Public Abstract

First Name:Yingnan

Middle Name:

Last Name:Zhu

Adviser's First Name:Wenjun

Adviser's Last Name:Zeng

Co-Adviser's First Name:

Co-Adviser's Last Name:

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With the increase of bandwidth in computer networks, video streaming is expected to become a common practice in various networking environments. It is challenging to support video streaming services in wired and wireless networks that constantly suffer from quality degradation caused by congestion, interference, etc.

The main objective of this dissertation is to improve the overall video streaming performance in various networking environments, such as IP-multicast in wired network and wireless mesh networks (WMNs), using cooperation among participants including clients and routers. We investigate a number of key challenging issues associated with video streaming, and we explore solutions to those issues using a cooperative networking approach, which includes constructing overlay Peer-to-Peer (P2P) retransmission networks and exploring hybrid architecture of content distribution networks (CDN) and P2P networks. To solve the reliability issue in IP-multicast, we propose a novel overlay P2P retransmission architecture to exploit path diversity. To improve the video streaming quality over WMNs, we design a framework for high quality video on demand services over infrastructure multi-hop WMNs. In this framework, mesh routers work cooperatively with mesh clients to construct a CDN and P2P hybrid structure to improve the QoS of video streaming. We present a series of solutions to address the key challenges in video streaming over WMNs, i.e., the design of a new high throughput routing metric, a new enhanced routing algorithm, a cross-layer server and path selection strategy, a novel admission control algorithm with per-flow routing and a new P2P structure for video streaming.