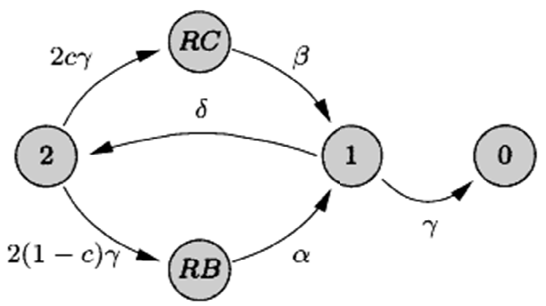
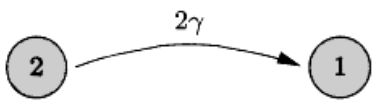
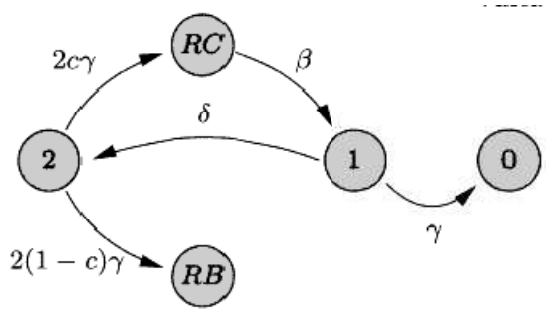
Network Technologies

Consider a system with $n = 2$ devices processing a given workload. Each device is subject to failures with a *Mean Time To Failure* (MTTF) $1/\gamma$.
In case of a failure, recovery can successfully be performed with probability c. Typically, recovery takes a brief period of time with mean $1/\beta$. Sometimes, however, the system does not successfully recover from a device failure and suffers from a more severe impact. In this case, we assume the system needs to be rebooted with longer average duration of $1/\alpha$. Failed devices need to be repaired, with the *Mean Time To Repair* (MTTR) of $1/\delta$. Only one device can be repaired at a time and repair of one device does not affect the proper working of the other device. If no device is running correctly, the whole system is <u>out of service</u> until first repair is completed. Neither reboot nor recovery is performed when the last device fails. All times are assumed to be independent, exponentially distributed random variables.
Considering an initial state of the system with two working devices,

a) draw the transition rate diagram of a CTMC with absorbing states representing a computational model by which system reliability can be evaluated.
b) how does the computational model change if we consider the most restrictive context in which reconfiguration is not acceptable?
c) how does the computational model change in case reconfiguration is tolerated but not reboot and not the failure of the last device?

SOLUTION:



State	Meaning
$i \in \{0, 1, 2\}$	i working devices
RC	recovery
RB	reboot