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Analyzing Capacity of Ad-hoc Wireless Networks

Ad-hoc wireless networking is envisioned to be the next revolution in data communications with a number of applications ranging from people-to-people to device-to-device communication. Habitat monitoring and object tracking with sensors, distributed database synchronization, and communication in disaster recovery are a few examples. Such systems consist of node-pairs communicating without a fixed infrastructure. Data packets are usually delivered from source to destination via multiple hops through other nodes helping to relay the information. Despite huge interest in ad-hoc wireless networks little is known about the capability of these networks to carry information. Therefore, it is important to understand theoretical throughput and capacity limits and possible network operation strategies which can achieve these predicted limits.

In my lecture I will talk about network models, summarize early results on ad-hoc network capacity, describe common upper bounding techniques, and derivation of the achievability methods. In addition I will talk about the improvement of the scaling laws which can be obtained using multiple user detection techniques. Finally I will discuss the impact of traffic localization on the network capacity scaling laws.