Faculty Name: Alagan Anpalagan

Project Title: Study of Wireless Sensors and Communication in Emerging Applications

1. Description of Project (Provide ½ page project description)

With the proliferation of millions of wireless sensors used in many real-life applications such as wildlife monitoring, power usage monitoring, and health care service delivery, machine-to-machine (M2M) communication has attracted lot of attention recently. M2M is also known as device-to-device (DoD) in some applications. In M2M wireless communication, limited radio spectrum has to be efficiently utilized in order to provide services to maximum possible number of M2M users/devices. The 4th generation wireless networks such as LTE-A use orthogonal frequency division multiplexed access (OFDMA) technology for radio interface and access between sensors and M2M base stations. The placement of sensors and radio access points (or base stations) has significant impact on the performance of the overall M2M communication. Radio resources such as transmit power, data rate, sub carriers and channel codes have to be intelligently managed to maximize the system capacity while being energy-efficient. Specific radio resource management (RRM) mechanisms include transmit power control, adaptive rate allocation, soft handoff, scheduling; others being call admission control and quality of service control etc. The resource allocation and sensor deployment are tightly coupled. In this project, various components of the M2M communication will be researched with details and the relationships between each component will be analyzed to form a coherent view of the M2M communication framework with a goal to optimize radio resource usage and sensor deployment. This research intern will gain knowledge of overall M2M communication and networking, green communication and optimization techniques through a systematic approach to research and development.
Responsibility of Student (Specify the duties and responsibilities of the student)

This project is in the wireless communications area especially in machine-to-machine communications and networking areas. The research intern will review the articles/technical reports, understanding the role of the respective M2M communication component with technical details. Green (end-to-end energy efficiency) communication will be the performance metric under consideration and the intern is expected to use mathematical tool to systematically analyze the problems working with other team members in WINCORE lab. Other duties and responsibilities include: - initial discussion with the supervisor to select the M2M communication component for investigation - identifying the goal of the research exercise and some procedural matters to achieve the goal - discussion of the scope of the project to be completed within the stipulated time frame - regular weekly meetings with the supervisor/senior PDF to discuss the progress, difficulties and directions - collecting the articles (initially suggested by the supervisor) from the IEEE Xplore and review them - identifying the importance and usage of the component under investigation to the M2M communication framework - describing the component in the context of M2M communication possibly in a pictorial view (i.e., block diagrams with inter-relationships) - preparing a report describing the M2M communication component. If possible, a survey/overview paper can be prepared and submitted for possible publication in national level magazines. - presenting the findings/results etc. in the monthly group meeting(s) when appropriate There exists opportunity to interact and work with graduate students who are working in the M2M research/development area.

2. Specify Requirements (Please state any specific requirement of this position)

The student must be interested in research and development work in communications and its applications that include mobile communication, smart grid, machine-to-machine communications and e-Health areas and; have a minimum GPA of 3.5 over the last two years of study. It would be a good opportunity for someone interested in graduate study.