Paper Review

“ Scheduling Beyond CPUs for HPC ”

1. Summary

Existing HPC schedulers are mainly CPU-centric. This paper describes a multi-objective genetic algorithm-based scheduler for MOD (multi-objective optimization) problems.

HPC nowadays not only focuses on CPU performance, but other performance measures such as burst buffer to IO performance also play an important role. Traditional schedulers such as slurm with a naive method not only schedule with low efficiency, they also ignore other resources. If we try to introduce a better scheduling method, it truly can introduce new tradeoffs. This paper presents BBSched, which uses the Pareto set to get optimization. The Pareto set is that if there does not exist a set that performs better, then the set is the best optimized set. As for multi-resource scheduling, BBSched's NPC complexity does not meet a scheduler's requirements for senselessness. This paper introduces a static method as a multi-objective genetic algorithm to solve the problem.

To save performance, the system designs a window size that considers a limited number of jobs and can statically adjust the window size based on data. The multi-objective genetic algorithm is paralleled and initialized as random. By continuously choosing the better parameter sets, it archives optimization. The algorithm archives a balance between performance and time consumption.

The evaluations were done on Cori and Theta at the Argonne Leadership Computing Facility. The evaluation mainly focuses on the burst buffer and uses slurm to schedule. It shows a great descent in execution time, an increase in resource ultility, and that BBSched performed better than any of the scheduling algorithms.

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2. Advantages

+ This paper pays attention to scheduling and finds some disadvantages to current scheduling methods.
+ The scheduling algorithm uses static methods to get a balance of execution time and performance.
+ The evaluation was compared with multiple scheduling methods and got convincing results.

3. Disadvantages

– It is based on SLURM, which may not be the only scheduling tool available.
– It pays attention to the burst buffer. I think they can extend their results to other fields.

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4. Brainstorming

Our work is also scheduled and based on some deep learning algorithms. I am glad to see that these combining are still open. As for our scheduling methods, this paper gives us inspiration.