# Chapter 9
# IoV-Based Blockchain Over LoRa for Accident Detection

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## ABSTRACT

*All over the world, the increase in the use of transport systems is defined as the cause of traffic problems reflected mainly by the increase in the number of road accidents due to poor traffic management. In order to ensure an intelligent mobility and transport and thus in the trend of building smart cities, the interest has turned to the development of the internet of vehicles (IoV). The IoV communication network involves the evolution of vehicle connectivity enabling the exchange of real-time traffic data between vehicles, with their environment and everything related to it, through different network technologies. Given the complexity of the IoV, it is necessary that its environment is secure, reliable, and protected against attacks, and that it allows the diffusion of information throughout the network. The blockchain technology allows the securing of different data transactions exchanged between IoV nodes, given its provision of several cryptographic techniques and that it provides a distributed, transparent, and highly confidential database. In order to expand the area of the covered network, long-range (LoRa) designed for low power wide area networks (LPWANs) is used to ensure simultaneous and long range transmissions. This chapter presents an IoV-based architecture that integrates blockchain technology to cover the database security aspects and the LoRa network as a service for vehicle tracking that allows to collect information from different vehicles including location in order to be able to prevent the presence of road accidents with the aim of warning, alleviating traffic and minimizing the risk of having others. For its implementation, this system is based mainly on the measurement of the speed of vehicles to detect the deceleration or blockage of traffic in order to identify the presence of accidents.*

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## INTRODUCTION

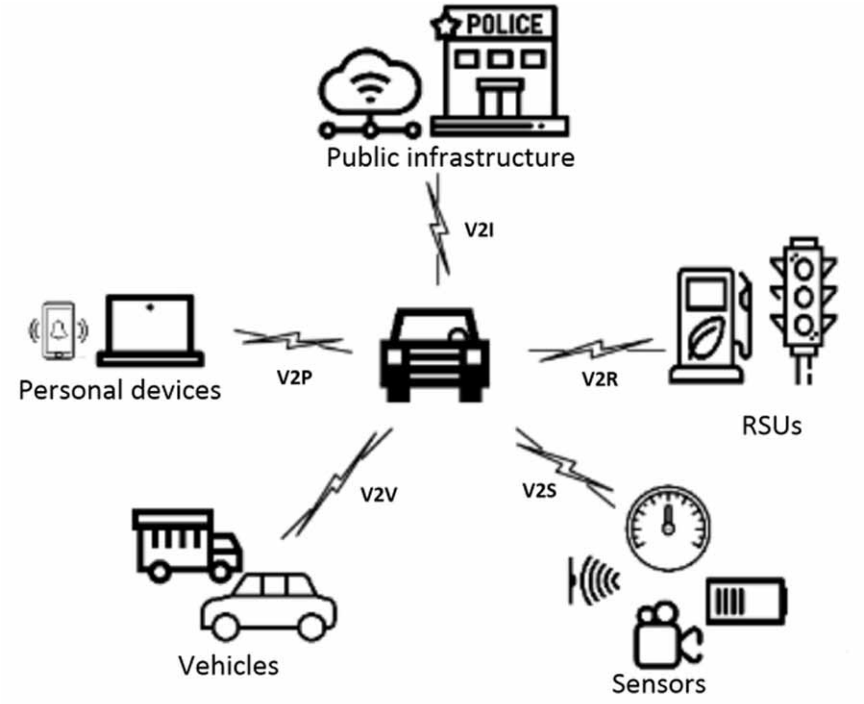
The amount of people who depend on the vehicles has increased exponentially in today's world. Due to the limited availability of emergency services and the increase in vehicular network, traffic hazards and road accidents have multiplied, resulting in a high death toll and significant material damage.

Intelligent Transport Systems (ITS) have developed rapidly and form the core of intelligent mobility, which ensures traffic management. ITS cover information gathering, detection, device control, data processing and transmission to ground devices via user-specific platforms. ITS has been further enhanced by the Internet of Things (IoT) to enable connectivity between different objects.

The Internet of Vehicles (IoV) is a central IoT theme that has developed from the Vehicular Ad Hoc Network (VANET) based on the connectivity and exchange of information and data between vehicles and their surroundings. The connectivity between vehicles is ensured by intercommunication between vehicles intelligent devices, sensors, and intelligent systems in the environment, as part of ITS. IoV's dynamic architecture and scalability allows all vehicles to interact with each other via the Internet, and enables for those moving to communicate independently of a fixed network infrastructure.

There are five types of IoV communication: vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), vehicle-to-pedestrian (V2P), vehicle-to-cloud (V2C), vehicle-to-sensor (V2S), vehicle-to-road node (V2R) and vehicle-to-network (V2N). In other words, it's vehicle-to-everything (V2X) communication (Figure 1).

*Figure 1. Communication V2X. Different communication types for IoV.*


POLICE
Public infrastructure
V2I
Personal devices
V2P
V2R
RSUs
V2V
V2S
Vehicles
Sensors