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Cooperative Video Caching Scheme over Software Defined Passive Optical Network

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Abstract

Localized video caching over passive optical network (PON), which means to cache videos on inner PON nodes (IPNs), i.e., optical line terminal (OLT), remote node (RN) and optical network units (ONUs), is now considered as an efficient scheme to provide better-quality video services for end users. However, given the limited local storage capacity of IPNs, the cooperation among IPNs is becoming critical for conducting localized video caching. In this paper, considering that caching videos on the RN will break the passive characteristic of PON, we study the problem of cooperative video caching (*CVC*) at the OLT-layer and the ONU-layer over GPON with a focus on maximizing the benefits introduced by localized video caching, under the finite local resources. We firstly design software defined GPON architectures to pave the way for efficiently implementing *CVC*, then we specifically study the *CVC* problem under two scenarios, one is that the cooperation can only be realized between the OLT and ONUs due to architecture constraint, the other is that the cooperation among all ONUs can also be enabled. In the first scenario, after proving the NP-hardness of the *CVC* problem, we derive a benefits upper bound for a special case with homogeneous required resources of videos of the problem, and then propose an efficient heuristic algorithm to solve the problem with general form. In the second scenario, given that the *CVC* problem is more complicated than that in the first scenario, we also design an effective heuristic algorithm to solve it. Simulation results validate

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