

IETF 115 in London

IPMON: IPv6 Moving Object Networking - Problem Statement and Use Cases

November 9, 2022

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Motivation of IPMON

- IPMON aims at the provisioning of IPv6 networking for moving objects such as terrestrial, aerial, and marine vehicles.
 - Those vehicles are mentioned as **vehicles** in this talk.
- IPMON fills in the gap of IPv6-related standards to provide those vehicles with the communication among them or with infrastructure nodes for the Internet connectivity.
 - **IPMON Communication Types:** Vehicle-to-Everything (V2X), Vehicle-to-Vehicle (V2V), and Vehicle-to-Infrastructure (V2I)
- IPMON considers wireless multihop communication, high-speed mobility, and optimal packet routing in a temporary network topology.
 - IPMON BoF aims at **developing protocols for moving objects** with **IPWAVE WG's Problem Statement and Use Cases Draft**:
 - [draft-ietf-ipwave-vehicular-networking-30](#)

Moving Objects (MO) in IPMON

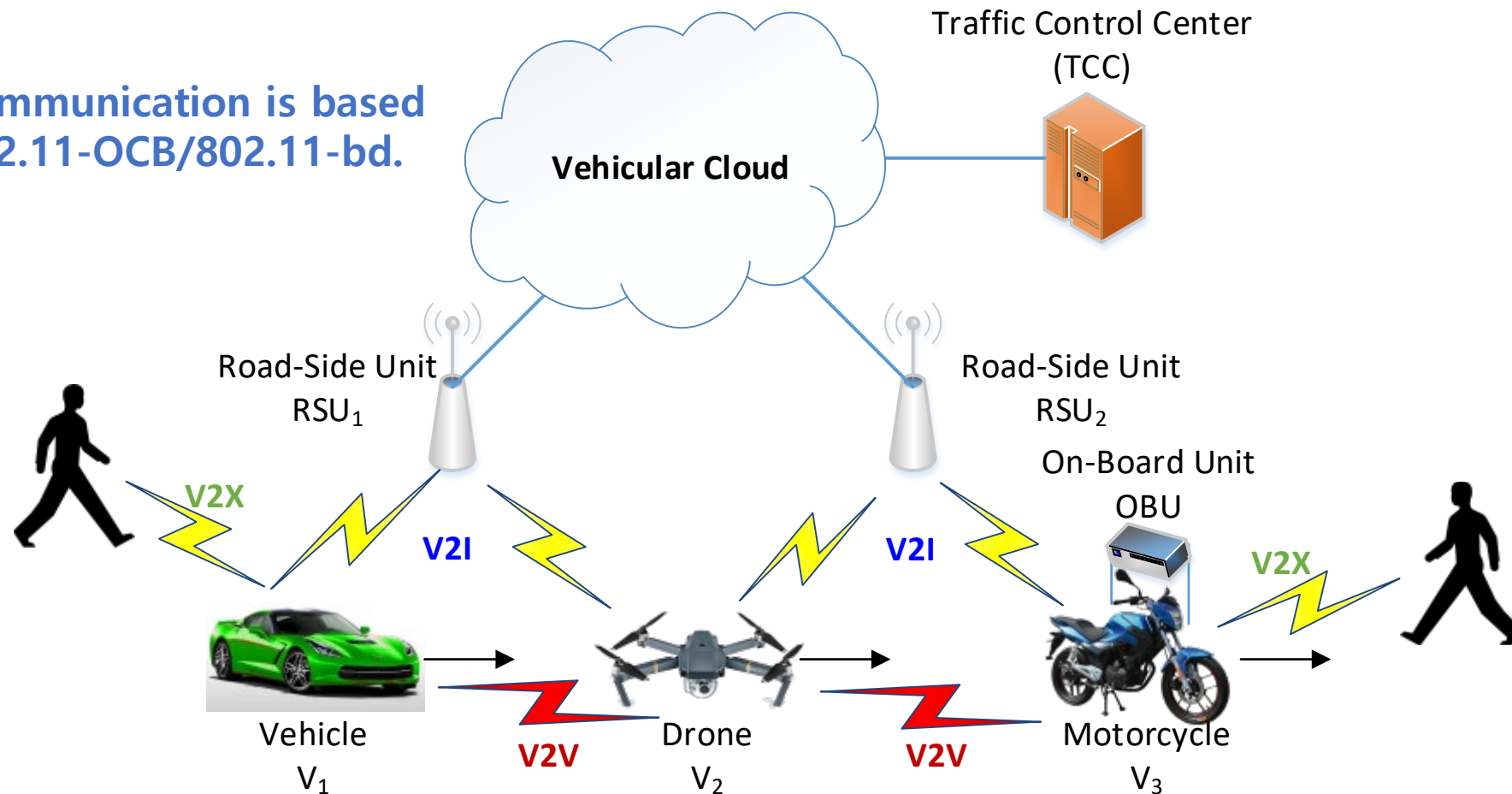
- Vehicle, Motorcycle, Scooter, Pedestrian, Unmanned Aerial Vehicle (UAV), Drone, Urban Air Mobility (UAM), Train, Subway, Boat, Ship, etc.



