INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

Multicasting is the process of disseminating the same information to multiple destinations as in file distribution, distance learning, and video-on-demand services. In reliable multicasting applications like a software update or downloading a medical image, strict packet reliability is needed at the receivers. The primary objective is to communicate all the packets to the destination nodes with efficient network resource utilization. This thesis focuses explicitly on reliable multicasting where the source and destination nodes are deployed in a multi-hop wireless network scenario. In the existing multicasting schemes, the wireless links are independent of each other, and the proposed protocols aim specifically on reducing delays, bandwidth utilization, energy consumption, and expected transmission count. Multicasting in wireless networks involves many receiving nodes, and their links may not always be completely independent of each other. Link correlation may then have an impact on multicasting performance. This thesis considers the correlation between the links while designing the multicasting protocols. The first contribution is to determine the multicasting cost and the associated forwarder set while taking links correlation into account. Network Coding is used in multicasting to combine multiple lost packets and send them in a single transmission. The second contribution demonstrates the application of network coding in multicasting over a multi-hop wireless network. The packets are efficiently transmitted from the source node to the corresponding destination set using the selected forwarder nodes to reduce the ETXs for efficient network capacity usage. Network coded packets are transmitted by allocating traffic efficiently among the forwarding nodes while ensuring that each destination receives all packets. Extensive simulation results are presented for both cases when the packets receptions over the different links are independent or correlated. The proposed protocol significantly reduces the expected number of overall transmissions in the network, for both independent links and correlated links, as compared to the existing multicasting schemes. In a random wireless network, the wireless broadcasting feature can combine packets of different sessions, which are simultaneously going on in the network. Due to the broad applications of multicasting, there are higher chances of having multiple-multicasting sessions in the network. The third contribution of this thesis introduces a network coding assisted reliable multi-

source multicasting technique for multi-hop wireless networks. The selected forwarding nodes are used to efficiently transmit the packets from multiple source nodes to their corresponding destination sets. The primary objective is to reduce the multicasting cost expressed in terms of the average number of packet transmissions over the network. This in turn reduces resource expenditure and tackles the traffic congestion problem of the network. A significant reduction is found in the overall transmission cost of the proposed scheme for both correlated and independent link networks.