Abstract

Collaborative Traffic Monitoring (CTM) systems exploit the location information continuously collected from vehicles. Users collaborate by providing their location information to have a global picture of the current traffic in real-time. However, location information is very sensitive information that made privacy a major obstacle for the widespread usage of CTM systems. Some of these systems depend on periodic location updates, where a vehicle updates location periodically [1]; other systems trigger update at particular regions [2], or with random time periods [3]. For privacy issues, these systems rely on a trusted third party for enforcing a predetermined privacy level. They may also generate low quality data because of the low precision in both time and space [4]. In this paper, we present a privacy aware collaborative traffic monitoring system, PA-CTM, where moving objects send their location updates to a traffic server, the latter then processes current data and provides its users with current traffic status. Users authenticate themselves to traffic server using pseudonyms that are changed according to user's privacy preferences. PA-CTM deploys two mechanisms for enhancing privacy, the first mechanism is the use of pseudonyms (to authenticate to the traffic server) to hide real identities, and changing these pseudonyms to hide trajectory information from the traffic server. Users can control their privacy by frequently changing their pseudonyms and hence become anonymous to traffic server. The second privacy enhancement technique in PA-CTM is the use of a novel autonomous location update mechanism, ALUM. In ALUM, location update is performed according to moving objects' behavior (change in speed or direction) without the need to a trusted third party. Unlike state-of-the art techniques, ALUM does not require a trusted third-party for triggering vehicles to update their locations. We utilized the existence of location prediction errors to calculate the region where a particular vehicle is expected to be in and hence to calculate anonymity level at that region. We compared ALUM against periodic and random silent period update mechanisms and it showed better privacy results in terms of *k*-anonymity metric.