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Vehicular Fog Computing: A Viewpoint of Vehicles as the Infrastructures

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摘要

With the emergence of ever-growing advanced vehicular applications, the challenges to meet the demands from both communication and computation are increasingly prominent. Without powerful communication and computational support, various vehicular applications and services will still stay in the concept phase and cannot be put into practice in the daily life. Thus, solving this problem is of great importance. The existing solutions, such as cellular networks, roadside units (RSUs), and mobile cloud computing, are far from perfect because they highly depend on and bear the cost of additional infrastructure deployment. Given tremendous number of vehicles in urban areas, putting these underutilized vehicular resources into use offers great opportunity and value. Therefore, we conceive the idea of utilizing vehicles as the infrastructures for communication and computation, named vehicular fog computing (VFC), which is an architecture that utilizes a collaborative multitude of end-user clients or near-user edge devices to carry out communication and computation, based on better utilization of individual communication and computational resources of each vehicle. By aggregating abundant resources of individual vehicles, the quality of services and applications can be enhanced greatly. In particular, by discussing four types of scenarios of moving and parked vehicles as the communication and computational infrastructures, we carry on a quantitative analysis of the capacities of VFC. We unveil an interesting relationship among the communication capability, connectivity, and mobility of vehicles, and we also find out the characteristics about the pattern of parking behavior, which benefits from the understanding of utilizing the vehicular resources. Finally, we discuss the challenges and open problems in implementing the proposed VFC system as the infrastructures. Our study provides insights for this novel promising paradigm, as well as research topics about vehicular information infrastructures.

关键词

作者关键词: Cloud computing; infrastructures; vehicular fog computing (VFC); vehicular network
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