Sengupta, Bhaskar

An operator geometric solution for a buffer occupancy problem. (English) Zbl 0603.60089

Commun. Stat., Stochastic Models 2, 251-271 (1986).

The paper is concerned with finding the distribution of buffer occupancy in a data communication problem. Customers arrive according to a Poisson process at a queueing station with a finite amount of available space. Each customer has a service time requirement which is the sum of two independent components - an overhead of exponential distribution and a constant (1/c) times the space required by the customer. The space required by a customer has a probability density function. Both the space and overhead required by the same customer or by different customers are independent.

At the queueing station a communications handler places an arriving message in the finite memory and causes a high priority interrupt for the CPU. The CPU then handles the interrupt by servicing the overhead for the arriving message and services the overheads of all other messages that arrive subsequently until all the overhead of the system is serviced. Now the CPU switches to its low priority task, namely transmission. The transmission is assumed to deplete the buffer occupancy of the system at a steady rate of c and continues until the arrival of the next customer or the buffer occupancy reduces to zero. Arriving customers who cannot fit into the system are lost.

It is shown that the distribution of space occupied by the customers can be described by an integro-difference equation and its solution has an operator geometric form. Some special cases of the problem are also examined and numeric results are reported.

Reviewer: J.Tanko

MSC:

60K25 Queueing theory (aspects of probability theory)
68M20 Performance evaluation, queueing, and scheduling in the context of computer systems

Keywords:

distribution of buffer occupancy; priority interrupt; buffer occupancy of the system at a steady rate; operator geometric form; numeric results

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