1. This program can be run on OSU’s flip server, and I use Mac OS’s terminal to access OSU’s server and run it on.  
   To run my program, be sure to put all my code in same directory, and type “./script.sh” If you encounter permission problem, do this before running the script:  
   “chmod +x script.sh”.  
   Since I did not declare environment variable NUMT and NUMNODES in project\_2.cpp, it would not be able to run by running the cpp file itself because I set this variable in the script file. But if the script is not working on your machine, you can remove the “//” before the define keyword in cpp file.  
   By the way, the script will clear the object file and exe file when everything is finished.
2. A picture containing text, appliance

   Description automatically generated

According to the results I found, the actual volume I believe would be 0.435.

1. Screen shot taken from project2 report.xlsx (which is included when turning in)

Chart, line chart

Description automatically generated

1. Speed is getting faster when threads are added. But there are things that requires attention: NUMNODES affects the speed, especially when NUMNODES is 600, there is a great speed falling comparing with NUMNODE is 500, then speed looks stable when more NODES are added.
2. I cannot say what exactly causing such problem, but I am guessing that they may encounter cache issues that causes many threads have to wait.
3. S = 16.44/4.02 = 4.09

Fp = 8/7 \* (1 – (1/4.09)) = 0.863

1. Smax = 1/(1-Fp) = 1/(1-0.863) = 7.3