Chapter 3
Evolution of Vehicular Ad Hoc Network and Flying Ad Hoc Network for Real-Life Applications:
Role of VANET and FANET

Sipra Swain
National Institute of Technology, Rourkela, India

Biswa Ranjan Senapati
ITER, Siksha 'O' Anusandhan University (Deemed), India

Pabitra Mohan Khilar
National Institute of Technology, Rourkela, India

ABSTRACT

The demand for the quick transmission of data at any point and at any location motivates researchers from the industry and academics to work for the enhancement of ad hoc networks. With time, various forms of ad hoc networks are evolved. These are MANET, VANET, FANET, AANET, WSN, SPAN, etc. The initial objective of VANET is to provide safety applications by combining them with ITS. But later, the applications of VANET are extended to commercial, convenience, entertainment, and productive applications. Similarly, connections among multiple unmanned aerial vehicles (UAV) through wireless links, architectural simplicity, autonomous behaviour of UAV, etc. motivate the researchers to use FANET in various sectors like military, agriculture, and transportation for numerous applications. Search and rescue operations, forest fire detection and monitoring, crop management monitoring, area mapping, and road traffic monitoring are some of the applications of FANET. The authors mentioned some applications in the chapter using VANET, FANET, and the combination of VANET and FANET.

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INTRODUCTION

Advancement in wireless access technology, demands in communication at anytime and at any location, availability of various sensors at affordable cost increases the demand for the ad hoc network (Helen & Arivazhagan, 2014). As per the demand for communication, various forms of ad hoc networks are evolved (Al-Absi & Lee, 2021). Different ad hoc networks are mobile ad hoc networks (MANET), vehicular ad hoc networks (VANET), flying ad hoc networks (FANET), airlift ad hoc networks (AANET), wireless sensor networks (WSN), smartphone ad hoc networks (SPAN), etc. Overall comparison for the different forms of ad hoc networks is presented in Table 1.

Table 1. Comparison of different forms of ad hoc networks

Characteristics	MANET	VANET	FANET	AANET	WSN	SPAN
Network connectivity	High	Medium	Low	Low	High	Medium
Availability of energy	Low	High	Low	Low	Low	Medium
Mobility models	Random	Restricted	Restricted	Random	Restricted	Restricted
Speed of the node	Medium	High	High	High	Low	Low
Link connectivity	Changes occasionally	Changes frequently	Changes frequently	Changes frequently	Changes occasionally	Changes Occasionally

(Zhang, et al., 2019)

The vehicular ad hoc network (VANET) is one of the subclasses of ad hoc networks (Hamdi, Audah, Rashid, Mohammed, Alani, & Mustafa, A review of applications, characteristics and challenges in vehicular ad hoc networks (VANETs), 2020). VANET consists of two components which are distributed and asynchronous (Senapati B. R., 2021). These two components are as follows.

1. **Vehicle:** These nodes are mobile.
2. **Roadside unit (RSU):** These nodes are static.

From the above-mentioned two components, RSU has greater sensing capability, computational power, and greater storage capacity. As RSU is static in nature, RSU is generally placed near the junction. Technological advancement in the electro-mechanical-computational-humanity department, availability of a large number of sensors at affordable cost, presence of communication unit (On-board Unit-OBU),