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**QUESTION**

Based on the perspectives of the operational laws you have studied; discuss the possibility of achieving an accurate performance report using the three major evaluation techniques

**ANSWER**

All engineering systems should be designed and operated with specific performance requirements in mind. It is essential that all performance requirements of any system to be designed should be stated at the outset and before investing time and money in the final design stages, which include testing and implementation used to validate the results obtained by the others.

In the early stage of the design, when the system designer/architect is searching to find the optimum system configuration, it is impossible to carry out experiments on prototype, and it is time consuming to conduct detailed simulation experiments. During this early stage of the design, the designer is interested in basic performance tradeoffs and in narrowing the range of parameters to be considered. Conducting real-time measurement on a proto- type or constructing detailed simulation experiments may be tedious and not cost effective. All that is required at this early stage is approximate calculations to indicate the performance tradeoffs. Analytic performance models provide such an approximate initial quick and rough analysis. It is important to keep in mind that almost all analytic models are approximate.

In general, performance evaluation analysts are typically interested in the: (a) frequency of occurrence of a specific event, (b) duration of specific time intervals, and (c) size of some parameter. In other words, the interest is in count, time, and size measures. If the system performs the intended service correctly, its performance can be measured by the rate at which the service is performed, the time needed to perform the service, and the resources consumed while performing the service. These are often called productivity, responsiveness, and usage metric/measures, respectively. The productivity of a multiprocessor computer system is measured by its throughput (number of packets or requests processed per unit time) or speedup (how fast the system compared with a single processor system). The responsiveness of the same system is measured by the mean packet delay, which is the mean time needed to process a packet. The utilization metric gives a measure of the percentage of time the resources of the multiprocessor system are busy for a given load level. The resource [usually a processor, but can be a memory or an input/output (I/O) device] with the highest use is called the bottleneck device.

To evaluate the performance of a system, we can use the measurement technique if the system exists and it is possible to conduct the required experiments and testing on it. However, when the system does not exist or conducting the measurements is expensive or catastrophic, then we rely on simulation and analytic modelling techniques.

To achieve success in simulation analysis, well-qualified problem formulators, simulation modellers, and analysts are much needed and crucial.