

Lottery Scheduling: Flexible Proportional-Share Resource Management – Critique

- Shashidhar Kumar Thangallapelli (862395355)

Abstract:

Conventional Operating Systems use several types of scheduling mechanisms which are not very inclined with some of systems. One of the most relevant and used mechanism like priority-based scheduling also has issues like starvation, very dynamic as the priorities keep changing and they are poorly understood. Even though some of the issues were addressed in some of the operating system scheduling approaches, the pre-processing and overhead associated with them makes them not so good for the real-time interactive systems. To address these problems, Lottery Scheduling mechanism has been introduced.

Lottery Scheduling is random ticket-based resource allocation scheduling mechanism. In this we use something called proportional-share resource management where the usage of resource for a particular process is proportional to the amount or quantity of share that process has been allocated. This mechanism is proved to be responsive in having control over the execution rate of processes. The paper implemented this on a Mach-3 microkernel where it has shown responsive control and flexible in various wide range of applications.

Strengths:

- No starvation problem at all for any type of processes as lottery scheduling is a ticket-based mechanism and each process has at-least one ticket. Thus, even low priority processes could be executed without being left in starvation like in priority-based scheduling.
- The ticket transfer approach is good in avoiding the problem of priority inversion. A process which is blocked can conveniently transfer its ticket to other processes which are waiting and ready to be executed.
- The modular resource management provided by the algorithm using concepts such as currency, compensation tickets and inflation avoid sharing of resource allocation policies externally.

Weaknesses:

- The mechanism used in the paper is most useful in case of interactive systems however may not be much useful for the real-time systems.
- The algorithm for lottery scheduling is dynamic and it varies its efficiency over long run as processes increase. In the paper it is mentioned that the large ratios will be converged to their assigned values on a long run. Thus, for short term this is biased.

Other comments and discussion:

The paper tries to solve the problems that are existent with some current resource allocation mechanisms such as starvation, lesser control over resource management etc., which are addressed well. Although, the implementation is probabilistically fair, the higher priority tasks get more tickets and thus have more chance of winning leaving aside the other low priority tasks with very fewer tickets. I feel there is still a scope of improvement in this algorithm. Overall, I am convinced by the approach and it's a good read.