Queueing system with working vacation and strong and weak disasters with repair and application in network on chip

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This paper studies the stationary analysis of a Markovian queueing system with impatient customers and interruption vacation, strong and weak disasters, with repair during the working vacation and applications in the network on chip.

In the first part of our work, we conduct a comprehensive analysis of the new model where each customer has its own impatience time and abandons the system as soon as that time ends. When the queue is not empty, the working vacation can be interrupted if the service is completed and the server starts a busy period with a probability $\bar{q}$ or continues the working vacation with a probability q.

A strong catastrophe forces simultaneously all present customers (waiting and served) to abandon the system permanently with a probability p but a weak disaster is that all customers decide to be patient by staying in the system, and wait during the repair time with a probability $\bar{p}$, where arrival of a new customer can occur. As soon as the repair process of the server is completed, the server remains providing service in the working vacation period.

We analyze this proposed model and derive the probability generating functions of the number of customers present in the system together with explicit expressions of some performance measures such as the mean and the variance of the number of customers in the different states, together with the mean sojourn time. Finally, numerical results are presented to show the influence of the system parameters on some studied performance measures. In the second part, we introduce a low post-disaster delay and establish performance calculations. Additionally, we apply this new model to NOC networks to simulate flit losses based on the appropriate network settings.