

Research on network bandwidth estimation techniques in multimedia data transmission

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Abstract: This study investigates network bandwidth estimation techniques to enhance multimedia data transmission over IP networks. Accurate bandwidth estimation is critical for adaptive streaming, ensuring quality of service (QoS) and quality of experience (QoE) by preventing buffer underruns and packet loss. The research evaluates both probe-based and model-based estimation methods, analyzing their performance under varying network conditions such as latency, jitter, and congestion. A hybrid estimation algorithm is proposed, combining packet-pair probing with a Kalman filter to dynamically adjust to bandwidth fluctuations. Experimental simulations demonstrate that the proposed technique achieves higher estimation accuracy and faster convergence compared to traditional methods, reducing playback interruptions by up to 18%. The findings contribute to more robust multimedia delivery systems, offering practical implications for real-time video conferencing and live streaming applications.

Keywords: bandwidth estimation, multimedia data transmission, network engineering, QoS