

Operational Experience with Incentive-Based Power Efficiency Mechanisms on the Fugaku Supercomputer (IEEE/ACM SC24 [48])

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Best Paper Finalist

Background

- The cost of energy is increasing and implies energy consumption of today's supercomputers are critical for sustainability
- Fugaku Points (FP) is an incentive-based program to motivate users to apply power control functions
 - $FP = (P_{\text{whole}} - P_{\text{group}}) \times NH_{\text{group}} / P_{\text{whole}}$ (i.e., Check the group's P higher or lower than the system ave P)
 - P_{whole} : Ave. power consumption in previous year
 - P_{group} : Ave. power consumption of the group, NH_{group} : Used NH of the group
- 5% of 1-month NH is proportionally distributed to each group based on FP as *priority NH*

Approach

- To evaluate the effect, we analyzed job and power logs

Results: 11 lessons learned (Details in [48])

- Eco-friendly groups take advantage of redeeming period
 - Priority queue: Enjoy highest perf. (w/o power ctrl) with less waiting time
 - Non-priority queue: at least one power control
- More groups are becoming eco-friendly
 - Top eco-friendly group (1st per.) → Continue to be eco-friendly (2nd per.)
 - Worst eco-friendly group (1st per.) → More eco-friendly (2nd per.)

TABLE IV. Wait Time Comparison Statistics.

	Avg. Wait time (hours)			
	1st Redeeming		2nd Redeeming	
Job Type	Priority	Non priority	Priority	Non priority
Normal	0.97	23.3	0.31	9.39
Bulk	0.48	35.9	0.12	8.39
Step	2.86	164	81.2	160

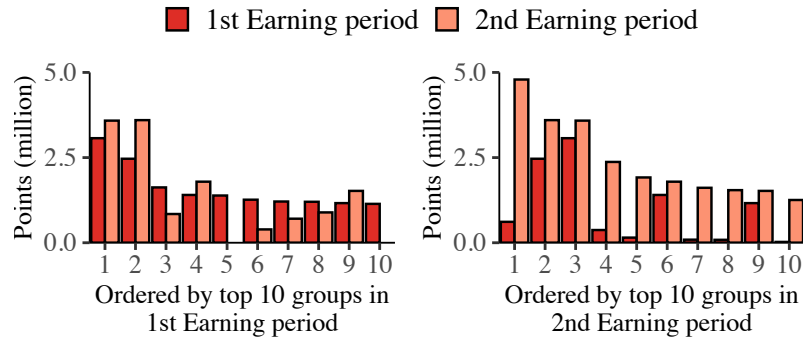


Fig. 11. The top-10 groups earning Fugaku Points in one earning period also earned points in the other period.

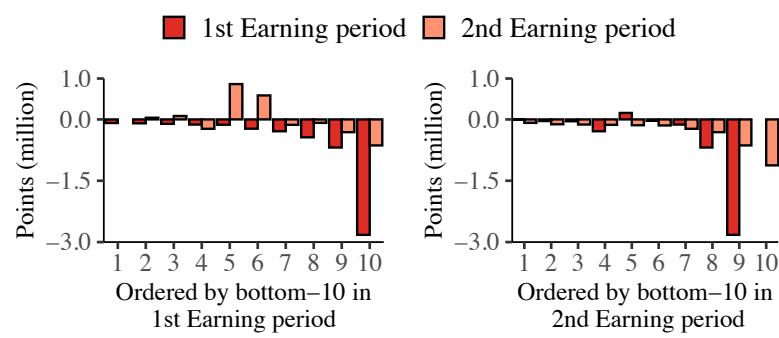


Fig. 12. Groups not earning points in the first period appear to have improved their behavior somewhat in the second period.

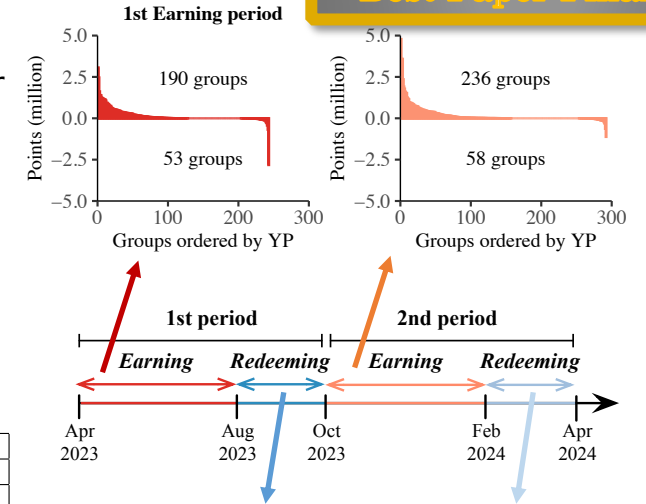


Fig. 15. Groups running jobs in the priority queue appear to take advantage of the priority queue for running their jobs with higher performance by opting for not using power controls for most of their jobs.

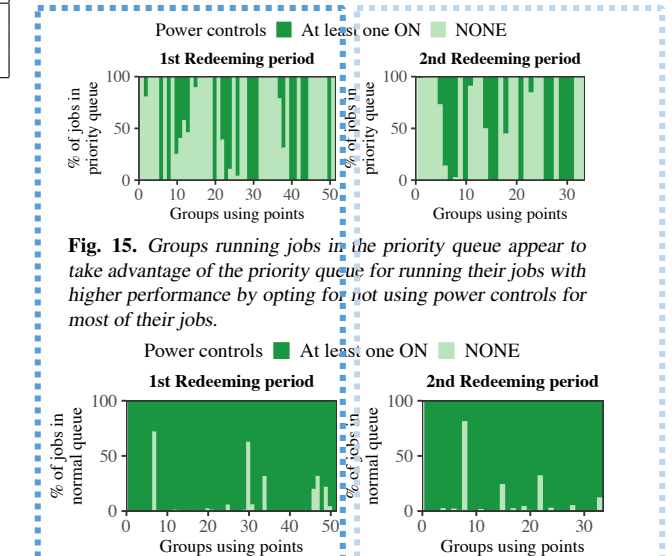


Fig. 16. Other jobs launched by the same groups in the redeeming period used the power controls.