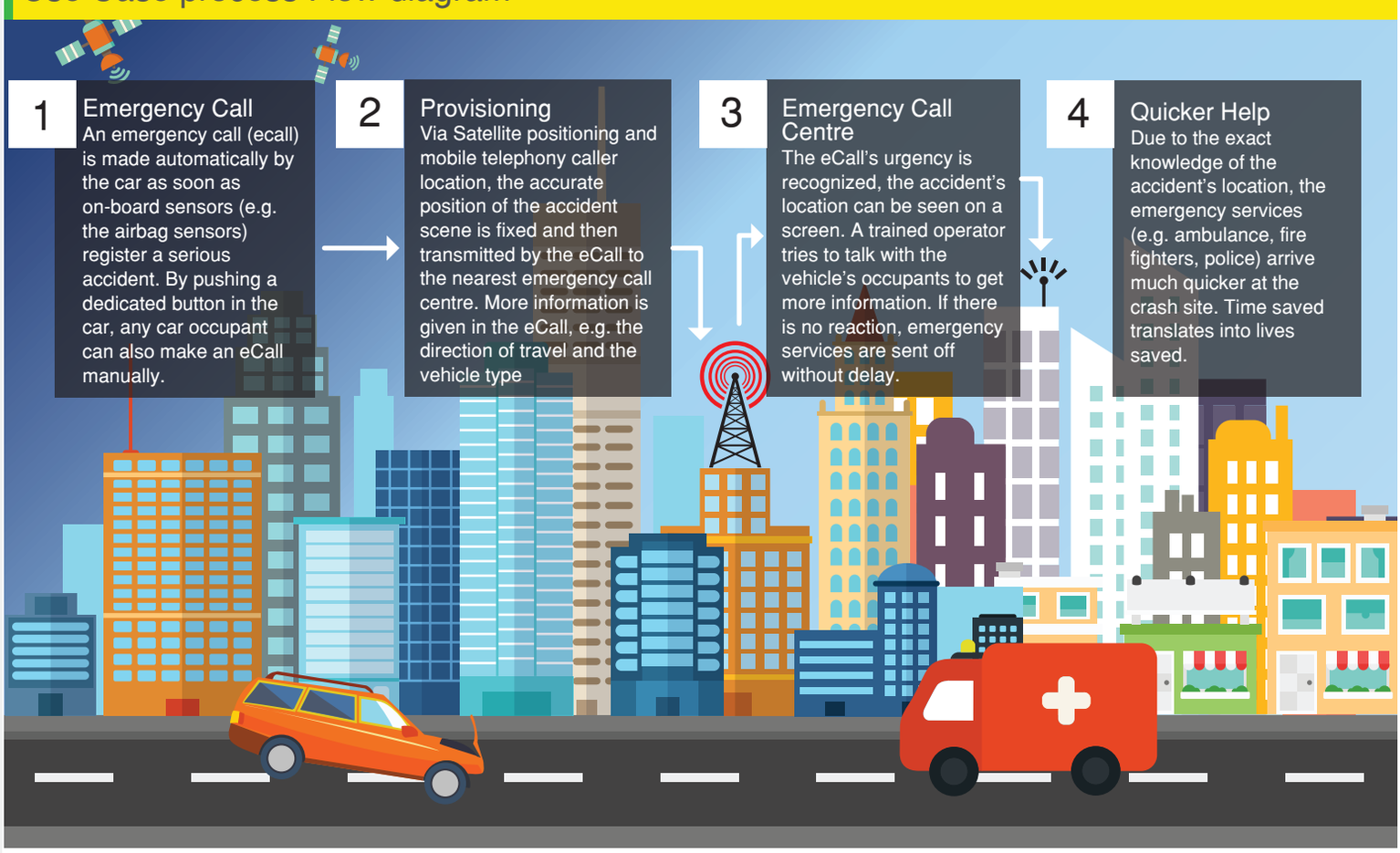
Scenario description

Normal Scenario (as applicable)

Following information is sent over SMS, for the service provider to identify the nearest emergency service that needs to be deployed at the incident site as early as possible

- Voice call is initiated – If at all driver is in a situation to speak, can provide additional information to assistant provider to help better
- Communication over Vehicle to Vehicle (V2V) network is established to communicate accident information with the nearing vehicles to avoid secondary accidents and traffic congestion in case of Highway driving
- Nearing Vehicle to alert the driver about such an incident and in turn communicate the same to other vehicles in its vicinity
- V2I network can also be planned to have information flow over a wider range to cover more vehicles
- Emergency Service Providers to identify the emergency service that needs to be deployed based on the received set of data
- Emergency Service Providers to arrive at best route for the service vehicle to take at that instance of time in the day to reach the destination as early as possible
- Emergency Service Provider to communicate the same to all the traffic signals in the route to make way for the service vehicles through the city

