OPTIMIZATION OF FIXED TIME POLLING SCHEMES

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Recently PTT Telecom has introduced itemized telephone billing. A mediation system has been implemented to manage the extensive data transmission that is involved in itemized telephone billing. The mediation system may be modeled as a polling system. A polling system basically consists of several queues cyclically attended to by a single server. Technological restrictions in the mediation system that is currently implemented require a fixed time polling scheme. A fixed time polling scheme specifies not only the order of the visits to the queues but also the starting times.

We propose an approach to the problem of constructing efficient fixed time polling schemes, i.e., fixed time polling schemes that minimize a weighted sum of the mean waiting times at the various queues. As fixed time polling schemes are not likely to be amenable to an exact analysis, we resort to approximations for the mean waiting times at the various queues. Subsequently we formulate the problem as a mathematical programming problem. As it is NP-hard, we solve the problem heuristically by dividing it into subproblems that appear easier to handle, viz., successively:

1. Determination of the visit numbers;
2. Determination of the visit order;
3. Determination of the visit times.

The approach that we propose is tested by numerically investigating the fixed time polling schemes obtained, for realistic as well as for fictive system configurations, the latter constructed by systematic variation of the system parameters. The fixed time polling schemes obtained appear to be efficient compared with some other natural fixed time polling schemes.