Vehicular Ad-Hoc Networks (VANET)
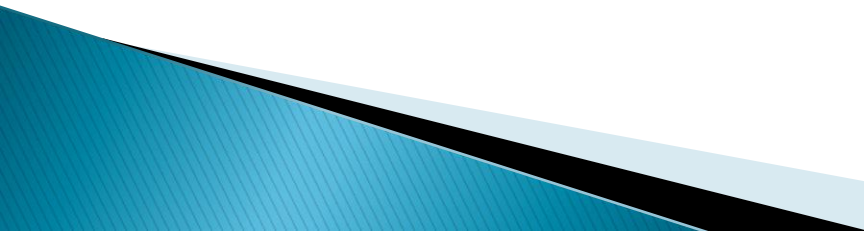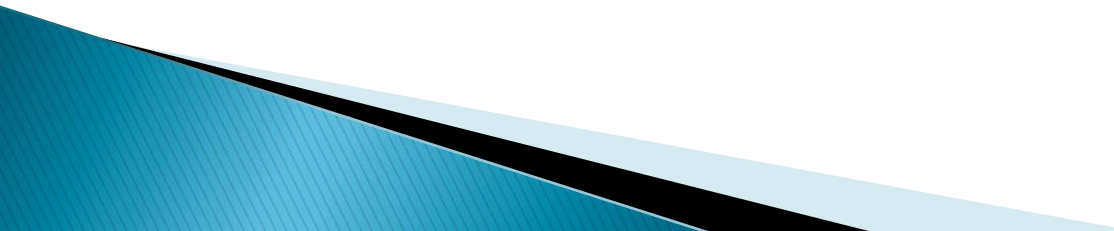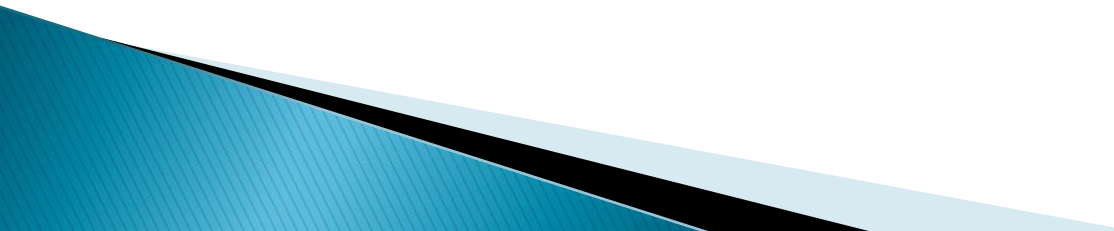
Motivation

▸ Safety and transport efficiency

◦ Congestion costs the U.S. economy over $100 billion per year.

◦ Vehicle occupancy has dropped 7% in the last two decades.

◦ In Europe around 40,000 people die and more than 1.5 millions are injured every year on the roads

◦ Traffic jams generate a tremendous waste of time and of fuel

Ad-Hoc Network

▶ A network with minimal or no infrastructure

▶ It is a temporary network composed of mobile terminals fitted with a relay function.

▶ Self-organizing

▶ Mobile nodes act as network router

mobile nodes provides not only function for information transmission and reception but also function for information relay.

Vehicular Ad-Hoc Networks

- It is special form of MANET and it provides
  - Vehicle–to–vehicle communications
  - Vehicle–to–infrastructure communications
- Uses equipped vehicles as the network nodes
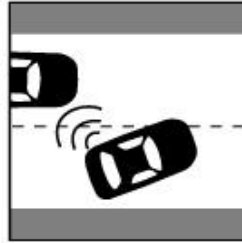- Nodes move at will relative to each other but within the constraints of the road infrastructure

Vehicular Ad-Hoc Networks (Example)

