With the advances in wireless communication technology and advanced positioning systems, a variety of Location-Based Services (LBS) become available to the public. Mobile users can send location-based queries to probe their surrounding environments. One important type of query in LBS is moving monitoring queries over mobile objects. Due to the high frequency in location updates and the expensive cost of continuous query processing, server computation capacity and wireless communication bandwidth are the two limiting factors for large-scale deployment of moving object database systems. To address both of the scalability factors, distributed computing has been considered. These schemes enable moving objects to participate as a peer in query processing to substantially reduce the demand on server computation, and wireless communications associated with location updates.

In the first part of this dissertation, we propose a distributed framework to process moving monitoring queries over moving objects in a spatial network environment. In the second part of this dissertation, in order to reduce the communication cost, we leverage both on-demand data access and periodic broadcast to design a new hybrid distributed solution for moving monitoring queries in an open space environment.

Location-based services make our daily life more convenient. However, to receive the services, one has to reveal his/her location and query information when issuing location-based queries. This could lead to privacy breach if these personal information are possessed by some untrusted parties. Most existing techniques address the problem by cloaking user locations to meet the k-anonymity requirement, which however does not protect the content of the query.

In the third part of this dissertation, we propose a new privacy protection measure called query l-diversity, and design two cloaking algorithms to achieve both location k-anonymity and query l-diversity to better protect user privacy.