Vehicular Network Architecture for IPMON (1/2)

- An IPMON Network consists of Vehicular Ad Hoc Networks (VANET) and Access Networks (AN) for Internet connectivity.
- Wireless Communications supports IEEE 802.11-OCB/802.11-bd, and 3GPP 5G V2X.

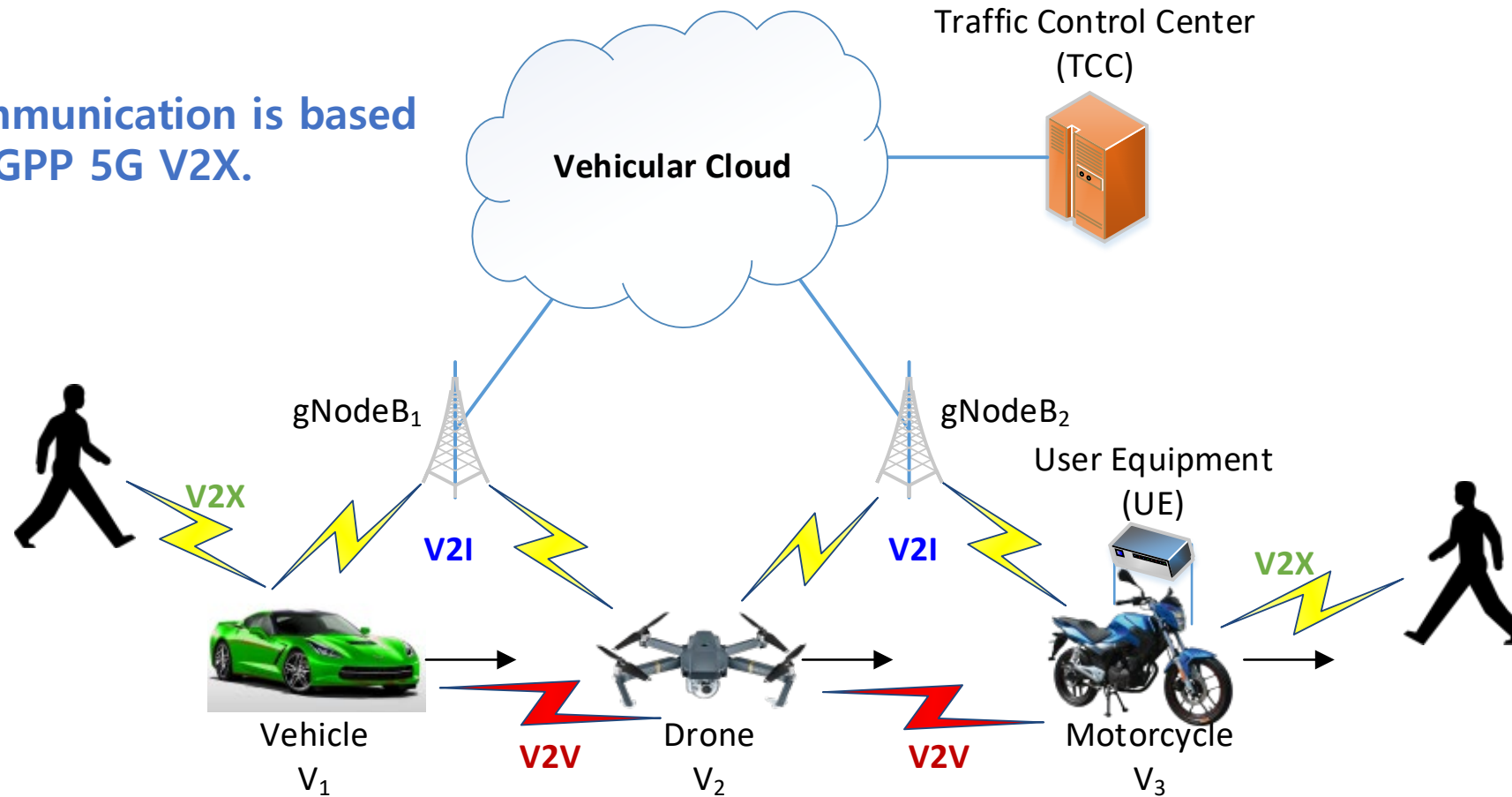
Wireless Communication is based on IEEE 802.11-OCB/802.11-bd.



