INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

The ever increasing demand for high bandwidth, low latency multimedia applications on mobile devices is set to pose an enormous challenge on the bandwidth allocation and multiplexing mechanisms in *Long Term Evolution* (*LTE*) and future wireless networks. In order to face this challenge, these cellular network infrastructures must be empowered with sophisticated but low overhead online radio resource allocation mechanisms to efficiently serve a variety of heterogeneous user equipments (mobile phones, laptops, tablets etc.) such that the *Quality of Service* (*QoS*)/*Quality of Experience* (*QoE*) demands of all flows/end-users are met. In addition to satisfying *QoS*/*QoE*, the resource scheduling mechanisms may also need to simultaneously cater to other practical constraints/objectives like limited power budget, maximizing spectral efficiency and graceful degradation in times of overload, in the face of ever changing network dynamics, user mobility etc. In this dissertation, we present a few novel scheduling methodologies for system level as well as client centric *QoS*/*QoE* management corresponding to multimedia streaming over cellular networks in general, and *LTE* based systems in particular.

The entire thesis work is composed of six distinct contributions which are categorised into four phases. In the first phase, scheduling strategies for generic real-time variable bit rate traffic was considered. The second phase extended the scheduling mechanisms designed in the first to specifically support non-adaptive video streaming. Mathematically structuring the intended design as an optimization problem with constraints, we have proposed optimal, stochastic and heuristic solutions for the same. The problem and algorithms designed in the first and second phases were extended to handle adaptive video flows, in the third phase. We not only presented a Dynamic Programming (*DP)* solution but also streamlined the *DP* solution based on the characteristic of the system at hand in order to provide optimal solutions with far lower overheads. In addition, a scalable approximation algorithm which can judiciously trade-off scheduling overheads with solution accuracy, has been provided. While the first three phases dealt with the design of primarily in-network scheduling approaches, in the final phase, we have endeavored towards the development of client-side *SVC-DASH* based video streaming adaptation mechanisms that attempt to maximize the perceived *QoE* of an end-user. Experimental results have demonstrated the versatility and efficacy of the proposed approaches.