GROUPLB: Load Balancer Proposal to Reduce the Execution Time of Parallel Applications

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WSPPD - 2018

Agenda

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- Goal
- GroupLB
- Methodology
- Results
- Conclusion
- Future Works

Introduction

- **Processor** is one of the hardware component that present more evolution
- There is an effort to improve applications **load balance**
- **Load balancing algorithms** have been developed aiming to achieve a better load balance between all cores/processors

Goal

We propose a new **load balancing algorithm** to **reduce multicore** applications' **execution time.**

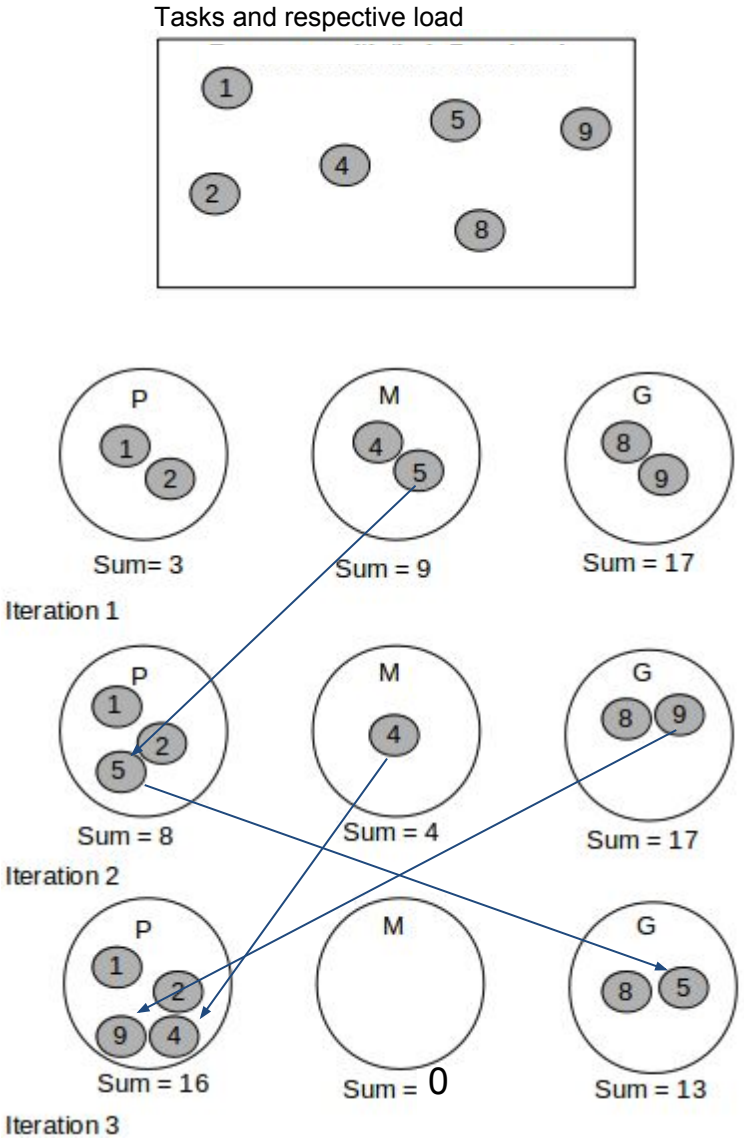
GroupLB

- We extend **AverageLB** and **SmartLB** load balancing algorithms.

- Our strategy divides tasks according to the computational loads into three groups:
  - **SMALL**
  - **MEDIUM**
  - **LARGE**

GroupLB

- An example of execution with:
  - 6 tasks
  - 2 cores
- Tasks are divided in three groups:
  - **SMALL**
  - **MEDIUM**
  - **LARGE**



Methodology

- To validate our algorithm we use the following **platform**:
  - **Intel Core i7** processor **- 8 physical cores**
  - **Linux operating system Ubuntu** 16.04
    - kernel version **4.4.33-1**
  - **Charm++** version 6.5.1
  - **g++** version 6.2.1

