

# Vehicular Ad hoc Networks and its Application in Today's Scenario

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**Abstract:** Vehicular Ad hoc Network (VANET) has become the potential area of research now a day. The VANET is a subclass of Ad hoc network assisting the drivers, passengers and pedestrians in the field of safety and convenience and entertainment. In addition to the safety and convenience, VANET also supports commercial oriented applications. In this article, we are presenting the introduction of VANET and the application areas supported.

**Keywords:** VANET, MANET, Safety Applications, Convenience Applications, Commercial Applications.

## 1. Introduction

Vehicular Ad hoc Network is a special class of Ad hoc network to assist the drivers, passengers and pedestrians. (Nagaraj et al., 2011; Zemouri et al., 2015; Kumar and Verma, 2015). Similar to Mobile Ad hoc networks (MANETs), VANETs also contain vehicles acting as mobile nodes. The moving vehicles form an ad hoc network when they come in the communication range of each other (Vegni and Loscr, 2015). In VANET, several different sensors are installed in vehicles for sensing the information of surroundings. One of the important applications of VANET is to help the drivers during journey by passing important messages timely to avoid serious conditions like accidents, traffic bottlenecks, unseen difficulties etc. Further, in addition to safety applications, VANETs are also useful by providing comfort applications to users like web browsing, online music, parking space, nearby shopping centres/mall location etc. (Zeletin et al., 2010; Amadeo et al., 2012).

Undeniably, VANETs are also capable to offer dissimilar communication services to pedestrians, passengers and drivers (Liang et al., 2014; Toor et al., 2008). Thus, VANETs are getting significant interest from the automotive industry, researchers and as well as from government organizations.

## 2. VANET Applications

The VANET application can be grouped mainly in three classes: Convenience applications, Safety applications (Willke et al., 2009; Chaqfeh et al., 2014; Kumar and Verma 2017), and Commercial applications (Emmelmann et al.).

### 2.1 Safety Applications

The Safety applications executed by observing the vehicular environment which consists speed of vehicles, road conditions, vehicle density, and status of traffic lights. The role of OBU and APU are to make the communication possible among vehicles to exchange vehicular environment information. In the following section, some of the significant safety applications are discussed.

### a) Intersection Violation Warning (IVW)

In IVW application, the Vehicle drivers got alerted about the traffic signal using road side unit (RSU) when they reach close to junctions (Hartenstein et al., 2010). The traffic signal information is broadcasted by RSU for nearby vehicles. The broadcasted information will be helpful to the drivers who did not notice the traffic signal.

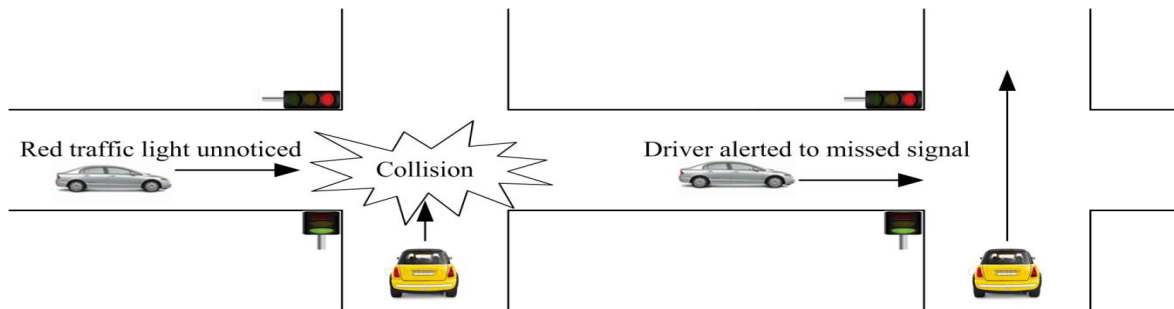


Figure 1 a. Scenario without IVW application b. Scenario with IVW application

The working of IVW application is shown in Figure 1 a, if the driver of white car, approaching to junction got failed to notice the red traffic signal then it can lead to collision. But, if IVW application is supported by vehicles (Figure 1 b), the traffic information can reach to the vehicle driver timely and the car can be controlled before the junction.

### b) Oncoming Traffic Warning (OTW)

This application is useful during overtaking situation, where a driver is not able to correctly judge the distance to the vehicle, coming from opposite direction. The figure 2 a and 2b are used to show a situation, where the driver of white car trying to overtake the yellow vehicle. Here, the white car driver miscalculates the distance to the red car, coming from opposite side. In this situation, the vehicle can end up with a disaster (Figure 2 b). However, with the help of OTW, the accident can be avoided (Figure 2 c).

