Capacity and Delay Tradeoff of Secondary Cellular Networks with Spectrum Aggregation

ABSTRACT

Cellular communication networks are plagued with redundant capacity, which results in low utilization and costeffectiveness of network capital investments. The redundant capacity can be exploited to deliver secondary traffic that is ultra-elastic and delay-tolerant. In this paper, we propose an analytical framework to study the capacity-delay tradeoff of elastic/secondary traffic in large scale cellular networks with spectrum aggregation. Our framework integrates stochastic geometry and queueing theory models and gives analytical insights into the capacity-delay performance in the interference limited regime. Closed-form results are obtained to characterize the mean delay and delay distribution as functions of per user throughput capacity. The impacts of spectrum aggregation, user and base station (BS) densities, traffic session payload, and primary traffic dynamics on the capacity-delay tradeoff relationship are investigated. The fundamental capacity limit is derived and its scaling behavior is revealed. Our analysis shows the feasibility of providing secondary communication services over cellular networks and highlights some critical design issues.

EXISTING SYSTEM

- Scaling law analysis is a novel framework that can characterize how the mean capacity and delay scale with the network size, but is not able to give an exact quantification on the capacity or delay.
- The framework of interference approximation focused on the session level performance of multi-cell networks, but can only provide loose bounds for the estimation of mean delay.
- The framework of timely throughput assumed that a queuing packet will be dropped if the packet passes a critical delay.

PROPOSED SYSTEM

- We propose a new framework that integrates stochastic geometry and queueing models to study the session level capacity-delay tradeoff of secondary traffic.
- Our framework can complement existing ones by offering a means to pinpoint the delay distribution analytically.
- The merit of our framework comes from the fact that the stochastic geometry and queueing models are the most tractable models in describing the complex spatial and temporal behaviors of a cellular network, respectively.

SYSTEM REQUIREMENTS

HARDWARE REQUIREMENTS

- Processor - Intel core i3
- RAM - 2B
- Hard Disk - 20 GB

SOFTWARE REQUIREMENTS

- Operating System : LINUX
- Tool : Network Simulator-2
- Front End : OTCL (Object Oriented Tool Command Language)

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