Abstract

Algorithms for Task Sharing in the Internet of Things

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The Internet of Things, (IoT), can be viewed as a network of IoT devices embedded in physical objects that we use every day. An IoT device is any device that has any sensing, actuating and/or computational capabilities. A promising feature of IoT devices is their ability to cooperate with one another by exchanging resources to improve their performance.

In this dissertation, we will design and analyse policies that enable IoT devices to exchange resources. Developing resource exchange policies in IoT networks is a challenging and very important problem. To tackle this problem, we will leverage the celebrated Max-Weight algorithm which was initially devised (in 1993) for optimizing packet routing in multi-hop data networks and since then has been applied to a number of problems in a variety of areas including communication networks, computing systems, transportation networks, economics, and so on.

We will adapt this algorithm to the IoT resource sharing context for deciding how each producer allocates their resources to different consumers. Furthermore, we will consider the increasingly relevant scenario where there are a number of different resource types that nodes exchange and producers can schedule the production of their resources to generate different types of resources to best serve the neediest consumers. We will study what the necessary conditions for these devices to successfully collaborative and achieve a sustainable network are.

The Max-Weight policy when deployed in different network topologies will be evaluated and based on results new task sharing algorithms will be designed. Different production policies will also be analysed and their advantages and disadvantages will be presented.