



HPC BRAZIL FORCE

IndySCC-SC25



Team Members



Julio Avelar

Major: Computer Engineering

About: Interested in computer architecture, digital systems design, and HPC. Research focuses on scalable verification and categorization of open-source RISC-V processors.



UNICAMP



Léo Hardt

Major: Computer Science

About: His focus on complexity analysis and testing strengthens the reliability and quality of our solutions.



UFRGS



Luiz Lago

Major: Computer Science

About: With a strong interest in programming competitions, he is recognized for his extensive professional experience with enterprise servers, and leads the team's training initiatives.



Universidade Federal de Santa Maria
1960



Mariana Fernandes

Major: Computer Science

About: Research in concurrent systems testing. Interested in high-performance green computing. Already working in the technology area with experience in debugging.



UFRJ



Mariana Padilha

Major: Computer Science

About: Interested in IoT and HPC. Her research focuses on flow simulation in porous media using Fortran, OpenMP/C, and CUDA.



Universidade Federal do Pampa



Pedro Conrado

Major: Computer Science

About: Interested in HPC, distributed processing, task scheduling, and machine learning. He currently works with cloud-based distributed systems.



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Team Presentation

Our team brings together the **diversity** of different regions and universities from across Brazil making our team truly unique. Moreover, All members share a **solid background** in **competitive programming** from local to Latin American competitions and the **ability** to perform under pressure.



SST Execution

- OS: Ubuntu 24.04.3
- Kernel 6.14.0
- Clang 18.1.3
- LLVM 18
- RISC-V 2.45
- Cmake 3.28.3
- OpenMPI 4.1.6



Ubuntu 24.04.3 | Rocky 9.6

Test	Ubuntu	Rocky
Sysbench Memory	5231.72 MB/s	5371.50 MB/s
Sysbench Memory Latency	3716.91 ns	3112.06 ns
Sysbench CPU (events/s)	1363.83	1338.23
Sysbench CPU Latency	9997.85 ms	9997.03 ms

Ubuntu has similar performance to Rocky Linux on JS2.
Ubuntu: newer packages and a more recent kernel (6.14 vs. 6.11).

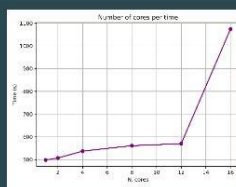
ECE Execution

- OS: Ubuntu 24.04.3
- Kernel 6.14.0
- GCC 13.3.0
- Python 3.12.3
- Cmake 3.28.3
- OpenMPI 4.1.6
- CUDA 11.8



Scaling & Build:

Tests with different core counts showed that execution time increased as more cores were used, even when cores were pinned to minimize OS scheduling effects. During compilation, several ExaGeoStatCPP dependencies failed or took too long to build, so pre-packaged libraries from the distribution were used whenever possible.



Team Preparation

- Our team is organized into **two sub-teams**, each focusing on distinct tasks.
- We hold **weekly meetings** with both groups to discuss progress, share insights, and plan next steps.
- Our strategy involves testing multiple environment setups, configurations, and optimizations to identify the ones that deliver the best performance.
- A key part of our approach is to find the **bottle neck** in each program and try to **optimize it**.

Resource Management

- Management of cloud resources through **OpenStack CLI**.
- Hardware monitoring techniques to ensure we are using the maximum potential of the machines.
- Development of Custom Scripts to instantiate multiple VM's quickly and reliably.
- Evaluation of different combinations of **file system**, **OS distribution** and **compiler flags** to get the best performance;

Advisors



Caleb Bianchini

Major: Computer Science

About: Researcher with over two decades of experience in HPC research and development, organizer of Brazilian parallel programming contests, and author of a notable HPC textbook.



Rogério Lope

Major: Physics

About: Researcher with over 25 years of experience in the design and development of Linux-based high-performance computing (HPC) systems, collaborating with Caltech on SC conference data transfer demonstrations.



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