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Rule Caching in SDN-enabled Radio Access Networks

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Abstract

Software Defined Networking (SDN) is recognized as a promising solution for efficient management of the infrastructure and numerous devices in 5G and Internet of Things (IoT) networks. In this regard, to appropriately forward the incoming packets, SDN-enabled devices request the controller for traffic rules resulting in a significant delay. To avoid frequent communication with the controller and reducing the delay, the devices cache the rules as match action pairs in flow tables for a certain amount of time. This is referred to as rule caching. Flow tables are made of ternary content-addressable memories (TCAMs) capable of high-speed parallel lookup. Nonetheless, due to the high expenses and power consumption of TCAMs, flow tables have limited capacity and cannot store rules of all the users. Therefore, the assignment of limited flow tables is a challenge particularly in scenarios with a large number of users.

In this talk, we consider an SDN-enabled base station serving a set of users in a cell and is equipped with a finite-capacity flow table. First, we assume that the users transmit with constant rates and formulate the fair allocation of flow table spaces as an MILP. We propose an optimal low-complexity solution for it. Then, we consider users' traffic obeys a bursty ON–OFF model and formulate the allocation of flow table over time. It results in a mixed-integer nonlinear program. To handle its complexity, we turn the problem into an integer linear program via a change of variables and design a time-efficient procedure with close-to-optimal performance to solve it.

Biography

Seyed Hamed Rastegar is a Postdoctoral Researcher at the School of Computer Science, Institute for Research in Fundamental Sciences (IPM). He received his PhD from University of Tehran in 2018. His research interests include networking and communications for IoT, network softwarization, and data science.

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