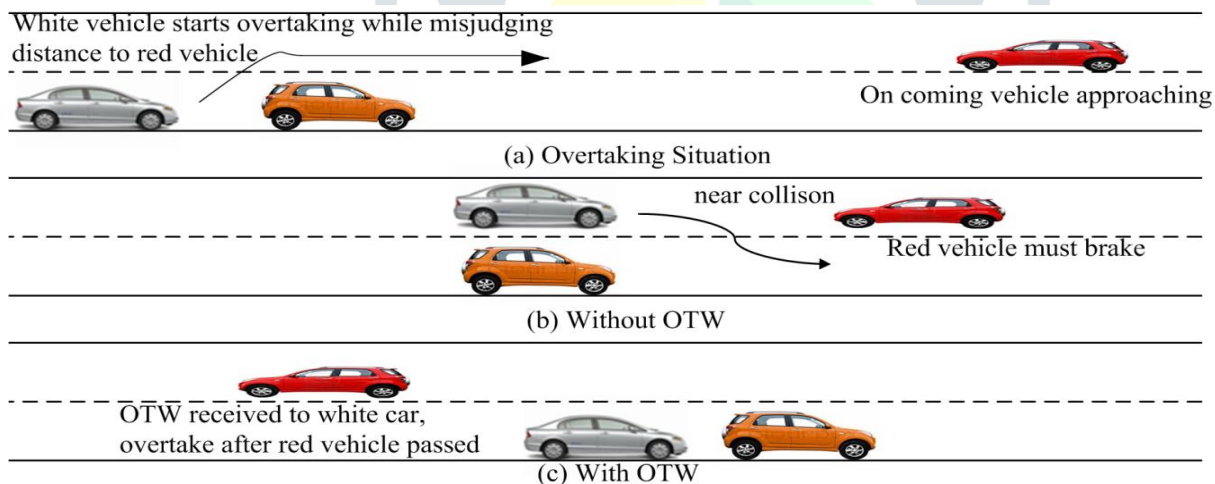


Figure 2 OTW Application. a Overtaking Situation. b Without OTW. c With OTW

### c) Vehicle Stability Warning (VSW)

In the VSW application when a vehicle observes a risky driving state through the vehicle stability control system (VSC), it broadcast the vehicle stability warning to all the neighbour vehicles. In Figure 3, the vehicle A observe the icy road situation and VSC system sends the VSW warning to vehicle C, resulting vehicle C crosses the icy road with slow speed. On contrary the absence of VSW, such a site can lead to the crash of vehicle B and C.

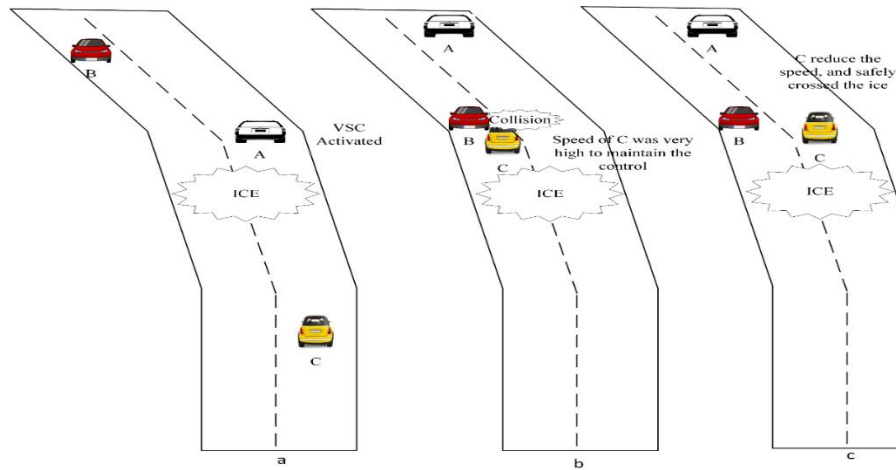


Figure 3 VSW Application. a Icy Road situation. b Without VSW. c With VSW

## 2.2 Convenience Applications

Convenience applications are used to increase the convenience of drivers, passengers, and pedestrians. This application enhances the ease of driving by sending information like traffic condition, road conditions, alternate paths in case of traffic jams.

### a) Congested Road Notification (CRN)

In the dense vehicular network, vehicles generate a congested road notification (CRN) message, with the intention to inform other vehicles to avoid congested road and to use any other alternate route.

### b) Parking Availability Notification (PAN)

This notification is very useful for the vehicle drivers. Whenever a driver looking for a parking space, he or she sends a request to the neighbour vehicle or RSU and if they own any information regarding the available parking space they respond back to the requesting vehicle with PAN. In the case of more than one parking slots, the vehicle can select any desired slot according to its convenience.

## 2.3 Commercial Applications

VANET is also useful for commercial applications. It can improve the productivity of drivers as well as the business houses. A driver or passenger can use entertainment services and vehicle maintenance services information from their neighbouring area. Moreover, a businessman can use RSUs to advertise about his product and services to increase the reachability up to nearest customers.

### a) Service Announcement Notification (SAN)

The service announcement notifications are useful for the drivers looking for specific services like restaurants, petrol pump, workshop etc. Similarly, this service helps the service providers to advertise their services to the customers directly.

### b) Real-Time Video Broadcast Notification (RTVB)

RTVB notification is used when a driver wishes to perform the live streaming of some specific circumstances like traffic roadblock, any road accident etc. Such live streaming can be made available to all the neighbour vehicles through multi-hop broadcast method.

## 3. Conclusion

Now a day's the fatal accidents have become common and there is a need of technology which can reduce it and the VANET has the potential to do something in this area. Thus, in this direction, the introductory part of Vehicular Ad hoc network is explained in this paper. Additionally, the usage of VANET in today's scenario is also presented. Further, the VANET

applications are also categorized in safety, convenience and commercial oriented applications.

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