

## Abstract

This Thesis targets to address different management issues such as pricing, caching, and virtual sensor (VS) formation in the sensor-cloud platform. We focus on the presence of the dumb behavior of a sensor node in sensor-cloud (SC). Dumb behavior is dynamic in nature, and the mere elimination of a dumb node from SC infrastructure is not always a feasible solution. When a it is assigned to a virtual sensor, the existing schemes in SC charge the same price as the normal nodes. Thus, in such a situation, a user pays the normal price for a dumb node to the Sensor-Cloud Service Provider (SCSP). Consequently, the sensor owner of the dumb node earns the same profit as the owner of a normal node. Therefore, we formulate a scheme for dynamic pricing in an SC environment, in the presence of dumb nodes. On the other hand, the existing works on SC consider the presence of static communication range of the sensor nodes. However, it is possible to modify the communication range of a node, based on the adjustment of its power levels. Moreover, the rent of a sensor node depends on the adjustment of its communication range. Therefore, we propose a scheme, which orchestrates a trade-off analysis between the communication range and price in an SC platform with range-reconfigurable nodes.

Additionally, VS formation is a crucial issue in SC. Practically, different sensor owners may have the same interest in terms of the sensor deployment region, and consequently, the deployment region of different sensor owners overlap with one another. In this Thesis, we propose a VS formation scheme, while providing equal privileges to all sensor owners to participate in the sensor-cloud platform. Similar to VS formation, the existing literature considers that data caching is an important aspect of SC platform and proposed a scheme for the same. However, in the existing literature, there does not exist any suitable caching mechanism, which is capable of storing data of a destroyed virtual machine (VM) that can be reused later. Considering the re-utilization of sensor data, we propose a scheme, which enables the storage of the data of a VM for a certain time duration, even if it is destroyed.

Furthermore, the existing literature on SC assumes that sensor nodes are stationary in nature, which limits the use of the associated theoretical models in mobile platforms. In this Thesis, we attempt to address this research lacuna by proposing a new architecture, termed as Mobile Sensor-Cloud (MSC), for enabling mobile sensors-as-a-service

(mSc-aaS), and analyze its performance. In the MSC architecture, we introduce a new actor – device owners – who lease their mobile devices to place different sensor nodes on these devices and provision mSe-aaS. The device and sensor owners earn certain revenues, based on the usage of the mobile devices and the sensor nodes, for provisioning mSe-aaS to the end-users. MSC is a contemporary architecture and no existing pricing schemes on sensor-cloud are applicable in it. Therefore, we design an optimal pricing strategy for MSC, while considering the presence of the device owners, sensor owners, SCSP, and end-users.

**Keywords:** Sensors-as-a-Service (Se-aaS), Sensor-Cloud, Misbehavior, Dumb Behavior, Pricing, Virtual Sensor, Data Caching, Mobile Sensor-Cloud.