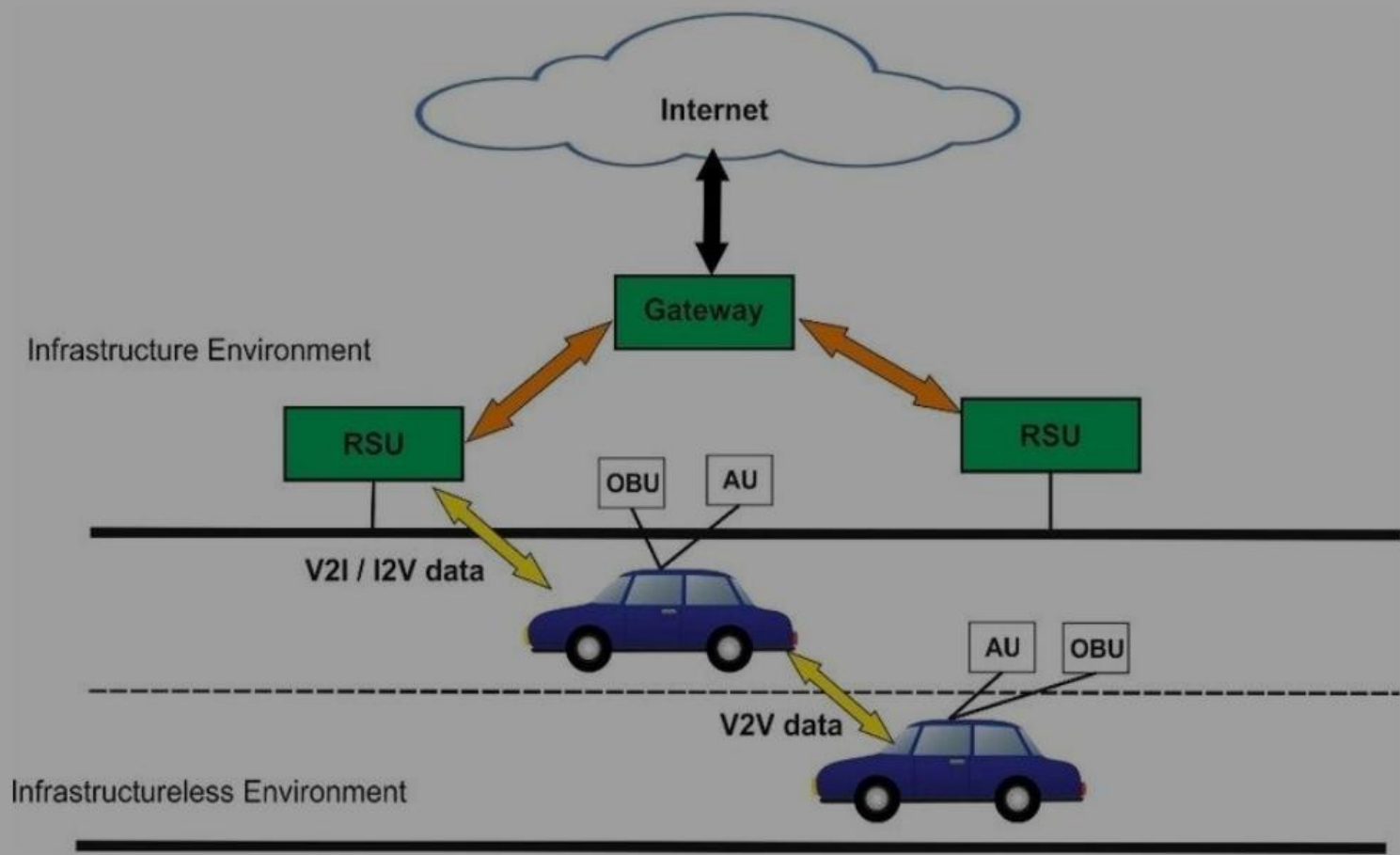


Vehicular Ad-hoc Networks (VANETs)

Elementrix Classes

A VANET (Vehicular Ad-hoc Network) is a type of mobile ad-hoc network (MANET) that is specifically designed for communication between vehicles. It allows vehicles to communicate with each other and with the infrastructure, using wireless communication technologies, such as Wi-Fi and cellular.

