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Resource Allocation With Multiagent Trading Over the Edge Services

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ABSTRACT

A number of studies have recently emerged to address the issue of resource allocation in edge computing environments. However, there are few works considering how to optimize resource allocation while satisfying market's requirements in multiagent technique for distributed allocation of Edge resources in distributed control. This study use trading-based multiagent resource allocation model as an allocation mechanism to optimal allocate resources through genetic algorithm in an Edge computing environment. The proposed model supports the optimal process between Edge computing cases to apply and allows Edge buyers and Edge providers both to derive their own pricing strategies and to analyze the respective impact to their welfare. The k-pricing schemes are adjustly to meet the Edge users/providers requirement and constraints set by composed services.

KEYWORDS

Edge Computing, Multiagent, Resource Allocation

1. INTRODUCTION

Traditional cloud-based infrastructures are not enough for the current demands of Internet of Things (IoT) applications. Fog computing, also called ”clouds at the edge”, is an emerging paradigm allocating services near the devices to improve the machine-to-machine (M2M) service (Aazam and Huh, 2014). In contrast to the cloud, fog platforms (see Figure 1) have been described as dense computational architectures at the communication chain's edge. Characteristics of such platforms reportedly include low latency, spectrum awareness and use of Fog access.

Fog computing has been proposed to complement the cloud to meet the mass traffic demand and accommodate diverse requirements of various services and systems in grid networks. One of the interesting researches that these systems face is the efficient allocation of Fog resources. In Fog environments, resources e.g. pricing, service placement, and services allocation, can be composed as services, which are offered to other Fog users. Fog service providers have to allocation their resource usage adaptively and be aware of dynamic environment changes of the incoming requests for their services. Therefore, various Fog services allocation methods are an exciting area of research which

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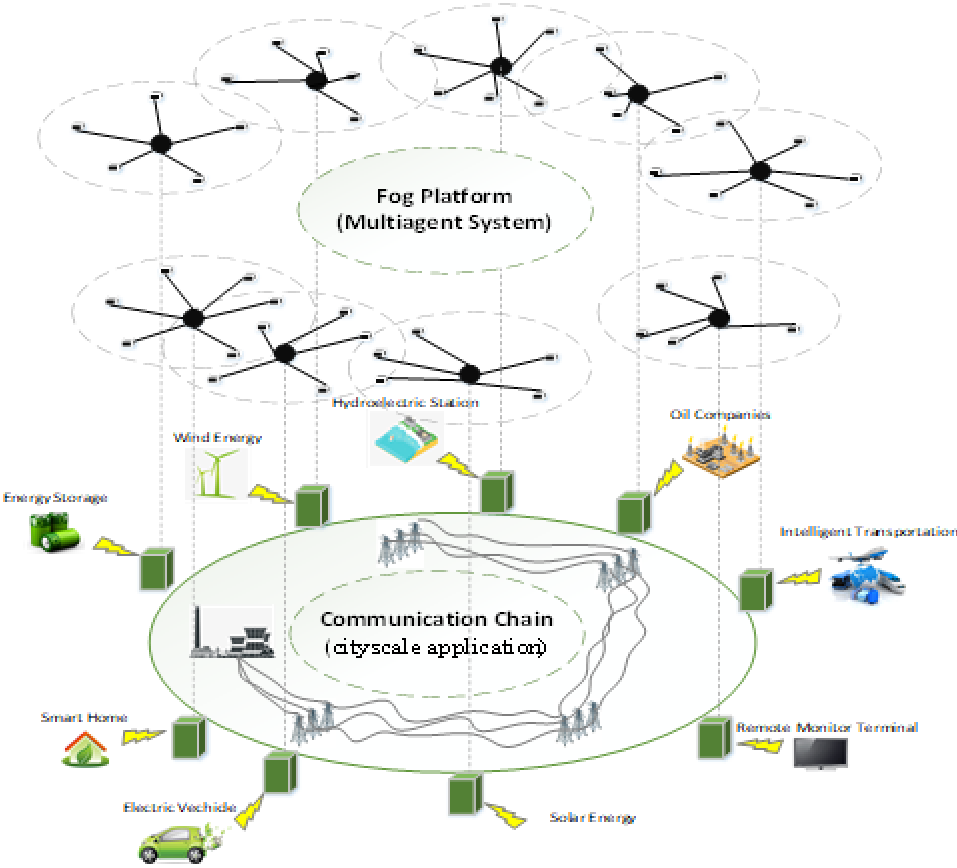
Figure 1. Communication chain value creation through fog accesss from different IoT M2M



have been proposed to address the problem (Yau, et. al. 2019). Some are based on the analogy between the Fog environment and the real market mechanisms. In these market mechanism, those methods offer a promising solution (Mills. and Dabrowski, 2016; Buyya et. al, 2019). In the market trading, Fog service providers are faced with dynamic and unpredictable user behavior. In the dynamic Fog market environment, the way prices are set and the way they are set affects the demand behavior of price-sensitive users. (Fujiwara, et.al,2017). Multiagent system (MAS) incorporates the software agents to have preferences over some attributes of the allocation, e.g. trading of Fog service price and allocation of their resources. The trading-based multiagent system also allow for computational and geographical distribution decentralized implementation while providing mechanisms to regulate the behaviors of users.

In this paper we consider the multiagent for trading-based Fog services allocation, which contain allocation mechanism and pricing mechanism. The Fog services allocation needs to satisfy the Fog service providers and the users. The pricing mechanism that is iteratively adjusted to find acceptable between a set of demands and a limited supply of Fog services allocation. Our goal is to devise the trading-based Fog resource optimal allocation that maximizes the utility across all Fog buyer and Fog service providers (i.e., welfare). Then the following economic requirements can be stated:

1) Trading efficiency: When the trading is economically efficient, it is impossible to increase a participant's welfare without decreasing another participant's welfare; i.e. there is no wasted

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