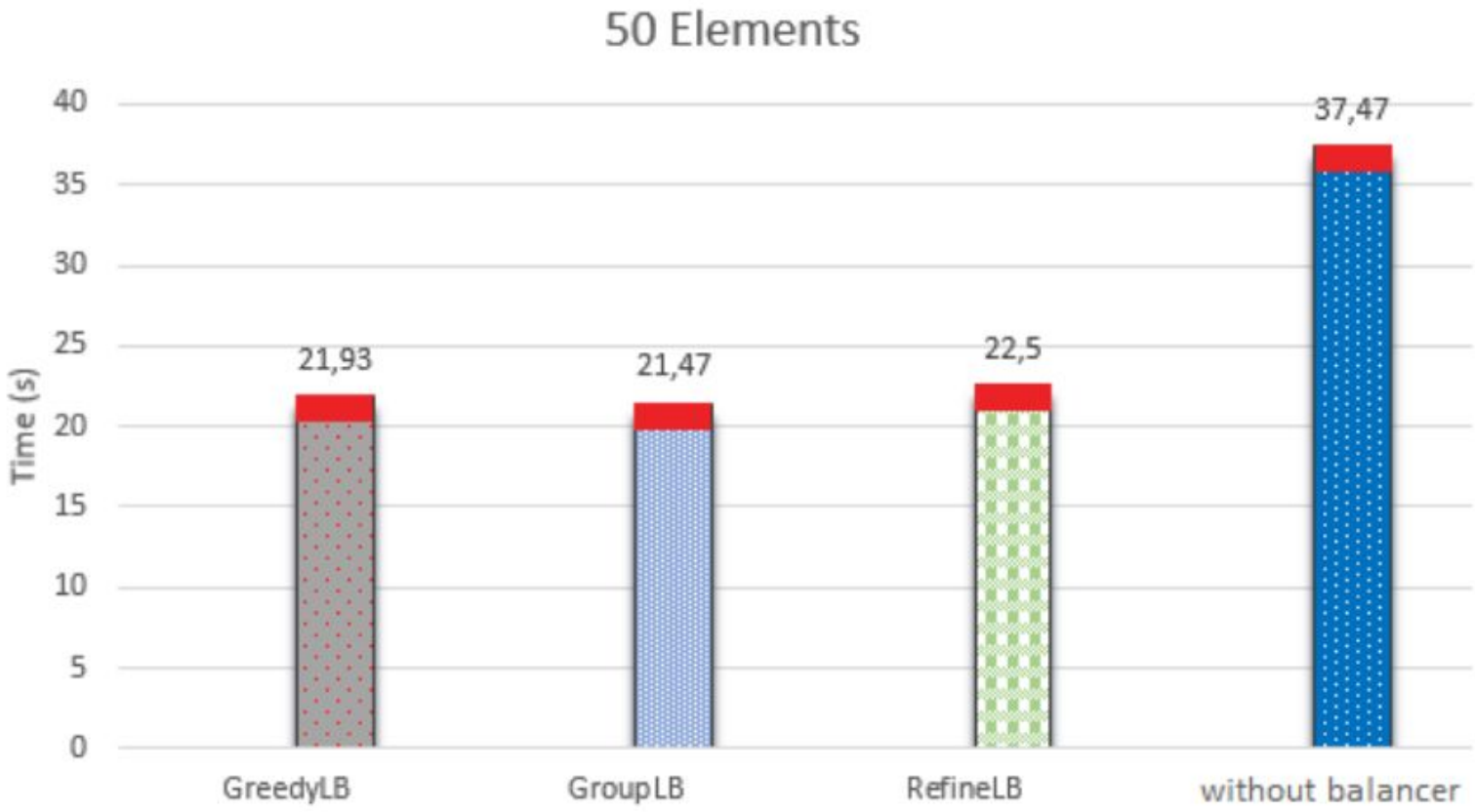
Methodology

- **benchmark lb_test**
  - **50**, **150, 250** and **350** tasks
  - computational load between **1500** and **150000** ms
  - **150** iterations per task
  - load balancer synchronizations - every **10** iterations