The architecture of a VANET consists of a network of vehicles that are equipped with wireless communication devices and sensors. The vehicles act as both hosts and routers, and they can communicate with each other directly or through one or more intermediate vehicles. The infrastructure can also be connected to the VANET through fixed access points, such as road-side units (RSUs) or cellular towers.



Infrastructure Environment

Internet

Gateway

RSU

RSU

OBU

AU

V2I / I2V data

V2V data

AU

OBU

Infrastructureless Environment

VANET communications are categorized as follows:

- ❑ **In-vehicle communication** between OBU of the vehicle and its AUs.
- ❑ **Vehicle-to-vehicle (V2V)** wireless communications between vehicles via their OBUs.
- ❑ **Vehicle-to-infrastructure (V2I)** refers to bidirectional wireless communications between vehicles and infrastructure-connected RSUs.
- ❑ **Infrastructure-to-Infrastructure (I2I)** communications between RSUs enable extending the coverage of the network.
- ❑ **Vehicle-to-broadband cloud (V2B)** communications between vehicles and broadband cloud via wireless broadband technologies such as 3G/4G.

The main characteristics of a VANET include:

- ❑ **High mobility:** Vehicles in a VANET are highly mobile, and they can move at high speeds and change their location frequently.
- ❑ **Dynamic topology:** The topology of a VANET is constantly changing, as vehicles enter and leave the network and as the network expands and contracts.
- ❑ **Limited resources:** Vehicles in a VANET have limited resources, such as power, bandwidth, and processing power, and these resources need to be carefully managed.

The main advantages of a VANET include:

- ❑ **Improved safety:** VANETs can be used to improve road safety by enabling vehicles to exchange information about their location, speed, and direction, and to alert drivers of potential hazards.

- ❑ **Enhanced traffic efficiency:** VANETs can be used to optimize traffic flow by allowing vehicles to communicate with each other and with the infrastructure, and to coordinate their movements.
- ❑ **Improved environmental sustainability:** VANETs can be used to reduce fuel consumption and emissions by optimizing routes and by enabling the use of alternative energy sources, such as electric vehicles.

The main disadvantages of a VANET include:

- ❑ **Complexity:** VANETs are complex systems that require the integration of multiple technologies, such as wireless communication, sensors, and navigation, and they may be difficult to design and deploy

- ❑ **Interoperability:** VANETs may be incompatible with other systems and standards, and they may require the development of new protocols and technologies to ensure interoperability.
- ❑ **Security and privacy:** VANETs are vulnerable to security threats, such as spoofing, tampering, eavesdropping, and denial of service, and they may require the development of security measures to protect against these threats. VANETs may also raise privacy concerns, as they may collect and transmit sensitive data, such as location, speed, and driving behavior.
- ❑ **Cost:** VANETs may be expensive to develop and deploy, as they require the integration of multiple technologies and the deployment of infrastructure, such as road-side units (RSUs).

Some of the main applications of a VANET include:

- ❑ **Safety applications:** VANETs can be used to improve road safety by enabling vehicles to exchange information about their location, speed, and direction, and to alert drivers of potential hazards.
- ❑ **Traffic management applications:** VANETs can be used to optimize traffic flow by allowing vehicles to communicate with each other and with the infrastructure, and to coordinate their movements.
- ❑ **Environmental applications:** VANETs can be used to reduce fuel consumption and emissions by optimizing routes and by enabling the use of alternative energy sources, such as electric vehicles.
- ❑ **Commercial applications:** VANETs can be used to enable a variety of commercial applications, such as advertising, location-based services

पढ़िए और पढ़ाइये

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