Roadside base station

Emergency event

Inter-vehicle communications

Vehicle-to-roadside communications
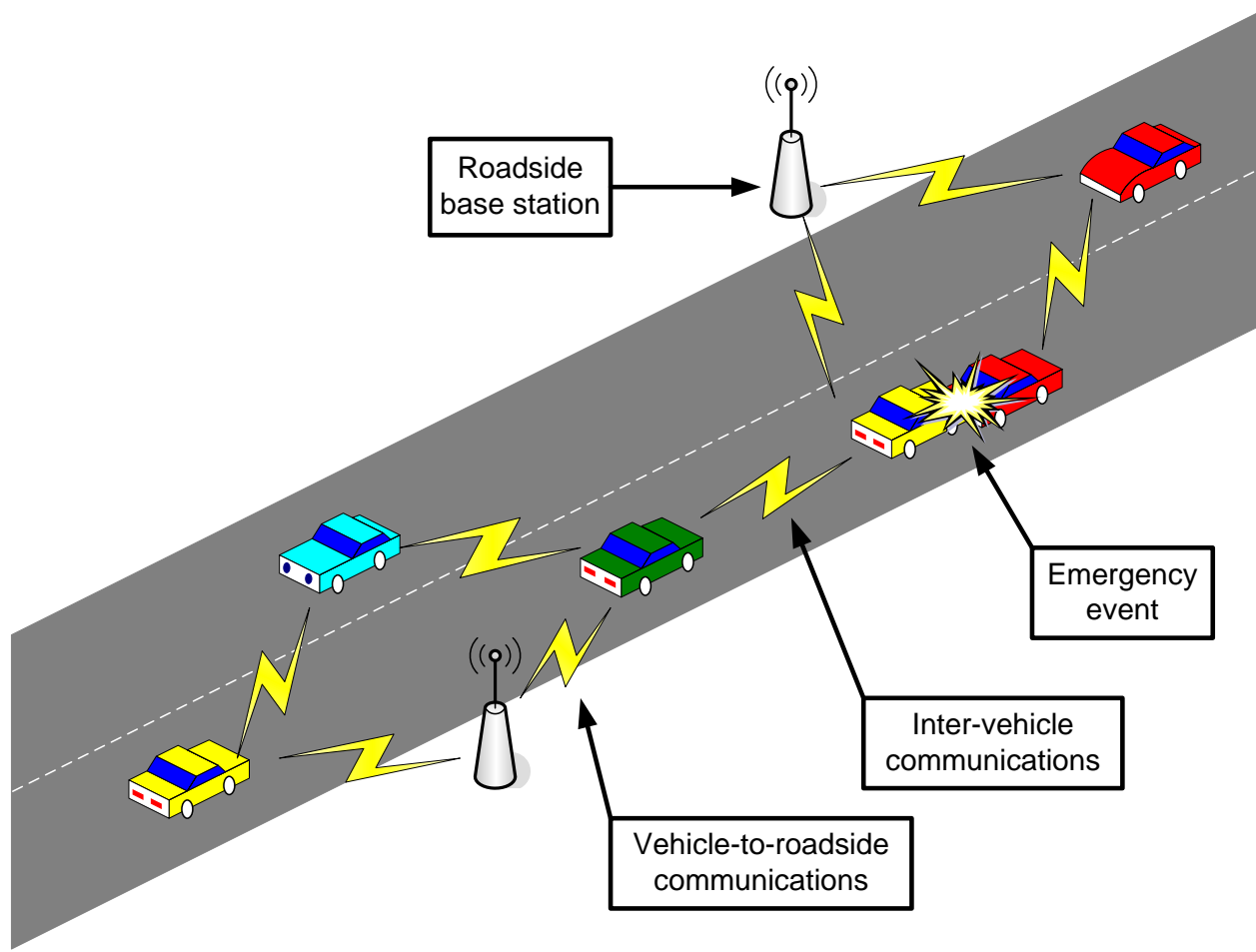
VANET Applications
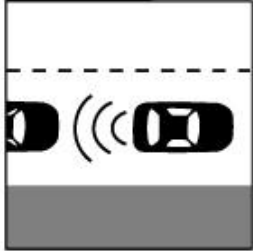
Co-operative Collision Warning

Lane Change Warning

Intersection Collision Warning
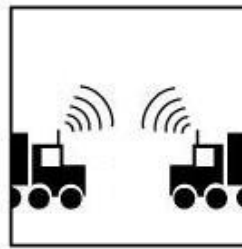
Approaching Emergency vehicle