- Metric
  - **execution time**

Results

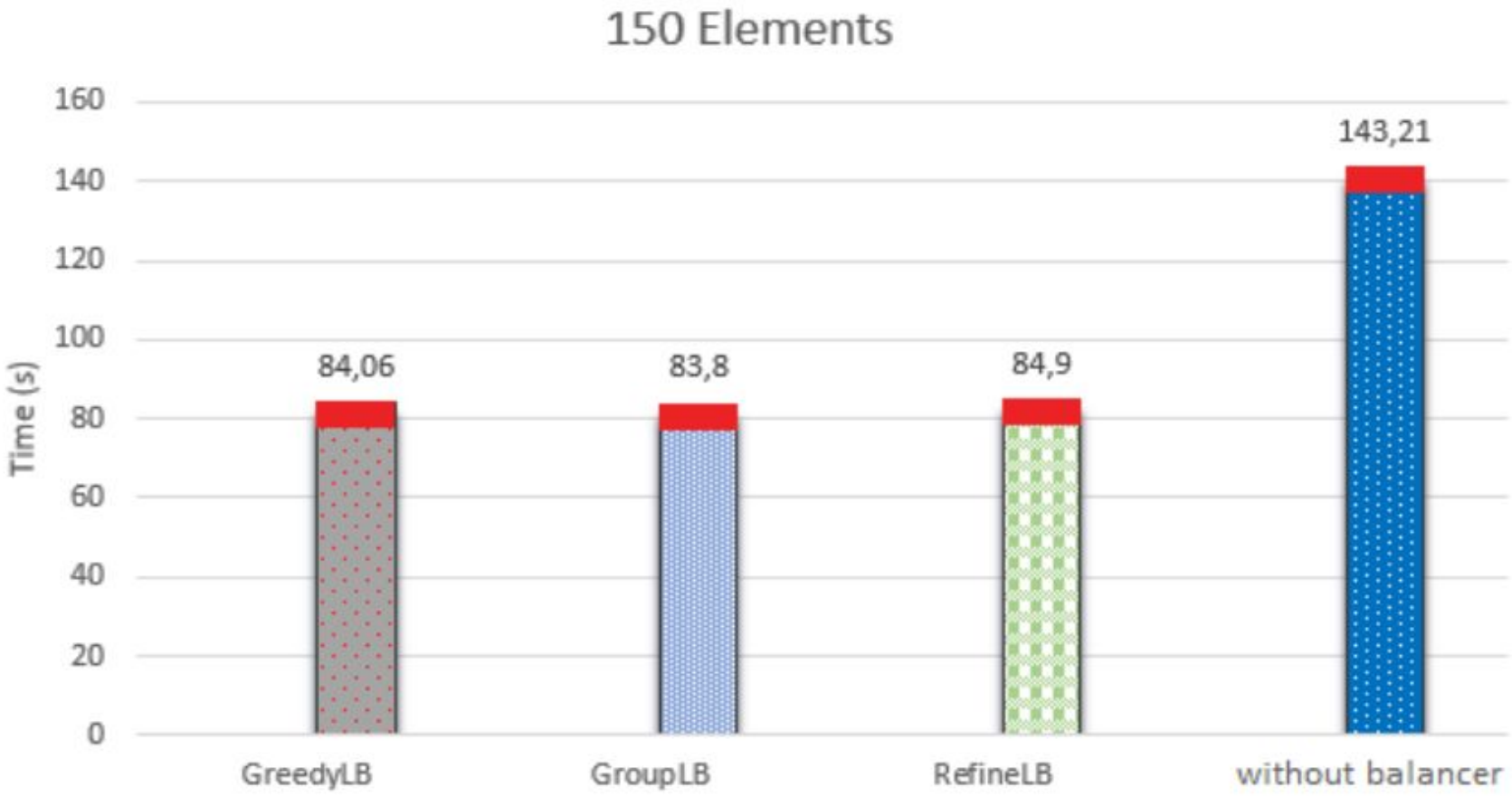
- benchmark lb_test:



- 50 tasks - performance improvement by
  - 37.47% compared to **without LB**
  - 4.58% and 2.09% compared to **REFINELB** and **GREEDYLB**

