A simulation of a multi-nodal communication network with contention
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The phenomenon of contention is prevalent in systems in which resources are shared by several users. The identification and resolution of the contention is necessary to improve the operation of the system and the utilization of the resources.

In this study, we consider a communication network in which one set of nodes receive messages of random length and transmit them through another set of nodes. This model is related to the interleaved memory design in computers. The messages are routed towards their destination by a probabilistic mechanism and when several messages try to access the same node, conflicts arise.

We present a simulation study to examine, through graphical output, the growth of congestion due to conflicts, the impact of contention on several system performance measures and the effects of the contention resolution procedures on these measures. We describe an updating routine that is efficient in storage and execution while giving us all the information about the network. Random variates are generated efficiently, utilizing the particular structures of the distributions.

The estimates and the graphs reveal that, even for the networks in which the receiving nodes are not saturated, contention forces a substantial number of sending nodes to become blocked. The dependence of the distribution of the workload among the sending nodes and the total amount of work completed during the simulation on the contention resolution procedure is brought out in the analysis. The simulation output data is analyzed using the batch means procedure to yield estimates of the measures.