Use Case process Flow diagram



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Information Exchange

Interface Requirements (as applicable)

1. eCall System shall be able to receive GPS data from GPS
2. eCall System shall be able to send data over GSM/CDMA module
3. eCall System shall be able to send data over Short Range Communication interface to nearing vehicle or nearby infrastructure module.
4. Service provider shall be able to receive data over GSM/CDMA
5. Service Vehicle shall be able to forward the data to nearby infrastructure unit

Performance Criteria

- Vehicle data as described above to be transmitted at the instance of accident from eCall system to Service provider.
- Latency: Ideally data to reach the service provider with minimum delay to service the situation in time.
- Volume: About 100 bytes of data (Geo Co-ordinates, VIN and OBD Data) to be transmitted from vehicle over GSM network at the time of accident to service provider.
- Service provider to dispatch this information to service vehicle with the problem description upon reception of data from the accident met vehicle.
- Also V2V and V2I system to send vehicle data over vehicular network (DSRC) at the time of accident
- Vehicle data transfer is of highest priority and is the only data transmitted at the time of accident. In case of network failure, Vehicle data sent over SMS shall be buffered at network provider and shall be available to end unit as soon as it gets connected back to network.

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User Interface

An UI shall be required at service provider and also at service vehicle to view the vehicle data. No such UI is required at the eCall System itself

Communication Infrastructure

eCall System shall use GSM network and V2V network for communication with outside world

Deployment Considerations

eCall System to be deployed in the region of car which is very less likely to be damaged upon an accident. The device must be very rugged/heat resistant to withstand the impact of the accident e.g the ruggedness and durability must be similar to that of a Black Box in Aeroplanes.

Geographical Considerations

Infrastructure units must be placed within few hundred meters of distance from each other.

Security

There are no potential data security threats because no critical data is transmitted. However, the reliability of the system and the authenticity of the data is a matter of concern.

