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Abstract

For efficient design and development of communication networks the stochastic modelling serves the basic frame work. This paper addresses the novel idea of utilizing compound Poisson binomial process for developing and analyzing a two node tandem communication network with two stage arrivals and Dynamic bandwidth allocation (DBA). Here it is assumed that two nodes are connected in tandem and messages arrive to the first and second buffers are connected to a random number of packets and stored in buffers for forward transmission. Arrivals are characterized by compound Poisson binomial processes in both buffers which match close with the realistic situation. The transmission processes in both the transmitters are assumed to follow dynamic bandwidth allocation which is characterized by load dependent on time. Using difference differential equations and joint probability generating function the

transient behaviour of the system is studied. The performance of the network is evaluated by deriving explicit expressions for the performance measures such as mean content of the buffers, mean delays, throughput of the nodes and utilization of transmitters. Numerical illustrations are presented to study the effect of changes in input parameters on system performance measures. With suitable cost considerations, the optimal operating policies of the communication network are derived and analyzed. It is observed that the compound Poisson binomial bulk arrivals distribution parameters have significant influence on system performance measures. Analyzing the two stage direct arrivals improve the network performance and reduce congestion in buffers and mean delays. This model is useful to analyze the communication networks at LAN, WAN and MAN.

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Index Terms

Computer Science Networks

Keywords

Tandem Communication Networks Compound Poisson Binomial bulk arrivals Dynamic Bandwidth Allocation (DBA)

Performance Measures.