

Scheduling for Perceptual Data Sharing in mmWave based V2X Networks

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1. Introduction

mmWave technology can potentially provide terabit data transfer rates among vehicles. In cooperative perception, when vehicles exchange sensor data to improve coverage, extremely high data rates are required. mmWave V2X is a key enabler for such advanced safety applications that require reduced latency and reliable environmental perception.

2. PhD Objectives

- To devise an efficient mmwave scheduling mechanism for cooperative sensing amongst vehicles in order to maximize concurrent transmissions.
- To identify blockages and devise relay selection scheme for reliable message delivery and reduced delay.

3. Scenario and Testbed

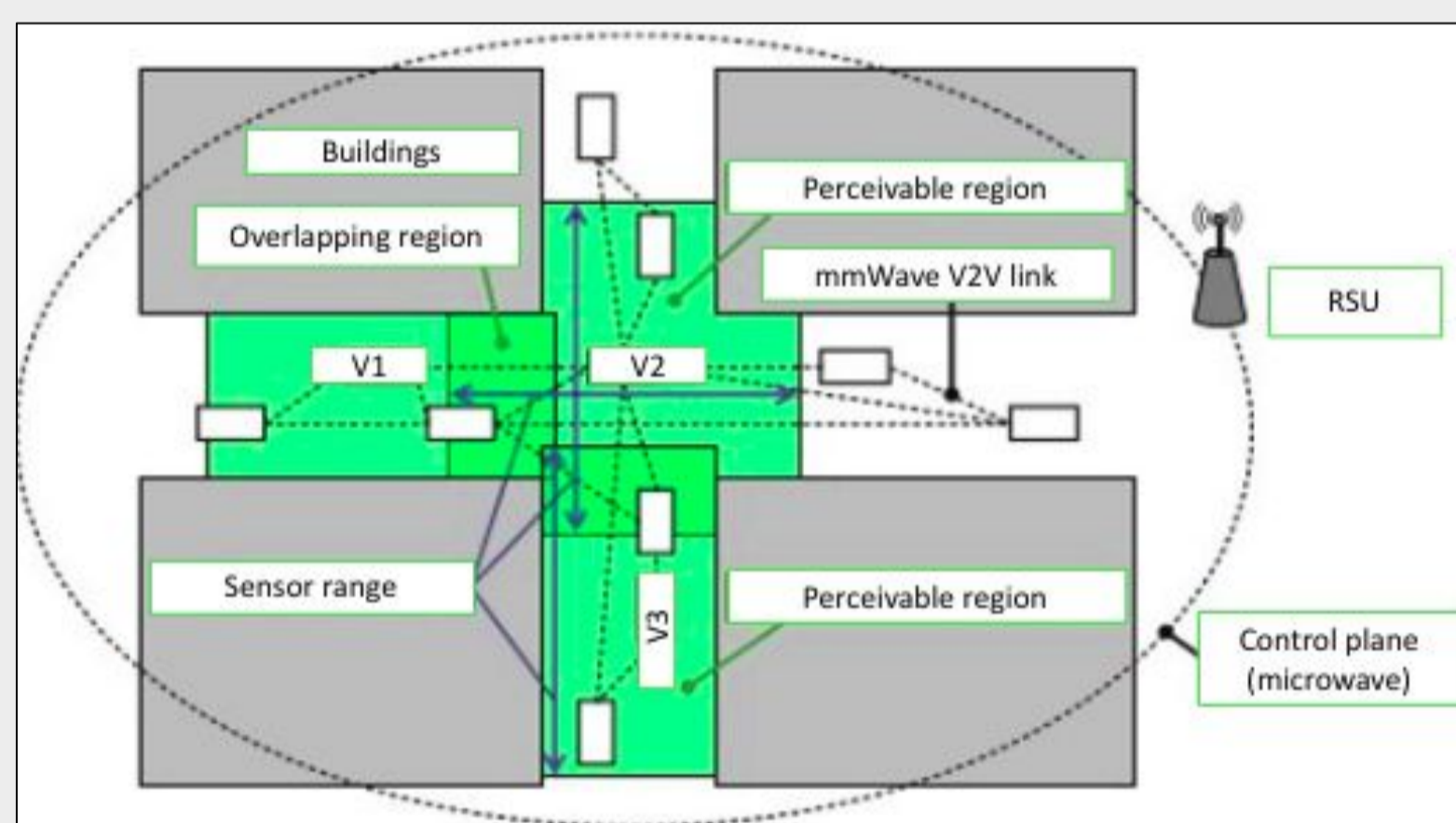


Figure 1. Vehicular Topology [1]