Vehicular Network Architecture for IPMON (2/2)

- An IPMON Network consists of Vehicular Ad Hoc Networks (VANET) and Access Networks (AN) for Internet connectivity.
- Wireless Communications supports IEEE 802.11-OCB/802.11-bd, and 3GPP 5G V2X.

Wireless Communication is based on 3GPP 5G V2X.



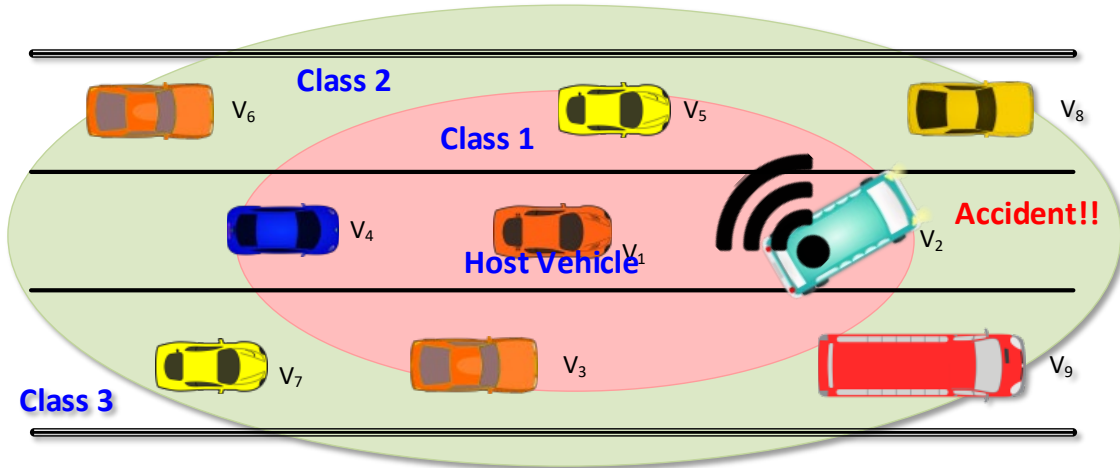
Target Scenarios of IPMON

- IPMON is used in various environments such as Highway, Urban Road Networks, Streets, Parking Lots, and Drone Networks.
- IPMON VANET is intermittently connected to the Internet infrastructure.
- IPMON MOs need to effectively configure their IPv6 addresses for both VANET and AN.
- Packets of MOs need to be routed to destinations efficiently.

