Load Balancing Proposal for Reducing Runtime in Multiprocessed Environments

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Presentation Script

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Summary

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1. Introduction

- One of the hardware components that presented a huge evolution was the processor;
- Most of the time there is a concern with the load unbalance generated by certain applications;
- Faced with this problem is that load balancers are developed aiming at an equilibrium of loads on the processors.

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2. Goal

- This paper presents a proposal for a new load balancer for reducing the execution time of parallel applications executed in multiprocessed environments.

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3. SmartLB

- Was created over improvements in the strategies used in GreedyLB and RefineLB algorithms;
- Balance the loads between processors reducing the number of migrations;
- The implementation uses a centralized approach;
- It adopts a threshold to define the acceptable load unbalance, reducing the number of migrations.

3. SmartLB

Implementation of the SmartLB algorithm:

```
1   PM = getCargaMaior();
2   Pm = getCargaMenor();
3   if((Pm/PM) > Threshold) {
4       for(i = 1; i <= nTarefas; i++) {
5           if(getProcessadorAtual(i) == PM) {
6               ct = getCargaTarefa(i);
7               D = PM - Pm;
8               if(ct <= D) {
9                   migrarProcesso(i, PM, Pm);
10                  PM = getCargaMaior();
11                  Pm = getCargaMenor();
12              }
13          }
14      }
15  }
```

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4. Methodology

- The benchmark used to perform the tests was the lb_test;
- The plataform used to execute the tests:
  - **Processor:** Intel i7-6500U.
  - **Operacional System:** Linux Ubuntu 16.04
  - **Kernel:** 4.4.33-1.
  - **Charm ++:** 6.5.1.
  - **g++:** 5.4.1.

4. Methodology

- To perform the tests, the three balancers were applied to a simulation using 150 iterations per task;
- The load balancer synchronizations were defined every 10 iterations;
- The number of chares varied from 50 and 100 tasks;
- With a computational load that can vary between 1500 and 150000;
- During the tests, we took into account the total execution time and the total of objects migrated between the processors.

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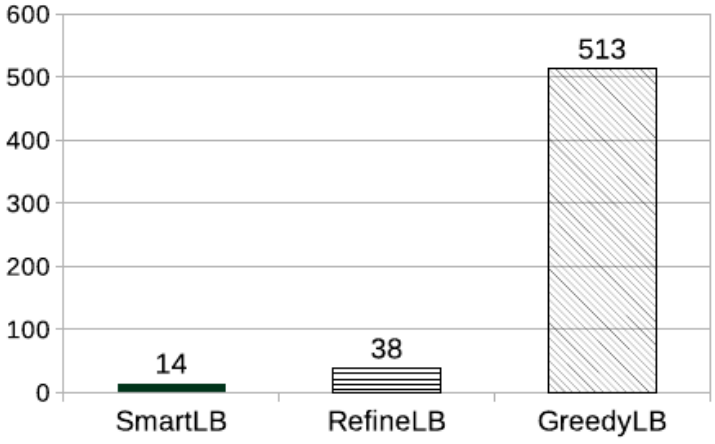
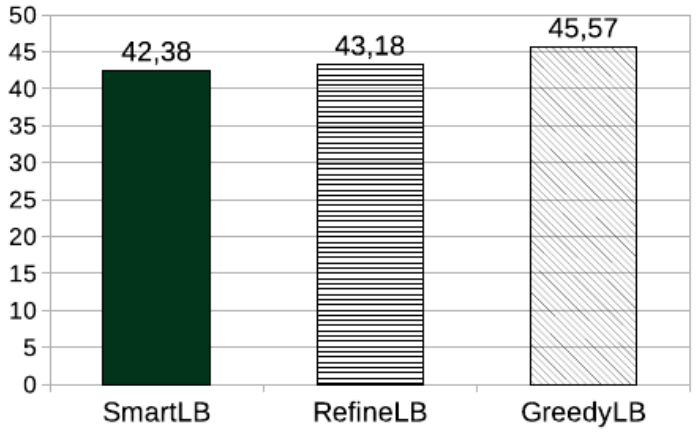
5. Results

- Test results using benchmark lb_test with 50 tasks:



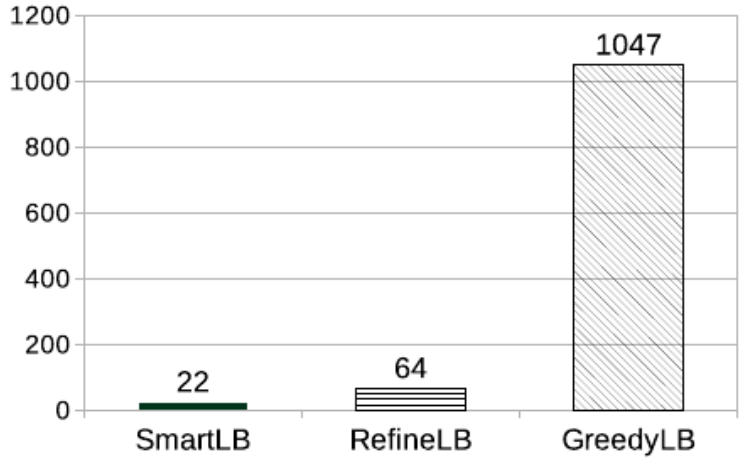
Total migrated tasks



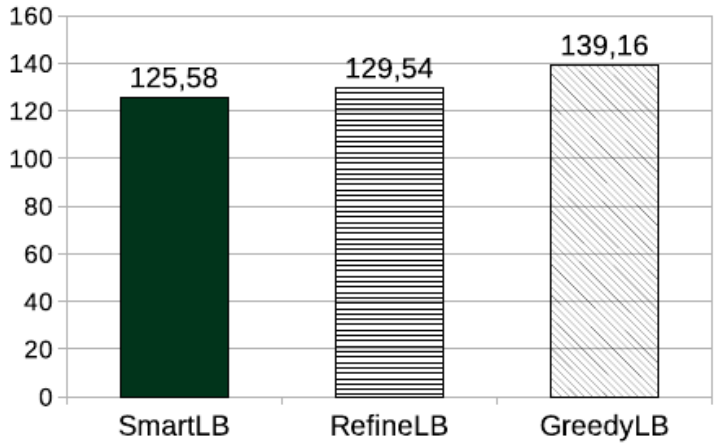
Total execution time (s)

5. Results

- Test results using benchmark lb_test with 100 tasks:



Total migrate tasks



Total execution time (s)

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6. Conclusion

- Comparing the results, we conclude that SmartLB showed a better performance in object migrations;
- The Load Balancer is performing a good control of migrated objects, avoiding waste and collaborating for agile and precise load balancing.

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7. Future Works

- To realize improvements in the algorithm SmartLB aiming to manage even more the control of migrations of tasks;
- Perform tests on large parallel machines in order to solve real problems.

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Thanks!

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