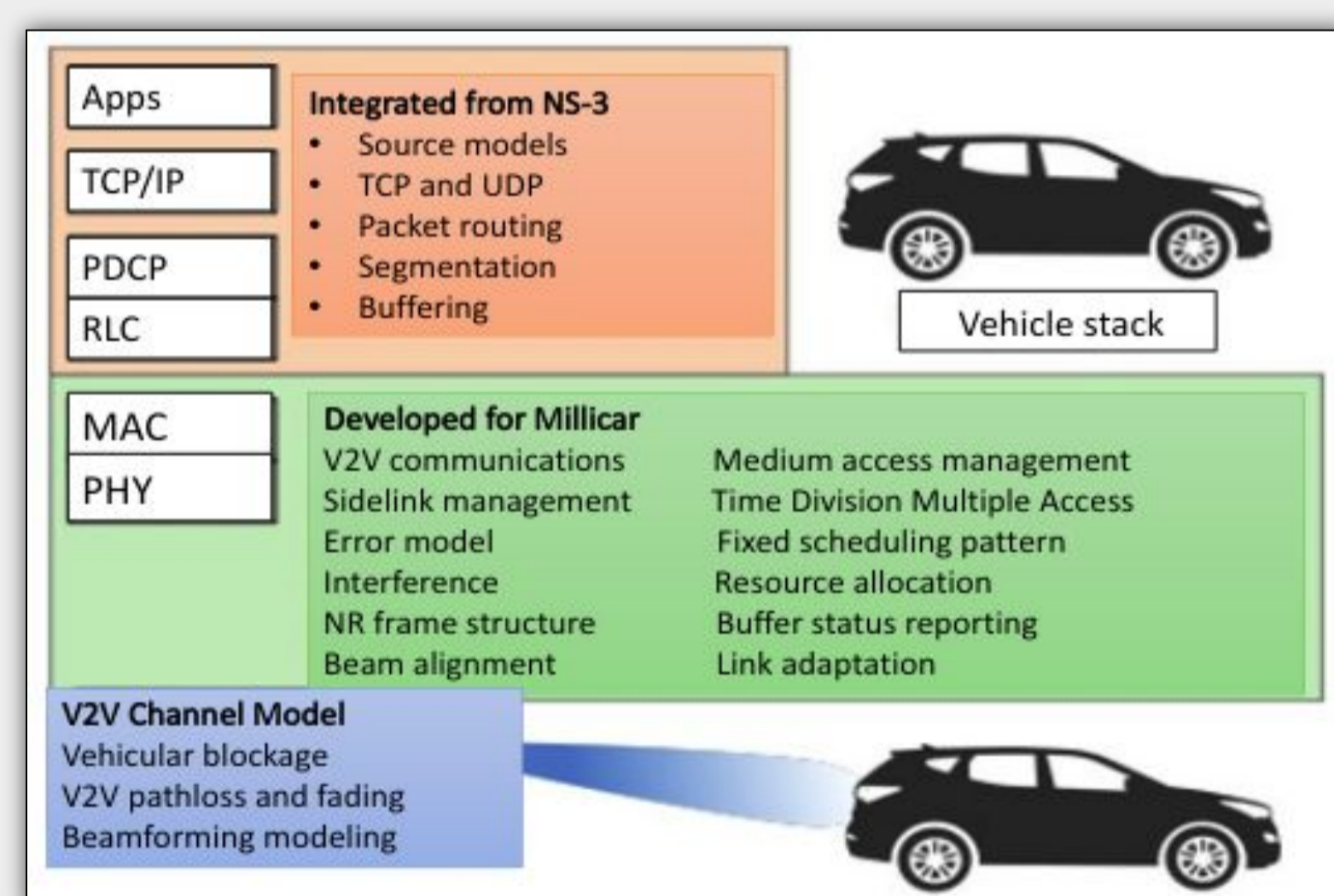


Figure 2. Millicar Module [2]

4. Methodology

- Methodology involves SUMO (Simulation of Urban MObility) and NS3. SUMO allows modelling of intermodal traffic systems including road vehicles, public transport and pedestrians while NS3 is a discrete-event network simulator.
- Scheduling mechanism for cooperative sensing and blockage identification, compliant with 3GPP NR V2X specifications, will be implemented by extending Millicar [2].
- Reinforcement learning will be employed for efficient relay selection to cater for blockages and ensure increased coverage and reduced delay.

