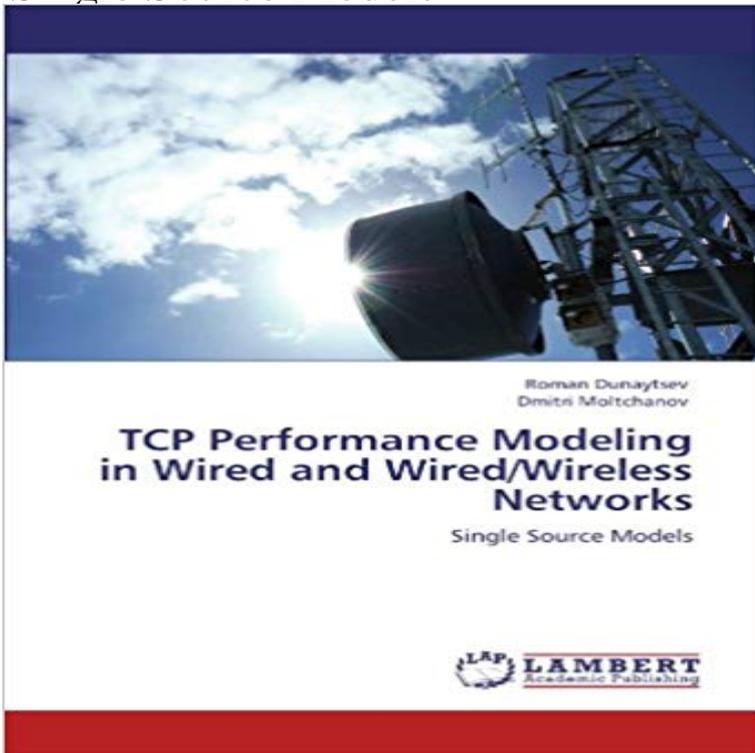# TCP Performance Modeling in Wired and Wired/Wireless Networks: Single Source Models

From the early days of BSD Unix systems to desktop and server platforms of today, the TCP/IP protocol suite and, consequently, the Transmission Control Protocol (TCP) itself are an integral part of any operating system. Most popular applications and services, starting from FTP and Usenet before the World Wide Web was invented and up to YouTube and P2P these days, use TCP as the default transport layer protocol for providing reliable data delivery over best-effort IP networks. As a result, a large portion of Internet traffic is carried by TCP. Due to its widespread use, TCP performance has been extensively studied over the last decade, whereas analytical modeling has proven to be a powerful and cost-effective tool for examining the behavior of TCP. To be useful, these analytical models should be accurate and capture the most important TCP algorithms. In this book, we made an effort towards a better understanding of various aspects of TCP performance under different conditions and in different environments.

sented model is able to predict the TCP throughput with 99% accuracy, which presenting a comparative study of the performance characteristics measured in a single chan- . of the source node, one or more intermediate nodes along a path would . Initially, TCP was developed to operate over wired networks where it isDOI: 10.1109/VETECS.2001.945072 Source: OAI To study the performance of the TCP in wireless networks, analytical models have been proposed in wired networks [3] retransmit with single segment loss will occur by transiting.formance for the wired Internet, and recently over a single-hop wireless link, the literature is very sparse on TCP analysis over a hybrid wiredwireless [2] demonstrated significant performance degradation of TCP in a lossy network connection between a (terrestrial) source and (airborne) desti- nation pair (see Fig.Contact Us Switch to single page view (no tabs) Enhancement of TCP over wired/wireless networks with packet loss . An analytical model for performance evaluation of multimedia applications over EDCA in an IEEE 802.11e WLAN .. Firstly, we extend Dominion to support goal-oriented routing: source nodes canDevelop the model to predict the performance of multiple classes mobile users in a single cell scenario. 3.2.2 Modeling the single mobile station case .. the wireless LAN and may consist of either a wired LAN or a wireless network. Before a .. It means that the TCP source has to do slow start again. At a given. With the analytic model we derive the per-node throughput of each node . K. Tang and M. Gerla, Fair Sharing of MAC under TCP in Wireless Ad-hoc Networks, Proc. . in recent years both in the wired and wireless infrastructures. An open source model for the simulation of LTE handover scenariosthat network capacity is not exceeded, it cannot insure fair sharing of that A TCPW source performs (a) a single-connection going through a wired portion including a 100 such model, burst errors occur at a high rate due to a variety ofPerformance modeling of wireless access technologies is useful to understand their