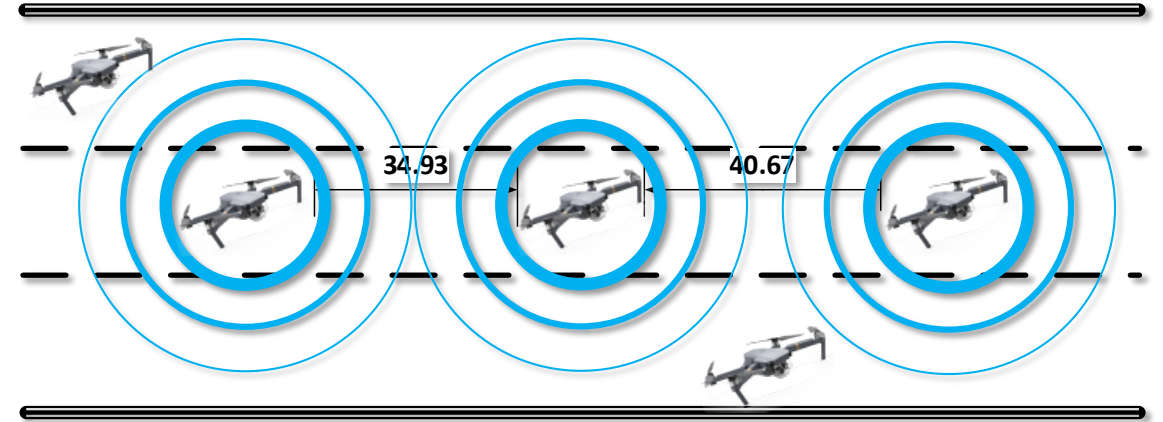
Use Cases of IPMON (1/4)

- V2V
 - Safe Driving in Road Networks
 - Safe Flying in Drone Networks
- V2I
 - Efficient Navigation in Road Networks
 - Efficient Navigation in Drone Networks
- V2X
 - Pedestrian Protection in Road Networks
 - Blind Spot Coverage in Road Networks with Drones