Rollover Warning

Work Zone Warning

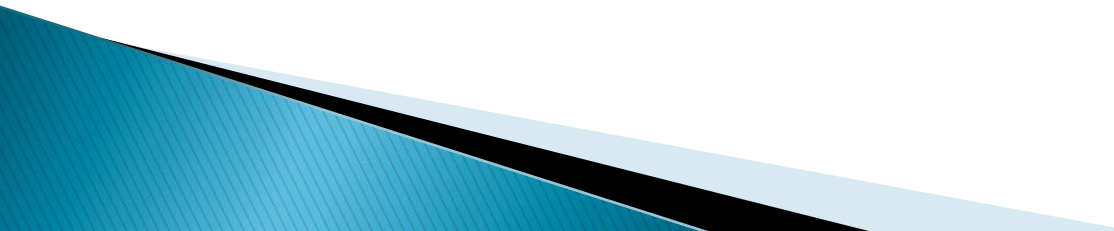**Coupling/Decoupling**

**Inter-Vehicle Communications**

Electronic Toll Collection

VANET Characteristics

‣ The main characteristics of VANETs

- High mobility of nodes

- Rapidly changing network topology (predictable to some extent)

- Unbounded network size

- Potential support from infrastructure

- Real time , time-sensitive data exchange

- Crucial effect of security and privacy