Results

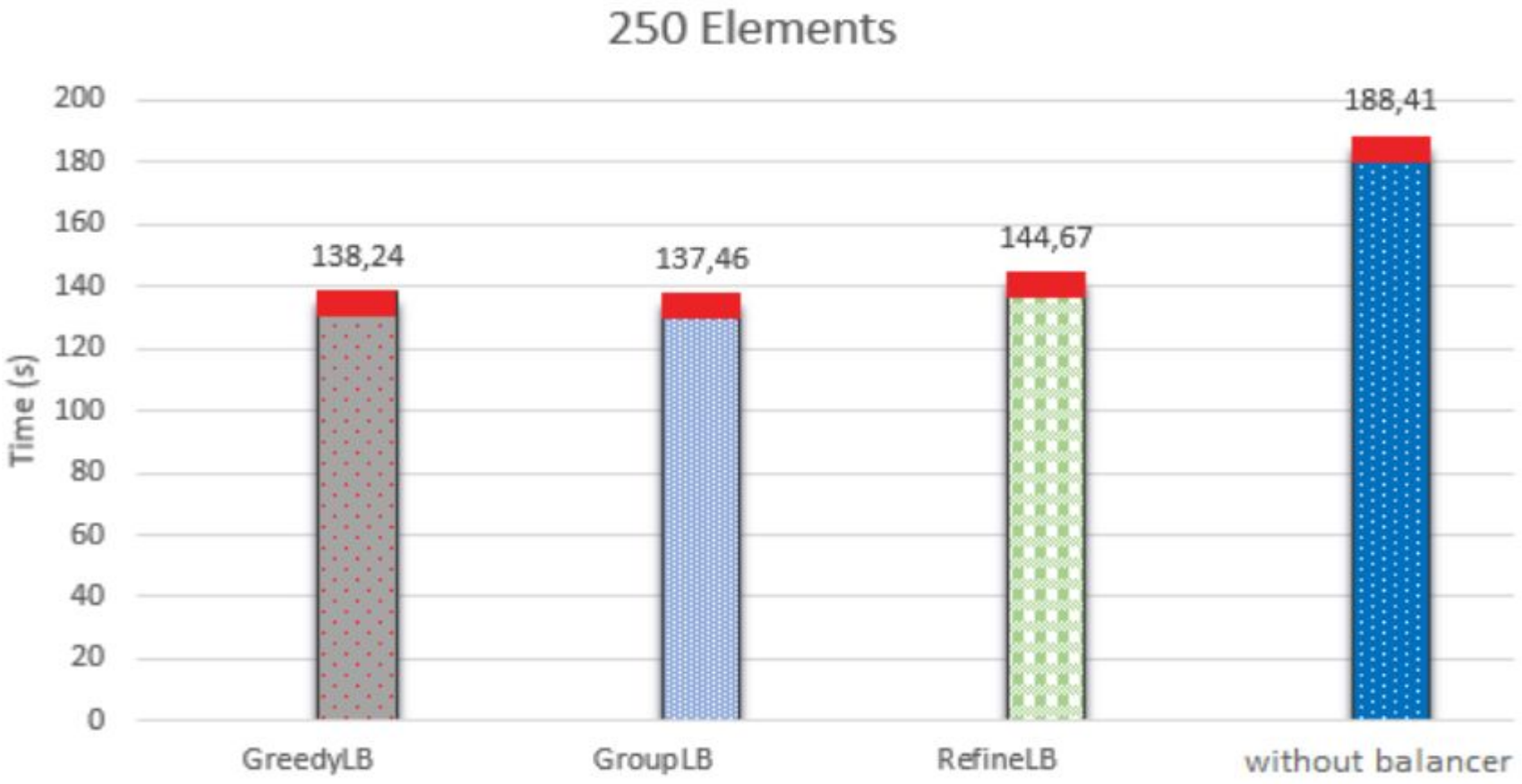
- benchmark lb_test:



- 150 tasks - performance improvement by
  - 41.48% compared to **without LB**
  - 0.3% compared to **REFINELB** and **GREEDYLB**

