Prioritized Processor-Sharing with a Maximum Permissible Sojourn Time

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Abstract : A prioritized processor-sharing (PS) system with a maximum permissible sojourn time (MPST) is proposed. In this PS system, a higher-priority request is allocated a larger service ratio than a lower-priority request. Moreover, each request receiving service is guaranteed the maximum permissible sojourn time determined by each priority class, regardless of its service time. Arriving requests that cannot receive service due to this guarantee are rejected. We further propose a guarantee method for implementing such a system, and discuss performance evaluation procedures for the resulting system. Practical performance measures, such as the relationships between the loss probability or mean sojourn time of each class request and the maximum permissible sojourn time are evaluated via simulation. At the arrival of each class request, its acceptance or rejection is judged using extended sojourn times of all requests receiving service in the server. As the MPST increases, the mean sojourn time increases almost linearly. However, the logarithm of the loss probability decreases almost linearly. Moreover with an MPST, the difference in the mean sojourn time for different MPSTs increases with the traffic rate. Conversely, the difference in the loss probability for different MPSTs decreases as the traffic rate increases.

Keywords : prioritized processor sharing, priority ratio, permissible sojourn time, loss probability, mean sojourn time, simulation

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