reproduce typical behaviors of vehicular traffic, fed with real 12-hour vehicular traces (see Fig. 8(a)). These traffic traces, kindly provided by the Madrid city council, were collected at a fixed measurement point placed along the M-30 orbital motorway in Madrid.

Our data set includes also the length of the vehicles (see Fig. 8(b)). This information is used to infer the type of the vehicle: short (e.g., less than 6 m) and large in other case (accounting for less than the 3% of the total). Our simulations take into account the type of vehicle, with large vehicles representing obstacles that block the wireless signal.

Our evaluation framework is based on Java simulator that merges the output coming from SUMO with the calculated RSSI values. RSSI values are calculated from [23] depending on the distance between vehicles\(^6\). The value of the inter-vehicle distance fixes the average and the standard deviation of a Gaussian distribution from which the actual value of the RSSI is calculated. The same work [23] shows that the minimum RSSI value that provides a packet delivery ratio greater than 90% is 12, for a wireless card with an Atheros-based chip-set.

The wireless channel quality between two nodes is considered to be bad if the RSSI remains for more than 0.3 s below the reference value of 12. Additionally, if a large vehicle (i.e., longer than 6 m) appears between a vehicle and its next-hop vehicle, the channel quality is considered to be under the threshold as well. Note that this last rule is not applied for the direct connectivity between a vehicle and the RSU, as we claim that RSUs will be installed in elevated positions where the influence of large vehicles would be negligible.

\(^6\) The authors of [23] kindly provided us the full experiment traces, that we used to estimate the RSSI values for a given inter-vehicle distance in both LOS and non LOS conditions.

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Fig. 9 Control Overhead