ME344 Project Report

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Overview

This covers the discussion of topics: Troubles I've had and lessons learned, Slurm, Container, and Topics in Shesha's Lecture. After the discussion, summarize the points I learned from this course.

Introduction

For almost 8 weeks, I learned lots of things from ME344. Furthermore, there are lots of lessons I learned from this course. Among the lessons I learned from this course, I will discuss the most important four lessons which I felt. First, I will discuss about Topics from Shesha's lecture. Second, I will discuss about Slurm. Third, I will discuss about Container. Then, I will end the discussion with the troubles I've had and lessons learned.

Discussion

I.   Topics from Shesha's Lecture

The main topic of Shesha's lecture was computer architecture. The lecture was started how modern transistor is small. It is smaller than a virus, and how the processor chip changed by these small transistors. After the concept of the size of transistor, latency and the band width were handled in the lecture. By using highway analogy, latency is the speed of the car, and band width is the number of lanes in the highway. By grasping these concepts, memory has various types, and each type of memory has different latency. By using these types of memories, we can get the computer architecture: register-cache-DRAM-Storage. Using kitchen analogy, computation power is a stove, and processing unit is a person who cooks. The register is the side table next to the stove, and cache is the refrigerator. The Dram is a grocery store in neighbor, and Storage is a Costco in town. When the person needs a specific ingredient for cooking, the person will check the side table. If the ingredient is not on the side table, then the person will check the refrigerator. The person will find the ingredient by checking the larger places than the previous steps. These processes are the work-flow of computer architecture. As it takes less time in checking the side table is less than checking the refrigerator, the latency is high for the close memory from the processing unit.

Therefore, these are the discussion of the topics in Shesha's lecture.

II.   Slurm

Slurm is an open-source cluster management system, and job scheduling system on linux cluster. Slurm has three main functions. The first main function is allocating resources to users for specific time, memory, processors, and compute node. The second main function is providing framework for starting, executing, and monitoring jobs in cluster. The third function is managing queue of pending works. Furthermore, Slurm does not need low-level modification such as kernel modification. The advantage of Slurm is that the management of jobs is automated, and permits administrator can manually partition the user's job, and provide more resources for specific jobs or users.

The workflow of Slurm used in this course has three steps. The first step is that the user access to login node. The second step is that the user submit job to compute node by using 'sbatch' command. The third step is compute-node does the submitted job with the manage from Slurm.

These are the discussion of Slurm.

III.   Container

Container is executable units of software in which application code is packaged, along with its libraries and dependencies. Because of this feature container can be executed in any machine regardless of the type of operating system or warehouse system. The advantage of container is virtualizing the operating system which has heavy features such as isolated process and control of the amount of CPU, memory.

Container has similar features and functionality with Virtual Machine. Virtual Machine contains the entire operating system, application, and its libraries, and dependencies. However, container only has application and its libraries and dependencies so that it has lightweight, and can be faster and much easier to portable than Virtual Machine.

These are the discussion of Container.

IV.   Troubles I've had and lessons learned

During the course, there were several troubles encountered in lab and the project. In labs, the major trouble was caused by the typo. In week 1 lab3, automated installation was failed because there were some typos in the /etc/hosts. Furthermore, in week 4 labs, Infiniband was not properly installed to $CHROOT so that IPoIB was not properly installed. Moreover, in week 5 labs, in the process of setting Node Health Check on the cluster, '.conf' files were missing in the command so that NHC was not correctly installed. Finally, the trouble in project 1 is that localhost was not working. The reason is that ssh command for localhost had different FQDN from the address of cluster logged in. After fixing the FQDN of the ssh command, localhost started to work properly.

The common reason of the troubles I've had is typo, and missing steps. By solving typo and missing steps, most of the troubles were solved. The lesson I learned from these troubles is that always be thorough in processing the work and commands. Furthermore, I learned that when the error is created, I need to stop and find the reason of the error in order to solve the error. From the trouble in project 1, I realized that I need to consider which domain/area I am logged in.

Thus, these are the troubles I've had, and lessons from the troubles.

Summary

For 8 weeks, there are various topics about HPC cluster. Among those various topics, I discussed the topics which I felt important and interesting. For interesting topics, topics from Shesha's lecture, Slurm, and Container were discussed. For important topic, troubles I've had and lessons learned was discussed. Thus, from the 8 weeks course, I learned and realized lots of aspects and features of HPC clusters.