# CAR-2-CAR communication consortium reference architecture (C2C CC)

- The in-vehicle domain is composed of an on-board unit (OBU) and one or multiple application units (AUs).
- The connections between them are usually wired and sometimes wireless.
- However, the ad hoc domain is composed of vehicles equipped with OBUs and roadside units (RSUs).
- An OBU can be seen as a mobile node of an ad hoc network and RSU is a static node likewise.
- An RSU can be connected to the Internet via the gateway; RSUs can communicate with each other directly or via multihop as well.
- There are two types of infrastructure domain access, RSUs and hot spots (HSs). OBUs may communicate with Internet via RSUs or HSs.
- In the absence of RSUs and HSs, OBUs can also communicate with each other by using cellular radio networks (GSM, GPRS, UMTS, WiMAX, and 4G)
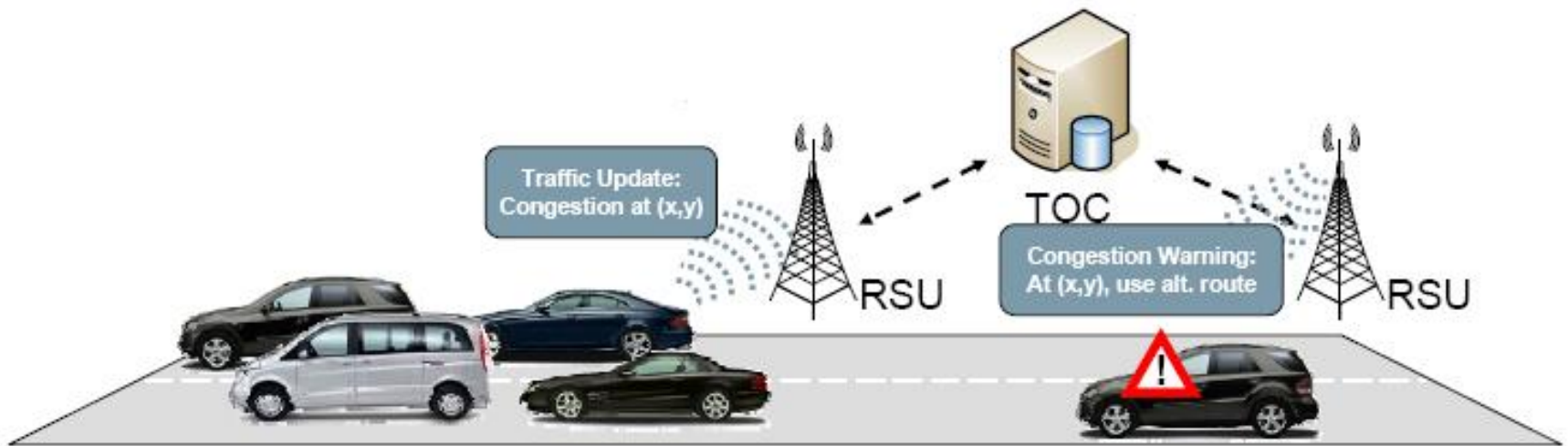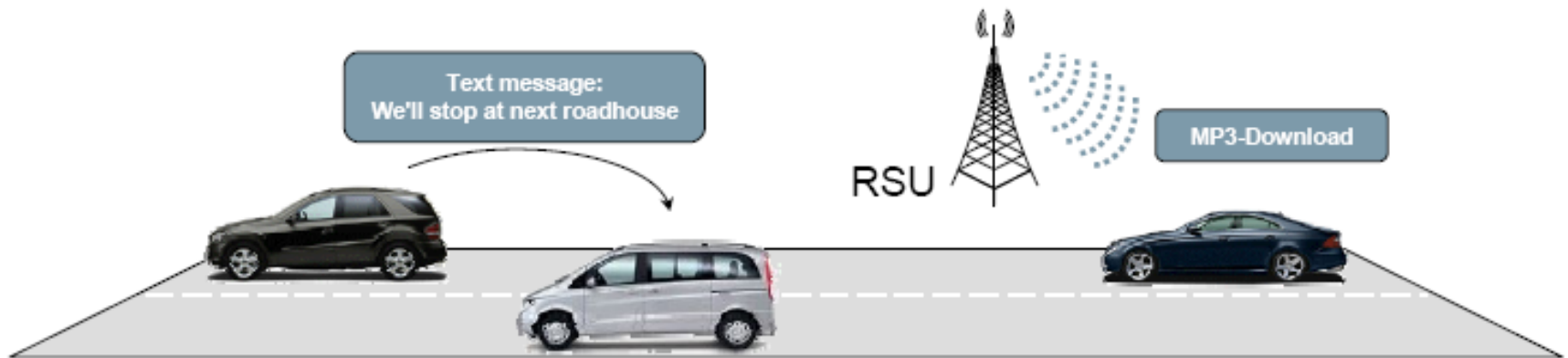
C2C–CC reference architecture
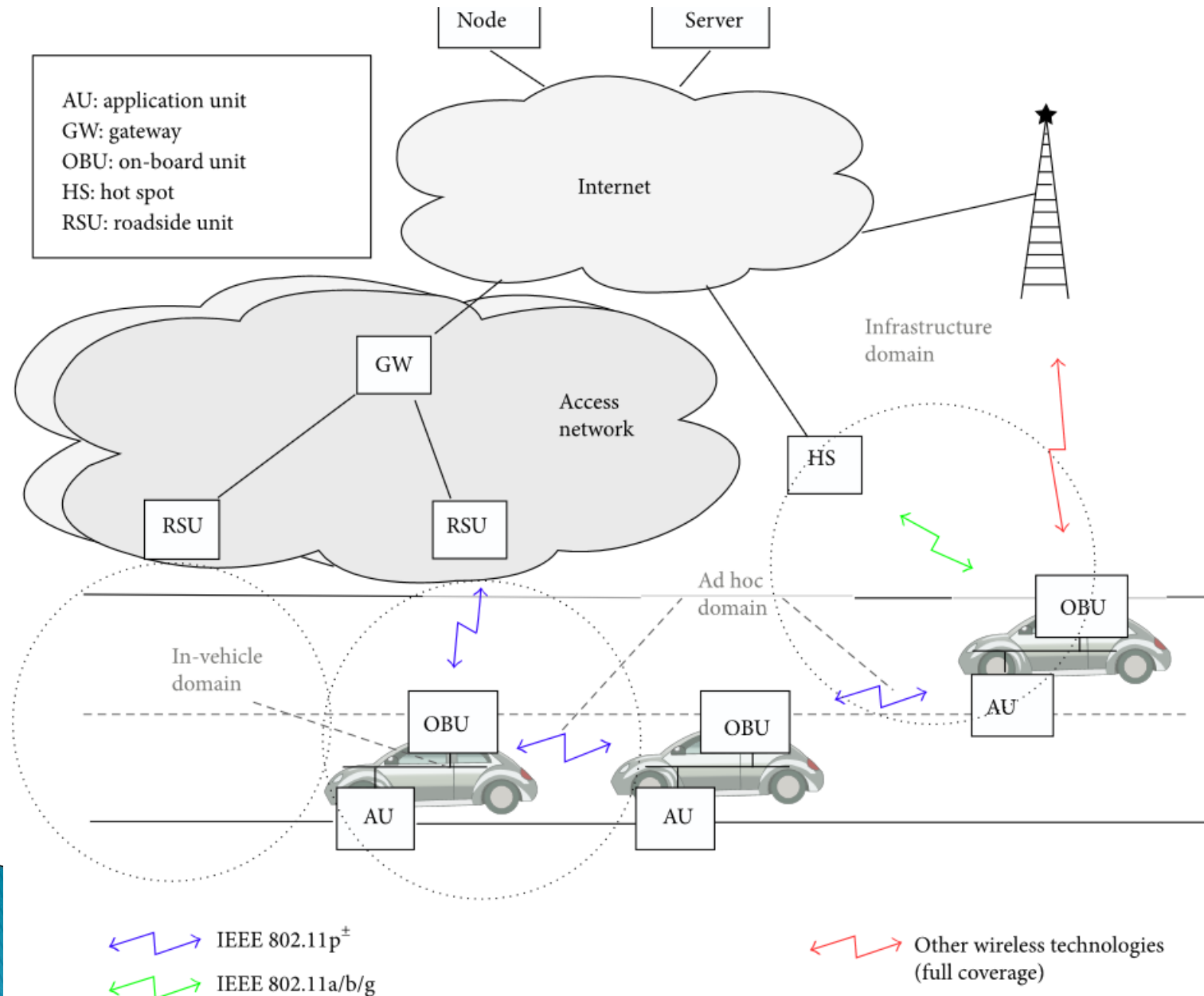
Objectives