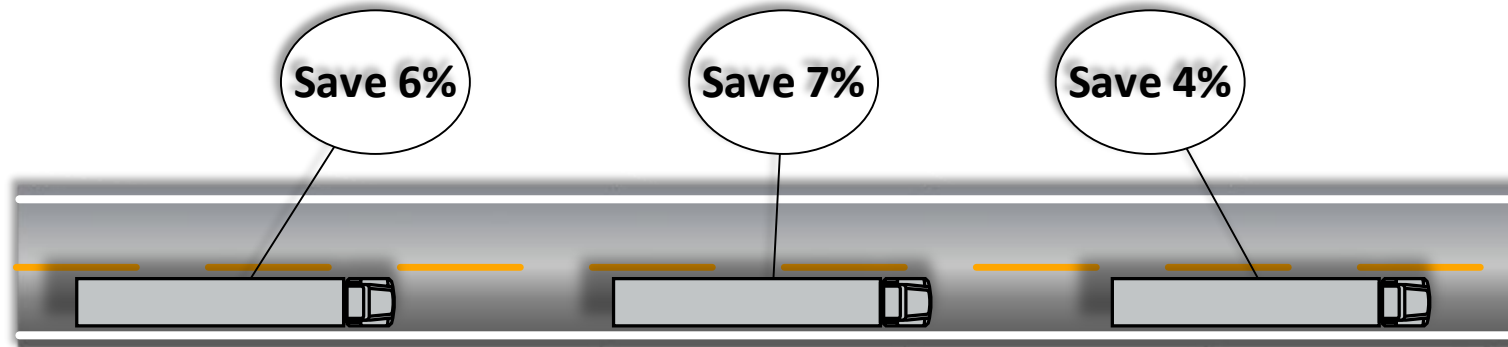
Use Cases of IPMON (2/4): V2V



Safe Driving in Road Networks



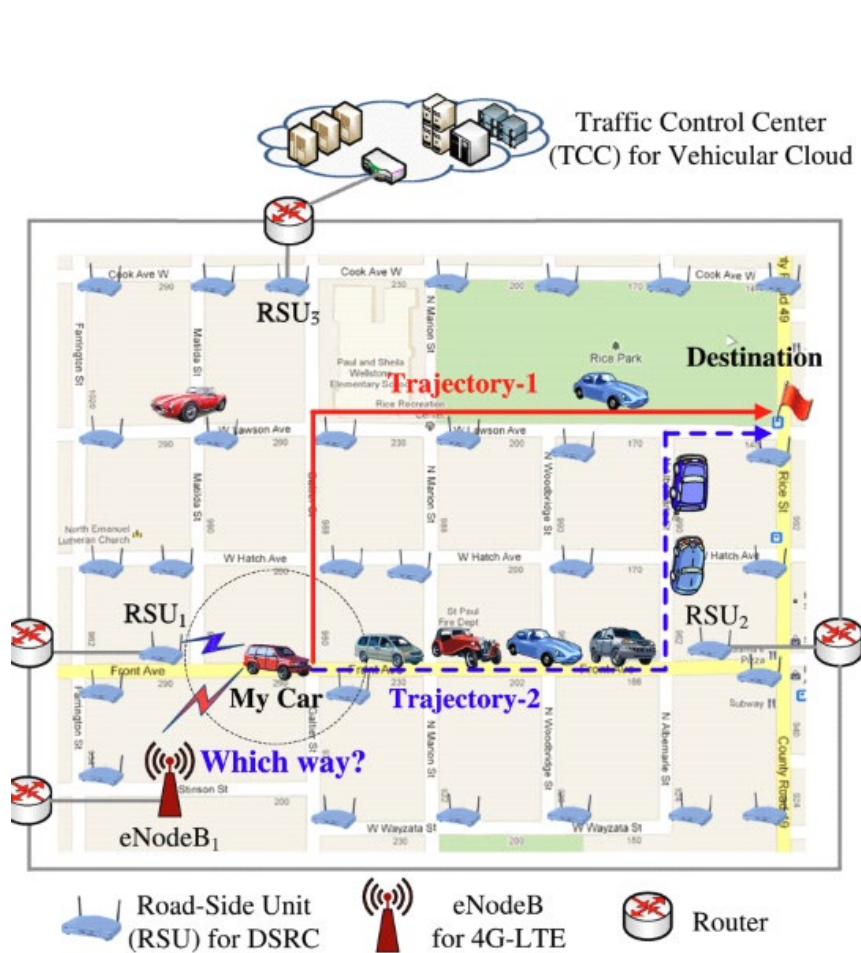
Safe Flying in Drone Networks



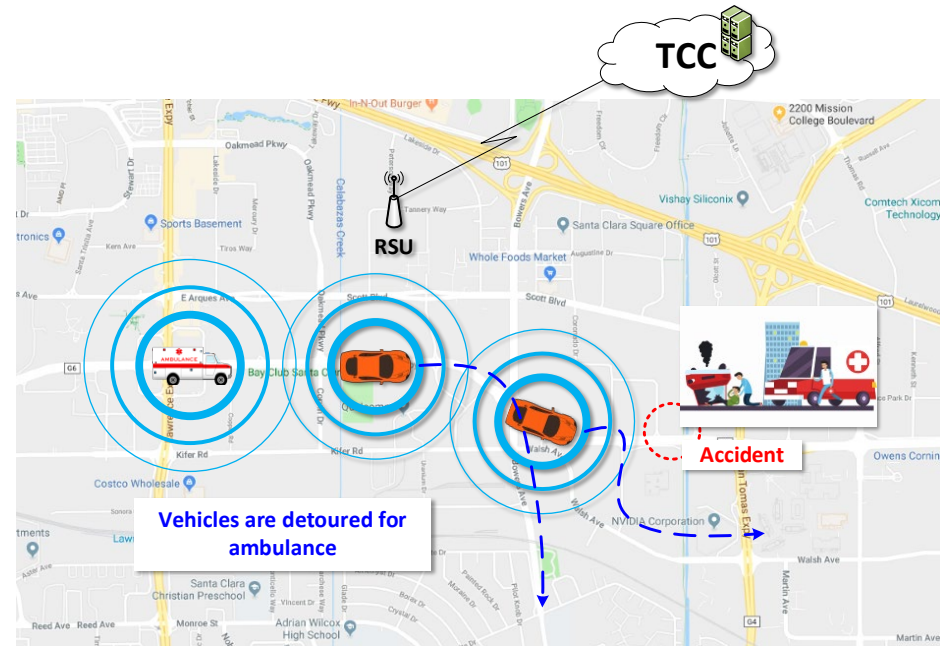
Total energy consumptions are saved by platooning.

