

Implementing and Evaluating Multi-Resource Scheduling Design in Slurm

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1. Read Slurm Overview from <https://slurm.schedmd.com/overview.html>
2. Watched the tutorials describing Slurm architecture, daemons, commands, build and configuration from <https://slurm.schedmd.com/tutorials.html> and <https://www.open-mpi.org/video/?category=slurm>
3. Read Slurm programmer guide from https://slurm.schedmd.com/programmer_guide.html and read about most of the plugin implementation details from <https://slurm.schedmd.com/documentation.html>
4. Cloned the git repository of Slurm(<https://github.com/SchedMD/slurm>) and went through each directory to check the directory structure to follow, how to add new plugins, the code implementation details and linux coding style.
5. Installed slurm by using a virtual box using the following document:

https://wr.informatik.uni-hamburg.de/media/teaching/wintersemester_2015_2016/nthr1516-tobias_wessler-energy-efficient_task_scheduling_algorithms_ausarbeitung.pdf

Issues Faced:

1. Couldn't dual boot since my machine had less memory. So tried setting up virtual machine.
2. Installed Oracle virtual box and booted ubuntu using its image. But after installing munge for authentication, configuring slurm.conf and all the prerequisites, Slurm control daemon and slurm daemon were not up and the laptop freezed most of the time. So tried using vagrant and docker.
3. Installed vagrant and booted with ubuntu, but munge wasn't starting up due to permission issues.
4. Finally Installed a different version of vagrant and virtual box and now Slurm is up.
6. Gone through each line of code from the sched/backfill plugin so as to understand how the external plugins would be implemented since ours would be one of them using both job scheduling and resource selection.
7. Read the Yuping's paper ["Scheduling Beyond CPU's"] multiple times to get a clear cut idea on the implementation.
8. Read the following papers on Multi-objective optimization:

- 1.C. Coello, G. Lamont, and D. Veldhuizen, “Evolutionary Algorithms for Solving Multi-Objective Problems,” in Springer, Berlin, Heidelberg, 2005.
 - 2. [35] K. Deb, “Multi-Objective Optimization Using Evolutionary Algorithms,” in John Wiley and Sons, Inc., New York, NY, 2001.
 - 3. [36] E. Zitzler and L. Thiele, “Multiobjective Optimization using Evolutionary Algorithms A Comparative Case Study,” in Parallel Problem Solving from Nature, 1998
9. Read on Slurm scheduler design from: https://slurm.schedmd.com/slurm_ug_2012/SUG-2012-Scheduling.pdf and <https://is.muni.cz/th/c4s5x/thesis.pdf>
10. Read online about Genetic Algorithms and their implementation.
11. Read on why MOO is NP-Hard from:
- “K. Bringmann and T. Friedrich, “Approximating the Least Hypervolume Contributor: NP-hard in General, but Fast in Practice,” Theoretical Computer Science, vol. 425, pp. 104 – 116, 2012”.