A Game-Theoretic Approach to Cache and Radio Resource Management in Fog Radio Access Networks

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***Abstract*—Fog radio access networks (F-RANs) have been seen as promising paradigms to handle the stringent requirements in the 5G era by utilizing the cache and resource management capabilities of fog access points (FAPs). To achieve better system performance, cache resource and radio resource should be jointly optimized. However, fully centralized optimization can put heavy burden on the resource manager in the cloud. Faced with this issue, a hierarchical resource management architecture is adopted. Specifically, the resource manager in the upper layer maximizes a long-term utility by optimizing cache resource, which is adaptive to the statistics of channel gains and user content requests. In the lower layer, FAPs self-organize into multiple clusters to mitigate**

I. Introduction

As an advanced architecture, fog radio access networks (F-RANs) can satisfy diverse and stringent communication demands in the 5G era by leveraging edge computing [1], [2], cloud computing and heterogenous networking like unmanned aerial vehicle (UAV) and device-to-device (D2D) communication [3], [4]. Particularly, fog access points (FAPs), which have edge caching and local radio resource management capabilities, can help alleviate the burden on fronthaul links and the cloud [5].