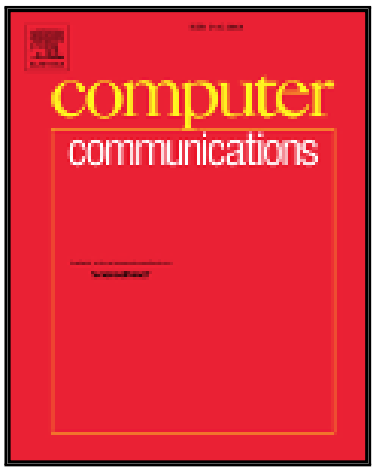

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Vehicular Cloud Computing through Dynamic Computation Offloading

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Abstract

The growing demand in the number of sensor–dependent applications and infotainment services in vehicles is pushing the limits of their on–board computing resources. Today, vehicles are increasingly being connected to the Internet and becoming a part of the *Smart* Internet–of–Things (IoT) paradigm. Leveraging such connectivity, the idea of vehicular cloud–computing, where computation for vehicular applications and services are *offloaded* to the cloud, becomes an attractive proposition. However, the large sensory data inputs, strict latency requirements, and dynamic wireless networking conditions make offloading of vehicular applications to the cloud very challenging. To address this challenge, we design a dynamic approach for offloading specific vehicular application components or *modules*. We develop heuristic mechanisms for placement and scheduling of these modules in the on–board unit versus the cloud. The highlight of the proposed design is the ability to offload computation to the cloud in an elastic manner through dynamic decisions during variable network conditions. Through an experimental evaluation using our prototype system we show the effectiveness of the design in reducing the response time for compute intensive applications across variable network conditions in two urban environments.

Keywords: vehicular, cloud computing, offloading, experiments, placement, scheduling, real–time, dynamic resource allocation, interactive application

1. Introduction

Computing requirements for vehicular applications are increasing tremendously, particularly with the growing interest in embedding new class of interactive applications and services using on–board sensory inputs. For example, autonomous