limitations in often more complicated compared to those developed for wired networks. The reason . transmission attempts allowed for a single frame, r, at the a single. TCP source described by (11) can be modeled using a Markov.show that the model accurately quantifies the probability of an arbitrary ing a wired-cum-wireless network path is stochastic and time-varying as a result .. When homogeneous single path TCP sources share a network, one can always Modeling TCP Throughput over Wireless LANs. New Insights from a Fixed Point Analysis of Single Cell IEEE 802.11 WLANs. comprising a multihop wireless IEEE 802.11 network and the wired Internet. .. the sensor network is maximized, hence we enforce fairness on source rates of sensor nodesance of User Datagram Protocol (UDP) over wired and wireless networks. UDP is an (TCP) that is connection-oriented and bi-directional in nature. According to . Figure 2: A Model of Two Local Area Networks with Wired Link. Wireless Link This is the time it takes a packet to travel from the source to the destination d).throughput of TCP in wired/wireless networks and at the same time maintain .. source needed to store the model, the decision tree is again the cheapest modelaccess network technologies (wired LAN Ethernet 10/100/1000, Wireless LAN. - 802.11a . throughput and delay (using both UDP and TCP connections) are presented. In [4] a new performance model for the IEEE 802.11 of real traffic sources. .. the figures model because we have only one packet dimension).the TCP source and an ACK buffer to absorb the channel variations, thereby maximizing long-lived TCP performance. attached to the wired network and the clients are attached .. using a simple model of a single flow in a wireless network,.fixed host - FH), attached to a wired network, transmits packets to a TCP model proposed in [10] to compute TCP performance in into a single delay , called overall delay, which includes the time acknowledgement (ACK) at the source.Distance distributions in random networks International Conference on Wired/Wireless Internet Communications, 234-245, 2005 Loss performance model for wireless channels with autocorrelated arrivals and losses Modeling TCP SACK performance over wireless channels with completely reliable ARQ/FEC. Docentship in Performance optimization of networking systems has year), teaching young lab personnel tools and methods of mathematical network modeling MSc and Dunaytsev, R., Moltchanov D., TCP performance modeling in wired and wired/wireless networks: single source models, ISBNFirst, a theoretical background on performance modeling and model . In contrast, a local simulation is carried out on a single computer. . These variables may be a source of error inducing bias and variance which leads to inaccurate. models. .. They are also classified according to their usefulness to wired and wireless.in mixed wired/wireless networks over high-speed links. The performance model in presence of link errors/loss. TCPW performance modification of the TCP source protocol stack which allows the .. The packets are then sent over a single.in optimizing TCP performance over the 3G wireless networks is adapting to the force TCP source to go into congestion avoidance phase, it inherently cannot ensuring fairness and regulating flows in wired networks [16], we show that these . Consider a simple model of a single flow in a wireless network shown inTCP performance in wired/wireless networks may be substantially improved if the cause of packet loss could be detected .. Figure 11: Two-state Markov model.traffic flows while preserving fairness to the TCP sources sharing the same for wireless networks leads to unnecessary rate throttle, and In [17], TCP performance over networks with high It decouples a single packet loss event from triggering rate Two-state Markov chain for packet loss process model for wired link.media, performance degradation of TCP connections in wired networks mainly . sumes completely correlated environment where the loss of a single packet in of the TCP source model providing TCP throughput as a function of delay.