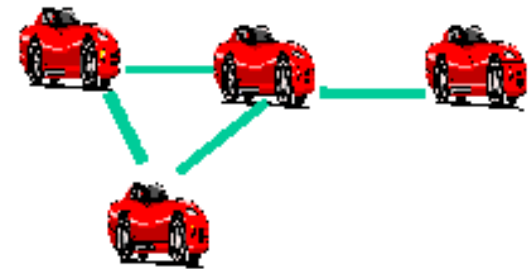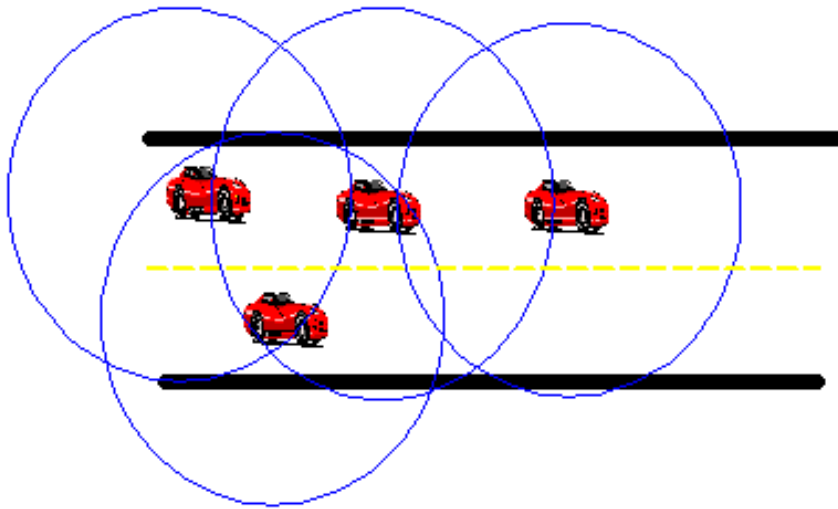▸ VANETs promises safer roads, assures less or no accidents.
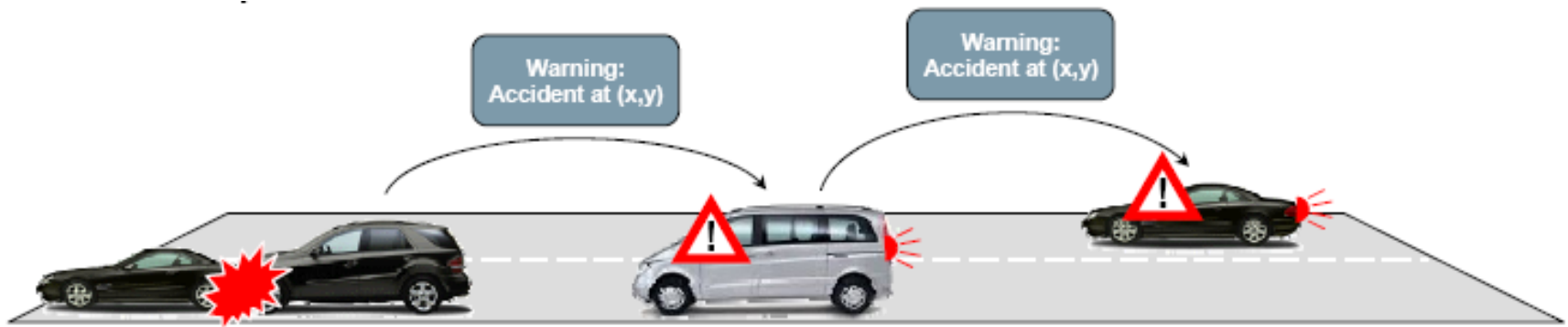
- More efficient driving
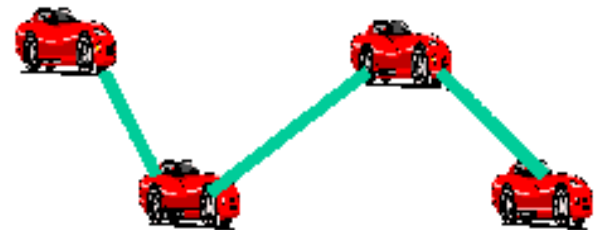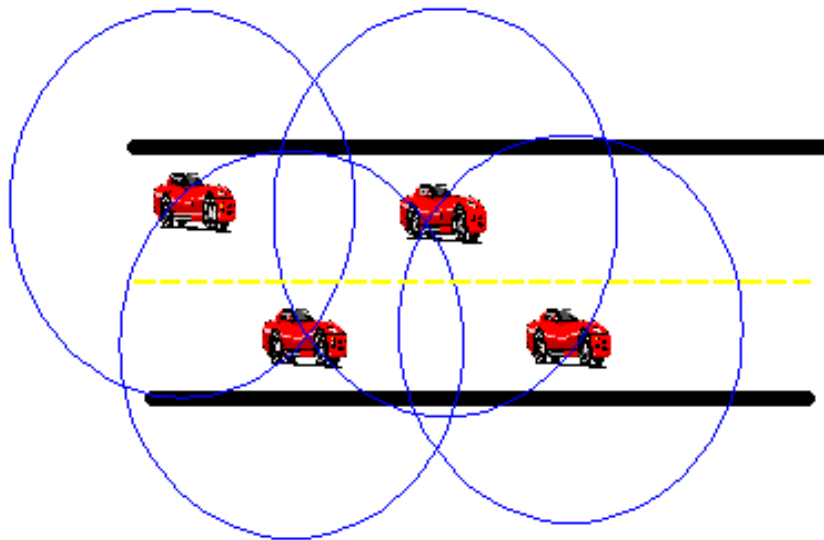- By letting the driver know about the traffic.

More fun and entertainment

‣ Message propagates to destination using a number of intermediate links

▸ If vehicle mobility causes links to break, message rerouted using a different path

Reference

- http://www.hindawi.com/journals/ijdsn/2015/745303/