National Institute of Technology Rourkela

Defence Seminar

Seminar Title	: Design and Stochastic Modeling of TCP Congestion Control Algorithms for Congested Networks
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Venue	: CS208, Convention Hall, CSE Department
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Abstract : The Transmission Control Protocol (TCP) ensures reliable data communication. However, congestion control affects its performance by regulating data flow to prevent packet loss. An increase in packet drops and high round-trip times indicates network congestion, prompting extensive research to enhance TCP congestion control algorithms over the past three decades. Despite various advancements, existing mechanisms face challenges such as bufferbloat, inefficient bandwidth utilization, and low throughput due to diverse application requirements. To address these issues, four novel congestion control mechanisms are proposed to enhance the performance of both TCP and Multipath TCP (MPTCP). The first contribution introduces BDP-Veno, a bandwidth-delay product (BDP)-based TCP congestion control algorithm that modifies TCP Veno by incorporating bottleneck BDP information. Implemented in ns-2, it improves throughput by 57% over Veno. The second contribution proposes a modified multiplicative decrease phase for TCP Veno using stochastic approximation, a model-free optimization technique. Performance evaluation in ns-2 shows a 42% throughput improvement over TCP Veno, along with reduced loss rate and delay. The third contribution presents Enhanced Balanced Linked Adaptation (EBALIA), which normalizes throughput per flow to optimize multi-subflow performance, achieving a 26.58% improvement over LIA and 8.23% over BALIA. The fourth contribution introduces a context-aware congestion control mechanism for MPTCP, incorporating multi-stream hierarchical scheduling to enhance efficiency. The proposed model is validated on ns-3 and it demonstrates improved transmission performance.