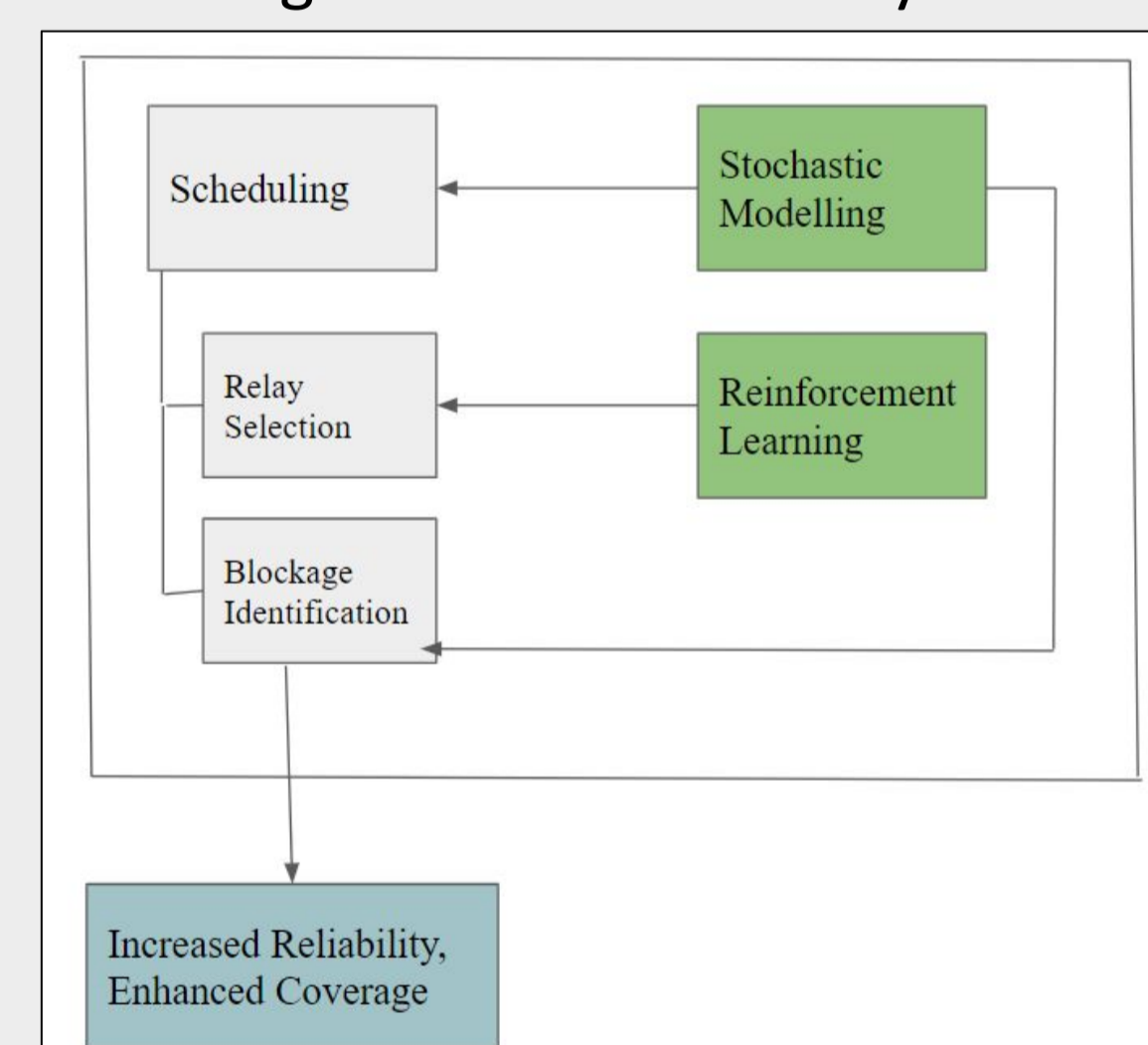


Figure 3. Methodology

5. References

- [1] A. Taya, T. Nishio, M., Morikura, K. Yamamoto, "Concurrent Transmission Scheduling for Perceptual Data Sharing in mmWave Vehicular Networks", IECIE Trans. on Information and Systems, 2019.
- [2] M. Drago, T. Zugno, M. Polese, M. Giordani, M. Zorzi, "Millicar - An ns-3 Module for MmWave NR V2X Networks," Proc. of the Workshop on ns-3 (WNS3), 2020.

6. Applicability with reference to SDGs

- The project finds application towards SDGs like:
 1. Good health and well being (reduced road fatalities).
 2. Sustainable cities & communities.
- Contribution to safer roads via cooperative situational awareness, hazard avoidance and accident prevention.

Host Institution