Barcelona Supercomputing Center
Centro Nacional de Supercomputación

DLB: Dynamic Load Balancing Library

BARCELONA SUPERCOMPUTING CENTER

A LIBRARY TO IMPROVE THE PERFORMANCE OF HPC APPLICATIONS

TECHNOLOGY DESCRIPTION

DLB aims at optimizing the performance of hybrid applications without a previous analysis or modifying the code.

DLB will improve the load balance of the outer level of parallelism by redistributing the computational resources at the inner level of parallelism. This readjustment of resources will be done dynamically at runtime.

This dynamism allows DLB to react to different sources of imbalance: Algorithm, data, hardware architecture and resource availability, among others.

DLB IS A LIBRARY DEVOTED TO SPEED UP HYBRID PARALLEL APPLICATIONS AND MAXIMIZE THE UTILIZATION OF COMPUTATIONAL RESOURCES SINCE 2009

THE EFFICIENT UTILIZATION OF COMPUTATIONAL RESOURCES IS CRUCIAL FOR HPC APPLICATIONS AND HPC SYSTEMS

AREAS

HIGH PERFORMANCE COMPUTING | PARALLEL PROGRAMMING | LOAD BALANCING

Human Brain Project
EBRAINS
Co-funded by the European Union

COMPETITIVE ADVANTAGES

A dynamic library transparent to the user:

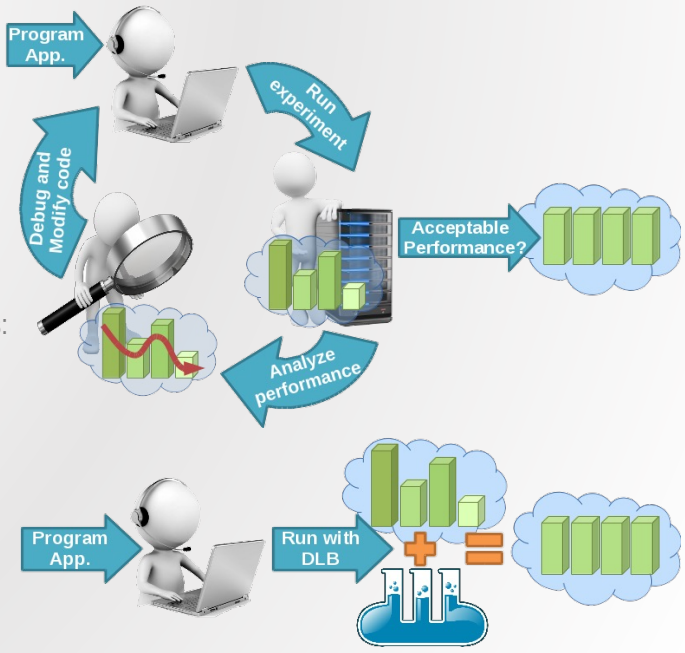
- No need to analyze nor modify the application.
- Transversal to the different layers of the HPC software stack.
- Compatible with MPI, OpenMP and OmpSs.

Maximizes the utilization of computational resources:

- Obtaining an efficiency close to 100%

Improves the load balance of hybrid applications resulting in:

- 2x times speed up with DLB simulating the particle transport in the human respiratory system up to 16k cores using Alya
- 5x times speed up of a relational databases process using DLB with Cybeletech



DLB MAXIMIZES THE UTILIZATION OF COMPUTATIONAL RESOURCES

APPLICATION & MARKET POTENTIAL

HPC applications: Aiming at obtaining the maximum efficiency from the computational resources

Parallel programming models and resource managers: to coordinate with other layers of the software stack

System administrators: Specially of many-core systems to maximize the utilization of the system

Hybrid applications: To address load imbalances at the outer level of parallelism

REFERENCES

- Current stable version 2.0.2 released on October 2018
- Used in several EU projects (TEXT, Mont-blanc3, HPCEurope3, Human Brain Project, EOCOEII)
- Used by spin-off ELEM Biotech
- Collaboration with Cybeletech company

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TECHNOLOGY READINESS LEVEL

1 2 3 4 5 **6** 7 8 9

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