Network Technologies

An Internet Service Provider (ISP) provides a remote access service to its customers by means of a system consisting of N Remote Access Servers (RAS), each of which has **m** ports. The system is capable to recognize the access requests sent by a privileged class of users. Assume that those requests, at high priority, and that the low priority requests arrive according to independent Poisson processes at rate, respectively, λ_1 and λ_2 [requests/hour]. Assume, furthermore, that connection times are independent and exponentially distributed random variables with mean $\mathbf{1/\mu}$ [hours]. If any port of the various RAS devices is available ("idle") when a high priority request arrives, the request is accepted and the port is assigned to it, otherwise the request is discarded. A low priority request, instead, is accepted only if **(g + 1) or more ports** are available on its arrival, otherwise the request is discarded.

Of course, RASs are subject to failures. Suppose that the "time to failure" and the "time to repair" of an RAS are independent and exponentially distributed random variables with mean, respectively, equal to $\mathbf{1/f}$ and $\mathbf{1/\beta}$ [hours]. A single "repair facility" is shared.

Introducing any further hypotheses needed to use the stochastic model that you intend to adopt, evaluate the probability P_H that a high priority request is discarded.

Suggestion.

If we neglect the effects that an RAS failure has on the metric P_H when some Internet connections are active through its ports, the problem can be approached by hierarchical modeling.

Now imagine being connected to the Internet through the ISP system mentioned above. Evaluate the probability that your connection is suddenly broken because of an RAS failure.