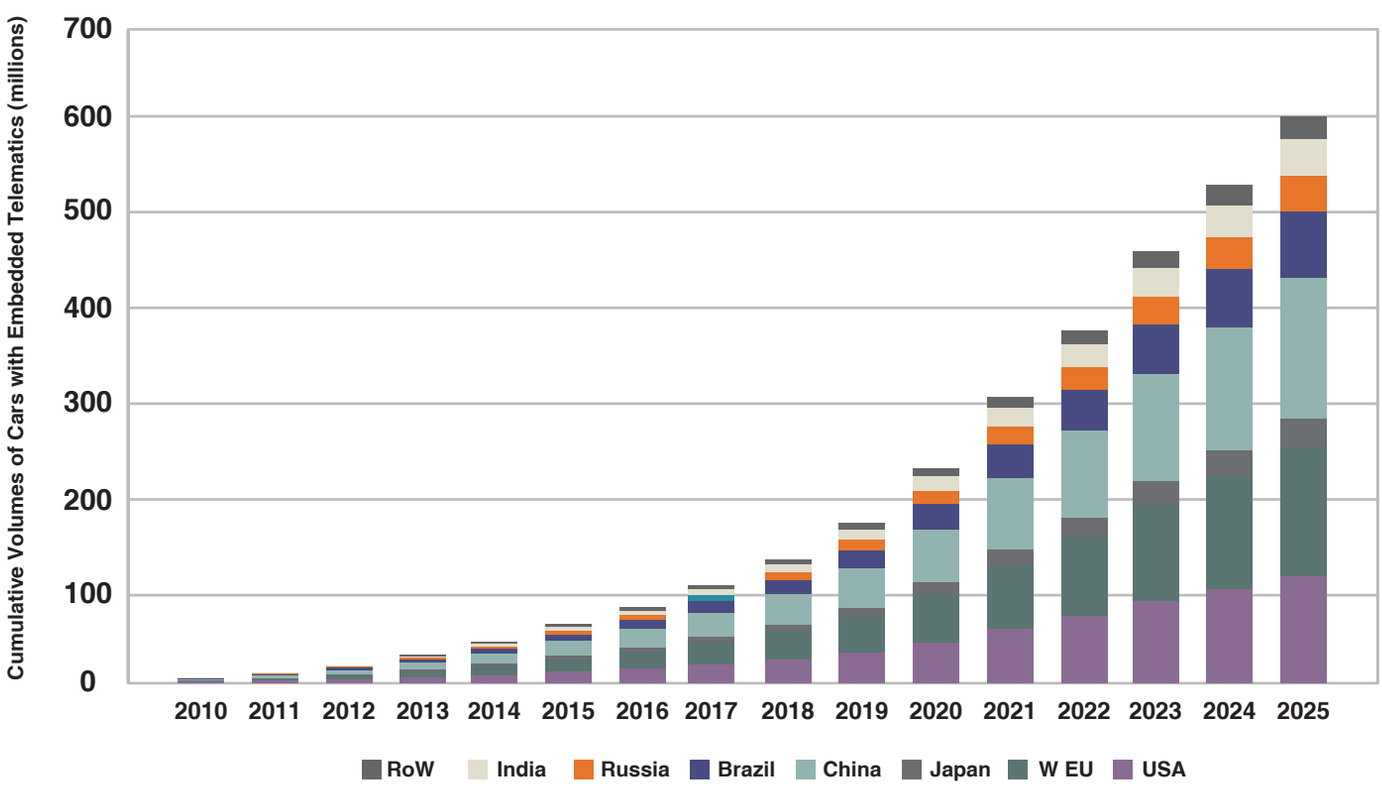
Startup Shutdown process

eCall System to be battery powered. Once the system is up and running, device to be in sleep state until accident event occurs thereby avoiding battery draining during normal operation of the vehicle.

Potential market growth

Safety systems in cars will be the key growth drivers for the Indian automotive electronics market in the next few years as it attains a compound annual growth rate (CAGR) of 21.8 per cent, as per research report. It is estimated that the 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 will grow at CAGR of 24.6% over the next 15 years to reach €20 billion by 2025.

Growth Forecast for cumulative volume of Embedded Telematics by Region



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India specific Challenges

Some of the Challenges anticipated are	No single Indian Emergency Service Provider	Interoperability of different emergency service provider	Detection of Fraudulent Calls	Detection of False Alarms	Back Up procedure to make the call in case of primary call system fails

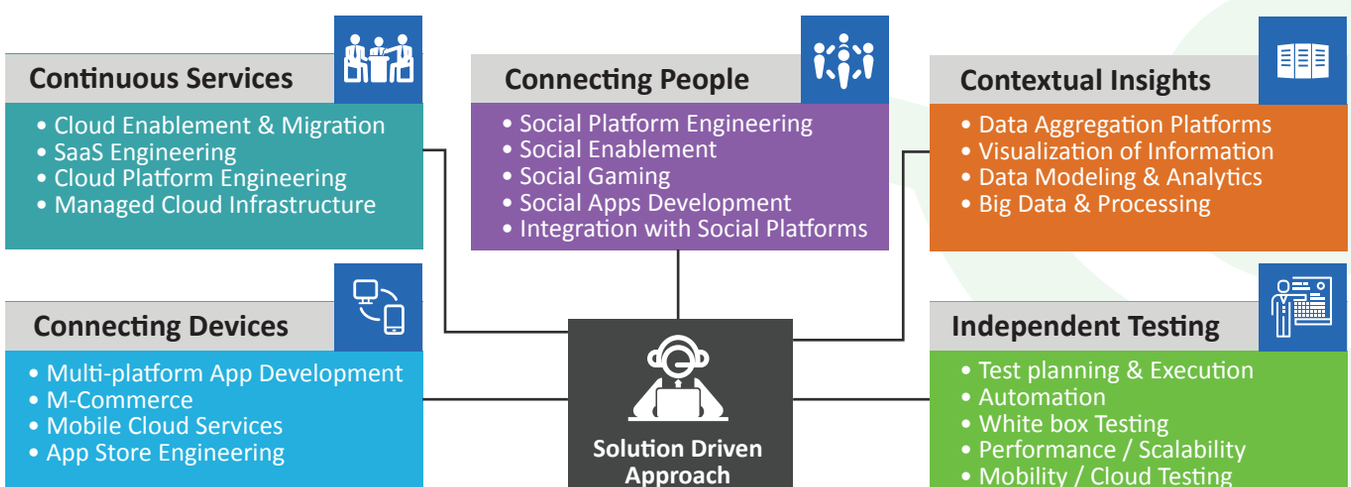
Happiest minds internet of things approach

Our brand commitment is to deliver a customer experience which is smart, connected and secure. With the advanced benefits of M2M technology, we focus on delivering services that would make enterprises, our environment and life smarter than in the future.

Industry Partnerships

Microsoft Partner | ILS technology | intel Intelligent Systems Alliance | ARM CONNECTED | CEA Consumer Electronics Association

Our IoT Services range from designing hardware devices, cloud enablement, mobility enablement, engineering and real-time analytics, and consulting to create end-to-end solutions. Our IoT services encompass managed services via SOC/NOC that ensures smooth functioning of the M2M infrastructure for the business



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About the Author

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Aditya is a certified Business Analyst, who holds the Vice Chair position for the IoT work group at TSDSI -TEC , a IoT specific standard development organization working with One M2M & ETSI.ITIL v3, Business Continuity Management and Business Process Framework Professional. He has a rich experience in technology R&D, business development and Solution Offerings with special focus on Internet of Things domain. Aditya holds a MBA degree from Symbiosis International University with a Bachelors' degree in Computer Science Engineering.
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