Results

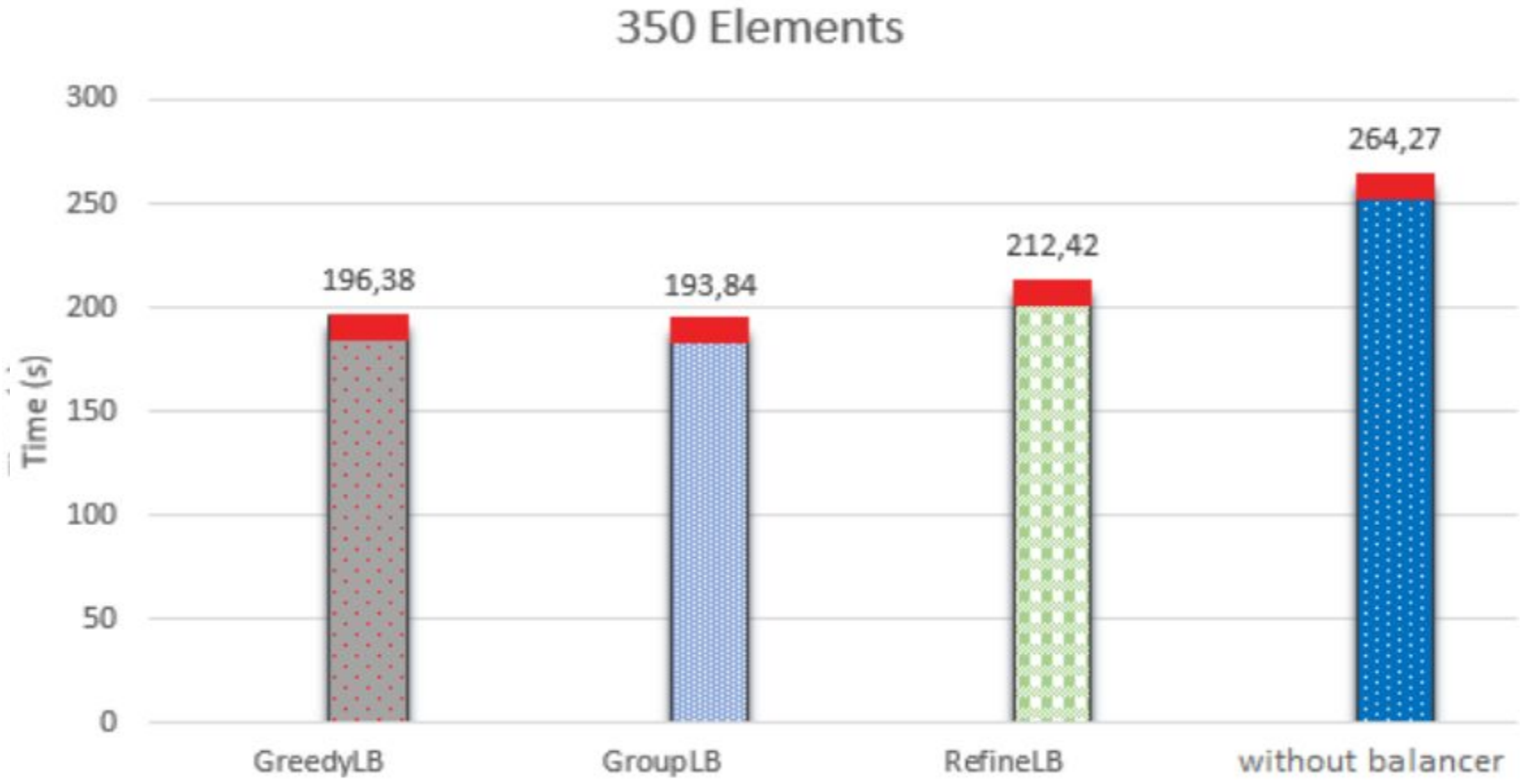
- benchmark lb_test:



- 250 tasks - performance improvement by
  - 41.5% compared to **without LB**
  - 1.3% and 0.30 % compared to **REFINELB** and **GREEDYLB**

Results

- benchmark lb_test:



- 350 tasks - performance improvement by
  - 27.05% compared to **without LB**
  - 4.98% and 0.56 % compared to **REFINELB** and **GREEDYLB**

Conclusion and Future Work

- The results achieved with our proposed LB showed

- The Load Balancer is performing a **good control** of migrated objects, avoiding waste and collaborating for a **more precise load balancing**

- As future works, it is intended to perform tests in parallel systems, using other benchmarks and real problems of scientific computation - **TCC's Giovani Lizot**

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Thanks

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