

Elektrotechnik-Elektronik-Informationstechnik

EEI KOLLOQUIUM

Turning Memory into bandwidth via Wireless Caching: Opportunities and Practical Challenges

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Diskussionsleitung: Prof. Dr.-Ing. R. Müller

Video is responsible for 66% of the 100x increase of wireless data traffic predicted for the next few years. Traditional methods for network capacity increase are expensive and do not exploit the unique features of video traffic. This talk presents a novel video delivery paradigm that capitalizes on the following two key properties: (i) video shows a high degree of asynchronous content reuse, and (ii) storage is the fastest-increasing resource in modern hardware. Based on these properties, we suggest caching at the wireless edge (e.g., at small cell base stations, WiFi access points, and/or user devices) combined with coded multicasting. We present both caching placement and delivery schemes that fully exploit the aggregate wireless caching capacity and have the potential of turning Moore's law into a bandwidth multiplier: the per-user throughput increases linearly, or even super-linearly with the local cache size. We show that the proposed schemes are information-theoretic order-optimal and identify the regimes in which they exhibit order gains compared to state-of-the-art approaches.

We then focus on the coded multicasting scenario and show that the promising multiplicative caching gain requires splitting all the files into a number of packets that grows exponentially with the number of caches, leading to delivery schemes with exponential-time complexity. To overcome this limitation, we design a novel greedy local graph-coloring delivery scheme that allows preserving a significant portion of the multiplicative caching gain with tractable polynomial-time complexity.