Abstract — Recent advancements in communications and networking stimulated a rapid development of vehicular networks technology. The United States Department of Transportation defines Vehicle to Infrastructure (V2I) communications as a “next generation of Intelligent Transportation Systems”. Such services as a Wrong Way Driver warning, Lane Change warning, Weather reports and others now can be provided to moving vehicles in a real-time fashion. The majority of the services in V2I systems are delay sensitive and require a very short response time. Moreover, after a certain period of time, the execution of a delay sensitive task has no value. Unfortunately, conventional cloud architecture does not eliminate the latency problem in this case. Communication with distant servers only contributes to the overall delay time. Thus, edge computing concept is proposed to address this problem. Moving some computational power to the edge can eliminate the delay produced by the communication with the cloud. Nevertheless, it is not the only source of a delay within a vehicular network. In V2I communications edge devices are represented in form of Roadside Units that can have different computational power and communication medium. Such heterogeneity notably contributes to the overall delay. Another complication can occur during “rush hours”. A rapid increase in service requests due to pick times or emergency situations can greatly affect the response time. All these factors significantly decrease Quality of Service (QoS) in V2I systems. In our research, we propose a robust recourse allocation model that is able to minimize the end-to-end delay without compromising the QoS. To indicate of the busyness of the system. The model includes a Load Balancer component that performs allocation of the arriving tasks between neighboring Roadside Units prior the internal allocation to the VMs. To decrease the number of tasks missing the deadline and, therefore, increase the QoS we propose a probabilistic allocation model based on historical data of the tasks completion times stored at the edge and updated through the cloud. Task allocation directly depends on the calculated probability of the task to meet its deadline in all of the neighboring Roadside Units. Additionally, different scheduling policies within the Roadside Unit have been considered to increase robustness. Simulation results demonstrate that proposed allocation model provides 40 % decrease in task deadline missing rate compare to conventional Roadside Unit architecture.

Index Terms—Road Side Unit, Vehicular Network, End-to-End delay, V2I, V2X.