Uplink Transmission over Virtual Carrier for low-cost M2M Communications

Lab: Communication Systems
Contact Person: Amin Azari (aazari@kth.se), Guowang Miao (guowang@kth.se)
Starting date: Immediately

Background

Machine to machine (M2M) communications, also known as machine-type communications (MTC), means the communications of machine devices without human intervention, which is applicable to health monitoring, smart metering, remote security, and so on. The continuing growth in demand from cellular-based M2M communications, 34-fold from 2014 to 2019, encourages mobile networks operators to investigate evolutionary and revolutionary radio access technologies for accommodating M2M traffic in order to decrease the revenue gap. The characteristics of MTC are: small packet payload, periodic or event-driven traffic, extremely high node density, limited power supply, limited computational capacity, and limited radio front-ends.

Unlike human to human (H2H) communications, which normally consists of message, voice, and video transfer, most M2M devices have only a small amount of data to transmit. Telecommunications industry has spent a great deal of resources investigating how to realize high-capacity high-throughput low-latency infrastructure but forgotten about scalable systems to support small data communications for low-cost machine-type subscribers. The type of functionality which is expected from a machine device (e.g. data collection and reporting) does not require complex processing to perform. However, beyond 3G networks benefit from advanced transmission techniques on the radio interface which require complex as well as expensive radio transceivers. Then, there is now a desire to design inexpensive and less complex machine devices to communicate using advance cellular networks.

Problem Formulation

This thesis project aims to explore potential solutions for reducing the cost of machine devices while maintaining the capability to communicate with 4G, and beyond 4G, cellular networks and benefit from their advanced communications technologies. Toward this end, one must reduce device complexity with controlled performance degradation. One complexity simplifying method which can bring significant UE cost savings is decreasing the bandwidth which simplifies baseband processing and FFT/IFFT design. As M2M communications is mostly uplink-oriented, in this project we consider uplink transmission with virtual carrier and try to investigate system design and performance evaluation in this regard.

Type of Project:
Analysis and simulation.
**Required background:**
Wireless networks or equivalent, good background in simulation is preferred.

**Related projects:**
Can be found here

**References**