Modeling data backup as batch service with vacations

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Abstract

Data backup processes are power intensive jobs and use substantial server resources. While serving each data packet immediately on arrival would result in too many connections to the cloud server, data packets, on the other hand, cannot be kept waiting in the buffer for too long. Power spent to keep the server on can be optimized by forcing the server to take a vacation when there are no packets to backup. Further, the number of new connections to the cloud server can be reduced by backing up batches of packets. Therefore, we introduce a new queueing model which has a single batch server and employs an exhaustive service discipline. As soon as the backlog of the server becomes zero, the system enters a vacation. During a vacation, the server consumes minimal power while the data packets arrive and wait in a buffer for backup service. When the server wakes up from the vacation, the server starts serving a batch, that is a new backup is initiated, if some starting conditions are met, otherwise it enters a new vacation period. These starting conditions depend on the number of backlogged packets. If at least l packets (starting threshold of policy) are present in the queue, the system resumes service. If there are i packets in the queue, where i is less than l, the service resumes with probability α_i or another vacation period starts with probability $(1 - \alpha_i)$. Such probabilistic starting conditions lead to shorter waiting time of data packets in comparison to fixed threshold based conditions. The service time of a batch is dependent on the number of packets in that batch. We analyze the performance of this queueing model and present how it can provide the same Quality of Service of data backup as existing queueing models at a cheaper cost. This can be achieved either by using a cost effective backup server or by ensuring that the system takes longer vacations.