



Original article

Cooperative Caching in Two-Layer Hierarchical Cache-aided Systems

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Abstract: Caching has received much attention as a promising technique to overcome high data rate and stringent latency requirements in the future wireless networks. The premise of caching technique is to prefetch most popular contents closer to end users in local cache of edge nodes, e.g., base station (BS). When a user requests a content that is available in the cache, it can be served directly without being sent from the core network. In this paper, we investigate the performance of hierarchical caching systems, in which both BS and end users are equipped with a storage memory. In particular, we propose a novel cooperative caching scheme that jointly optimizes the content placement at the BS's and users' caches. The proposed caching scheme is analytically shown to achieve a larger global caching gain than the reference in both uncoded – and coded caching strategies. Finally, numerical results are presented to demonstrate the effectiveness of our proposed caching algorithm.

Keywords: Hierarchical caching system, cooperative caching, caching gain, uncoded caching, coded caching.

1. Introduction *

Among potential enabling technologies to tackle with stringent latency and data hungry requirements in future wireless networks, edge

caching has received much attention [1]. The basic premise of edge caching is to bring the content closer to end users via distributed storages at the edge network. Caching usually comprises a placement phase and a delivery phase. The former is executed during off-peak hours when the network resources are abundant, in which popular content is prefetched in the distributed caches. The later usually occurs

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