Platooning for Efficient Driving

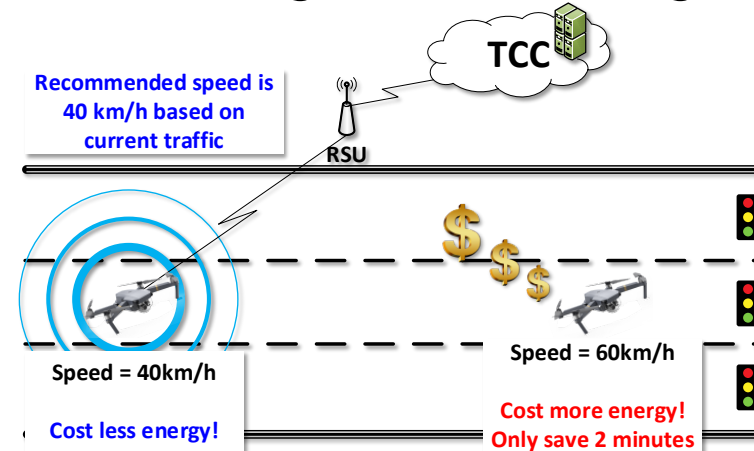
Use Cases of IPMON (3/4): V2I



Efficient Navigation for Road Networks

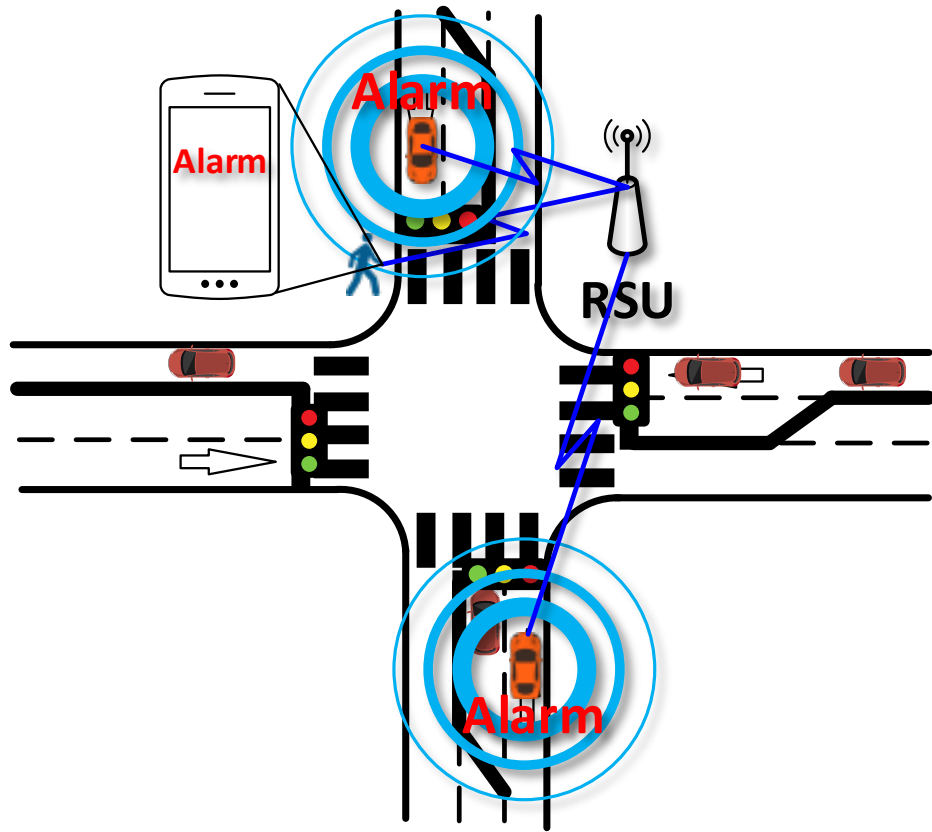


Effective Navigation for Emergency

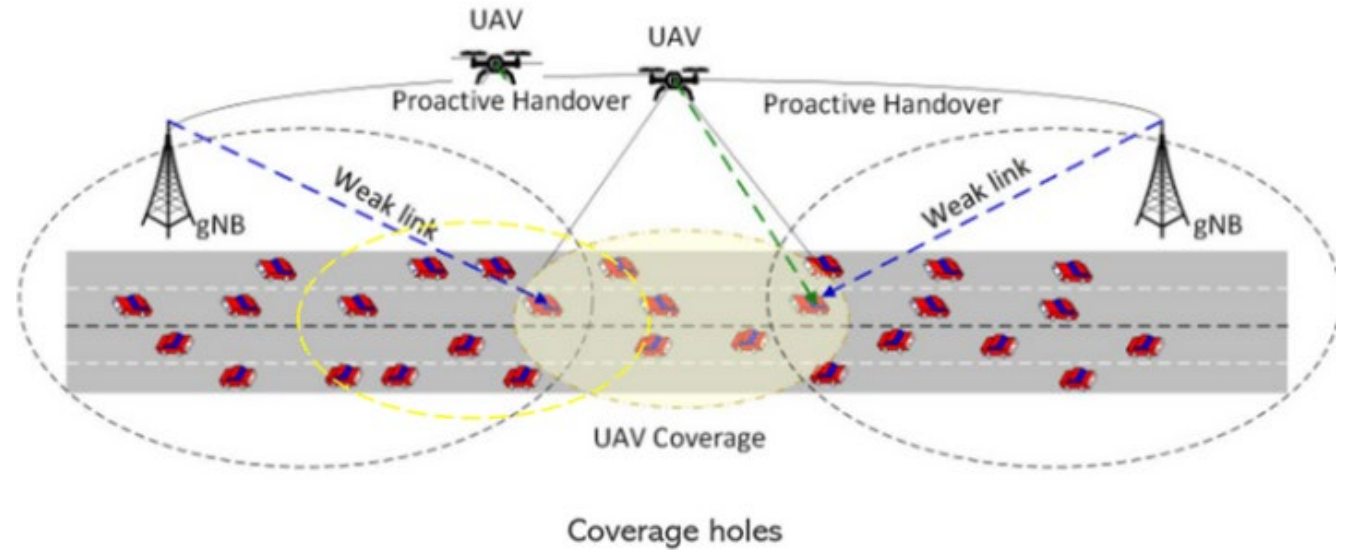


Speed Recommendation for Energy Efficiency

Use Cases of IPMON (4/4): V2X



Pedestrian Protection



Blind Spot Coverage in Road Networks with Drones

Problem Statement in IPMON

- IPv6 Packet Delivery over 3GPP 5G V2X
- Vehicular Neighbor Discovery (VND) for IPv6 Address Autoconfiguration
- Vehicular Mobility Management (VMM)
- Vehicular Packet Routing (VPR)
- Vehicular Security and Privacy (VSP)
- Vehicular Maneuver and Navigation (VMN) in Safe Driving (or Flying)
- Thus, IPMON focuses on these problems (i.e., VND, VMM, VPR, VSP, and VMN), taking advantage of **IPWAVE WG's Problem and Use Cases Draft**:
 - [draft-ietf-ipwave-vehicular-networking-30](#)

Drafts for Problem Statement in IPMON

- IPv6 Packet Delivery over 3GPP 5G V2X
 - [draft-jeong-6man-ipv6-over-5g-v2x-00](#)
- Vehicular Neighbor Discovery (VND) for IPv6 Address Autoconfiguration
 - [draft-jeong-ipwave-vehicular-neighbor-discovery-13](#)
- Vehicular Mobility Management (VMM)
 - [draft-jeong-ipwave-vehicular-mobility-management-07](#)
- Vehicular Packet Routing (VPR)
 - [draft-jeong-ipwave-vehicular-neighbor-discovery-13](#)
- Vehicular Security and Privacy (VSP)
 - [draft-jeong-ipwave-security-privacy-05](#)
- Vehicular Maneuver and Navigation (VMN) in Safe Driving (or Flying)
 - [draft-jeong-ipwave-context-aware-navigator-05](#)
- Thus, IPMON can extend IPWAVE drafts for its problems such as VND, VMM, VPR, VSP, and VMN.

Plan of IPMON BoF

- **IETF 115 (London)**

- The Clarification of Problem Statement for IPMON
- The Collection of Use Cases for IPMON
- The Identification of Gaps of 3GPP 5G V2X Documents for IPMON

- **IETF 116 (Yokohama)**

- BoF Request for an Official BoF Session
- The Clarification of IPMON Charter
- Request for Presentation of IPv6 Packet Delivery over 5G V2X in 6MAN WG
- Request for Forming IPMON WG